ArcNews

Esri | Winter 2013/2014 | Vol. 35, No. 4

The Relevance of Cartography

By University Professor Dr. Georg Gartner, President
International Cartographic Association

In the geospatial domains, we can witness that more spatial data than ever is produced currently. Numerous sensors of all kinds are available, measuring values; storing them in databases, which are linked to other databases being embedded in whole spatial data infrastructures; following standards and accepted rules. We can witness also that we are not short of ever more new modern technologies for all parts of the spatial data handling processes, including data acquisition (e.g., unmanned aerial vehicles currently), data modeling (e.g., service-oriented architectures, cloud computing),

continued on page 6

ArcGIS for Desktop Now Includes ArcGIS Online Subscription

Every ArcGIS for Desktop user can now publish maps, tools, and data to ArcGIS Online and turn desktop GIS into a web GIS.

You may be thinking to yourself, I work on the desktop; does web GIS do anything for me? The answer is yes. ArcGIS for Desktop is the premier application for authoring authoritative content and includes many tools for conducting spatial analysis and generating useful information products. ArcGIS Online provides desktop users with a wealth of maps, data, and services to supplement their own content and speed up their projects. Turning a desktop GIS into a web GIS is the best way to share work with non-GIS users.

To help you get started, every Esri customer that had ArcGIS for Desktop received one ArcGIS Online subscription at no additional cost earlier this year. For each ArcGIS for Desktop license that's

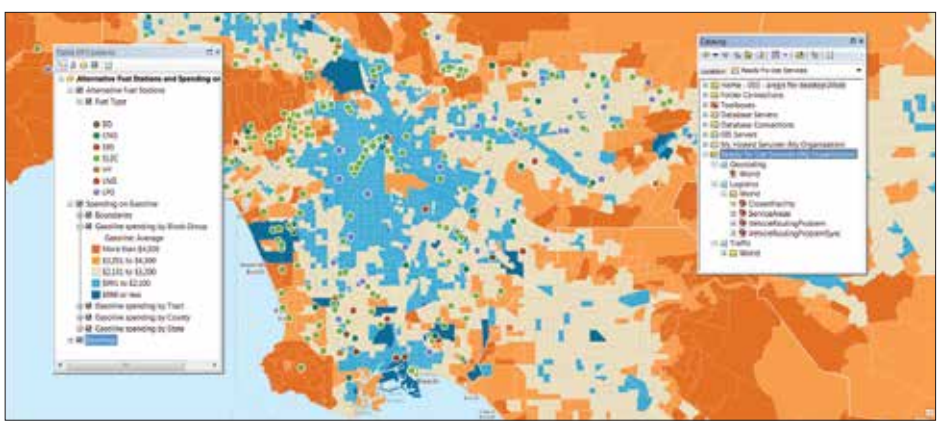
continued on page 2

GIS Accelerates Big Data Discovery

Social Media Content Fuels Big Data Analytics for Esri and IBM

Opinionated consumers, take heart. Your Tweets are being read by people very important to you—the manufacturers of the products you buy. An exciting experiment recently pooled the knowledge of many disciplines to analyze your opinions buried in big data from the Twitterverse. Twitter content is now being mined and is used in analytics methodologies developed by Esri, IBM, and various stakeholders in the big data struggle. Recently, that collaboration kicked off a new era of research that combines Esri technology with IBM's linguistic and psychological analytics to decode virtual galaxies of information.

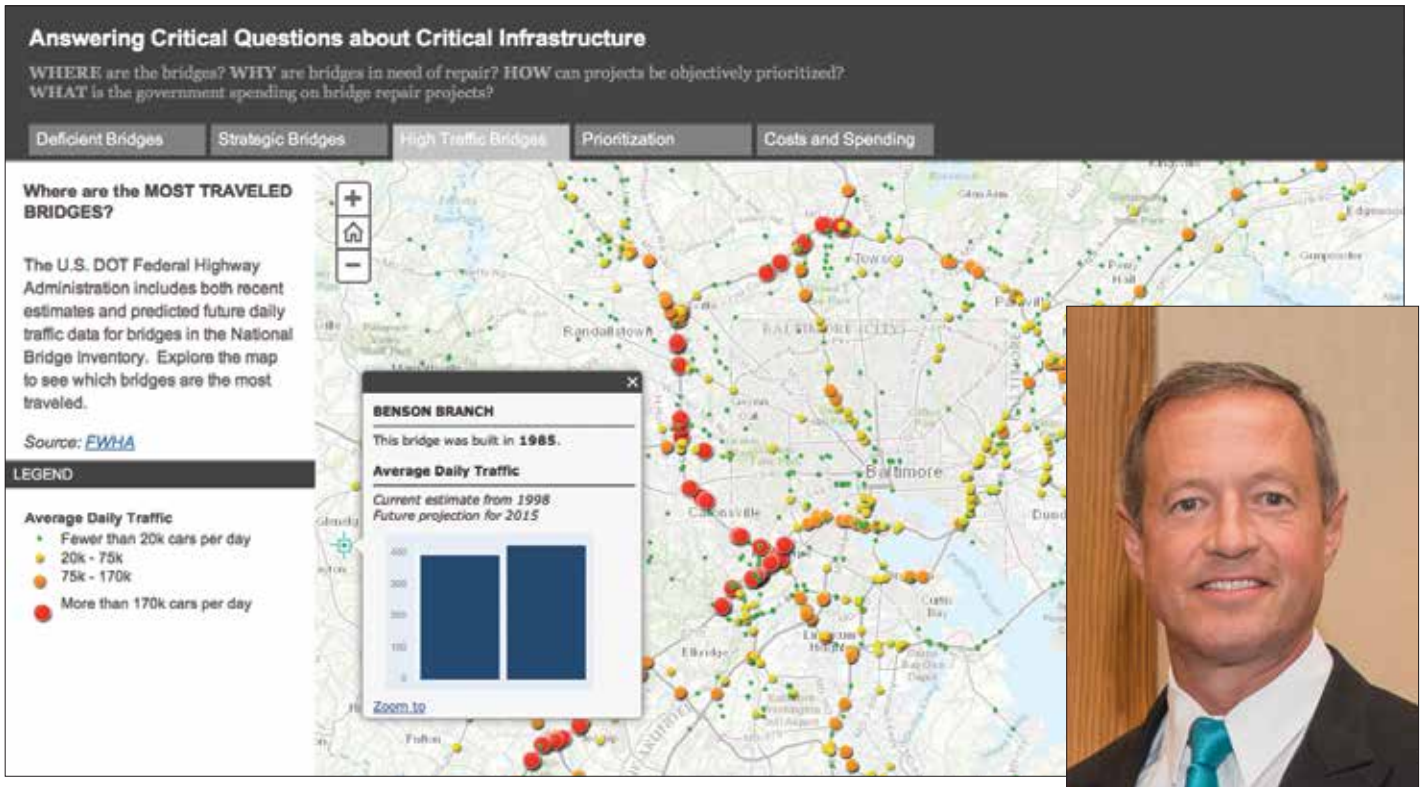
continued on page 3



Desktop users have easy access to ArcGIS Online tools, such as geocoding and network analysis services.

Technology Provides the Tools

Governor O'Malley Calls for Results-Driven Government



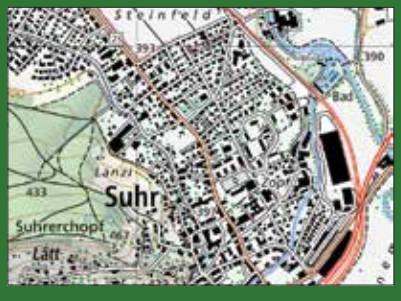
Above: Showing which bridges are most traveled in and around Baltimore, Maryland, from Esri's Bridge Infrastructure Maps app [esriurl.com/bridgeapp], the newest version of the bridge app described by Governor O'Malley in this article. **Right:** Governor O'Malley at the NASPAA Annual Conference in Washington, DC. (Photo: MDGovpics.)

In October, Maryland Governor Martin O'Malley addressed the Network of Schools of Public Policy, Affairs and Administration (NASPAA) Annual Conference in Washington, DC. He emphasized governments' need to measure performance. In this abbreviated version, he explains how GIS supports it.

There are a lot of things that are right about our country. But we also have to acknowledge that middle-class American families are earning no more now than they were in 1989. How do we fix this?

continued on page 4

ArcGIS Fully Automates Cartography and Dramatically Improves Efficiency.



See the national mapping poster on pages 20–21.

ArcGIS for Desktop Now Includes ArcGIS Online Subscription

continued from cover

Highlights

- Web GIS is the best way for GIS professionals to share ArcGIS for Desktop work with non-GIS users.
- With web GIS, ArcGIS for Desktop users can share maps on consumer devices, like smartphones and tablets.
- Get apps and templates with online subscriptions.

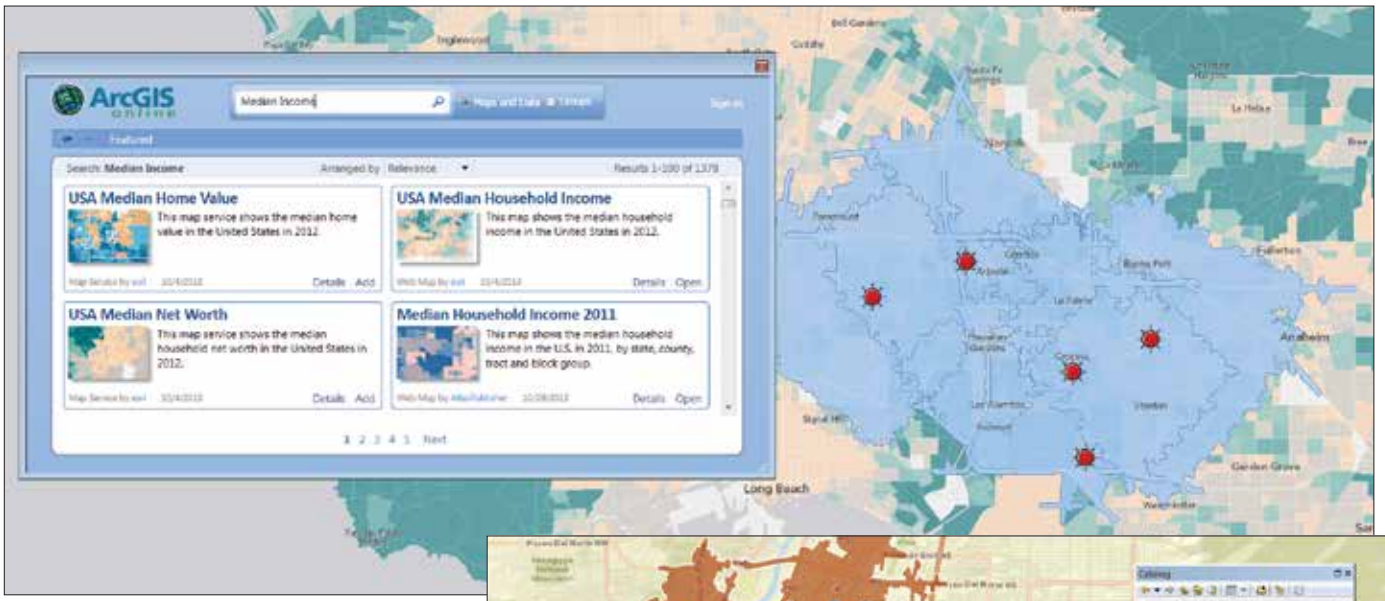
current on maintenance, you are now entitled to one ArcGIS Online named user and 100 service credits each time you renew (see what a service credit is worth at esri.com/agolcredits).

You Also Get Apps and Templates with Your Online Subscription

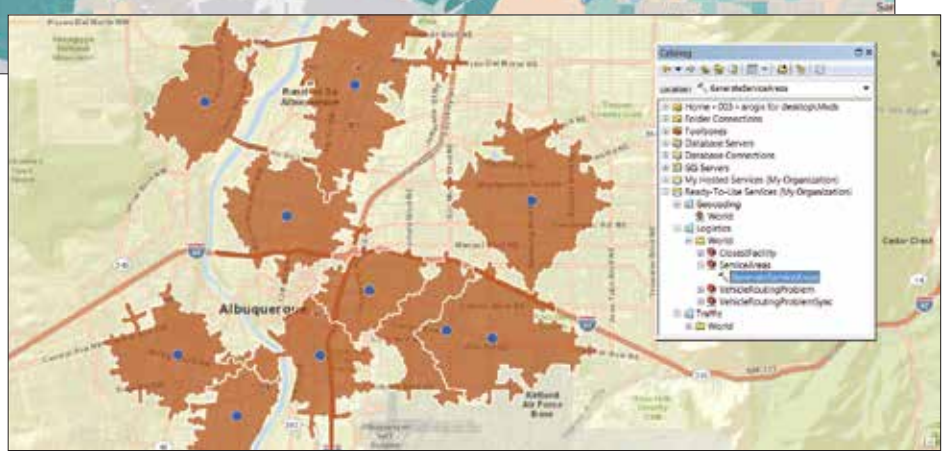
This web GIS implementation of the ArcGIS platform enables you to quickly organize all your content and users and easily share your work. It also gives you access to all the additional productivity apps, such as Collector for ArcGIS, Operations Dashboard for ArcGIS, Esri Maps for Office, Esri Maps for SharePoint, and web application templates in ArcGIS Online.

Collector for ArcGIS is a native, configurable app for iOS and Android devices. This app enables fast, straightforward field data collection on smartphones and tablets. Operations Dashboard brings together a common view of systems and resources you manage, and you can monitor real-time data feeds for large-scale events or day-to-day operations. Web app templates in ArcGIS Online, such as story maps, allow you to quickly build useful and attractive maps and other information products that you can easily share and that are tailored to your organization's needs without writing any code.

As a GIS professional, you play a critical role as a curator of content. In this role, you understand how to organize, manage, and share geographic data with your organization and beyond. You are accustomed to creating and managing your own authoritative data. ArcGIS makes it easier to organize and share that data with the rest of your organization. In addition to improving your capabilities with your own data, Esri also provides you with ready-to-use content and services that augment your internal offerings via ArcGIS Online.



Desktop users can tap into ArcGIS Online ready-to-use map services.



Desktop users can share their content and tools through ArcGIS Online.

A Word About Content

When you need up-to-date information at your fingertips, sometimes you find that you don't have what you need to answer basic questions. For example, drive-time analysis requires current street data and a network dataset. In the case of a natural disaster, you may need updated satellite imagery. When trying to decide where a new facility should be located, you need current demographic information. This kind of information is now provided through the ArcGIS platform.

ArcGIS comes with an amazing collection of authoritative, best-of-breed content. This includes a suite of basemaps with varying levels of cartographic detail; a diverse collection of imagery; demographic and lifestyle maps; real-time traffic and weather; and scientific maps that look at things like land use, terrain, and soils.

Web GIS supports apps on any device.

Web GIS is the best way for GIS professionals to share ArcGIS for Desktop work with non-GIS users. People are eager to use maps but are not necessarily ArcGIS for Desktop experts. In fact, people expect to be able to find and use maps right from their own consumer devices, like a smartphone or tablet. People also expect to be able to take maps and use them as a starting point for their own creations and purpose. Web GIS enables all this, and now as an ArcGIS for Desktop user, you have the ability to take the lead in your organization. You have the power to create interesting and useful content, tell amazing and compelling stories, and share those stories in informative and novel ways.

To learn more, visit esri.com/webgis.

Featured in This Issue

Regular Columns and Departments

Editor in Chief
Thomas K. Miller

Graphic Designer
Takeshi Kanemura

Illustrator
Daniel Gill

Founding Editor
Karen Hurlbut

***ArcNews* Subscription Additions or Deletions and Changes of Address**
To subscribe to Esri publications, visit esri.com/subscribe. To unsubscribe from Esri publications, visit esri.com/unsubscribe. Requests for back issues, missed issues, and other circulation services may also be sent via requests@esri.com; 909-793-2853, extension 1-2778; or faxed to 909-798-0560. To update your mailing address, visit esri.com/coa or use any of these e-mail, phone, or fax options. Outside the United States, please contact your international distributor to subscribe, unsubscribe, or change your address. For a directory of distributors, visit esri.com/distributors.

How to Reach *ArcNews*
Tel.: 909-793-2853, ext. 1-1660

Article submission guidelines/advertising information:
esri.com/arcnews

ArcNews
Esri
380 New York Street
Redlands, CA 92373-8100, USA
tmiller@esri.com

See *ArcNews Online* at
esri.com/arcnews

ArcNews (ISSN 1064-6108) is published quarterly by Esri at 380 New York Street, Redlands, CA 92373-8100, USA. *ArcNews* is written for the Esri user community as well as others interested in mapping and geographic information system (GIS) technology. It contains material of interest to planners, foresters, scientists, cartographers, geographers, engineers, business professionals, and others who use spatial information.

GIS Accelerates Big Data Discovery

continued from cover

Highlights

- GIS is used to study big data at IBM research facility.
- Proof-of-concept Esri map displays Twitter data analysis for gauging brand sentiment.
- Monitoring Twitter activity demonstrated the scope of a defective clothing recall.

Mapping Social Media

We're bursting at the proverbial seams with data. Never have more IT gurus agreed so widely that data obesity is the biggest threat to human progress if we don't gain control of it soon. Taming big data requires the invention of new techniques to better understand the monster through analytics and visualization.

For years, social media has provided a rich source of data in Esri maps. In 2011, Esri launched the Japanese earthquake map—a proof-of-concept map that contained Twitter feed data composed of millions of Tweets from Japan. Tweets following the 9.0 Honshu earthquake helped reveal where resources were needed in the crisis. Since then, it has become commonplace to enrich maps with this social media content. Last year, Esri officially entered the big data space by integrating big data workflows into ArcGIS and launching a number of open-source projects on GitHub, including GIS Tools for Hadoop, that infuse big data with geospatial capabilities.

Monitoring Brand

Social media's high volume, variety, velocity, and veracity meet the defining four characteristics of big data. With more than 500 million Tweets and 3.5 billion "Likes" a day, social media is a perfect example of an extremely large and noisy data source. Within all that chatter, Twitter users share various opinions about their tastes. Filtered from the noise, those opinionated Tweets become a potential window into the buyer mind.

In collaboration with IBM Research Almaden's Accelerated Discovery Lab—a state-of-the-art facility for researching big data analytics across a variety of industries and domains—Esri built an interactive proof-of-concept map called the Social Monitor that uses Tweets and geospatial technology to understand customer sentiment and focus brand management.

"Just like GIS, big data analysis starts by asking the right questions," says Jack Dangermond, Esri president. "Through analytics, we extract the answers to help organizations know their customers better. The joint Esri/IBM Social Monitor demonstration combines GIS with the latest research in that area."

Decoding the Decahose

That Tweets are rich with consumer sentiment would explain why Twitter commoditized its daily user output back in 2010. Since then, Twitter has been licensing its Tweet streams so that companies and their consultants can pan gold from them. To begin its social media analysis, IBM licensed a Decahose of Twitter content (10 percent of daily Tweets) from a third-party reseller.

Could all that customer sentiment be monitored in a brand management tool for, say, clothing retailers? Equipped with the tools to analyze Tweets through multiple lenses, researchers at the Accelerated Discovery Lab plunged into an inaugural project to answer that intriguing question. For the Social Monitor demonstration jointly built with Esri, eight nationwide clothing retailers were chosen to be represented during March 2013.

To build the Social Monitor demonstration, an Esri developer visited the lab for a day to work side by side with the IBM researchers. All software, data, and expertise were available for his use. Using Portal for ArcGIS and ArcGIS for Server, Esri produced an interactive map application that visualized Twitter user data by location and time. This helped the lab identify patterns in the Tweets and provided insights about demographics and consumer type. IBM's social media analytics decoded sentiment, location, and psycholinguistic attributes to gauge retailer image according to region. Summary information about Tweeters not included in Tweets, including gender and personality traits, is all inferred by the Accelerated Discovery Lab's algorithms and is displayed on the bottom of the map. Participating brands can be selected on the pull-down menu, making it easy to compare Tweet mentions and customer characteristics between different retailers. For an even more granular perspective, the results of the lab's psychological analysis runs concurrently with demographics data from Esri Tapestry data. Being able to tease out data on an individual level that considers the intrinsic traits of buyers gives brand managers an extremely powerful customer relations management tool.

Scope of a Crisis

It was a week that felt like forever to one clothing retailer included in the Social Monitor experiment. Last year, the company was barraged with complaints about a defect in a signature line of clothing.

Predictably, Tweet activity mentioning the brand increased in certain areas of the United States, the locations of which are represented on the map in the Social Monitor. Displaying those Tweets geographically revealed consumer reaction to the defect by region, demonstrating the power of social media analytics to deliver real-time information for more immediate brand management.

"GIS can help identify the scope of a problem," says Mary Roth, research staff member and data integration expert at the Accelerated Discovery Lab. "Coupled with our analytics, Esri can quickly determine where the flurries of Tweets are coming from. If it's just from Rhode Island, for instance, the geoprocessed data will show that the problem is local rather than national. That information ultimately saves cost in response."

The Social Monitor demonstration is a simple and effective way of displaying analysis results extracted from Twitter feeds. Once this information is understood, brand managers can drill deeper into the data by studying Tweeters' personalities and demographics. Data displayed in the map is provided without compromising user privacy and gives companies a more thorough understanding of their customer bases. With that knowledge, they can tailor brand image and respond to negative situations faster and with more focus.

Big Data Analytics for Everyone

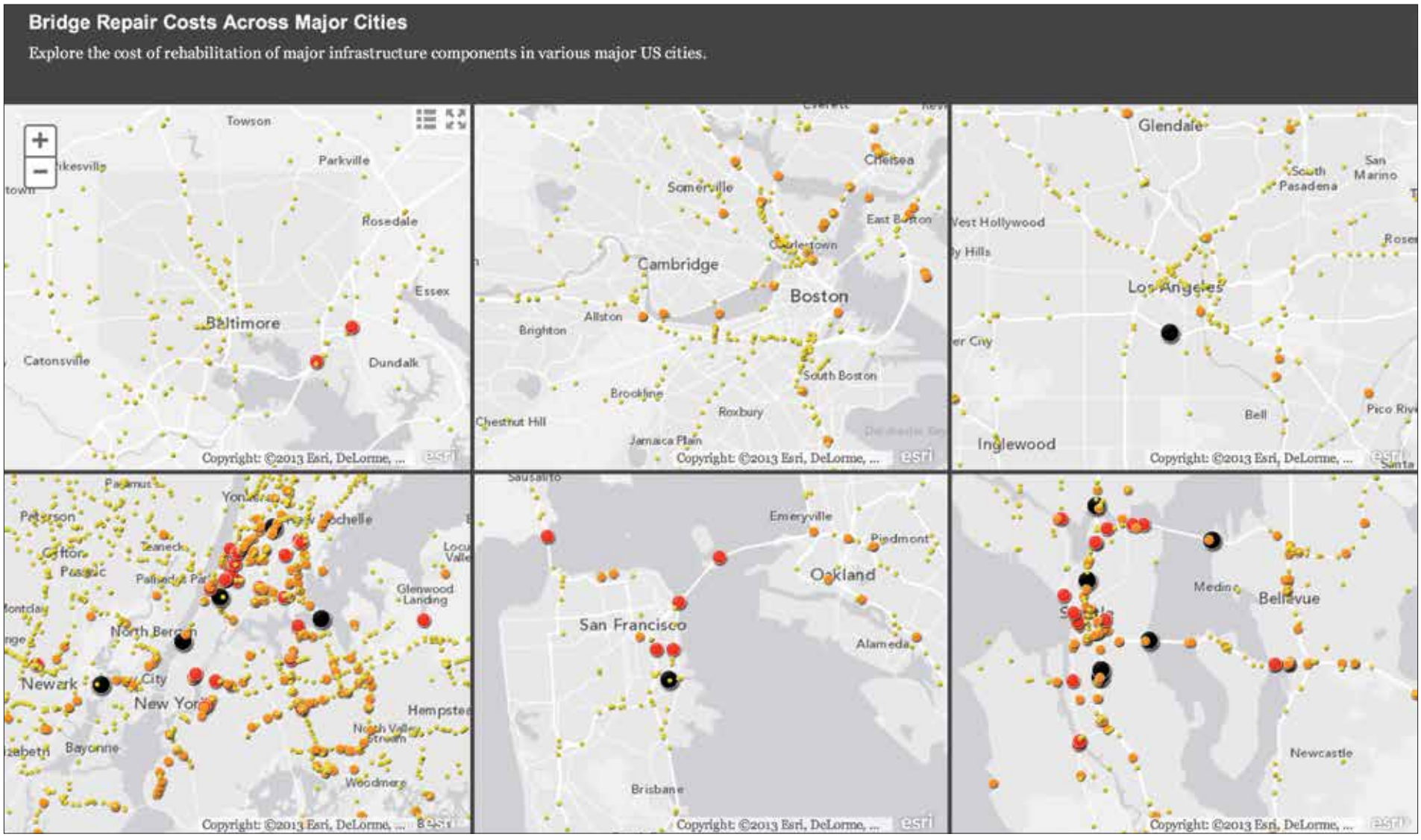
Although intimidating, the data deluge opens new opportunities for research not possible before with old, piecemeal analytics. The Social Monitor is just the tip of the iceberg in the quest for better data science. Esri and IBM are currently devising new methods for big data analytics that combine geographic analysis with methodologies born from collaborative research and development. This year, Esri will reveal innovative new tools and methodologies for studying big data as it expands further into this space.

For more information, contact Mary Roth, research staff member, IBM (e-mail: torkroth@us.ibm.com), and Marwa Mabrouk, Esri (e-mail: mmabrouk@esri.com).

Above: Esri Tapestry data reveals consumer lifestyle attributes for more informed brand management.
Right: The IBM and Esri Social Monitor demonstration sorts positive and negative mentions of brand separately. Here, those mentions are represented in a chart graph.

Governor O'Malley Calls for Results-Driven Government

continued from cover



With the new Esri Bridge Infrastructure Maps app, users can easily compare bridge repair costs in several cities at once.

We must restore the balance of investments necessary for middle-class opportunity. And connected to this mission is the responsibility to modernize our government to make it more efficient in cost and more effective at delivering results.

Over these last several and very difficult years in Maryland, we have chosen to move forward, not back. We have recovered 100 percent of the jobs we lost in the recession; reduced crime to 30-year lows; and last year, the health of the Chesapeake Bay actually improved a little bit rather than being degraded.

The US Chamber of Commerce named us the number-one state for innovation and entrepreneurship. And we have the number-one median income in the country.

If we want better results for ourselves and for our children, we must make better choices—choices that restore the balance of investments necessary for progress, choices that recover our shared sense of national purpose, choices that modernize and reform the way we govern ourselves.

Performance Measurement

There is emerging in our country right now a new way of leadership. We see it rising from the ground up and from the next generation forward.

We baby boomers, and our parents and grandparents, grew up with a way of leadership that was ideological, hierarchical, and bureaucratic. This next generation demands a different way of leadership. This new way of leadership is fundamentally entrepreneurial, operationally collaborative, and relentlessly performance measured.

It is no longer about the tall triangle of command and control. It is about the circle on its side—an intelligent circle—in the center of other concentric circles. Circles of effective collaboration.

When I was elected mayor of Baltimore in 1999, we had allowed ourselves to become the most addicted and violent city in America.

But we saw what our neighbors in New York were doing—they were reducing crime with the CompStat system. Timely, accurate information shared by all; rapid deployment of resources; effective tactics and strategies; relentless follow-up.

We borrowed this new approach to policing in Baltimore. And we went on to achieve the biggest reductions in Part 1 crime of any major city in America from 2000 to 2009.

We also took this new system of performance measurement enterprise-wide. We called this innovation CitiStat.

We made it the new way of driving every department and agency. It is what cities all across America are now implementing in some way, shape, or form.

This new way of leadership in public management is fundamentally changing the way we govern our cities, fundamentally changing the way we advance the common good.

We used the Internet to make the information of progress making open and available to every citizen. We moved from "some time" management to real-time management—real time, real fast, real open, real transparent, and real accountable. We moved from a spoils-based system of patronage politics to a results-based system of performance politics. We moved from siloed bureaucracies to common platforms.

Geographic information systems—GIS—allowed us to not only "put the cops on the dots"; smart maps also allowed us to run plays instead of just sending people out to scramble.

Traditionally, the essential endeavors of any government—whether it's state, federal, or local—were departmentalized into silos.

One could spend a lifetime paying technology people a lot of money to try to connect up and down those separate silos of individual human effort, and still it would not happen.

But in better-managed, modern governments, the informational bases of each of those silos now land on the same GIS map. Collaborative synergies start to take shape. Independent actions become part of a larger collaborative undertaking, part of a better synchronized dynamic of progress.

Hit the Targets: Dangermond and Rendell

Jack Dangermond—whose company, Esri, is now one of the leading GIS companies in the world—once approached me at a National Governors meeting with a simple request: "I really want you to get me some time with your friend, Governor Ed Rendell of Pennsylvania."

He knew that Governor Rendell had a passion for infrastructure and the proper funding of our transportation needs like bridge repairs. Jack wanted to show Governor Rendell a new bridge app.

When I finally succeeded in corralling a busy and skeptical Governor Rendell into a corner with Jack Dangermond and his computer screen, I warned Jack, "You have 45 seconds."

Jack launched immediately. "This," he said, "is a map of Minnesota, and each dot on this map shows where the bridges are in Minnesota."

Click.

Here's a red, orange, yellow color code showing the same bridges, ranging from most structurally sound to most structurally deficient.

Then he said, "Now I'm going to click on this other layer, which will change the size of these red dots relative to how many human lives go across these most structurally deficient bridges every single day."

Click.

Finally, he said, "I want to show you where the federal dollars for repairing these bridges actually go."

And with that, he clicked the final key . . . and the dollars fell all over the place.

Governor Rendell immediately exclaimed, "None of the dollars are landing on the targets!"

Jack Dangermond replied, "Not yet, but they are all landing on the map!"

The Most Important Truths

Our job is to make sure we land the resources on the targets. That's what CompStat was about. This is what CitiStat and StateStat are about.

It's what we are now doing in the State of Maryland with BayStat, with VetStat, and with JobStat. And it is a fundamentally different, smarter, and better way of governing for results.

We have also started to see this movement head into the federal realm.

The way every state, with our federal government, deployed the Recovery and Reinvestment Act dollars and tracked them openly online so every citizen could see whether the dollars were landing on the targets. Through the EPA [Environmental Protection Agency], President Obama created something called ChesapeakeStat, where the EPA tracks our efforts to reduce the nitrogen, phosphorous, and sedimentary flow into the bay.

Other new federal evolutions include HUDStat, FEMAStat, and NASAStat.

Common Platforms for Progress

The legendary American police commissioner Bill Bratton observed, "People make it happen, but common platforms make it possible."

Understanding and harnessing the powerful connections in these human chains of delivery require the building of common platforms for progress.

CitiStat maps highlighting shootings and homicides in Baltimore in 1999 (top) and 2005. Shading denotes intensity.

CitiStat is a common platform. Our energy grid is a common platform.

Technology has arrived at a point where these common platforms not only facilitate relentless collaborations, but they also allow for crowd-based solutions on a massive scale.

Crowd-based solutions that rise up from the power of individual actions—better informed, better connected, and more deeply aware.

A Second American Revolution

The challenge of our times is enormous.

To create jobs and expand middle-class opportunity at a time when human population growth now depletes world resources faster than our planet can regenerate them. To make the needed change from a global economy of depletion to more localized economies of regeneration.

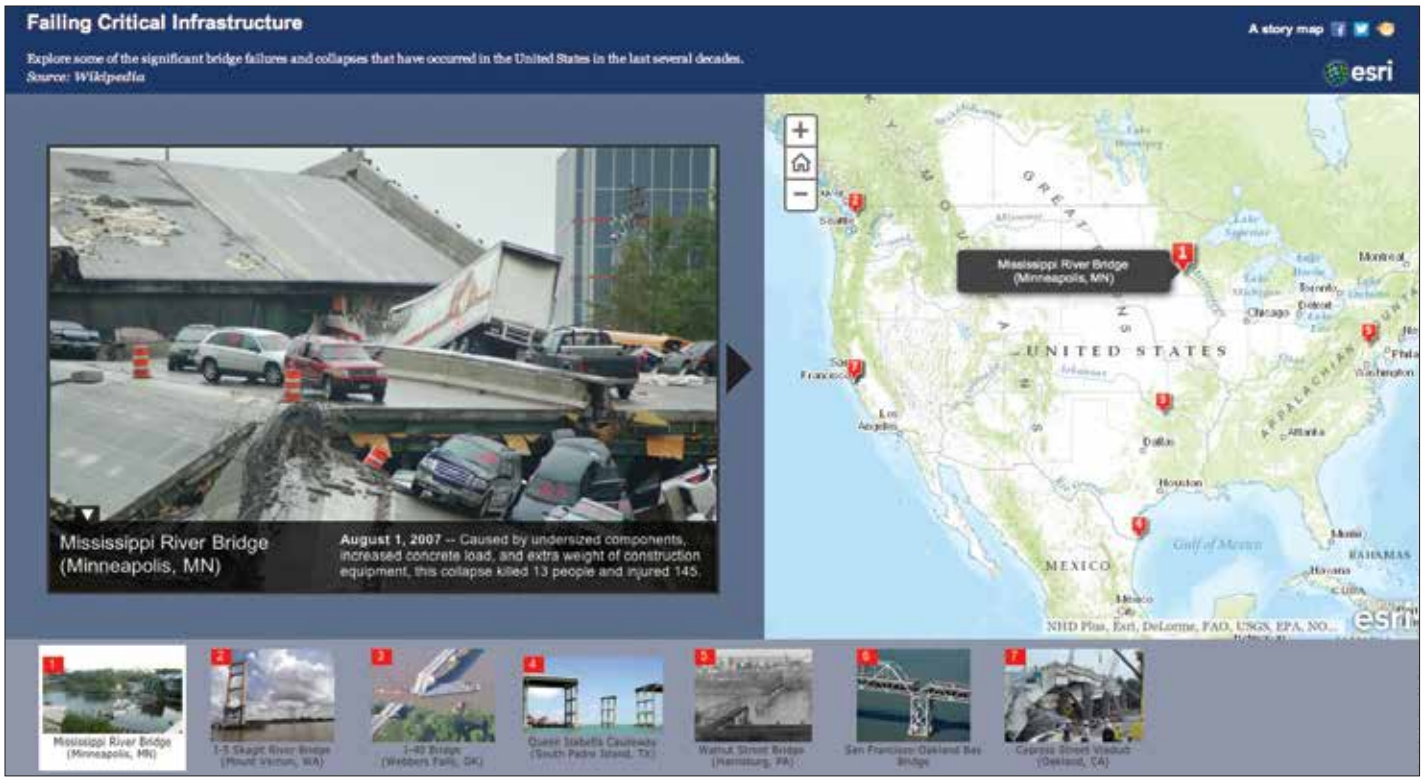
We can only solve the challenges we face if we better understand the connections that we share.

As our challenge is great, so, too, is our capacity, our technology, and our potential for greater compassion and deeper understanding.

Mindful, individual action is the key. Action based on awareness; compelled by intention; motivated by a deep preference for a better future; and empowered by a modern, collaborative, performance-driven government.

I'm not dreaming of some utopia here. I'm talking about more effective public administration. I'm talking about the difficult and urgently important work of a second American revolution.

Visit Maryland's Open Data Portal, **statestat.maryland.gov**, to learn more about StateStat.



Details of the 2007 Mississippi River Bridge collapse in Minneapolis, Minnesota, are presented in the new Bridge Infrastructure Maps app, along with examples of other bridge collapses.

The Relevance of Cartography

continued from cover

and data visualization and dissemination (e.g., location-based services, augmented reality). So **where are we now** with all those brave, new developments?

Obviously, **we are not short of data** in many ways. Clearly, we can state that it is rather the opposite. The problem is often not that we don't have enough data but rather too much. We need to make more and more efforts to deal with all that data in an efficient sense, mining the relevant information and linking and selecting the appropriate information for a particular scenario. This phenomenon is being described as "big data." Often, application developments start there. Because we have access to data, we make something with it. We link it, we analyze it, we produce applications out of it. I call this a data-driven approach.

We are also **not short of technologies**. It is rather the opposite; while just being able to fully employ the potential of a particular data acquisition, modeling, or dissemination technology, new technologies come in and need to be considered. New technologies become available more and more quickly and need to be evaluated, addressed, and applied. Often, application development starts there. Because we have a new technology available, we make something with it. I call this a technology-driven approach.

However, the particular need, demand, question, or problem of a human user is often taken into account only when the data-driven or technology-driven application, product, or system has been built. Often, this causes problems or leads to products, systems, and applications that are not accepted, not efficient, or simply not usable. By starting from the question What are the demands, questions, problems, or needs of human users in respect to location? we could eventually apply data and technology in a sense that they serve such **user-centered approaches** rather than determine the use.

But how can we better unleash the big potential of geoinformation in such truly interdisciplinary approaches? How can we make sure that spatial data is really applicable for governments, for decision makers, for planners, for citizens through applications, products, and systems, which are not forcing them to adapt to the system but are easy to use and efficiently support the human user?

In this respect, maps and cartography play a key role. Maps are most efficient in enabling human users to understand complex situations. Maps can be understood as tools to order information by their spatial context. **Maps can be seen as the perfect interface** between a human user and all that big data and thus enable human users to answer location-related questions, to support spatial behavior, to enable spatial problem solving, or simply to be able to become aware of space.

Today, maps can be created and used by any individual stocked with just modest computing skills from virtually any location on earth and for almost any purpose. In this new mapmaking paradigm, users are often present at the location of interest and produce maps that address needs that arise instantaneously. Cartographic data may be digitally and wirelessly delivered in finalized form to the device in the hands of the user or the requested visualization derived from downloaded data in situ. Rapid advances in technologies have enabled this **revolution in mapmaking** by the millions. One such prominent advance includes the possibility to derive maps very quickly immediately after the data has been acquired by accessing and disseminating maps through the Internet. Real-time data handling and visualization are other significant developments, as well as location-based services, mobile cartography, and augmented reality.

While the above advances have enabled significant progress on the design and implementation of new ways of map production over the past decade, many **cartographic principles remain unchanged**, the most important one being that maps are an abstraction of reality. Visualization of selected information means that some features present in reality are depicted more prominently than others, while many features might not even be depicted at all. Abstracting reality makes a map powerful, as it helps to understand and interpret very complex situations very efficiently.

Abstraction is essential. Disaster management can be used as an example to illustrate the importance and power of abstract cartographic depictions. In the recovery phase, quick production of imagery of the affected area is required using depictions that allow the emergency teams to understand the situation on the ground from a glance at the maps. Important ongoing developments supporting the rescue work in the recovery phase are map derivation technologies, crowdsourcing and neocartography techniques and location-based services. The role of cartography in the protection phase of the disaster management cycle has always been crucial. In this phase, risk maps are produced, which enable governors, decision makers, experts, and the general public alike to understand the kind and levels of risk present in the near and distant surroundings. Modern cartography enables the general public to participate in the modeling and visualizing of the risks neighborhoods may suffer from on a voluntary basis. Modern cartography also helps to quickly disseminate crucial information.

In this sense, cartography is most relevant. **Without maps, we would be "spatially blind."** Knowledge about spatial relations and location of objects are most important to learn about space, to act in space, to be aware of what is where and what is around us, or simply to be able to make good decisions. Cartography is also most contemporary, as new and innovative technologies have an important impact into what cartographers are doing. Maps can be derived automatically from geodata acquisition methods, such as laser scanning, remote sensing, or sensor networks. Smart models of geodata can be built allowing in-depth analysis of structures and patterns. A whole range of presentation forms are available nowadays, from maps on mobile phones all the way to geoinformation presented as augmented reality presentations.

Where are we heading? What we can expect in the near future is that information is available

Maps can be seen as the perfect interface between a human user and big data.

anytime and anywhere. In its provision and delivery, it is tailored to the user's context and needs. In this, the context is a key selector for which and how information is provided. Cartographic services will thus be widespread and of daily use in a truly ubiquitous manner. Persons would feel spatially blind without using their map-based services, which enable them to see who or what is near them, get supported and do searches based on the current location, and collect data on-site accurately and timely. Modern cartography applications are already demonstrating their huge potential and change how we work, how we live, and how we interact.

The successful development of modern cartography requires **integrated, interdisciplinary approaches** from such domains as computer science, communication science, human-computer interaction, telecommunication sciences, cognitive sciences, law, economics, geospatial information management, and cartography. It is those interdisciplinary approaches that make sure that we work toward **human-centered application developments** by applying innovative engineering methods and tools in a highly volatile technological framework. A number of important technology-driven trends have a major impact on what and how we create, access, and use maps, creating previously unimaginable amounts of location-referenced information and thus putting cartographic services in the center of the focus of research and development.

In this situation, it is of high importance that those who are interested in maps, mapping, and cartography are working together on an international level. This is exactly the role of the **International Cartographic Association** (ICA). ICA is the world authoritative body for cartography and GIScience. It consists of national members and affiliate members. Basically, we encourage every nation, company, government agency, or cartographer in the world to join the big family of cartography and GIScience, which makes the voice of ICA even more important (www.icaci.org).

I would like to **summarize with three key messages**:

1. Cartography is relevant!
Modern cartography is key to humankind. Without maps, we would be spatially blind. Knowledge about spatial relations and location of objects are most important for enabling economic development, for managing and administering land, for handling disasters and crisis situations, or simply to be able to make decisions on a personal scale on where and how to go to a particular place.

2. Cartography is modern!
New and innovative technologies have an important impact on what cartographers are doing. Maps can be derived automatically from geodata acquisition methods, smart models of geodata can be built, and a whole range of presentation forms is now available.

3. Cartography is attractive!
Maps and other cartographic products are attractive. Many people like to use maps; to play around with maps, for instance, on the Internet; or simply to look at them. We can witness a dramatic increase in the number of users and use of maps currently.

About the Author

Georg Gartner is a full professor of cartography at the Vienna University of Technology. He holds graduate qualifications in geography and cartography from the University of Vienna and received his PhD and his Habilitation from the Vienna University of Technology. He was awarded a Fulbright grant to the University of Nebraska at Omaha in 1997 and a research visiting fellowship to the Royal Melbourne Institute of Technology in 2000, to South China Normal University in 2006, and to the University of Nottingham in 2009. He is dean of academic affairs for geodesy and geoinformation at Vienna University of Technology. He is a responsible organizer of the International Symposia on Location Based Services and editor of the book series *Lecture Notes on Geoinformation and Cartography* by Springer and editor of the *Journal on LBS* by Taylor & Francis. He serves as president of the International Cartographic Association.

For more information, contact university professor Dr. Georg Gartner, Research Group Cartography, Department of Geodesy and Geoinformation, Vienna University of Technology, Vienna, Austria (e-mail: georg.gartner@tuwien.ac.at). Dr. Gartner is also president of the International Cartographic Association (e-mail: president@icaci.org).

Social Services Planning Streamlined

In South Australia, GIS Clarifies the Big Picture, Helps People in Need

By Gary Maguire (GISP-AP) and Penny Baldock (GISP-AP), Department for Communities and Social Inclusion, Government of South Australia

Highlights

- GIS facilitates sharing information across the organization, enabling collaboration and openness.
- GIS helps make data accessible to all decision makers through innovative technology platforms.
- ArcGIS was central to a pioneering approach for arranging and communicating data and modeling results.

Planning social services effectively so that a community's most vulnerable people are getting the help they need has always been a complex challenge for governments around the world. To help tackle this problem, an innovative government department in Australia has begun applying a geographic lens over its decision-making processes to find an improved way of looking at how it can capture and analyze huge amounts of information to make better decisions.

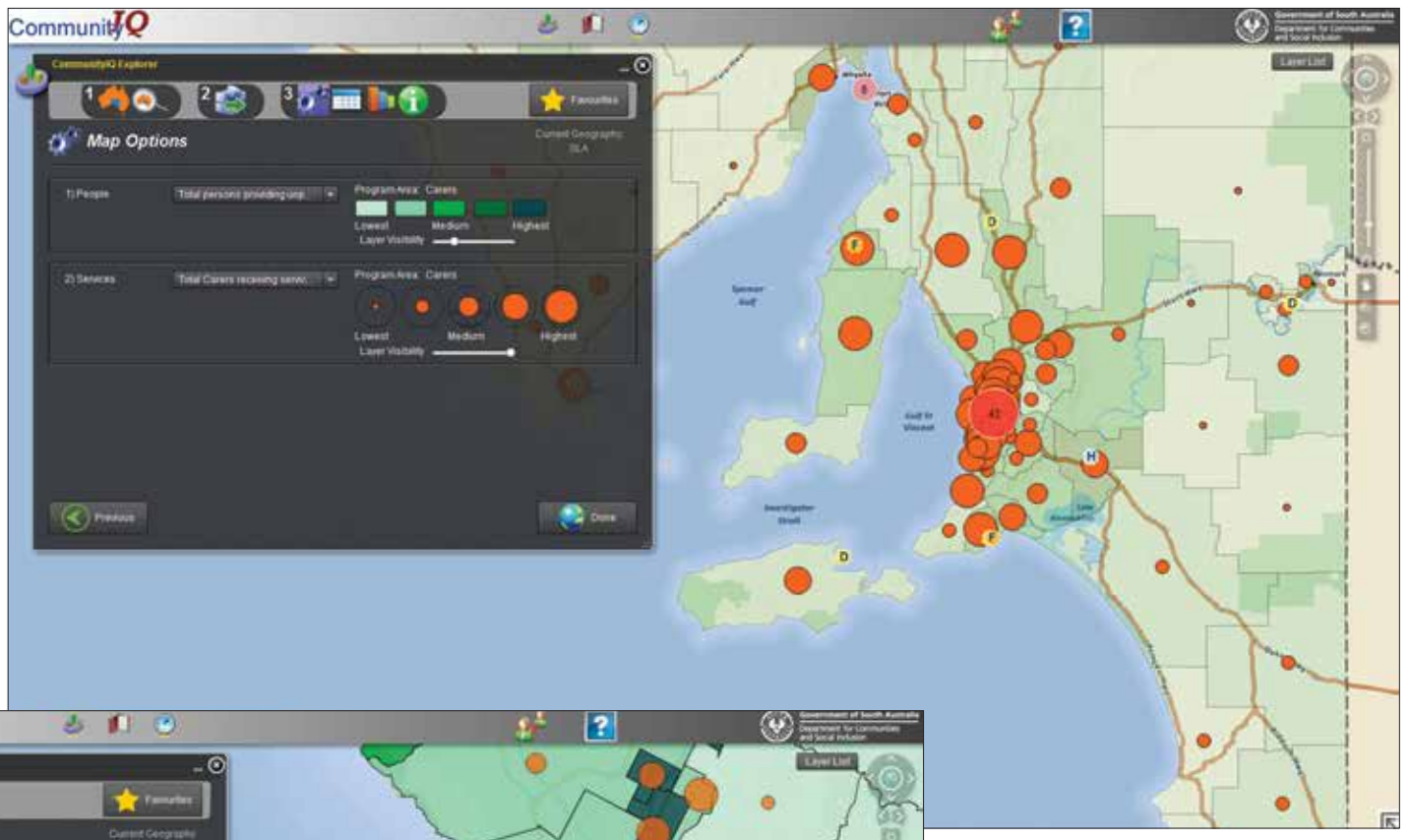
In South Australia, the Department for Communities and Social Inclusion, based in the capital city of Adelaide, provides services across a state where the population is relatively small, at about 1.7 million people, but is spread over a huge geographic area of more than 350,000 square miles (900,000 square kilometers), much of it arid desert and scrubland. For comparison, South Australia is roughly 30 percent larger than Texas and three times the size of Britain. The department plays the lead role for the South Australian government in the planning and delivery of social services to some of the community's most disadvantaged people. These are families and communities struggling to make ends meet and often facing multiple levels of disadvantage.

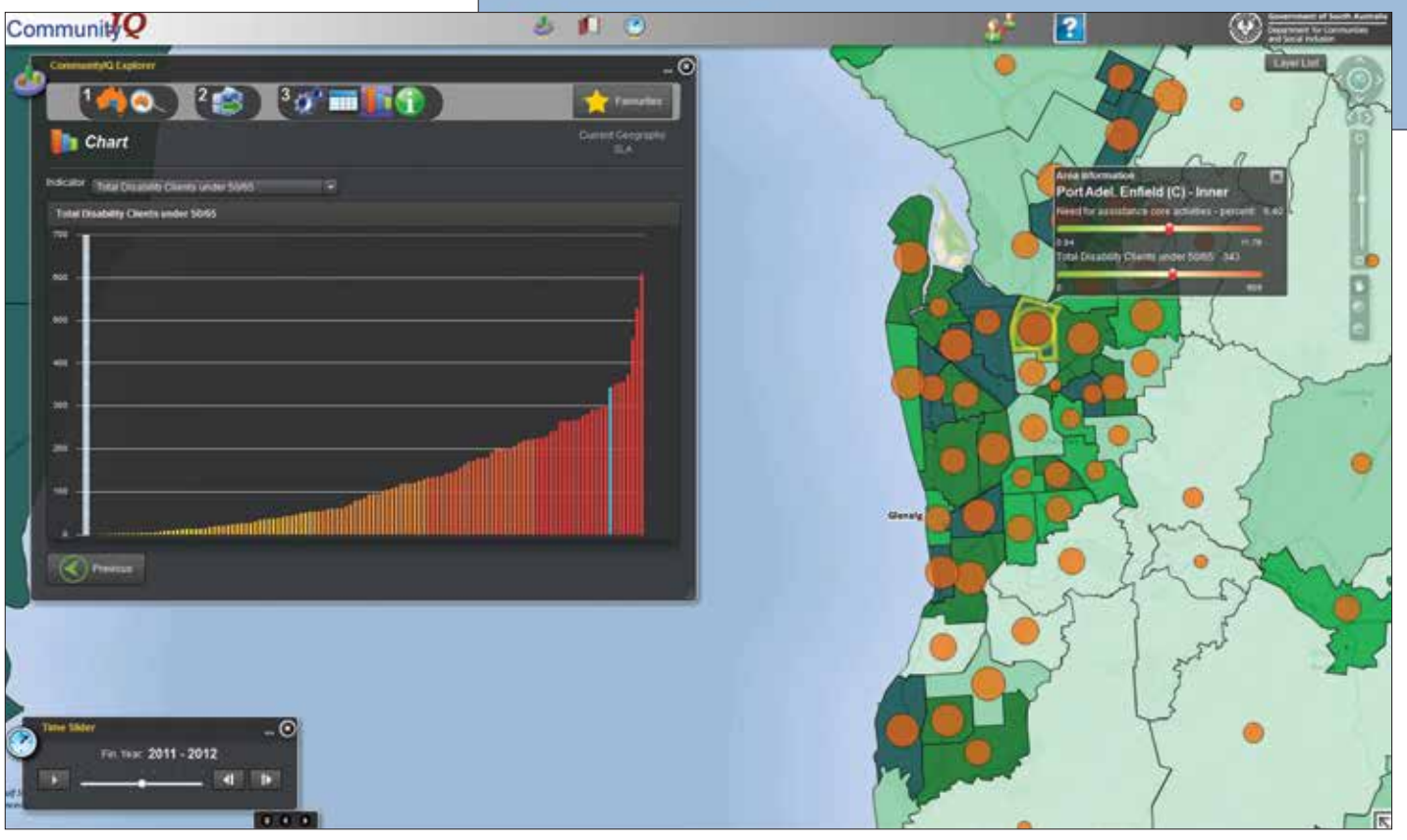
The department has an incredibly broad social responsibility within South Australia. It provides public housing for thousands of people, including crisis accommodation for those in immediate and desperate need, a mother and children fleeing domestic violence, for example. It is responsible for helping homeless people get off the streets and supporting them as they transition into a situation where they can remain in their own home. It runs the state's juvenile justice system, recently opening a new detention facility with a strong emphasis on rehabilitation and education. It provides services and opportunities to people living with disabilities, assisting them to participate in community life through recreation and work. It provides domiciliary care services to those who need help at home to remain independent, offers multicultural and interpretive services to people who need them, spearheads the state government's efforts to raise awareness about problem gambling, and manages concession payments to low-income earners. The department works extensively with nongovernmental organizations that deliver many of the frontline services.

In late 1999, a small group of individuals in the department had a vision to use GIS for land-use planning and asset management to improve the way public housing was used in the community. Over the next five years, geographic services became entrenched in many aspects of the business. The demand for services became so intense that the team had to seek a new and more efficient method of delivery. A pivotal point occurred in 2005 for the public housing agency as GIS went from a few scattered desktops to an integrated GIS web mapping solution accessible to all staff, including in geographically remote regions, through the use of Citrix thin clients.

In 2006, departmental executives began to see the advantages of geospatial analysis, mobile data capture, and web-based GIS solutions for information collaboration and why these things should and could be applied to the department more widely. In the years since, GIS solutions have been applied to many projects, including

- Client connectivity to service locations.
- Logistics modeling of vehicle usage.
- Department-wide regional planning and service alignment.
- Community profiling.
- Urban and public housing redevelopment.
- Work force health and safety modeling.
- Supporting recovery efforts after major disasters.





Analyzing the number of carers against the location of service outlets.

Comparing the number of carers (people who provide unpaid care and assistance), shown as shaded areas, with the number of carers receiving services to aid with assistance, shown as orange circles. This helps to target future services for carers in South Australia.

These activities made it clear that a plan was needed to fully reap the benefits this technology could bring to social services planning.

The department now has a geospatial strategy, designed to bring GIS into the center of the decision-making process. It is still very new to the organization, but it is encapsulated in a simple philosophy in line with the department's strategy: coordinate data under one main umbrella; simplify it to make it accessible to all decision makers; enable people through a range of geographic services like ArcGIS to analyze, visualize, and report the information; and make it available through innovative technology platforms.

The Evidence Based Management Framework (EBMF) solution has used this strategy throughout many GIS projects. EBMF

is the department's innovative approach to using ArcGIS to arrange and communicate the data and modeling results in a simple and understandable format for decision makers.

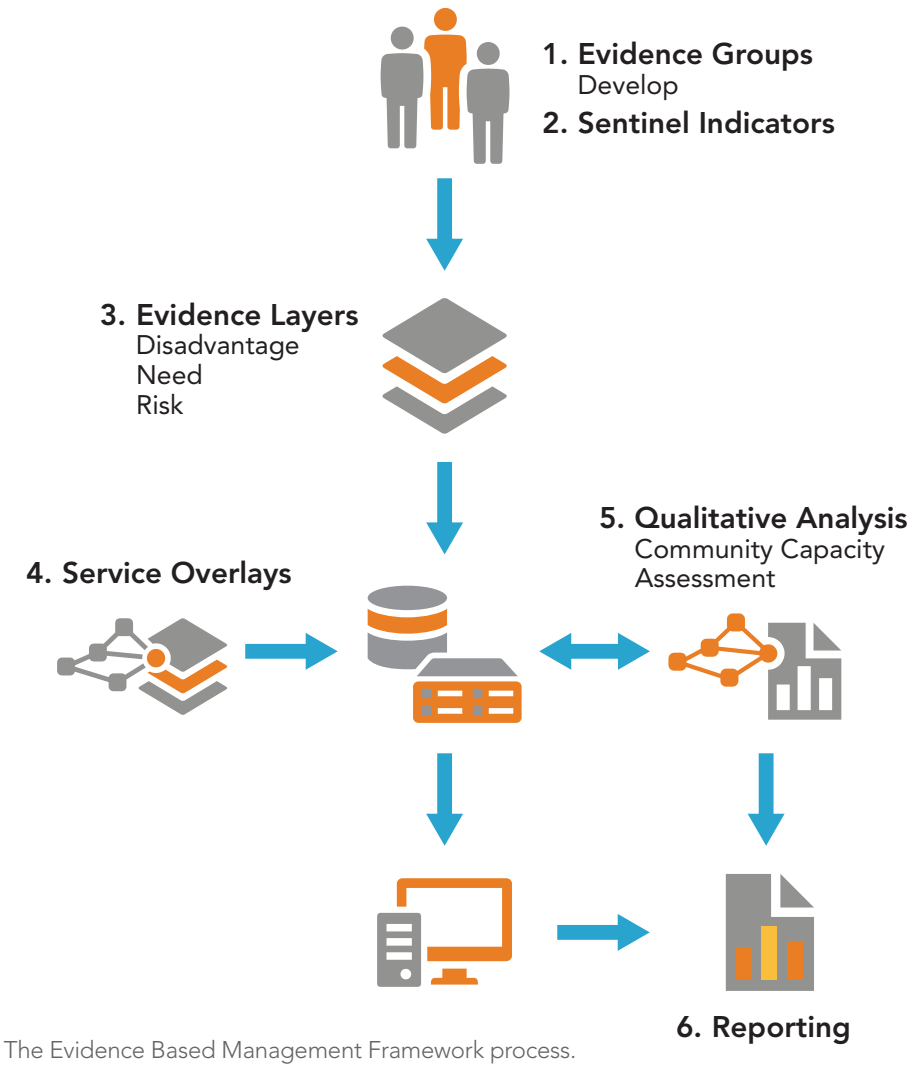
The EBMF approach begins by locating the high-risk population groups, regarded as high priority for the department in terms of service delivery. Through early intervention, EBMF identifies the factors that indicate high levels of risk in a community and compiles GIS datasets to measure them. For example, high levels of school truancy could indicate young people in an area are running a higher risk of an encounter with the judicial system. By identifying communities where the risk is high, the department can work at the local level to strengthen and expand existing community networks and services.

By establishing GIS datasets to measure each risk factor, EBMF provides a robust baseline for analyzing and comparing the risk profiles of communities across the state. In the second step of EBMF, the risk measures are narrowed to a group of "sentinel indicators" using a statistical decision tree to model the datasets with the greatest predictive ability. The sentinel indicators are used to establish the Disadvantage-Need-Risk scores, which are a composite measure of risk and identify and rank target populations according to the highest need.

The GIS coordinated service data is overlaid on a map of the target populations, creating an exact picture of where the resources are provided in the community, compared to where the people in need are located. In a true exercise of geoaccounting, the department can compare funding and resource allocation to areas of service priority.

The development of the EBMF information layers is an interactive and collaborative process involving a wide group of contributors, many of them practitioners delivering the services at the front line. The end product is a neat, accurate map with tables and charts, where all the relevant information is in one place and is easily shared as a web service. It means that the program planners can determine exactly where the greatest need is and where the funds are going. Staff in different parts of the department, responsible for planning different services, can view the same information, meaning information is easily shared between parts of the department and seen in context, not in isolation. Those who have worked in a large company or department understand how challenging it can be to source information outside their particular business area, which is why the benefits of this easy and efficient information-sharing process within such large organizations cannot be underestimated. Being able to see it easily on a map means it not only results in less frustration; it also enables a collaborative and open result across different parts of an organization. This sharing of information means that a "whole-of-government-approach" to assisting people in need is more likely to occur.

The EBMF has been presented to some of the nongovernmental organizations the department has partnerships with. The next step is to share information with the wider community development sector. The potential for geoaccounting to break down information barriers between organizations with the same goals and shared aspirations and to deliver better outcomes for society's most disadvantaged people is enormous.



The Evidence Based Management Framework process.

About the Authors

Gary Maguire and Penny Baldock are with the Department for Communities and Social Inclusion. Maguire is the department's corporate enterprise manager of Business and Location Intelligence Services. Over the past seven years, he has been leading the organization in transforming the way it uses its corporate systems/information with GIS for business solutions. Baldock is the senior project and policy officer with the Policy and Community Development directorate. She manages the EBMF program and continues to engage all sectors within and outside the department on GIS and the value it provides policy makers.

For more information, contact Gary Maguire, manager, Business and Location Intelligence Services, Department for Communities and Social Inclusion, South Australia (e-mail: gary.maguire@sa.gov.au).

Quick Learner Saves San Francisco Bay Area Rapid Transit District Millions of Dollars

GIS Hero

Travis W. Engstrom

This article is part of an ongoing series honoring individuals who have made a difference in the world by applying a GIS solution to conservation or community challenges. Since these unique individuals have been selected for their innovations or special achievements, the series is appropriately named GIS Heroes. Esri recognizes Travis W. Engstrom as a GIS hero.

With six siblings and a journeyman police chief for a dad, Travis W. Engstrom, manager of information systems at the San Francisco Bay Area Rapid Transit District (BART), learned independence at a young age. That independence drove his work ethic early on, inoculating him to the pressure of large-scale projects. The career path that eventually led him to overhaul the BART GIS began in 1999.

That's when the City of Lakeport, California, hired him to lead its fledgling GIS effort using hardware and software acquired from a grant. Engstrom was assigned to map the city's water, sewer, and storm drain infrastructure. Engstrom confidently dove right in with no previous GIS training or experience.

In three months, Engstrom built an entire water, sewer, and storm drain layout for Lakeport's community of 5,000 residents. The effort included manually capturing utility assets using an ArcPad enabled GPS receiver on more than 62 miles of curb, all on foot.

Later in his career, Engstrom applied his GIS expertise in a more nontraditional context for a nonprofit in Durban, South Africa, organizing volunteers and relief aid using GIS. There, he performed analysis with Esri demographic data tools and made maps in ArcGIS while managing a staff of 120.

"The organization I worked for was massively GIS-centric," says Engstrom. "It used geospatial technology to focus its mission, find people in need, and plan the distribution of its outreach services. This was a great experience in teaching me how to use GIS creatively, and it paid huge dividends later on."

Consultation

Engstrom went on to earn a law degree from Berkeley and simultaneously work as a private GIS consultant with North Star Precision Mapping, LLC. For 10 years, Engstrom performed a mix of municipal consultation and staff training for more than 1,000 government agencies. The work could be grueling. At times, Engstrom averaged 20 to 30 training sessions a month, educating agency staff on everything from how to jump-start GIS services to how to manage assets more efficiently. At the same time, he was also performing GIS builds from scratch for numerous Native American tribal governments throughout the Southwest.

Eventually, Engstrom, who was married with two sons, tired of living out of a suitcase and working on the weekends. When the opportunity came to overhaul the GIS of one of the most sophisticated public transportation systems in North America, he jumped at the chance.

BART

In 2011, BART contacted professional services firm Universal Field Services, Inc., to create an enterprise GIS pilot project. The firm passed the request on to Engstrom, well aware of his record and ability to create successful GIS builds from the bottom up. Being within driving distance of his Bay Area residence, the new opportunity was just the move he wanted. Although it was only a 10-month contract to perform a total assessment of BART's needs and develop a long-term enterprise GIS strategy for the network, Engstrom recognized an opportunity to build something great.

"BART wanted me to come up with budget suggestions, staffing suggestions, and business cases to do a full return-on-investment analysis," says Engstrom. "I was confident that the project would be a success simply because BART said they'd continue the effort if the proof of concept worked. I had enough experience under my belt to know proof would be ably demonstrated in a short amount of time."

Built with ArcGIS Online, BART's internal mapping system (Enterprise GIS-Enhanced Base Map) serves the mapping needs of every division within the agency.

Engstrom enjoyed the BART assignment and the freedom it offered to develop innovative enterprise solutions. When the opportunity arose to manage the IT division, he applied for and was given the job.

A Babel Problem

With 3,200 employees, 103 miles of infrastructure, and 44 stations, BART presented some significant communication challenges. One of the agency's biggest obstacles was the years-long accumulation of nonstandardized terminology by different groups, which led to information silos. Different offices used different names for the same objects, which hindered communication and made uniform mapping impossible.

To put that in perspective, at the time of Engstrom's hiring, the main maps used by BART were simple station maps to help orient the public. No maps existed to show the communities and jurisdictions through which trains ran. BART track schematics consisted of straight-line drawings without the benefit of scale or orientation. Engstrom's first major achievement at the agency was to create a uniform map with the exact geographic position of the entire system—including track centerlines, mileposts, and critical facilities. The map served as a key to "unsilo" the information between departments.

"That first map showed the potential of a comprehensive view with layers that could be toggled on and off according to the needs of every department," says Engstrom. "In very short order, major decisions were made to convert to a standardized system where everyone spoke the same language."

Putting the ROI in Irony

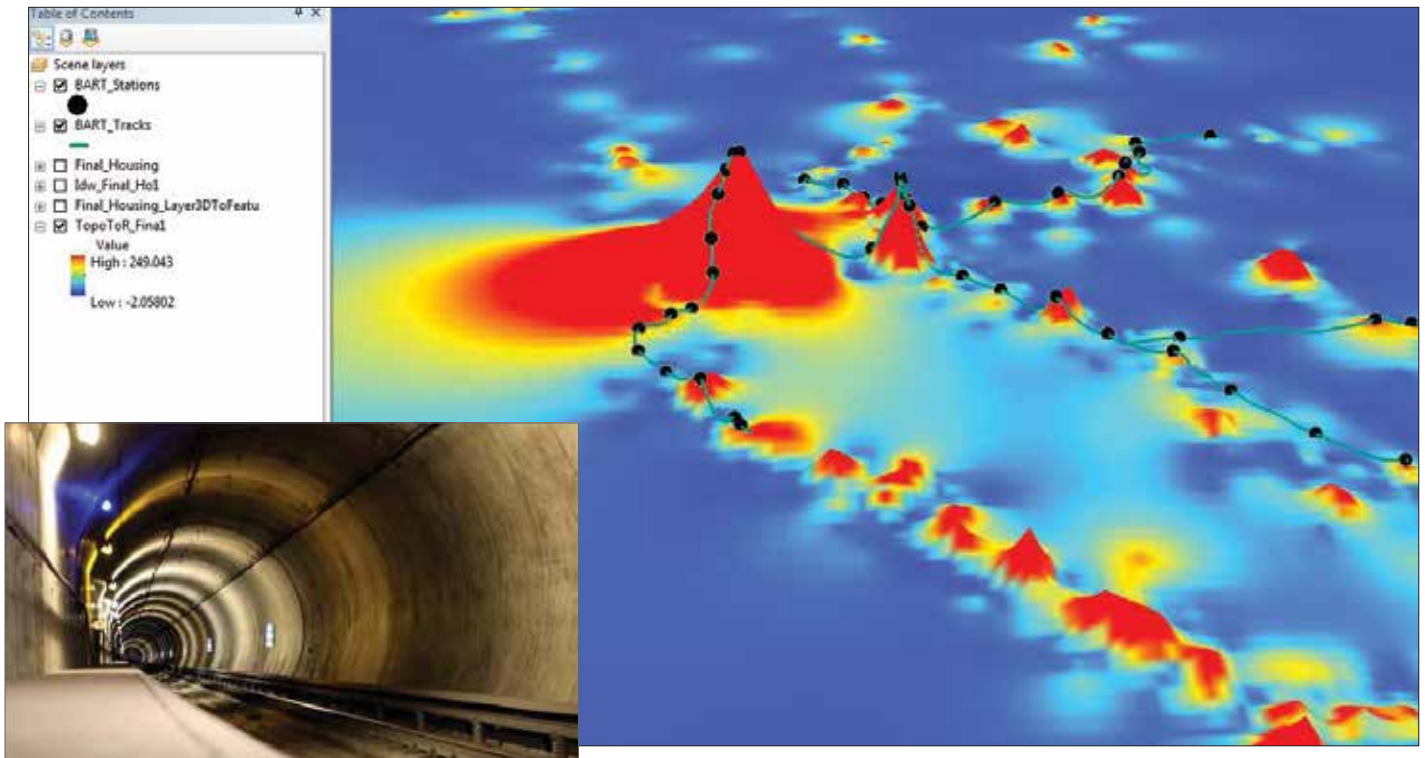
Being initially hired as a GIS contractor, it's ironic that Engstrom ultimately helped BART achieve independence from GIS contractors. Prior to Engstrom's enterprise developments, consultants would be hired to perform expensive research required by the federal government to understand the demography of the citizens BART served. Experienced in demographic analysis since his work in South Africa, Engstrom used Esri Community Analyst to conduct the same research. Community Analyst not only provided superior demographic reporting compared to the outsourced services BART previously paid for; it also integrated into the ArcGIS system, allowing demographic information to easily be included in any map-based report BART generated.

A significant portion of BART's budget is spent on asset life cycle replacement programs, including dive teams to replace underwater infrastructure on the network's Trans-Bay Tube that connects Oakland to San Francisco. Performing maintenance on this equipment involved sending out divers to manually inspect and carry out repairs. With little to no assistance from location technology, this work took a considerable amount of time and money.

"BART was able to convert existing AutoCAD drawings of the tube to GIS, reference this data against known survey records, and equip the diving teams with GPS coordinates showing exactly what features needed to be inspected and replaced," says Engstrom. "That alone saved us $800,000."

Subsequent analysis revealed that, within five years, BART's enterprise GIS will generate a net present value of $6.6 million. Those numbers led BART to establish a permanent GIS team. The figures also forced a major shift in organizational perspective at BART, essentially making GIS the linchpin of the enterprise and expanding Engstrom's role to include advanced anti-terrorism applications and cyber defense. Engstrom's reorganization of BART's GIS project has since spawned more than 100 other major projects at the agency, resulting in a new enterprise license agreement for all the Esri software BART uses.

For more information, contact Travis W. Engstrom, manager of information systems, BART—Office of the Chief Information Officer (e-mail: TEngstr@bart.gov).



Above: The 3D map depicts housing density in proximity to BART tracks and stations. **Left:** The BART network runs more than 30 miles through subways and tunnels such as the Transbay Tube.

Bring Locations to Life with Esri's New Geotrigger Service

Highlights

- New Geotrigger Service allows developers to make their own iOS and Android apps geoaware.
- Engage customers with personalized content or deals the moment they enter a store.
- The Geotrigger Service includes a set of battery management tools.

When people think of location-based mobile apps, it's often apps like Foursquare or Yelp, or tools for navigation. Esri's new Geotrigger Service enables you to bring your location data to life with location-based alerts for the devices in your organization or user base. The Geotrigger Service includes a set of battery management tools, meaning you can add persistent location awareness to your apps without the battery drain.

The Geotrigger Service—now available in beta in ArcGIS for Developers—allows you to make your iOS and Android apps geoaware, send relevant push notifications based on your organization or user's location, and collect business intelligence. The Geotrigger Service is completely cloud based and does not require an ArcGIS for Server solution.

Here are some use cases that the Geotrigger Service can add to your app or organization:

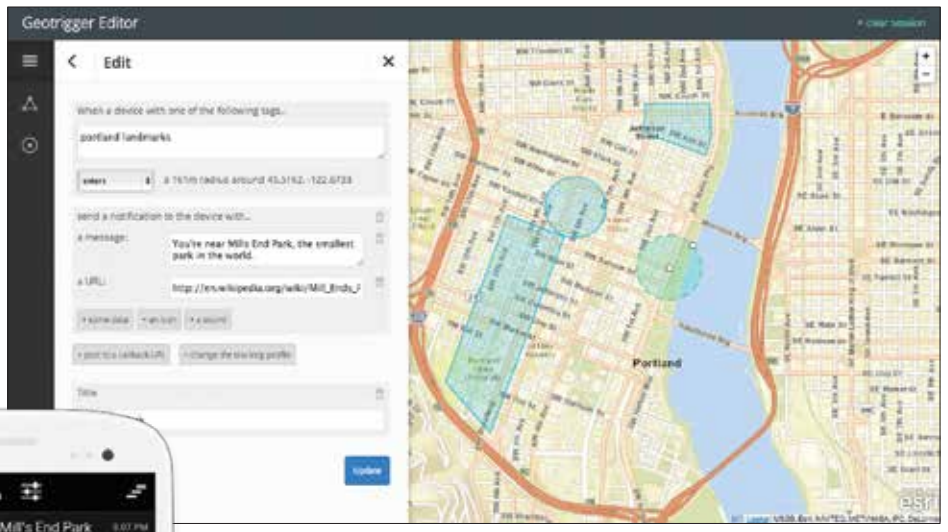
- **Notify citizens** about road closures, emergencies, or public safety warnings based on their past or current location.
- **Allow people to leave notes** at places for others to receive upon arrival.
- **Inform tourists** about interesting places as they explore your city, theme park, etc.
- **Monitor field-workers**' locations in real time and automatically alert them if they get too close to a danger zone.
- **Engage customers** with personalized content or deals the moment they enter a store—or a set amount of time later.
- **Send a message** to prospective home buyers when they're near a home that matches their search criterion.
- **Prevent users** from accessing certain content when not in a specific place.
- **Optimize customer service** by notifying employees when a customer who just ordered something in your mobile app arrives at your store.

How Does the Geotrigger Service Work?

Once developers include the Geotrigger SDK in their iOS and/or Android app, it will be able to send and receive location data from a cloud-based streaming server in real time. Then, developers can define points or polygons of interest using the Geotrigger API and set the action they want to happen when someone enters the "trigger zone"—whether that's to send a push notification message; log the time until they leave the area; or post a callback to an external service, such as a customer relationship management system.

Why Would a Mobile Developer Want to Use the Geotrigger SDKs?

First, the Geotrigger SDKs make it easier for developers to build geoaware iOS and Android apps. Doing location work in iOS and Android is very different, and the Geotrigger SDKs make it more consistent and fast for developers to make their apps for both mobile platforms. The Geotrigger SDKs are built on top of core iOS and Android location services, making the services easier and more complementary to work with.



A mobile app using the Geotrigger Service can let you know when you're near interesting places you might not notice or know about, like the world's smallest park.

The notification as it appears on an iPhone (front) and Android (back).

Second, the Geotrigger SDKs make apps as battery efficient as possible without the developer having to do any work beyond choosing one of four tracking modes in the Geotrigger SDK.

How Does the Geotrigger SDK Integrate with ArcGIS Online for Developers?

The Geotrigger API understands Esri JSON, which is a way to store and communicate geometry information between Esri services. There are also extra tools that can import features from services into trigger areas.

An ArcGIS for Developers account will give you access to the Geotrigger Service, along with the many other tools we have for location-minded developers, such as geocoding, context, directions, and advanced routing.

The Geotrigger Service will come out of beta in late February 2014. Until then, it will be free to use, and we'll publish pricing as soon as it's available. We will continue to improve the Geotrigger Service based on feedback from the developers who use it during the beta period.

You are invited to try out the beta of the Geotrigger Service and bring your data to life in a completely new way.

For more information on the Geotrigger Service or to start using it, visit **developers.arcgis.com/en/geotrigger-service**.

ArcGIS Online What's New?

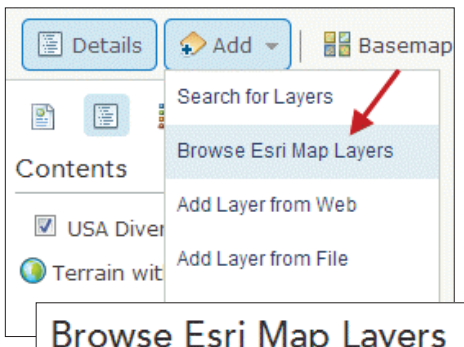
The September update to ArcGIS Online included changes and enhancements to the map viewer and application templates and improvements for configuring enterprise logins. ArcGIS Online basemaps were also updated with many contributions from the Community Maps Program. Also, ArcGIS Online is now included with ArcGIS for Desktop *(see article on page 1)*.

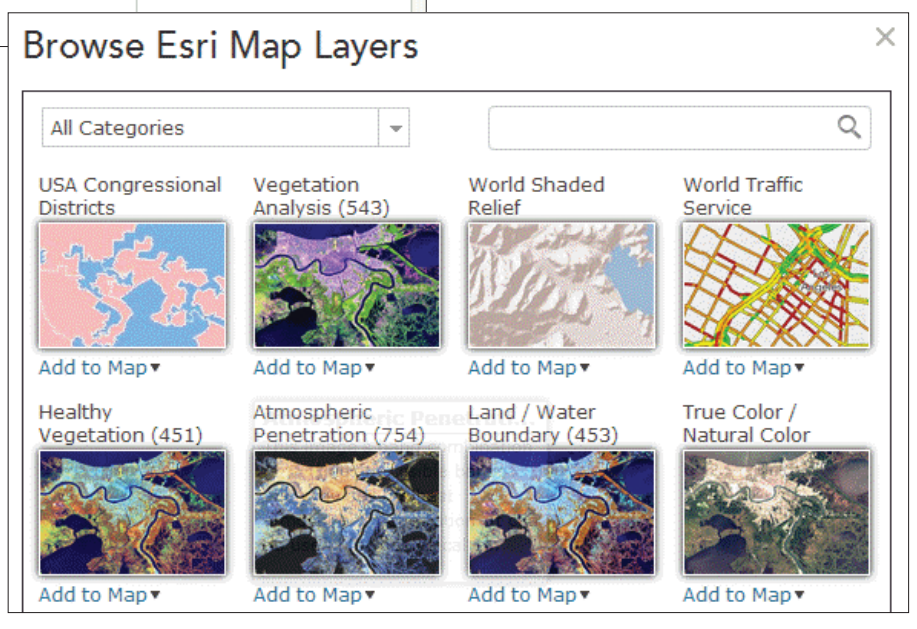
New to ArcGIS Online? Try It Today.

If your organization doesn't have an ArcGIS Online subscription yet, sign up for a free 30-day trial. You can invite up to five named users to participate in the trial, and you get 200 service credits. You also get these productivity apps as part of your trial: Collector for ArcGIS, Operations Dashboard for ArcGIS, Esri Maps for Office, and Esri Maps for SharePoint. Once your trial is over, purchase a subscription and continue to use all the features and services in the same ArcGIS Online subscription account. To sign up for the trial, go to **esri.com/agoleval**.

Map Viewer

We've improved how you can access and add Esri Map Layers to your maps. You can now access a gallery of Esri Map Layers directly from the Add button in the map viewer. Esri Map Layers include imagery and layers about people (demographics and lifestyle), earth (land cover, soils, elevation), and life (ecology, species biology, ecosystem). You can drag and drop layers to reorder your map content. If your map includes a layer that could be updated while the map is open (for example, when your field crew is collecting data), you can now set a refresh interval for the layer. This will keep your map in sync with the latest data, even while your map is open in a browser, on the desktop, or web or mobile apps. We also improved the Find address or place locator. Now, as you type in your search terms, you get a list of suggestions that you can choose from.





Browse dozens of Esri Map Layers, including demographics and land cover, and add them to your map.

Web Application Templates

With this updated Map Tour template, you can now incorporate videos (existing and new Map Tours). An interactive builder guides you through adding videos hosted on YouTube and Vimeo (and other sources). In the Storytelling Swipe template, you can include a scene navigation tool that takes users to a specific location and displays notes. We retired a number of templates from the web app gallery: Compare Maps, Search Maps, Side-by-Side Viewer, Storytelling Tabbed, and Twitter Timeline. However, these templates are still available as items in ArcGIS Online that you can find and download using Search.

Geocomments created by the web scene author in the Esri CityEngine Web Viewer that are symbolized differently can now be displayed independently of other comments. You will see faster performance when working with scenes that contain many features.

Ready-to-Use Layers and Tools

Forty new landscape layers are available. These layers focus on critical habitat, species range, and soils. There are also new dynamic layers for hazardous waste, aquifers, and coalfields. In total, there are now more than sixty Esri landscape layers available for the United States that you can use with your maps and as input to your geoprocessing models. They cover a wide range of uses, from biogeographic analysis and natural resource management to land use and conservation planning. While these layers are still in beta, anyone with an ArcGIS Online subscription can access them.

Performance has been improved for service area analysis with overlapping polygons and the traffic map display. The closest facility and service area output results include additional attribute information from input features.

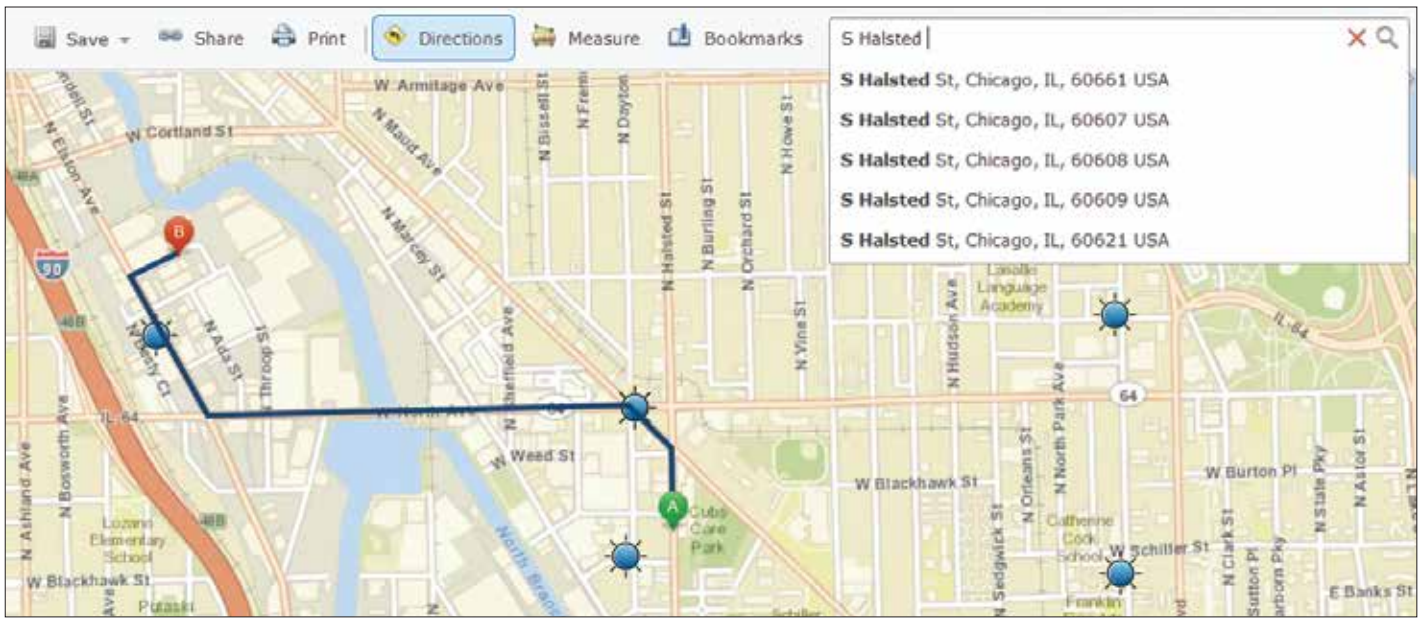
ArcGIS Online Account Administration

ArcGIS Online Help includes steps for configuring OpenAM 10.1.0 and NetIQ Access Manager 3.2 as enterprise providers. We've improved the design for configuring the organization description field. You have a View HTML Source option to more easily create a description with HTML.

Other Enhancements

When you add an image file to ArcGIS Online and share it publicly, the details page displays the URL of the image. You can use the URL to reference the image in web apps, web map pop-up windows, and so on.

Two new language options have been added to ArcGIS Online: Czech and Finnish, for a total of 24 languages. Setting your language determines the user interface as well as the way time, date, and numerical values appear.



Get an interactive geosearch experience that suggests places in a list as you type in your search terms.

ArcGIS Online Basemap Updates

World Imagery Map—In mid-October, we released the fifth significant update of DigitalGlobe imagery in the World Imagery Map. More than 30 terabytes of new and updated high-resolution imagery, covering nearly 45 million square miles (about 115 million square kilometers) at a scale down to 4,000, have been added to the World Imagery Map. Much of this release fills in areas between major metropolitan centers, but cities such as Osaka, Japan; La Paz, Bolivia; and Bamako, Mali, display high-resolution imagery. In addition, some areas were updated with more recent imagery, including Christchurch, New Zealand; Phnom Penh, Cambodia; and Izmir, Turkey. We also received a number of new contributions and updates from the Community Maps Program. Some of the new contributions at 36,000 to 1,000 scale include the Kingdom of Denmark; Leon County, Florida; City of Riverside, California; Tompkins County, New York; and Central Vermont, USA, at 36,000 to 2,000 scale. Updated imagery includes the countries of Singapore (36,000 to 4,000 scale) and Suriname (36,000 to 1,000 scale).

World Topographic Map—New and updated content received through the Community Maps Program was added to the World Topographic Map. New content for the United States includes El Paso County, Texas; Lewis & Clark County, Montana; Las Vegas, Nevada; Kittitas County, Washington; University of Wyoming, Wyoming; and University of Tuskegee, Alabama. Updated content for the United States includes Collier County, Florida; Denver County, Colorado; El Paso County, Texas; Peoria County, Illinois; Chandler, Arizona; York, Maine; Greater Portland, Oregon; and Tacoma, Washington. We've also added new and updated content for Canada at 9,000 to 1,000 scale for 68 communities, including municipalities, cities, towns, universities, and colleges. Comprehensive updates for the countries of the Czech Republic, the Netherlands, and France were also added. The data for the update to France came from best available authoritative sources, including IGN BD ADRESSE and IGN BD TOPO, as well as HERE and INTERMAP. Updated content for Australia and New Zealand was published in World Topographic, World Street, and Light Gray Canvas basemaps, as well as in World Transportation and World Boundaries and Places reference overlays. We continue to update and expand our global large-scale basemap coverage from 288,000 to 4,000 nationwide in the United States and to 2,000 and 1,000 in select areas.

For a complete list of all contributions to each of the world basemaps, visit **esriurl.com/contributors**.

For Additional Information About Esri Products

esri.com/products

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

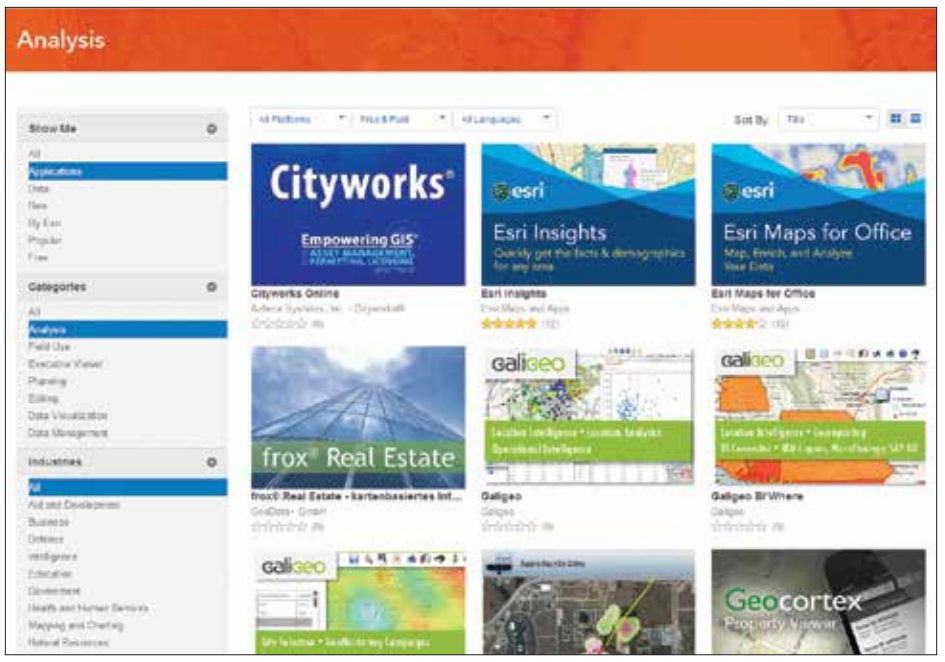
Contact your local office:
esri.com/locations

Contact your local Esri Partner:
esri.com/partners

ArcGIS Marketplace Is Open for Business

ArcGIS Marketplace is a new website that allows ArcGIS Online subscribers to search for, discover, and get apps and data from qualified providers.

Need some high-quality data? The Marketplace offers premium data from organizations such as AccuWeather, DigitalGlobe, RapidEye, and Esri. How about an easy-to-use app that answers a specific business need? The Marketplace includes a range of apps from Esri and its distributors, as well as partners such as Azteca Systems, con terra, Eagle Information Mapping, Galigeo, GeoData+ GmbH, and Latitude Geographics. The apps are built specifically to work with ArcGIS Online and can easily be shared with ArcGIS Online groups and users within your organization.



Easily discover apps and data that will work with your ArcGIS Online account.

"While there are app marketplaces that serve consumer audiences, only ArcGIS Marketplace is specifically designed to serve the needs of GIS users, making it truly unique," says Johan Herrlin, senior business strategist at Esri. "ArcGIS Marketplace is another facet of the ArcGIS platform. Now you can easily find apps and data services that integrate with your ArcGIS Online subscription, allowing you to get more value out of the platform."

Anyone can browse the listings in ArcGIS Marketplace, but you need to be an ArcGIS Online subscriber to get free trials or make purchases. Because all apps in ArcGIS Marketplace require an ArcGIS Online login, users can access their organization's maps via the apps. Data services acquired via ArcGIS Marketplace are also accessible via ArcGIS Online, so you can add them to your basemap gallery or other apps.

For apps and data service providers, ArcGIS Marketplace provides a mechanism to provide free trials, grant access to listings, manage subscriptions, and generate leads.

ArcGIS Marketplace is available globally. Keep checking in over the coming months, as the number of app and data listings will grow rapidly.

To get started empowering your enterprise with apps and data services, visit **marketplace.arcgis.com**.

New ArcGIS Solutions Website Makes It Easy to Find Templates for Your Industry

Fast-Track Your App, Map, and Data Model Creation with ArcGIS Solutions Templates

Do you sometimes feel as though you are reinventing the wheel when you set out to create an app, map, or data model that's easy for nontechnical people to use? Now you can streamline that aspect of your work and spend more time on the other important GIS projects that you do. Esri has created a collection of solution templates, tailored for specific industries, that you can quickly configure to fit the needs of your organization.

Solutions templates employing best practices are available for a variety of industries.

To help you find suitable templates in a single place where you can also get support and connect with your peers, Esri has created the ArcGIS Solutions website at **solutions.arcgis.com**. Here you will find templates categorized by industry, including state and local government, utilities, telecommunications, military, intelligence, emergency management, and public gardens. You can try many of the templates in a browser before downloading. You can also watch videos of how to use the templates, discover in-depth documentation, and find plenty of options for support.

"By supporting specific workflows within your organization, ArcGIS Solutions helps GIS professionals empower their stakeholders with spatial information," says Damian Spangrud, Esri director of solutions. "They deliver forward-looking best practices and ready-to-use apps that can make a real difference in the adoption and use of GIS throughout the enterprise."

Each template employs best practices so you don't have to spend time worrying whether you are standing up a map, app, or data model in the most optimal way. The templates are freely downloadable and fully supported by Esri. To use and deploy the templates, you need to have Esri's core ArcGIS technology.

To get started with ArcGIS Solutions for your industry, visit **solutions.arcgis.com**.

Collector for ArcGIS and Operations Dashboard for ArcGIS Apps Provide Tablet Support

Collect, Monitor, and Analyze Rapidly Changing Data in Real Time

At version 10.2, Collector for ArcGIS includes an updated user interface and support for iPad and Android tablets.

Collector for ArcGIS and Operations Dashboard for ArcGIS have been updated at 10.2 to include display, configuration, and workflow enhancements that improve field data collection and enterprise oversight. Both apps are available at no cost to Portal for ArcGIS users and ArcGIS Online subscribers.

Collector

Collector for ArcGIS is a native, configurable field data collection app for iOS and Android that improves the accuracy and currency of spatial data. It is a companion to Operations Dashboard but can also be used in a stand-alone environment. Field-workers can download maps using Collector and then capture data, attach photos and video, plan routes, and get directions. Information can be transmitted and immediately displayed in Operations Dashboard and shared throughout an organization in real time.

At 10.2, the user interface for Collector has been refreshed and now includes support for iPad and Android tablets. Templates, selection results, directions, and more, can now be viewed alongside the map on mobile devices with larger screen real estate. Collector at 10.2 also expands the types of data that can be collected. The input of GIS features for all primary shape types (e.g., points, lines, and polygons) is now supported. The app also gives you the ability to view and control GPS accuracy when capturing features so you can stream positions from the GPS as you move.

Data capture often involves recording repetitive information at different locations and/or multiple features of different types at the same location. To reduce that manual repetition, Collector at 10.2 includes a continuous collect mode that allows users to copy the location or attributes of the last collected feature, saving time and effort.

Collector for ArcGIS can be downloaded directly from the Apple App Store and Google Play.

Operations Dashboard

Operations Dashboard for ArcGIS is a Windows-based application that provides real-time access to information. Users can monitor and manage an event (or series of events), track field personnel, and assess daily operations within their organization. The app integrates interactive maps and a variety of dynamic data sources, including bar charts, lists, histograms, gauges, and other performance indicators, based on live geographic information defined in a web map or web service. Operations Dashboard is available for use on Windows desktops and Intel-based Windows 7 and 8 tablets. Microsoft .NET Framework 4.5 is required before downloading the application from ArcGIS Online.

At 10.2, the Operations Dashboard application improves the way you work with data. Because the dashboard enables you to view extensive lists of information, the ability to search within lists has been added to quickly find what is needed. You can now see charts, graphs, custom text, and photo attachments within each pop-up window. When displaying information within graphical widgets, such as pie charts, you can now include labels so those viewing Operations Dashboard can better understand the values that appear. You can also filter the map and all widgets using relative time, such as within the last hour or month, or after a specific date. This helps monitor and analyze data that changes rapidly over time.

Operations Dashboard for ArcGIS now fully supports Portal for ArcGIS, as well as ArcGIS Online. A new configuration utility is available to Portal for ArcGIS users, making it easy to sign in and deploy the Operations Dashboard app on-premises. Portal for ArcGIS users can access the Operations Dashboard application from the Esri Customer Care portal.

For more information, visit **esri.com/dashboard** and **esri.com/collector**.

Build Dynamic Mapping Applications for a Variety of Devices

Fast Development and Deployment Using ArcGIS 10.2 Runtime SDKs

Highlights

- Runtime SDKs are freely available with an ArcGIS for Developers subscription.
- Deploy applications to the widest possible audience with expanded platform support for Qt and Mac OS X.
- A beta version of offline capabilities for routing, geocoding, and data editing is included.

ArcGIS Runtime SDKs provide a set of powerful tools for developers to embed dynamic mapping and geospatial technology into existing applications or build native, focused, client applications for desktop, mobile, and embedded devices. These SDKs make use of the ArcGIS platform by integrating mapping, geocoding, and advanced geoprocessing models to create rich, highly functional GIS apps. They can consume content and services from ArcGIS Online (including hosted services available as part of an ArcGIS Online for Organizations subscription) or your own on-premises ArcGIS servers. Developers can now sign up for a free ArcGIS developer subscription and download the new ArcGIS 10.2 Runtime SDKs from the ArcGIS for Developers site for a variety of platforms, including iOS, Android, Java, Mac OS X, Windows Presentation Foundation (WPF), and Qt.

ArcGIS 10.2 Runtime SDKs include major performance enhancements and new capabilities to help you stay productive when building and deploying apps. APIs have been improved to simplify the coding model for commonly performed tasks, such as geocoding and assigning basemaps, making some of the fastest maps users have ever interacted with. For more accurate display and distance calculations, geometry libraries have been enhanced to support geodesic buffering and geodesic offsets. Apps built with the 10.2 Runtime SDKs also include support for OAuth, which integrates seamlessly with security models built in ArcGIS Online and Portal for ArcGIS.

Esri's first-ever SDK releases for Qt and Mac OS X have been included in the 10.2 release. ArcGIS Runtime SDK for Qt is designed to help C++ developers use the Digia Qt framework to create GIS applications that use local services, bypassing the need for an ArcGIS for Server connection. Users can build ArcGIS applications with the new Qt Runtime SDK on both Windows and Linux platforms, 32 and 64 bit.

The new ArcGIS Runtime SDK for OS X provides an Objective-C API for developers to add mapping and GIS functionality to Mac applications. The API leverages services from ArcGIS Online and ArcGIS for Server through the REST interface. The SDK supports the Mac OS X Mavericks operating system and can either be installed on any Mac or distributed using the Apple Mac App Store. ArcGIS Runtime SDK for iOS also supports iOS 7, allowing users to deploy apps to the widest possible audience.

Also included in each of the 10.2 Runtime SDKs (except WPF) is a beta version of offline capabilities, available via a new API. Developers can create apps that take data offline, edit their information, and immediately sync changes back to the server. Users can also receive changes that others have synced to the server. Users will be able to provision devices with the data, basemaps, and editable layers they need to work completely offline. The following functionality has been included in the beta 10.2 version of the offline API:

- Offline routing
- Offline geocoding
- Downloading a tile cache
- Downloading features
- Offline editing
- Synchronization of offline edits to an online server

The official release of the offline API is expected in Q1 2014.

For more information on ArcGIS Runtime, visit **esri.com/runtime**.

Locate, view, and interact with web maps using Mac OS X. This preview application was built with ArcGIS 10.2 Runtime SDK for OS X. Developers can access the application from ArcGIS Online or adapt its source code from GitHub.

Controlling Growth from the Inside

Beaufort County School District Organizes Building Data to Better Serve Students

Highlights

- ArcGIS software-based solution provides easy-to-use interface to building information.
- Using GIS to organize drawings allows staff to find information they need quickly.
- Thematic mapping of space usage allows better management.

Beaufort County School District is located south of Charleston, South Carolina, and serves all students within the county, an area that encompasses over 900 square miles, of which a third is water. The beautiful scenery, with many islands, draws visitors to the area and has fueled growth. According to the 2010 Census, one area of the county had grown more than 800 percent over the prior decade.

This growth, combined with educational system changes in the early 2000s, led to a pent-up demand for facility improvements and additional space. At one point, one school had more children in mobile classrooms than in permanent buildings. Before this extreme growth, the district didn't have an in-house facilities department, instead relying on outside contractors. A bond referendum for a new elementary and middle school passed in 2006, and by 2007, the district hired an experienced in-house construction manager and planning staff. By 2008, when an additional referendum to build more schools was passed, the district had created its own Facilities Planning and Construction (FPC) Department.

By 2010, the district built two early childhood centers, two elementary schools, a middle school, and a high school, and the facilities department was able to change focus from building schools to managing them. The FPC team needed a solution to help manage and maintain the facilities it had while simultaneously preparing for more growth.

Pulling Together All the Pieces

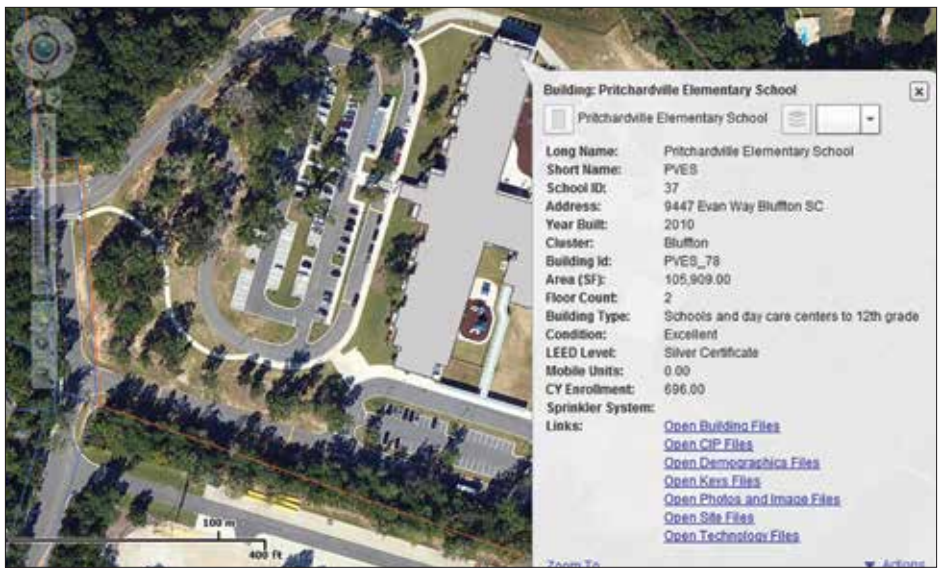
Carol Crutchfield, the district's school planner, had used GIS before for student assignment and attendance planning, but the rest of her team had limited experience with the technology. "We needed something that has a simple interface and could be accessed from anywhere so we can be out in the field and perform our normal tasks, including quick sketches and measurements," says Crutchfield.

Over the previous five years, the building portfolio had grown by 33 percent, including new buildings and several building additions. The district had also added cameras; secured entrances; integrated whiteboards; higher-efficiency heating, ventilation, and air conditioning systems; motion sensors; occupancy sensors; wireless networks; emergency response software; and a networked automated building controls system. A transformation had begun with a growing level of technology integrated into the overall building operation.

The FPC team approached the district's Board of Education, which supported the goal to find a solution to house facility information in one networked location. After inquiring through multiple sources, it found PenBay Solutions, an Esri Gold-Tier Partner based in Brunswick, Maine. To allow collaboration and system development outside the district's own network, PenBay created a solution that is hosted securely in the Amazon cloud and helped Crutchfield negotiate an educational license agreement with Esri that would serve its needs.

The solution PenBay provided was its facilities GIS application, InVision FM, based on the ArcGIS platform. The solution allows district staff to consolidate facilities data into a single platform where it can be more easily accessible to planning coordinators, construction managers, security officers, principals, and even teachers. The solution is user-friendly—allowing staff members to access maps of each school by selecting a bookmark in the interface. The previous workflow consisted of searching through a room stuffed with rolled-up floor plans.

The process of developing the district's InVision FM solution required the FPC to think logically about data needs, storage, and use. It also helped strengthen existing interdepartmental dynamics and the overall relationship with local government partners regarding data needs and data sharing.



Links to building files and documents are found on the Building Information window.

By Assignment (Grades or Usage) | By Type (Classrooms, Offices, etc.) | By Access (Staff, Visitors, Students)

Thematic mapping allows the user to "see" rooms in different ways.

A Safer View

Now, the most accurate information is available at the touch of a button. School footprints are layered on top of aerial imagery provided by the county. Parcel tax information is also available so users can easily pull up property ownership information.

The district's Protective Services officer is now using InVision FM for managing many different situations, ranging from excess traffic at a downtown school during drop-off and pickup times to more serious situations, including hurricanes, earthquakes, and school lockdowns. Since the district's location is on an earthquake fault and in a coastal area that is always alert to the possibility of hurricanes, this solution provides a consolidated approach for viewing facilities to better protect the students and staff.

Time Saved Means Money in the Bank

To use the system, a staff member simply clicks a particular school's bookmark and the map zooms to that location. The user then clicks the building footprint to launch a pop-up window that has links to all the documents associated with the building, including design drawings, record drawings, CAD files, photographs, demographic information, equipment data, roof leak data, emergency evacuation plans, and construction closeout documents. This is important, as every structure, building, and renovation in the district has dozens of related files.

"We've linked these documents so they can be easily accessed directly through the GIS; just click on the map and you are taken to where the documents live," says Crutchfield. "This is a significant time-saver, and saving time often equates to saving money."

Viewing the building information with the new solution allows staff to thematically map the data and manage usage with GIS. Rooms can be color coded based on use, such as type (classroom, office), and whether spaces such as the gymnasium or auditorium are available for rent. The possibilities for use continue to grow. Currently under development is a workflow in which principals can use InVision FM to efficiently plan teacher assignments and the locations of classroom groupings to keep grade or curriculum teams together.

Recently, the district used the solution to brief a contractor that had just won the grounds maintenance contract with the county. Instead of driving to each of the 34 buildings, staff members were able, with the system, to show the contractor where each school needed grass to be cut, contract boundaries, and what areas needed special attention.

Beaufort Gives GIS an A-plus

District staff quickly realized that GIS could not only serve to help maintain space at facilities but that it was also an excellent educational tool. And since one of the school district's strategic goals is to help students cultivate real-world technical skills and the district has an Esri educational site license, the district plans to offer GIS as a pilot course at one high school this fall using a state-level defined GIS curriculum.

For more information, contact Carol Crutchfield, planning coordinator, Beaufort County School District (e-mail: carol.crutchfield@beaufort.k12.sc.us or tel.: 843-322-0716), or David Brooks, project manager, PenBay Solutions (e-mail: dbrooks@penbaysolutions.com).

Studying at ITC to Kick-Start an International Career

Rolf A. de By, Tom Veldkamp, and Nino Kheladze

GIS has changed Nino Kheladze's life, and the present-day tools that the field offers and with which she works make her realize that she had made a fundamental career switch back in 2003. With a BSc degree in management and microeconomics under her belt, she then joined the consulting firm Geographic in her home country, Georgia. She quickly understood that this working environment demanded new skills, so she applied for an ITC short course on spatial data handling *(see "ITC's History" on page 17)*. That initial bit of coursework whetted her appetite, and soon she registered for more courses at ITC, resulting in back-to-back degrees: a professional master's in geoinformation management in 2008 and an MSc degree in government and spatial information management in 2011. Her MSc thesis work was devoted to the particularly serious societal domain of disaster risk management. Georgia is a mountainous country where earthquakes, floods, and landslides are not uncommon.

Nino Kheladze in the ITC library, checking the latest literature in her domain of science.

The Project

So when CENN, the Caucasus Environmental nongovernmental organization (NGO) Network, asked her to join its team on the ongoing Institutional Building for Natural Disaster Risk Reduction (called MATRA) project in Georgia, Kheladze did not hesitate. MATRA was run by ITC and CENN and funded by the Dutch Ministry of Foreign Affairs' Social Transformation Programme for Central and Eastern Europe, which aims to build institutional capacity for natural disaster risk reduction in Georgia and raise both public and institutional awareness on natural hazards and risks.

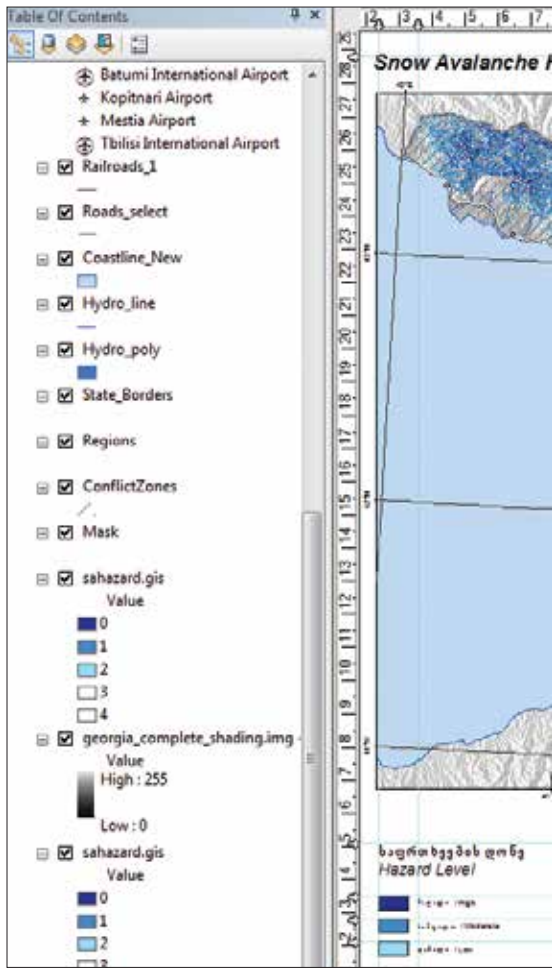
Kheladze became the CENN team lead on atlas development, which involved the construction of both a paper and online atlas of Georgia's disaster risks, two flagship results of the project. This was the first time that such an atlas was compiled in Georgia. The main goal of the risk atlas is to provide national and local governments, businesses, and the Georgian population with information about existing and potential natural hazards, risks, and socioeconomic vulnerability. It is in this context that Kheladze's education started paying off: she understood how to leverage ArcGIS functionality in an international cooperation setting with ITC colleagues Cees van Westen, Wim Feringa, and Ulan Turdukulov, which allowed sharing of data and map designs easily and which gave her the functional system robustness that such a context demands. The atlas is seen by all involved as a true example of great collaboration and idea sharing diagonally across Europe. Both paper and online versions can be viewed via **drm.cenn.org/paper_atlas** and **drm.cenn.org/index.php/en**, respectively.

Initiating and working with the risk atlas at a national scale was quite challenging, as there was a need of large-scale spatial data handling to prepare the respective indicators required for the risk analysis at national scale (social, economic, physical, and environmental vulnerability assessment and different types of hazard assessment). Handling and managing these amounts of spatial data were greatly facilitated by ArcGIS software, which provides many tools to realize different spatial data processing tasks (accomplished by visualization) in the limited time frame that was allocated for the atlas development. A special workflow was even designed.

The University

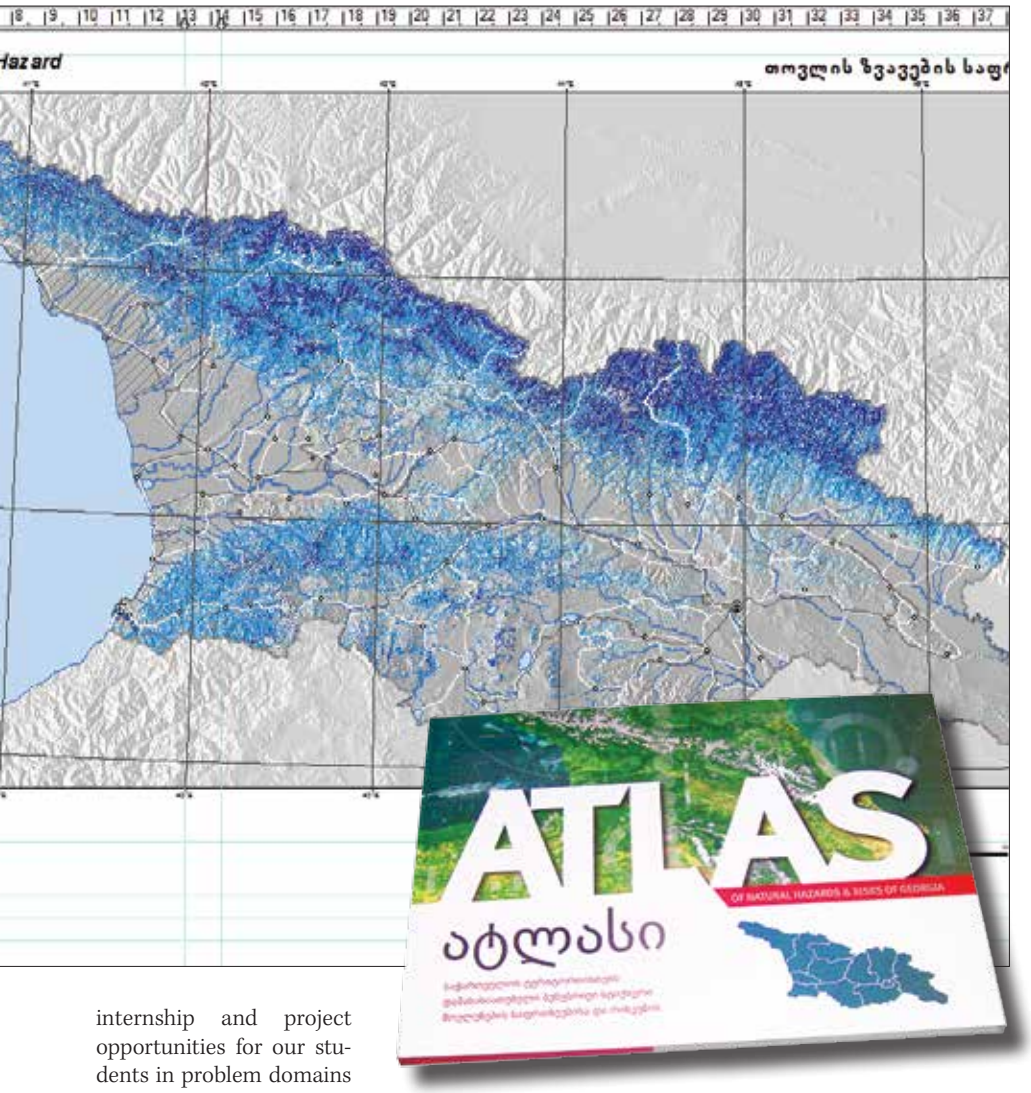
Every year, many students from the Americas, Africa, and Asia come to ITC—of the University of Twente in the Netherlands—with the prospect of giving their GIS or remote-sensing careers a substantial boost. They do so with the understanding that the ITC degrees are recognized in the global job market as being of high quality and durability and that the degree is a great entrance ticket to work in GIS in globally operating organizations, such as the World Bank and the United Nations (UN). Indeed, the relationships with the UN are strong: ITC is the home of two UN University Schools, one on disaster risk management and the other on land administration studies.

A wide spectrum of geoinformation application fields is covered by ITC's educational offerings, which range from technician all the way to PhD-level courses, with the MSc courses being the most prominent and most attended. Fields include water resources, natural resources, urban and rural planning, and earth systems analysis, each of which is addressed from a geoinformation and earth observation perspective. These studies tackle the grand societal challenges of our times: climate change; the urban/rural balance; disasters; food security; and the scarcity of other resources such as freshwater, minerals, and arable land, to name a few. In addition to the above, the technological field of geoinformatics caters to the more technology-savvy



One of the map products, a five-class snow avalanche hazard map in ArcGIS.

student. In combination, these fields are especially addressing the needs of those who want to develop their GIS careers in the truly international domain, possibly in or for the continents away from the industrialized North. To make it all happen, ITC regularly teams up with large international entities like the UN, the World Bank, continental development banks, and international donor and charity schemes, thus creating



The book version of the risk atlas.

internship and project opportunities for our students in problem domains that are international, exciting, and challenging.

The Student Experience

ITC is a miniworld in itself, a true melting pot with many nationalities represented in the students and staff alike. Study facilities are modern and immersive and invite students to collaborate. Enschede is a real student city, with great cultural and sports events, and because it is only two train hours away from Amsterdam Schiphol airport, excursions to the other great European capitals are both cheap and easy to arrange.

Of equal importance is the cost structure of a study at ITC. As our institute has historically focused on students from developing and emerging economies, the aim has always been to keep courses affordable. For students from the North American continent, this means that even with airfare, our fees are highly competitive, and the prospective student would be wise to verify this at our website (www.itc.nl/usa), where the latest tuition scheme is provided.

And what about Kheladze? She currently works on a variety of follow-ups of the disaster risk management project, still very pleased with her ArcGIS platform; keeping the information up-to-date; improving the uptake of the system by local communities; and developing more tools that utilize the infrastructure. She is also contemplating a return to ITC one day soon . . . one more time, to obtain her PhD.

About the Authors

Rolf A. de By is an associate professor in the Geo-Information Processing department at ITC/University of Twente. Tom Veldkamp holds a full professorship in spatial environmental quality and is also ITC's rector/dean. Nino Kheladze is project coordinator at the Caucasus Environmental NGO Network in Tblisi, Georgia.

For more information, contact John Horn, ITC senior project officer (e-mail: j.a.horn@utwente.nl), or visit www.itc.nl/usa, or Rolf A. de By (e-mail: r.a.deby@utwente.nl), and Nino Kheladze (e-mail: nino.kheladze@cenn.org).

ITC's History

Founded in 1950 as the International Training Institute, ITC has always targeted the spatial survey and planning problems of the developing world. ITC has changed names a few times and is currently known as the Faculty for Geo-information Science and Earth Observation of the University of Twente, which it joined in 2010, while retaining its mission oriented to development cooperation. ITC has more than 20,000 truly international alumni. ITC has historically had a big impact in the staff composition of governmental agencies that address spatial problems, such as various ministries, national cadastres, survey agencies, and bureaus of statistics, and various mapping agencies. That impact has been most prominent in Latin America, Africa, and Asia. More recently, ITC's alumni are finding positions also with internationally operating organizations like the World Bank, United Nations, various global donors, and global nongovernmental organizations.

Oakland Unified School District Uses GIS to Further Academic Achievement

NGO Non-Governmental Organization

Highlights

- ArcGIS serves as a decision-support tool for Oakland Unified School District administrators and policy makers.
- ArcGIS for Server makes available the enormous amount of information stored in the county's data warehouse.
- With ArcGIS for Server and REST APIs, the county provides detailed data for use by local government agencies.

Oakland, California, lies directly across the bay from San Francisco. During the California Gold Rush in the mid-18th century, it served as the main staging point for miners and cargo traveling between the Bay Area and the Sierra foothills. Today, the city continues to serve as a major cargo terminus, and its seaport is the fourth busiest container port in the United States.

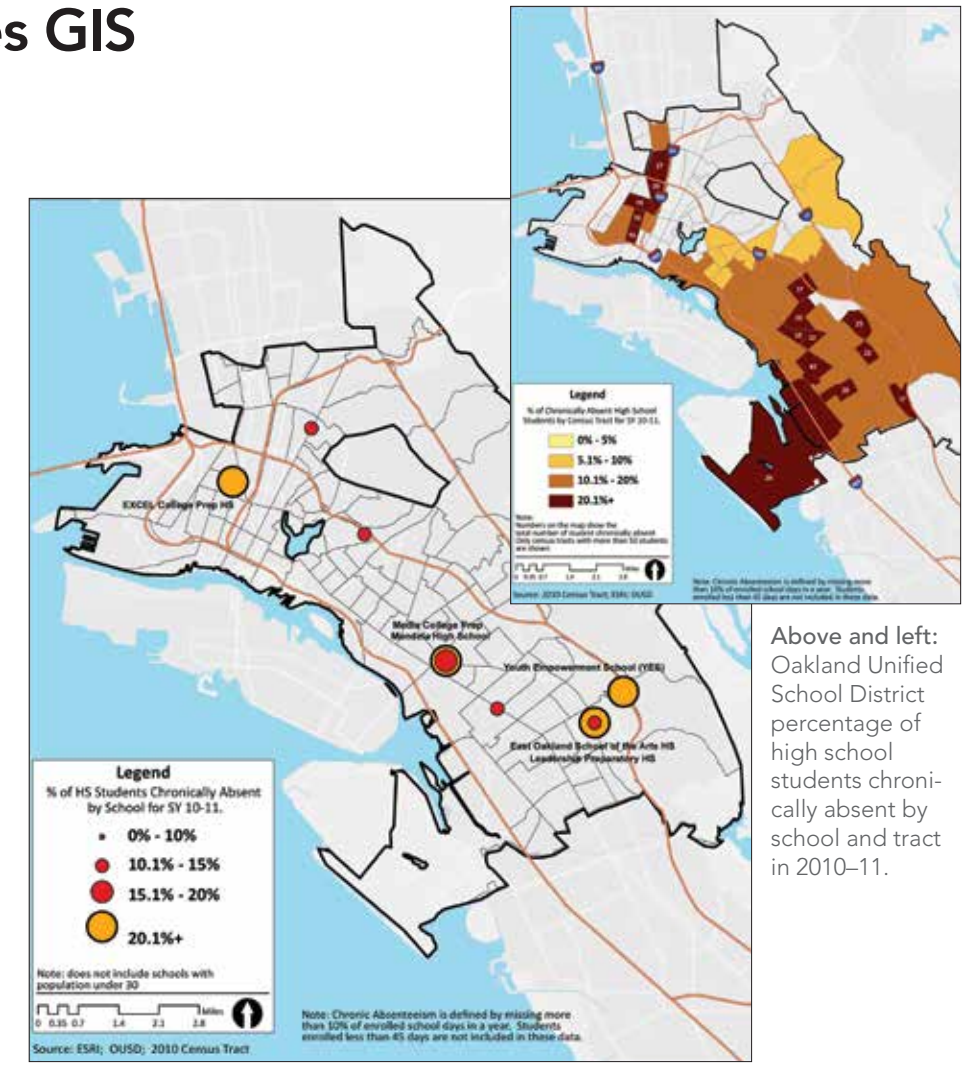
Due to the economic opportunities provided by the Gold Rush, the city was a destination for immigrants looking for greater prosperity. As a result of this and successive migrations, Oakland is now known for its ethnic diversity, with significant populations of African-American, Hispanic, Asian, and Caucasian residents. While valuable from a cultural perspective, this poses certain challenges for local government, particularly the Oakland Unified School District (OUSD), which must accommodate the diverse needs of its students, who speak more than 70 languages at home.

OUSD includes 61 elementary schools, 16 middle schools, 20 high schools, three K–8 schools, and one 6–12 school, as well as special education, independent study, and early childhood education centers. It is the 70th largest school district in the United States, and there are about 38,000 students in its K–12 programs. Chronic absenteeism is a major concern for the district, with nearly 40 percent of students in the East Oakland area dropping out of high school before graduation. OUSD works with the Urban Strategies Council (USC), a nonprofit organization in Oakland, to collect and analyze data related to school attendance and other social issues in the city.

Implementing a Community Data Portal with ArcGIS for Server

USC has used ArcGIS software for more than 20 years, applying it to a wide range of urban policy and reform initiatives affecting Alameda County, where Oakland is located, including health care services, affordable housing, violence prevention, education analysis, urban planning, disaster mitigation, and school absenteeism. For example, it recently launched InfoAlamedaCounty Map Room (www.infoalamedacounty.org), a free data portal that provides community access to public datasets for research, application development, civic engagement, and analysis.

Due to the enormous amount of information stored in the county's data warehouse, which needs to be made available to those organizations doing local research, ArcGIS for Server has greatly benefited the county's data portal project. With ArcGIS for Server and REST APIs, the county can take very detailed Alameda County data about individuals that is collected through special nondisclosure agreements and aggregate it to a safe level for general use by local government agencies, such as OUSD, and the general public.



Above and left: Oakland Unified School District percentage of high school students chronically absent by school and tract in 2010–11.

Tackling Chronic Absenteeism

USC and OUSD are using ArcGIS to analyze the social and economic factors that dominate those areas with high rates of absenteeism to better determine why students aren't attending school and what needs to be done to increase attendance.

"Statistics show that when a student is absent from school 10 percent of the time, which we define as chronic absenteeism, that student is much less likely to graduate, and this will affect the rest of his or her life," says Steve Spiker, director of research and technology for USC. "Our goal is to help foster a culture of attendance within the Oakland public school system."

To better understand student absenteeism in Oakland, data about all OUSD students is geocoded and then processed with ArcGIS to determine how many days of school each student has missed and where the chronically absent students live. The 38,000 data points representing the students are aggregated so that individuals can't be identified. The data is then mapped to examine absentee variations across the school district. This can be overlaid with census data to determine if some geographic areas and/or population groups are more prone to absenteeism than others and, if so, why. In addition, this data can be examined over time to see if the areas with historic chronic absenteeism are getting better or worse.

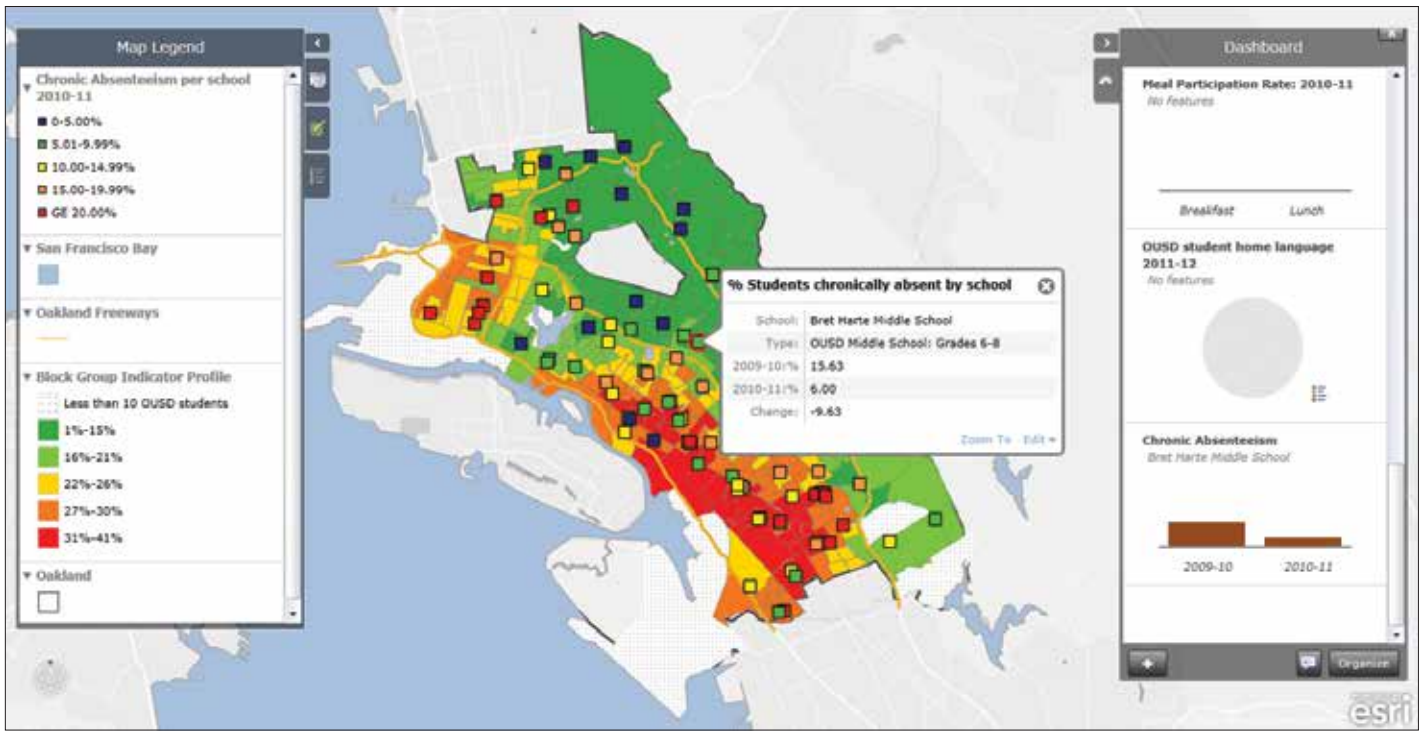
"Performing an analysis of student absenteeism with GIS allows us to present the results on a map that engages the community on an emotional level that can't be achieved with tabular data," says Spiker.

Aligning Resource Allocation with Community Partners

USC and OUSD have formed a partnership, which has increased the district's use of USC's geospatial datasets. OUSD used ArcGIS for several years for administrative purposes, and its Research, Assessment and Data (RAD) department developed the Opportunity Mapping application (www.thrivingstudents.org/42/use-maps) to serve as a decision-support tool for district administrators and policy makers.

The application uses data from USC, as well as OUSD's Healthy Kids, Healthy Oakland data framework. Mapping categories include school sites and enrollment, graduation rates, school-based food services and free and reduced lunch, academic performance and physical fitness assessment, chronic absenteeism, demographic ethnicity, early childhood education and campus health centers, community resources, health and wellness/life expectancy, and vacant housing.

"Mapping these indicators and freely distributing our analyses helps district leaders and school communities see where the gaps are in the school district's educational initiatives," says Susan Radke, a consultant for OUSD RAD. "It is a new way for OUSD to use place-based data to drive strategies and decisions, such as the allocation of resources to places and students where the need is greatest. It also helps community partners align their resources with the school district, which is especially important in a time of diminishing resources throughout the entire system."



Oakland Unified School District Opportunity map comparing chronic absenteeism per school for the 2010–11 school year.

Down the Road

Radke says that the next iteration of the Opportunity Mapping application will include an expanded set of indicators, such as measures of student health, healthy neighborhood indicators (fresh food locations) that have been ground truthed by students, crime analysis, and school-based analysis of career paths. The architecture for the application will be migrated to a fully developed ArcGIS Online cloud-based web service, which will afford greater customization via APIs.

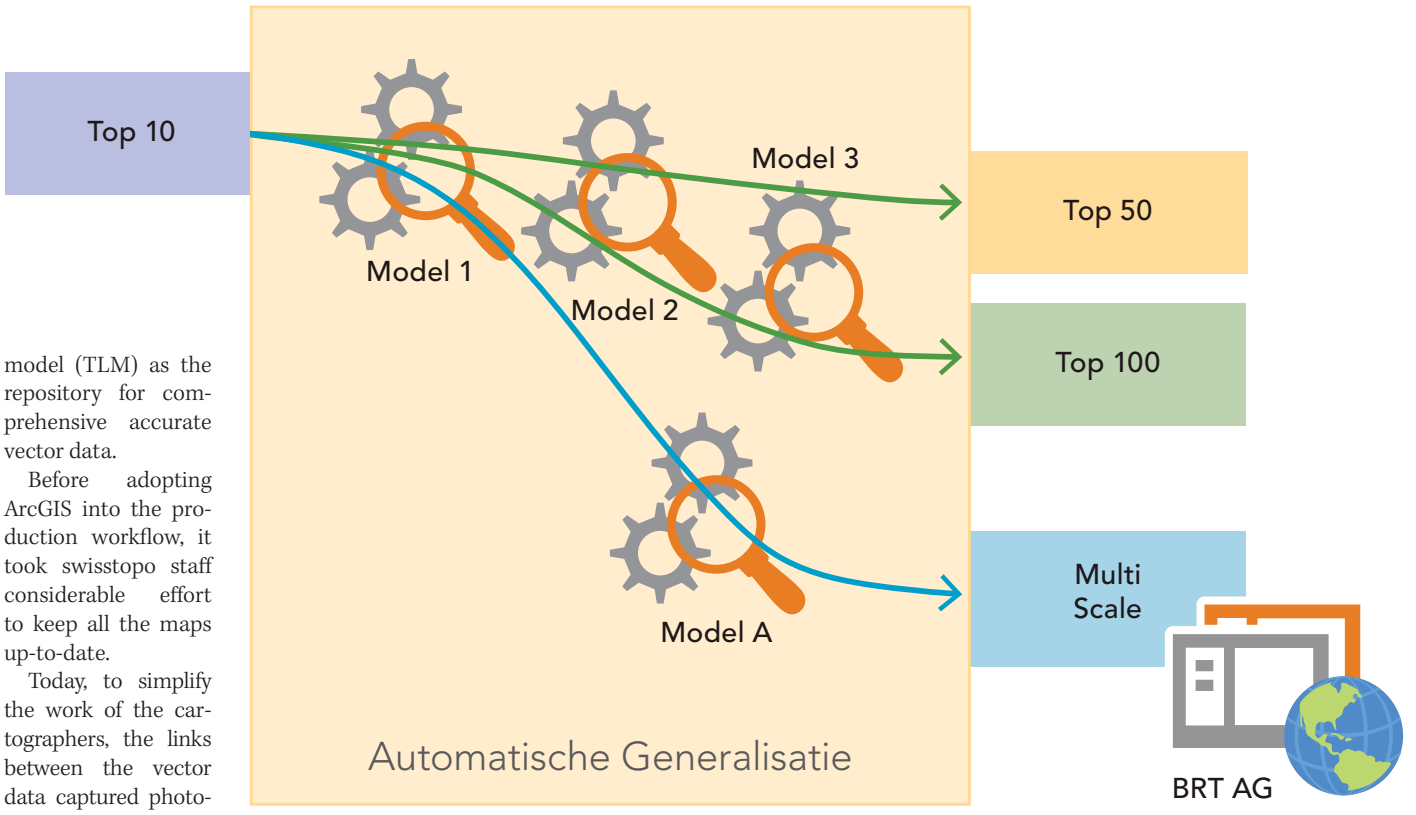
For more information, contact Susan Radke, mapping analytics specialist, Quality, Accountability, and Analytics, Oakland Unified School District (e-mail: susan.radke@ousd.k12.ca.us), or Steve Spiker, director of research and technology, Urban Strategies Council (e-mail: steves@urbanstrategies.org).

Transforming National Map Production

Mapping Agencies Save Time and Keep Information Current While Maintaining Cartographic Standards

Highlights

- National mapping organizations streamline product creation and services to help people solve problems.
- swisstopo readily keeps maps up-to-date with ArcGIS.
- Dutch Kadaster reduces map production time by 5,000 percent.



The automated flow of 1:10,000-scale data through geoprocessing models to produce product-specific generalized data.

National mapping organizations (NMOs) are in charge of creating authoritative products and services that help people understand where things are and what is happening there. This information helps people in government, business, and everyday life solve problems.

Two NMOs in particular, the Swiss Federal Office of Topography (swisstopo) and Dutch Kadaster, the national land registry and mapping agency for the Netherlands, have the strategic goal to use common databases and production environments for all their maps enabled by the ArcGIS platform.

Both organizations chose ArcGIS after using other solutions. They found that the ArcGIS platform can transform map production with geoprocessing, including generalization, automated text placement, symbol-level drawing, and printing and overprinting, to radically cut the time required to produce maps. The ability to apply technology in such an efficient manner and produce great cartographic results is one of the many designed goals for the ArcGIS platform.

These two mapping organizations exemplify the "capture once, use many times" way of thinking. There are many ways to implement cartographic workflows, but there are several common themes these organizations have discovered using the ArcGIS platform.

Keeping Up with a Changing World

swisstopo has a unique, highly regarded style of cartography. The production process integrates photogrammetry with geoprocessing production workflows. swisstopo staff publish topographic map series in scales from 1:25,000 up to 1:1,000,000 using a topographic landscape model (TLM) as the repository for comprehensive accurate vector data.

Before adopting ArcGIS into the production workflow, it took swisstopo staff considerable effort to keep all the maps up-to-date.

Today, to simplify the work of the cartographers, the links between the vector data captured photogrammetrically and the cartographic products are maintained. The swisstopo central production environment is called TOPGIS, and it is the foundation that integrates photogrammetry and 3D GIS to produce many products from one database. Each map product's production process has a unique digital cartographic model (DCM), which uses data from the TLM that has been transformed to become the product-specific symbolized data. This is important when changes in the real world happen, because it increases the efficiency of necessary updates.

A whole suite of DCMs are used to create different map products. Each DCM corresponds to one of the many map scales required. The office creates many printed products, like the Swiss national map series, which among other things is an excellent resource for hiking in the Alps, as well as digital products like SwissMap Online. Today, using ArcGIS, swisstopo has improved its map currency and the world-renowned quality of its cartographic products.

A 5,000 Percent Savings in Time Needed for Map Production

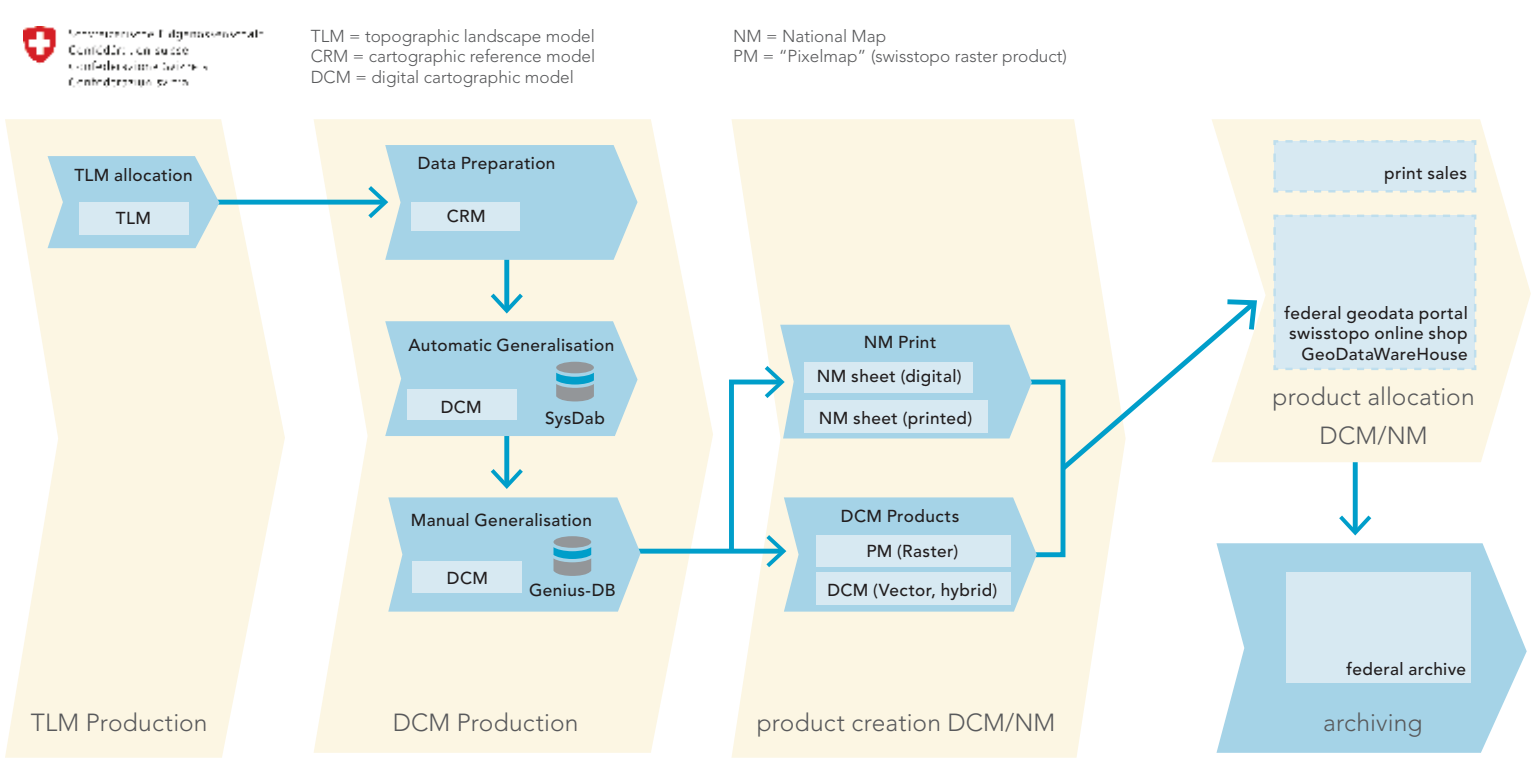
Dutch Kadaster is the national land registry and mapping agency for the Netherlands. The organization surveys, registers, and performs land consolidation, as well as providing mapping and information services for the country. Dutch Kadaster staff members have transformed their mapping process by implementing the ArcGIS platform to create and maintain standard topographic data and maps for the country. For years, Dutch Kadaster has maintained its Top10NL, a 1:10,000-scale topographic geodatabase of all of the Netherlands. Now the highly skilled geoinformation development team adopted new innovation concepts in close cooperation with users.

ArcGIS was configured out of the box to completely automate derived map production by creating sophisticated models that reflected the cartographer's vision with no customization.

Both Kadaster and its users benefit from the implementation of a fully automated generalization production workflow. The automation of manual cartographic labor led to a significant cost reduction. Using the new procedure, Kadaster produces the 1:50,000-scale map series at one-fourth of the original budget. Processing time has been reduced tremendously and has increased the update frequency of the derived map series from a six-year to a two-year cycle. This is fully in sync with base data acquisition—the source dataset at 1:10,000 scale and derived map series at 1:50,000 scale are released simultaneously five times a year. Map content itself is optimized by applying generalization algorithms consistently for the whole country and by improving the base dataset and algorithms after each development and production iteration.

Using ArcGIS, including tools for map automation and generalization, Dutch Kadaster realized a 5,000 percent savings in the time required by traditional cartographic methods for map production. Ultimately, the users are the real beneficiaries of this innovation: getting real maps more frequently at lower costs.

For more information, check out the poster on the following pages, 20–21, to see eight important features both of these agencies used to define their map production processes to help usher in a new era to cartographic design and efficiency. Also, contact Mark Cygan, Esri (e-mail: mcygan@esri.com, tel.: 909-793-2853, ext. 2333).

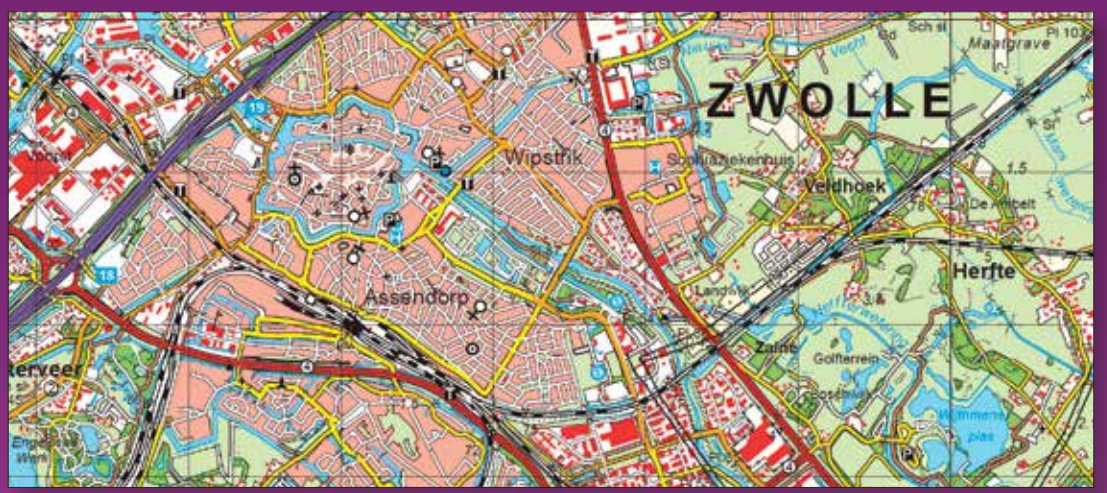


The workflow that transforms detailed data into swisstopo's map and data products.

National Mapping in the 2

Dutch Kadaster—Automating Production

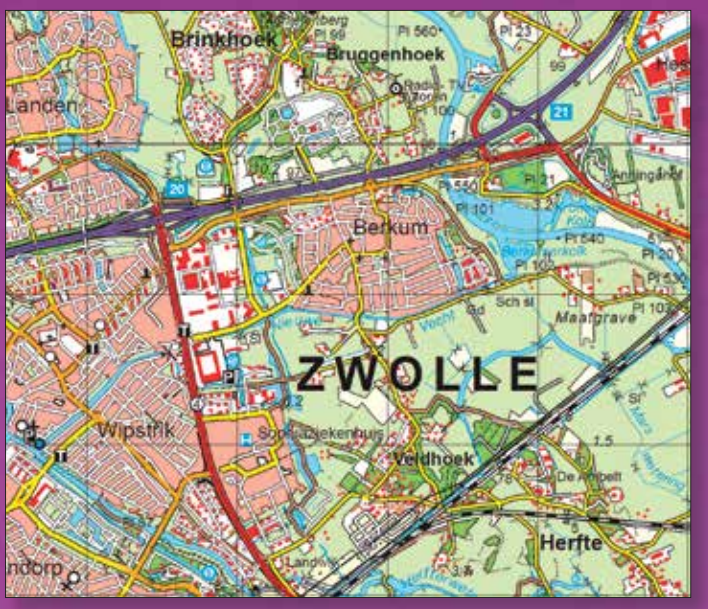
The Dutch national mapping agency uses ArcGIS® for automated generalization and production of topographic data and maps. The organization configured out-of-the-box software to automate the generalization of the 1:50,000-scale maps from the TOP10NL dataset (1:10,000-scale topographic data). The new automatic generalization process replaces the earlier process used to create the old-fashioned 1:50,000 map. The results of this fully automated system save millions of euros and dramatically reduce production time from years to weeks.



100 Percent Automated Map Production

Kadaster started by translating the cartographer's designs for how the 1:50,000-scale map should look and function into a form of artificial intelligence to encapsulate how different features on the map needed to relate. The source data from TOP10NL was enhanced and enriched with this information. The resultant intelligent map data became the basis for automated symbolization and generalization workflows. Hundreds of individual models were leveraged, and over 70 ArcGIS geoprocessing tools were used to accomplish the processing tasks.

1:25,000 Scale



1:50,000 Scale

Automating Generalization

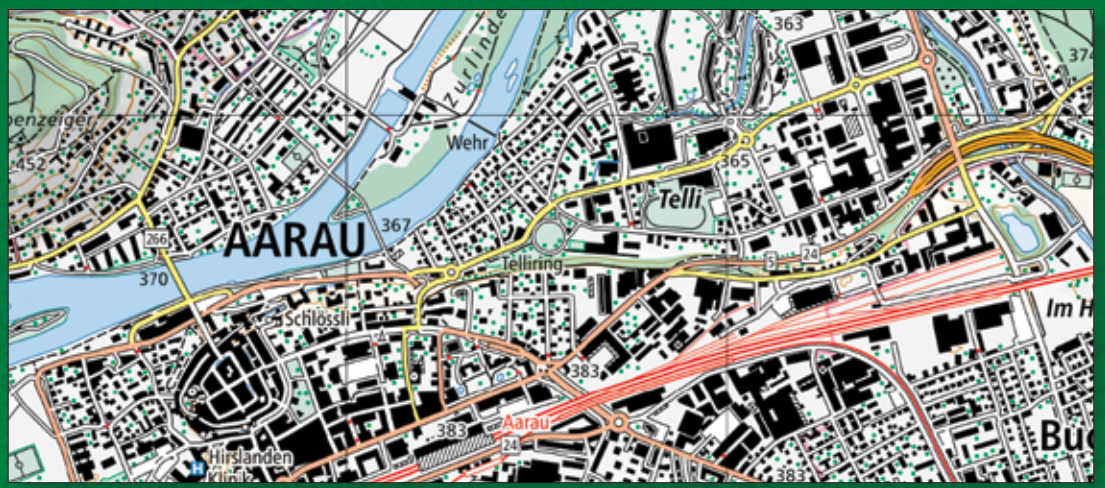
These examples illustrate the results of Dutch Kadaster's automated generalization process. Kadaster used a two-stage approach to automating generalization. The major roads network was first used as a basis to partition the country. This produced about 500 partitions that can be separately generalized in the second stage of the approach. Some datasets, such as administrative boundaries, railroads, and high-tension lines, could not be changed or divided and were processed as a whole, nationwide. The data within the partitions and the nationwide data were both processed using the same three-stage model. The first stage was model generalization, which translates the types of information from the TOP10NL data to what would be represented on the map. Next was geometric changes and displacement that aligned, regularized, or simplified geometry. Last was graphical displacement to resolve visual conflicts between symbolized representations of features.

The Netherlands' Cadastre
Land Registry and Mapping Agency
www.kadaster.nl

21st Century

swisstopo—Achieving Quality Cartography

The Swiss Federal Office of Topography (swisstopo) is responsible for creating and updating the country's topographic data and national map series. ArcGIS is the central production platform for the Topographic Landscape Model (TLM) and map production workflows. The TLM integrates photogrammetry and 3D GIS into the mapmaking process. This system is database driven so that when changes in the real world happen, swisstopo can easily maintain the currency and world-renowned quality of its cartographic end products. Each of these examples includes features from the rich, informative map design of swisstopo's 1:25,000-scale national maps.



Production PDF

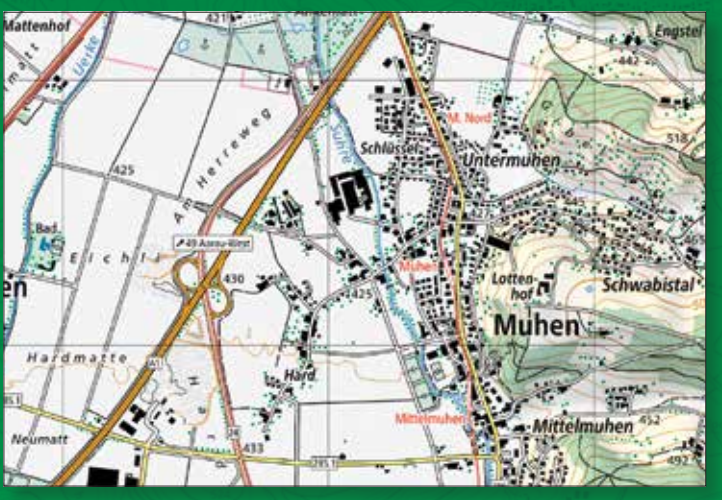
swisstopo used ArcGIS to produce seven 2,520 dpi PDF files and six raster exports for the final prepress process. These files represent individual themes within the maps, such as vegetation or drainage. They were combined to create a single print-ready file for an offset printing press using eight colors, three process colors (black, magenta, and yellow), and five Pantone® spot colors. These PDF files took full advantage of capabilities added to the Production Mapping desktop extension at version 10.1, including color mapping, tint percentage, and overprint properties.

Symbol-Level Drawing and Layer Masking

This map used over 20 masking layers for annotation like "Hunzenschwil" or "Dorfbach," roads and railroad over/underpasses, and connections between various types of roads. Symbol-level drawing enabled each pairing of masks and features to be masked to be managed during production. Group layers managed those layers requiring symbol-level drawing, allowing the cartographers to define the drawing order for related groups of symbols.

CartoProcesses: Embankments

Esri Switzerland aided the effort by developing a collection of "CartoProcesses," one of which was used to create the "hachures" for embankment symbols. Two polyline features that defined the top and bottom of the embankment were the basis for this CartoProcess. The result was editable hachure features that could be rotated, lengthened, or shortened when needed to enhance their relationship with the underlying terrain. This allowed automated production of all embankment features without risk of errors or omissions.



Cartographic Representations with Overrides and Masking

Without cartographic representations, this map, in this form, would simply not be possible. Cartographic representations were used throughout the data model for features like embankments, orchards, and sports fields and even for the relatively simple mask symbols; this was due to an early decision to use a single, consistent symbol for each kind of feature.

All cartographic representations' many possibilities were fully exploited. Multisymbol layers are used, as are various geometric and global effects. Geometry overrides are also widely applied to set not only the size and rotation angles of point symbols but also to set the width, extremity, and caps for polyline symbols along with the grid angle on certain polygon symbols that are filled with markers.

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Office of Topography swisstopo
www.swisstopo.ch

Striking Gold

GIS-Based Portal Achieves Safe, Secure Global Data Access

Highlights

- Barrick implemented ArcGIS Online and created the Barrick Online Mapping Portal.
- ArcGIS Online allows the company to store data behind the firewall while hosting the user interface in the cloud.
- The cloud-based platform makes spatial data available to a broad audience without increasing the load on the IT department.

Above: One of Canada's Barrick Gold Corporation's 27 operating mines. **Inset above:** The Barrick Online Mapping Portal gives users instant access to information on biodiversity and sensitive lands for mine sites across the globe.

Barrick Gold Corporation of Toronto, Canada, is the world's largest gold-mining company, with a current portfolio of 27 operating mines. Recently named to the Global 100, a listing of the most sustainable corporations in the world, Barrick employs more than 20,000 people and has advanced exploration and development projects dispersed across the globe.

As the world's top gold producer, the corporation is estimated to have amassed over 100 terabytes of geologic data in addition to more than 100 years' worth of geochemical, geophysical, and remotely sensed data inherited from acquired companies.

While Barrick had developed and implemented an effective spatial data management (SDM) workflow, it is used primarily by the company's force of geospatial professionals with hundreds of ArcGIS for Desktop licenses. Nevertheless, there was a much larger group within the mining company that required access to Barrick's spatial data to make informed decisions. This prompted the organization to look for a complementary solution that would extend access to spatial data.

"Although we have a large group of technology users and more than 500 desktop licenses, there are others within the organization that do not have a license yet require quick access to data," says Iain Allen, senior manager of GIS, Barrick Gold. "We felt that we'd be able to make better decisions, faster, if this group had easy access to relevant spatial information."

To expand access to a growing volume of cataloged data generated by the SDM workflow, Barrick expanded its use of ArcGIS technology and implemented ArcGIS Online to create the Barrick Online Mapping Portal.

Enabling Global Data Access to a Century's Worth of Data

Leveraging the SDM, Barrick completed metadata for more than 100,000 datasets, a necessary precursor to adding data to the Global Data Catalog. A custom metadata editor is used to complete the metadata; the MXDs are then published to file geodatabases stored in an MXD repository on the network. Each night, a metadata software program "spider" harvests new metadata and adds it to the Global Data Catalog. This allows data, now available on the Barrick network rather than individual laptops, to be searched and used long after a project has been completed.

Selected datasets are then made available as web services published to ArcGIS Online. Services can be created from virtually any existing spatial dataset—both vector and raster—including geology, geophysics, geochemistry, structure, drilling, and environmental monitoring.

The home page was developed using ArcGIS Online, showcasing Barrick's unique look and feel. Featured maps and apps have also been added to the home page.

Through the Barrick Online Mapping Portal, Barrick data can be combined with a large collection of online basemaps. Web apps are also made available through the portal, including the Global Data Catalog and internal Global Deposits database, both of which were formerly stand-alone applications. Discipline-specific data compilations allow staff to access directly the data that is vital to their work.

"By leveraging a cloud-based platform, we've been able to outsource most of the administrative overhead, allowing us to make spatial data available to a much broader audience without increasing the load on an extremely busy IT department," says Allen.

By simply opening a web browser, senior managers can now make critical determinations, such as What is our biodiversity risk globally? and How many sites do we have around the world at various stages of exploration? Key decision makers are able to interact with the data and get a better understanding of global issues.

When mine site expansions occur, relevant infrastructure data can be integrated into an interactive web map. This may include satellite imagery, geology, protected areas, road networks, and local towns. This map can be referenced to analyze changes over time and to monitor activity as outside the fence. Because mine sites in developing countries often attract large numbers of local people, tracking the growth and distribution of this population is important in the event of an expansion.

Ensuring Confidentiality

To ensure compliance with organizational policies, ArcGIS Online allows Barrick to store data behind the firewall while hosting the user interface in the cloud. Publishing capabilities are restricted to a small group, typically the GIS expert or spatial data manager at each site or office. These specialists create and publish specific data packages around ongoing projects and restrict data access to relevant users by creating groups in ArcGIS Online. This ensures that sensitive information always remains confidential.

"The ability to keep data private is essential due to the amount of confidential information that is shared between users," says Allen. "Security features within ArcGIS Online allow us to ensure that only users specific to a certain mine site are able to access information."

Future Plans

In addition to creating site-specific data packages, Barrick is planning to leverage the cloud platform to create a travel security map for all its mining sites across the globe. The map will display risk factors for each site, including political instability, earthquakes, tsunamis, typhoons, and other threats. The site-specific risk factors will be drawn from a spreadsheet managed by the security team, and any changes made will be automatically reflected on the map, providing users with a live feed of security-related updates.

Future plans include leveraging the Compare Maps template within ArcGIS Online, which will allow users to view datasets relative to multiple mine sites on a split screen. Barrick also hopes to link the data catalog directly with ArcGIS Online so that data can be searched in the cloud using metadata keywords.

For more information, contact Iain Allen, senior manager—GIS, Barrick Gold Corporation (e-mail: iallen@barrick.com).

The digital *North Sea Atlas* makes an enormous amount of North Sea information, including photographs, available to anyone. (Photo courtesy of Joop van Houdt.)

The Netherlands' *North Sea Atlas* Evolves in a World of Devices

Highlights

- Using ArcGIS Online ensures that North Sea information is available to everyone.
- The GIS-based *North Sea Atlas* is dynamic and accessible to a broad public through PCs, smartphones, and tablets.
- The *North Sea Atlas* viewing experience is now supplemented by detailed remarks and fine photography.

Offshore platforms, fish, cables, pipes, and wrecks. It all lies on the bottom or lives in the North Sea. Rijkswaterstaat (the ministry of highway infrastructure and waterways in the Netherlands) has an enormous amount of information about the North Sea, which has been available in its *North Sea Atlas* (www.noordzeeatlas.nl) to anyone who needs it. Available for years as a traditional book atlas, since 2007 it has also been available in a digital version.

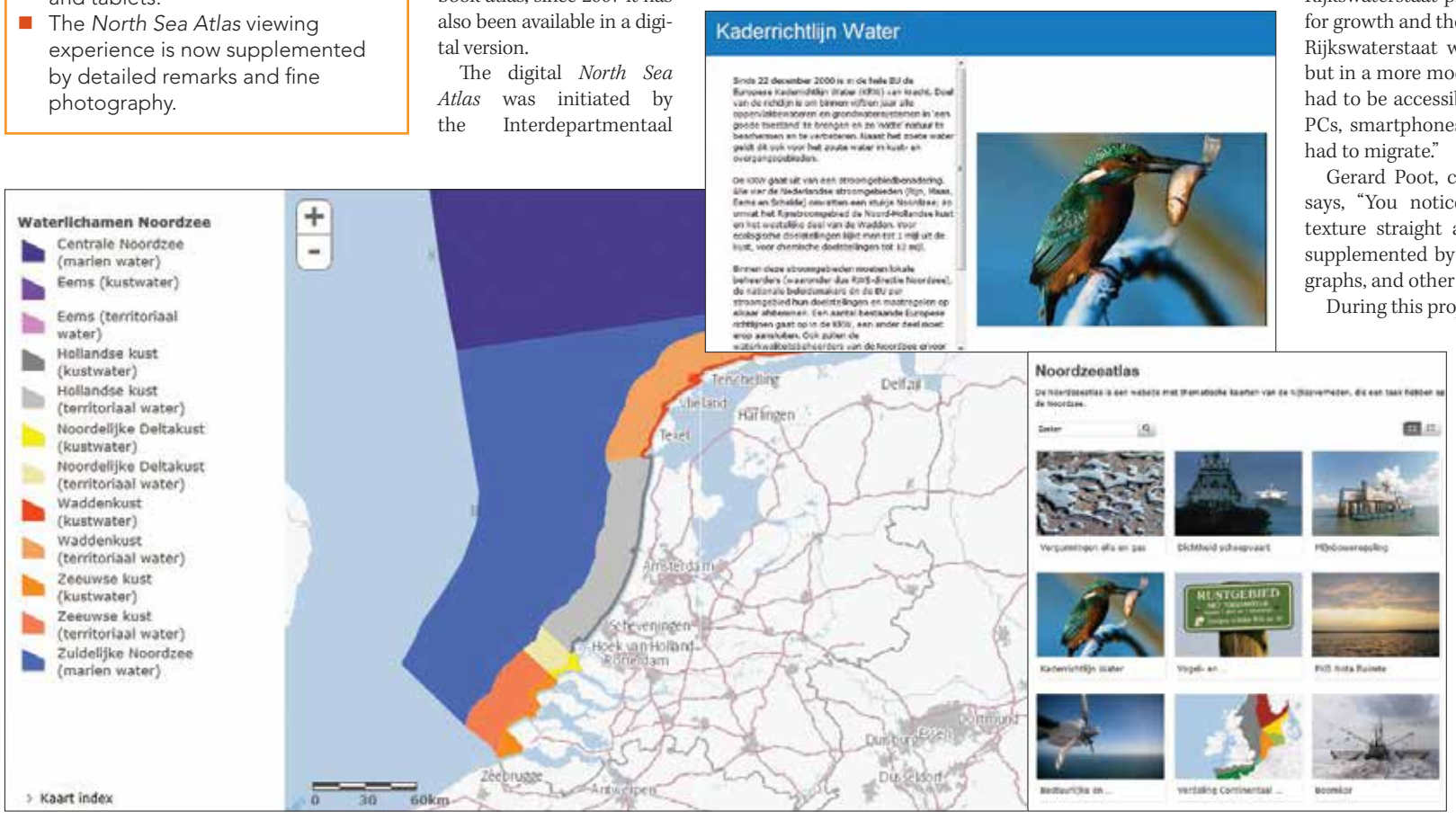
The digital *North Sea Atlas* was initiated by the Interdepartmentaal Directeurenoverleg Noord-zee (interdepartmental board meeting North Sea), an affiliation of the ministries involved in the North Sea projects, and now an updated atlas has been implemented to take advantage of new technology and growing user needs. Rijkswaterstaat's first objective for the updated atlas was to be certain that the North Sea information would continue to be available to everyone, the public and professionals alike. It was with that goal in mind that it selected ArcGIS Online, after examining the alternatives.

"The new atlas is dynamic," says Kirsten Culp, project manager at Grontmij GIS & ICT, an Esri Gold-Tier Partner based in de Bilt, the Netherlands, and an adviser in many Rijkswaterstaat projects. "There must be room for growth and the possibility to add new maps. Rijkswaterstaat wanted to keep the old atlas but in a more modern version, and of course, it had to be accessible to a broad public through PCs, smartphones, and tablets. That's why we had to migrate."

Gerard Poot, contractor at Rijkswaterstaat, says, "You notice the new appearance and texture straight away, because the maps are supplemented by explanatory remarks, photographs, and other illustrations."

During this project, Grontmij was assisted by Esri Nederland B.V.

For more information, contact Ronald van Lanen, geoinformation consultant, Grontmij (e-mail: ronald.vanlanen@grontmij.nl), or Harmen van Doorn, Esri Nederland (e-mail: avandoorn@esri.nl), or visit www.noordzeeatlas.nl.



ArcGIS Online is the portal for obtaining the North Sea maps.

GIS Plays Central Role in Opening Pennsylvania's Environmental Assets

Agency Builds Interactive Window to Pennsylvania's Natural Resources

Highlights

- The ArcGIS API for Flex application provides easy access to an array of information on the state's interactive map.
- The state used GIS to integrate bureau-specific data seamlessly into central and web-facing databases.
- Since adding mobile functionality, the department doubled activity on its main site.

More than half of Pennsylvania is swathed in temperate forest. Out of those 17 million verdant acres, the state Department of Conservation and Natural Resources (DCNR) manages 2.2 million as state forest, along with 120 state parks. It serves as the primary agency to ensure sustainable use and maintain viability of the important economic and environmental assets.

That combined role of steward and recreational leader has driven the department to embrace GIS technology. Among other GIS successes, DCNR developed its interactive map (**www.gis.dcnr.state.pa.us/maps/index.html**). Through the map, users can quickly access information on each of the 120 state parks, determine what facilities they offer, view park maps, select hiking trails, get driving directions, link to photos and videos, and even make camping reservations.

The ArcGIS API for Flex based interactive map was launch in April 2012 and has generated positive response. In 2013, it has averaged 30,000 hits per month.

Development

Because the department has embraced GIS for years and was familiar with the capability of Esri technology, DCNR decided to use the Esri Enterprise Advantage Program as the framework through which it could turn the interactive map from a vision into reality through consulting engagements and premium support.

Michael Bialousz, GIS director for DCNR, worked with Esri Professional Services staff to help pull the pieces of the interactive map together. The team created a replication strategy to integrate bureau-specific data seamlessly into central and web-facing databases.

Foundational work needed to launch the map was conducted earlier with the release of ArcGIS 10.0, at which time DCNR built a series of statewide mosaic datasets for Pennsylvania (PA) Map imagery and lidar data.

"It took us from the cumbersome process of hosting PA Map data on multiple locations and having to seek the data you needed before even using it," says Bialousz, "to a one-point-of-entry geodatabase deployment, making the PA Map data readily available to users."

In September 2012, state forest information was incorporated into the map. The update added forest boundaries, office locations, wild and natural areas, and designated state forest hiking trails. Search functions and driving directions are incorporated into the update as well.

Geologic information was incorporated in November 2012, allowing users to overlay parks and forests with bedrock geology, outstanding geologic features, earthquakes, and more.

"This is our approach for the foreseeable future, and really, we see this application as our primary GIS data-sharing application across all our program areas," Bialousz says.

DCNR Goes Mobile

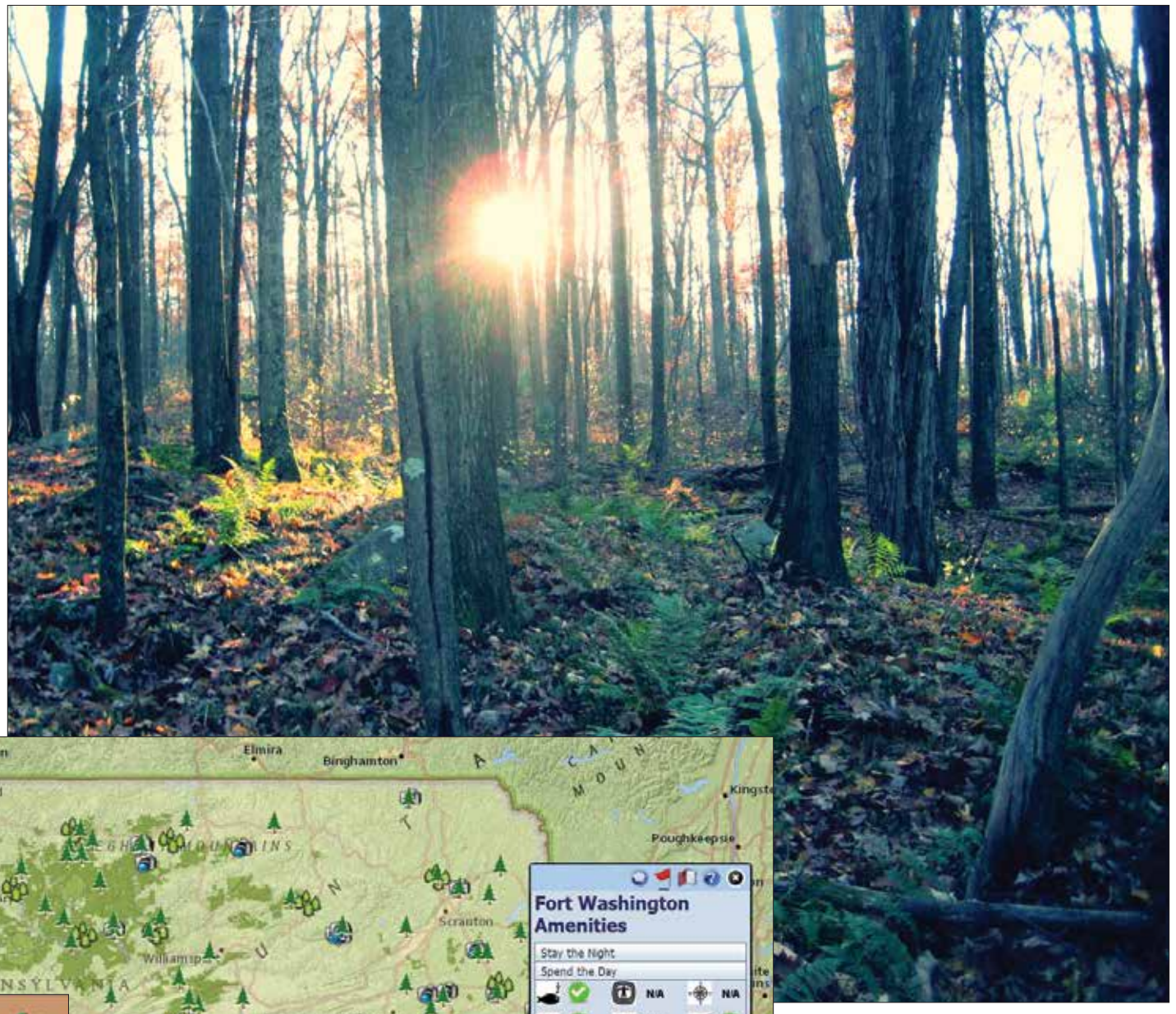
As a natural consequence of all this success, in August 2012, DCNR went a step farther and launched a mobile version of its website with interactive maps (**m.dcnr.state.pa.us**).

"The mobile website revolutionizes the way we use technology to connect citizens with the outdoors," says Stephen Aux, DCNR chief information officer. Since the mobile application was introduced, thousands more have reached into the department's services and offerings. "This is just the beginning; we intend to build upon the site," Aux adds.

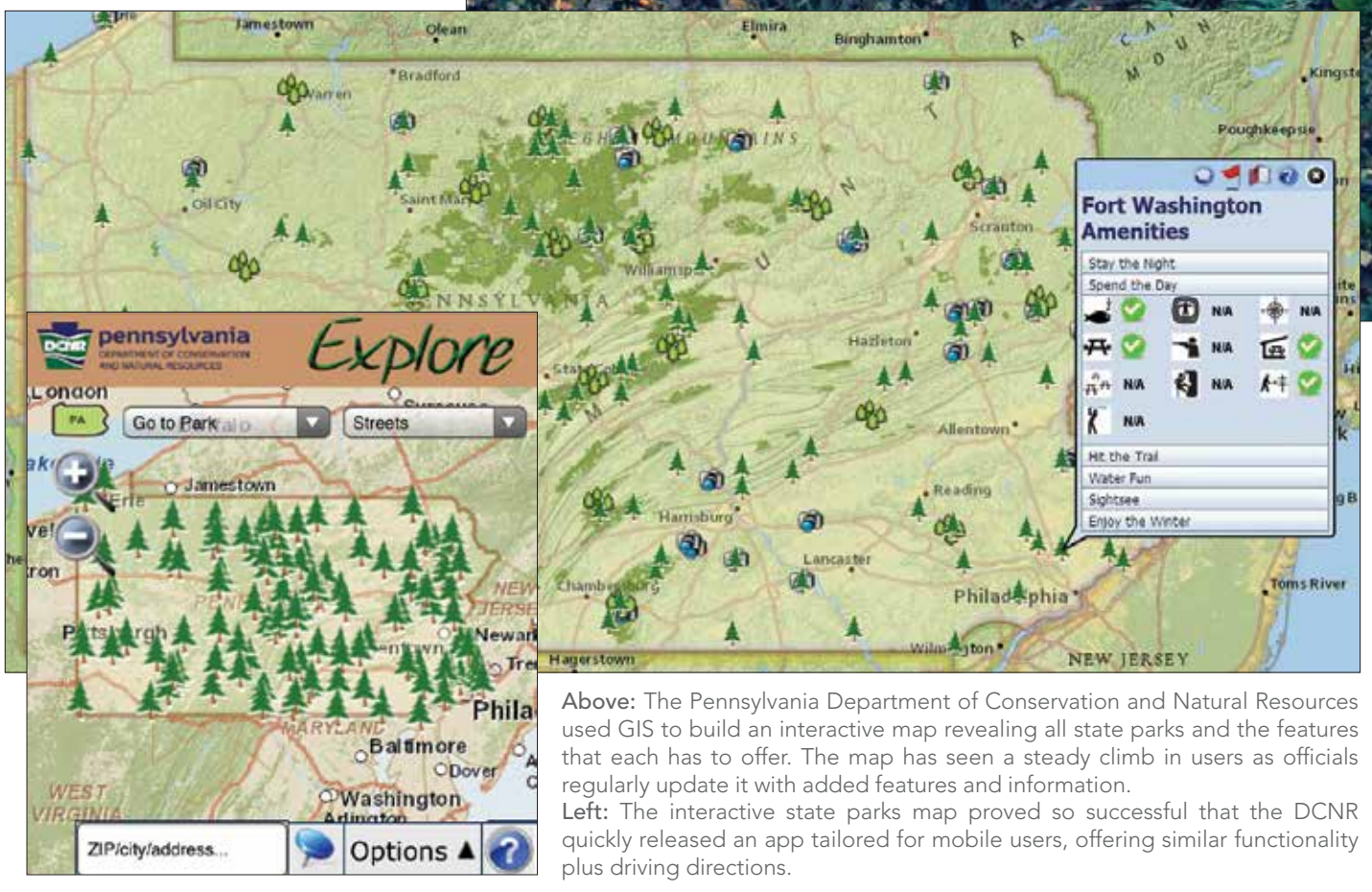
Data added to the main page also goes into the mobile version. Since adding mobile functionality, the department doubled activity on its main site, which gives users the option of going to a site optimized for mobile.

During 2013, information about Americans with Disabilities Act locations, where disabled citizens can find state park and forest resources and locations meeting their needs, was a critical addition to the interactive map, along with other features.

DCNR also became the first Pennsylvania state agency to embrace story maps with eight deployments during the fall of 2013. These function to supplement existing web and interactive map resources and support the many missions of the Pennsylvania DCNR.



The sunset peeks through the trees in Clear Creek State Forest in Jefferson County, Pennsylvania, about 75 miles northeast of Pittsburgh. (Photo by Jim Ritchie.)



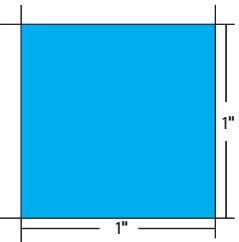
Above: The Pennsylvania Department of Conservation and Natural Resources used GIS to build an interactive map revealing all state parks and the features that each has to offer. The map has seen a steady climb in users as officials regularly update it with added features and information.
Left: The interactive state parks map proved so successful that the DCNR quickly released an app tailored for mobile users, offering similar functionality plus driving directions.

For more information, contact Michael Bialousz, GIS director, DCNR (e-mail: mbialousz@pa.gov); visit **maps.dcnr.pa.gov/maps/index.html** or the mobile site at **m.dcnr.state.pa.us**; or contact Taylor Sims, Esri (e-mail: tsims@esri.com).

4,147,200

COLOR DROPLETS

PER INCH



Our plotters deliver brilliant photographic output up to 2880 x 1440 dpi.

THE NEW EPSON® SURECOLOR® T-SERIES

- Extreme plotting accuracy at resolutions up to 2880 x 1440 dpi
- Advanced pigment ink technology for durable, photographic-quality plots
- Produces a presentation quality, color, D-size plot in 25 seconds
- High-capacity ink cartridges up to 700 mL for low printing cost
- Space-saving design with easy access front-loading paper and ink

EPSON SureColor T3000 - 24" | $2,995
EPSON SureColor T5000 - 36" | $3,995
EPSON SureColor T7000 - 44" | $4,995

EPSON®
EXCEED YOUR VISION

EPSON.COM/PLOTTERS

Amica Gets the High-Tech Jump on Hurricane Sandy

Insurance Company Uses GIS to Prepare Maps and Data to Better Serve Customers

Highlights

- Using GIS and real-time data, Amica made informed decisions during all phases of the response.
- Esri-based public information online mapping feeds for hurricanes made monitoring the storms easier.
- Using map services available on arcgis.com, Amica published maps for all its claims managers to use.

The 2012 hurricane season was unfolding as a relatively mild one—that is, until Hurricane Sandy hit. The eighteenth named storm of the year, Sandy was a category 3 storm at its peak intensity when it made initial landfall in Cuba. While the storm may have been downgraded to an extratropical system before it made its second landfall, it still packed a major punch for the northeastern United States. At 900 miles across, Sandy was the largest Atlantic hurricane on record, causing damage across 16 different states in the Northeast.

Total economic damage estimates are assessed at up to $50 billion according to EQECAT, a catastrophe risk-modeling firm. The severe damage from the storm, along with strong storm surges, severe flooding, and wind damage, earned it the name Superstorm Sandy. The Insurance Information Institute reports that insurers will pay an estimated $18.8 billion in claims to policyholders.

For Amica Mutual Insurance Company, the response to Superstorm Sandy began well before the storm made landfall. Amica, a provider of personal insurance for autos, homes, and boats, has a reputation of providing excellent service to its policyholders.

Real-Time Monitoring Makes the Difference

What made this event different from previous large-scale disasters was the widespread use of digital mapping and technology from Esri. Prior to the storm making landfall, the company visually analyzed exposure using the Esri-based public information mapping feeds for hurricanes via the web, as well as select data feeds from the National Oceanic and Atmospheric Administration (NOAA) NowCoast services.

The company used the Esri data feeds to continually monitor the latest National Hurricane Center (NHC) forecasts. "We were able to track how our exposure changed, in real time, as each update from the NHC was released," says Adam J. Kostecki, manager at Amica. With forecast updates released every few hours, the data feeds provided by Esri make monitoring the storms much easier.

Amica used its own Hurricane Viewer to identify which policyholders would receive prestorm alerts. Using this location-based data, the company sent e-mails to hundreds of thousands of policyholders in advance of the storm. When the storm made landfall on October 29, they began monitoring the storm's impact using live mapped data, plotting claims in real time to identify areas where claim volume was most significant. This helped Amica identify the hardest-hit areas and allowed it to dedicate its more experienced adjusters to those claims.

"Days into the event, we were able to accurately predict the number of claims we would eventually see in the areas inundated by storm surge." says Kostecki. "This allowed us to make better decisions on the number of adjusters we would eventually need for these inspections."

Helping at a Local Level

While Superstorm Sandy was a huge storm that affected a widespread area, it also caused some highly localized areas of damage. For example, a neighborhood in Breezy Point, New York, was not only affected by storm surge but also suffered a large fire that destroyed over 100 homes. Amica was able to quickly identify whether or not it had policies in this area.

"When we learned of the fire, we proactively contacted our policyholders on the peninsula," says Kostecki. "We even reached an out-of-state policyholder who had no idea their secondary home was at risk of burning. Thankfully, their home was spared—but they appreciated that we were watching out for them."

A Speedy Timeline

Amica went quickly from discovering map and data services to publishing maps that all claims managers could use. First, Amica discovered the NOAA digital Esri-based map services available on arcgis.com. Staff used the NOAA Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model to identify policies and claims in the areas likely to have been inundated by storm surge. The SLOSH model is made up of a set of calculations that are used to understand the estimated heights that can be expected at various points along the shoreline. Atmospheric pressure, size, forward speed, and track data are all taken into account to create a model of the hurricane's wind field, which is what drives the storm surge.

Then Amica incorporated a NOAA postdisaster imagery service to identify the extent of damage in areas where access was limited. Postevent imagery from Esri Silver Tier Partner Pictometry of Rochester, New York, was also included to provide an incredibly detailed aerial view of the damage from the storm. The Pictometry data helped document damage shortly after the storm passed, which was useful in cases where repairs had been completed prior to the adjuster's inspection. It was also used to document minor exterior losses, like downed fences, enabling claims to be settled without an adjuster's inspection.

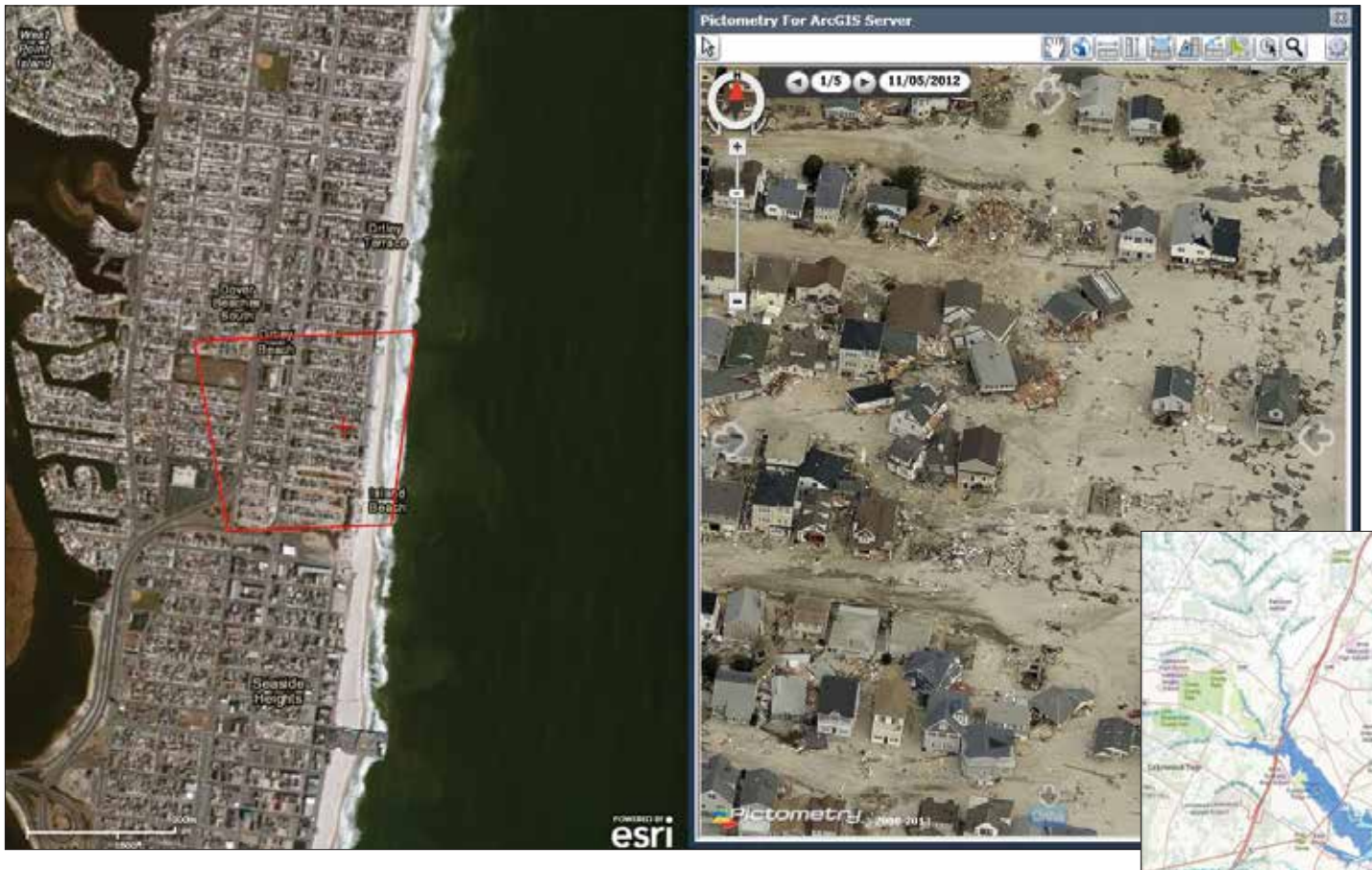
Amica also provided its own specific map layers that included claims/policies, outside adjuster territories, and more. Then, Amica's digital map was published to all claims managers and claims supervisors in the company.

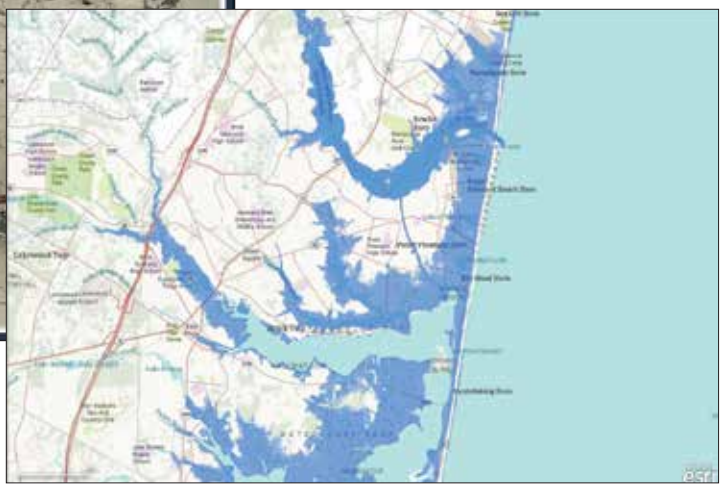
From Reactive to Proactive

Major catastrophes will always be a challenge to respond to, especially those that affect a wide area like Superstorm Sandy did. Each event is different and poses unique problems to overcome. Whether it involved contacting policyholders before the storm made landfall or identifying claims that should be closely monitored until conclusion, Amica's use of GIS technology and real-time data enabled it to make more informed decisions during all phases of the response—which is critical with any catastrophe.

"With past events, we would often find ourselves in a reactive position," says Mike Gillerlane, senior assistant vice president and head of the Property Loss Division at Amica. "Maps with real-time information provide us with a better overall view of the event and allow us to be more proactive."

For more information, contact Adam Kostecki, manager, Amica (e-mail: akostecki@amica.com).





Above: Amica seamlessly integrated highly detailed postevent aerial imagery into its maps.
Right: The FEMA SLOSH model helped Amica identify areas that were likely inundated by storm surge flooding.

History of GIS and Early Computer Cartography Project

By John Hessler, Cartographic Specialist, Geography and Map Division, Library of Congress

The Geography and Map Division of the United States Library of Congress is the largest repository of cartography and related forms of geographic representation in the world. Its collections include more than five million maps and tens of thousands of atlases. It also holds the archives of many important cartographers and geoscientists and manuscript materials related to mapmaking that date from the late 13th century through the modern era.

Recently, the library has undertaken a large-scale project to collect materials, technical information, maps, and algorithms from the earliest days of computer cartography. This project, which is being directed by the author, and which began as a series of lectures for graduate students at Johns Hopkins University, has resulted in the library's acquisition of a number of important archives from the earliest days of computer cartography. One recently acquired archive, of personal papers related to the development of geographic information systems, was that of Dr. Nicholas Chrisman. He was one of the many imaginative geographers, mathematicians, and computer scientists working at the Harvard Laboratory for Computer Graphics and Spatial Analysis during the time in the 1960s and 1970s that saw the beginnings of what would become modern GIS.

The research at the Harvard Laboratory was a cross section of geographic ideas circulating at the time, and Chrisman's archive contains his notes, computer programs, and papers, including most of the official publications from the laboratory. One set of papers in particular, which deserves much more attention from today's mapmakers, historians, and those interested in the foundations of current geographic thought, is the *Harvard Papers in Theoretical Geography*. These papers, subtitled, "Geography and the properties of surfaces," detail the lab's early experiments in the computer analysis of cartographic problems. They also give insight into the theoretical thinking of many early researchers as they experimented with theorems from algebraic topology, complex spatial analysis algorithms, and various forms of abstract algebras to redefine the map as a mathematical tool for geographic analysis. Reading some of the titles in the series today, for example, "Hyper-surfaces and Geodesic Lines in 4-D Euclidean Space and The Sandwich Theorem: A Basic One for Geography," gives one a sense of the experimentation and imaginative thinking that surrounded the breakthroughs necessary for the development of our modern computer mapping systems.

The *Harvard Papers* shows in stark mathematical detail the multidisciplinary thinking that surrounded many of the lab's projects. In an attempt to answer previously intractable geographic and cartographic questions, purely mathematical and geometrical concepts, like existence theorems, whose basic logical structure contains statements that confirm or deny the existence of particular sets of objects, were employed in various computer mapping schemes. The development of these programs injected high levels of topological and algebraic abstraction into geographic analysis and fundamentally changed the basic ontology of geographic and cartographic objects. However, although existence theorems provide logical proof for whatever mathematical entity they are claiming existence for, they do not necessarily provide a way to find or calculate those objects.

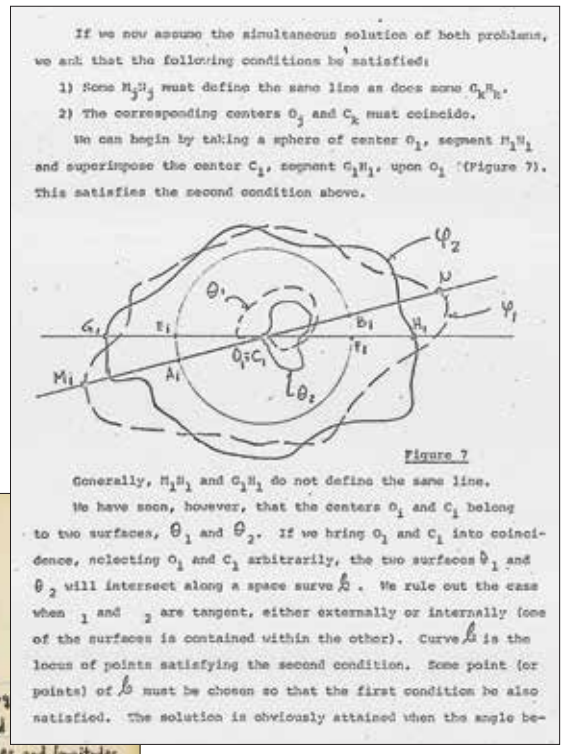
The authors of these papers, of which 57 were produced, and all of which have been collected by the library, look to us now like a who's who of the analytic turn that geography took in the post-World War II era. William Warntz, Ernesto Lindgren, Michael Woldberg, Waldo Tobler, Donald Shepper, Carl Steinitz, William Bunge, and Geoffery Dutton are just a few who added their insights and ideas to this highly theoretical series of papers.

Aside from the technical aspects that archives like this reveal, they also show deeper connections with cultural and intellectual history. They demonstrate how the practitioners and developers of GIS found themselves compelled to draw both distinctions and parallels with ideas that were appearing in the contemporary scholarly literature on spatial and temporal reasoning. Their explorations into this literature was not limited to geographic ideas on lived human space but also drew on philosophy, cognitive science, pure mathematics, and fields like modal logic—all somehow to come to terms with the diverse phenomena that have spatiotemporal extent and that might be mapped and analyzed.

Because of these deeper connections, the Library of Congress is collecting quite broadly in the area of early computer cartography. It has obtained many other archives from cartographers like John Parr Snyder, who was the original developer of the space-oblique Mercator projection. It was Snyder who developed the equations for this extremely complicated projection using an early Texas Instruments programmable calculator. It is his equations for the projection that first allowed remote-sensing imagery from the earliest Landsat satellites to be made into low-error maps. In thinking through the geometry of the projection, Snyder had to take into account the various motions of the satellite and the earth, and in doing so, invented a dynamic and time-dependent map projection. His archive contains all his original notes, mathematical derivations, and also his calculators and the magnetic strips that stored his original programs. In addition to the technical material, there are several notebooks into which he copied his ideas on projections when he was 16 years old and that show him to be, perhaps, one of the few modern cartographic prodigies.

The study of cartography and its related geographic disciplines underwent profound technological and conceptual advancements in the last half of the 20th century. These advancements, brought about by the advent of computers, the development of newer and faster mathematical and computational algorithms, and the birth of satellite imagery, contributed to paradigm changes that can be considered revolutionary. Technological and conceptual improvements have generated new forms of data, maps, and artifacts that differ radically from those typically archived in map libraries. In the future, these new artifacts and materials will form the basis for the study of modern cartography and as such, their collection and preservation present new challenges to the archivist and the map librarian.

The Library of Congress's program of collecting computer software, new computational devices, hardware, and new forms of geospatial data is based on the assumption that all these need to be preserved in a way that allows future researchers to access not only data but also the techniques, data structures, and algorithms used by today's mapmakers. Many of these ephemeral materials are disappearing, through either obsolescence, scholarly neglect, or the inevitable degradation of all magnetic media. These fragile parts of our history need to be collected now, before they disappear, for even though we are talking about materials from the recent past, the one thing we do not have in the preservation of this history is the luxury of time.



If we now assume the simultaneous solution of both problems, we ask that the following conditions be satisfied:

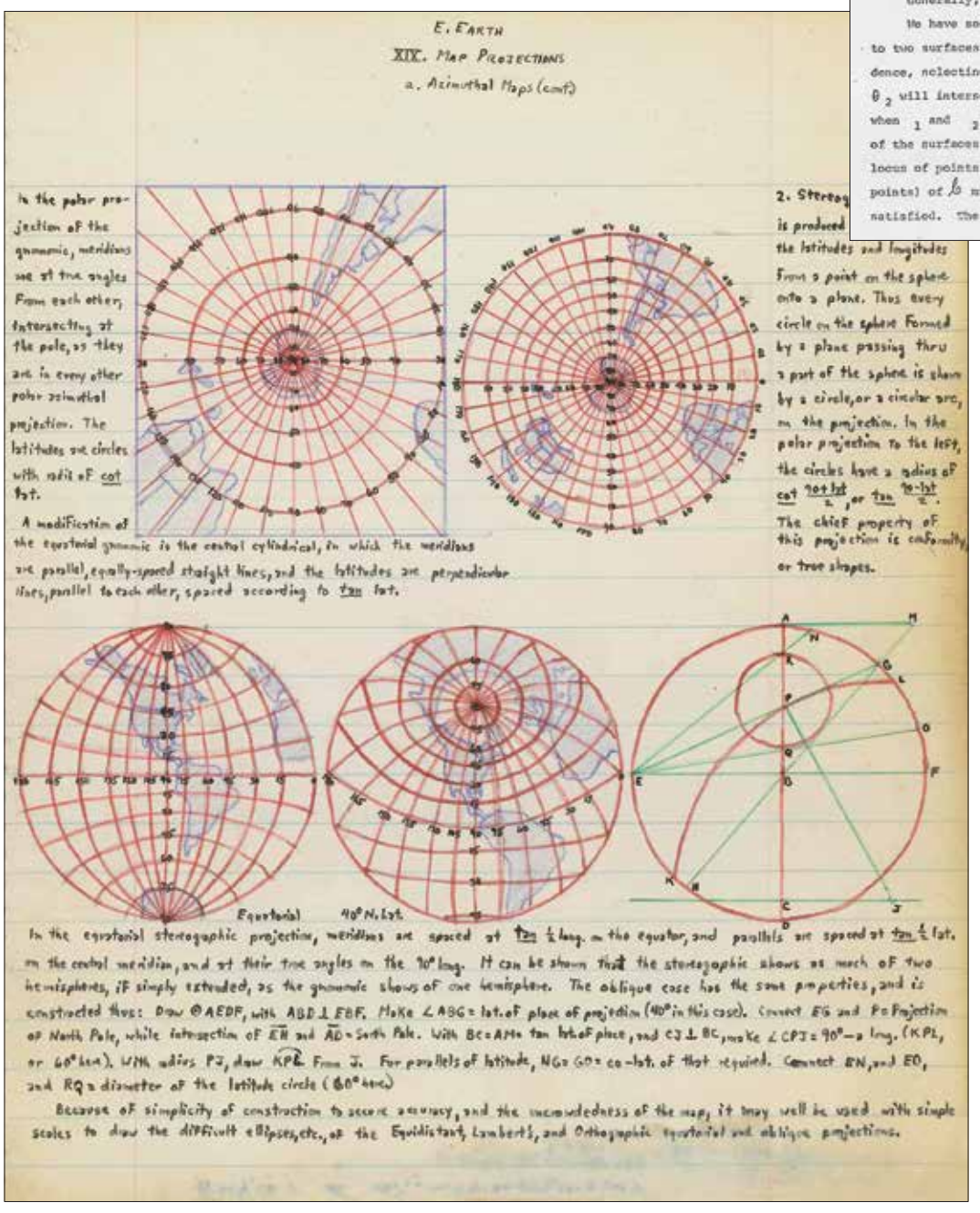
1) Some N_jN_j must define the same line as does some C_kN_k.
2) The corresponding centers O_j and C_k must coincide.

We can begin by taking a sphere of center O_1, segment N_1N_1 and superimpose the center C_1, segment C_1N_1, upon O_1 (Figure 7). This satisfies the second condition above.

Figure 7

Generally, N_1N_1 and C_1N_1 do not define the same line. We have seen, however, that the centers O_1 and C_1 belong to two surfaces, θ_1 and θ_2. If we bring O_1 and C_1 into coincidence, selecting O_1 and C_1 arbitrarily, the two surfaces θ_1 and θ_2 will intersect along a space curve β. We rule out the case when θ_1 and θ_2 are tangent, either externally or internally (one of the surfaces is contained within the other). Curve β is the locus of points satisfying the second condition. Some point (or points) of β must be chosen so that the first condition be also satisfied. The solution is obviously attained when the angle be-

Typical typewritten and hand-drawn page from *Harvard Papers in Theoretical Geography*, Number 37. Design-wise, the series is not much to look at, but the content shows the multidisciplinary range of the Harvard Lab at the time. (Nick Chrisman Collection, Geography and Map Division, Library of Congress.)



E. EARTH
XIX. Map Projections
a. Azimuthal Maps (cont)

In the polar projection of the gnomonic, meridians are at true angles from each other, intersecting at the pole, as they are in every other polar azimuthal projection. The latitudes are circles with radii of $\cot$ lat.

A modification of the equatorial gnomonic is the central cylindrical, in which the meridians are parallel, equally-spaced straight lines, and the latitudes are perpendicular lines, parallel to each other, spaced according to $\tan$ lat.

2. Stereog
is produced
the latitudes and longitudes
from a point on the sphere
onto a plane. Thus every
circle on the sphere formed
by a plane passing thru
a part of the sphere is shown
by a circle, or a circular arc,
on the projection. In the
polar projection to the left,
the circles have a radius of
$\cot \frac{\text{co-lat}}{2}$, or $\tan \frac{\text{co-lat}}{2}$.
The chief property of
this projection is conformity,
or true shapes.

Equatorial 40° N. Lat.

In the equatorial stereographic projection, meridians are spaced at $\tan \frac{1}{2}$ long. on the equator, and parallels are spaced at $\tan \frac{1}{2}$ lat. on the central meridian, and at their true angles on the 90° long. It can be shown that the stereographic shows as much of two hemispheres, if simply extended, as the gnomonic shows of one hemisphere. The oblique case has the same properties, and is constructed thus: Draw ⊙AEDF, with ABD ⊥ EBF. Make ∠ABG = lat. of place of projection (40° in this case). Connect EG and FG Projection of North Pole, while intersection of $\overline{EH}$ and $\overline{AD}$ = South Pole. With BC = AM = $\tan$ lat. of place, and CJ ⊥ BC, make ∠CPJ = 90° − long. (KPL, or 60° here). With radius PJ, draw $\widehat{KPL}$. From J. For parallels of latitude, NG = GO = co-lat. of that required. Connect EN, and ED, and RQ = diameter of the latitude circle (80° here).

Because of simplicity of construction to secure accuracy, and the incumbedness of the map, it may well be used with simple scales to draw the difficult ellipses, etc., of the Equidistant, Lambert's, and Orthographic equatorial and oblique projections.

Page from a notebook of John Parr Snyder that dates from his sixteenth year showing his early interest in map projections. (John Parr Snyder Collection, Geography and Map Division, Library of Congress.)

About the Author

John Hessler is a specialist in Modern Cartography and Geographic Information Systems in the Geography and Map Division of the Library of Congress and teaches the history of cartography at the Johns Hopkins University. The author of many books and articles, he is currently working on a forthcoming book, *Cartography in the Age of Computer Simulation: Lectures on the Historical and Mathematical Foundations of GIS*.

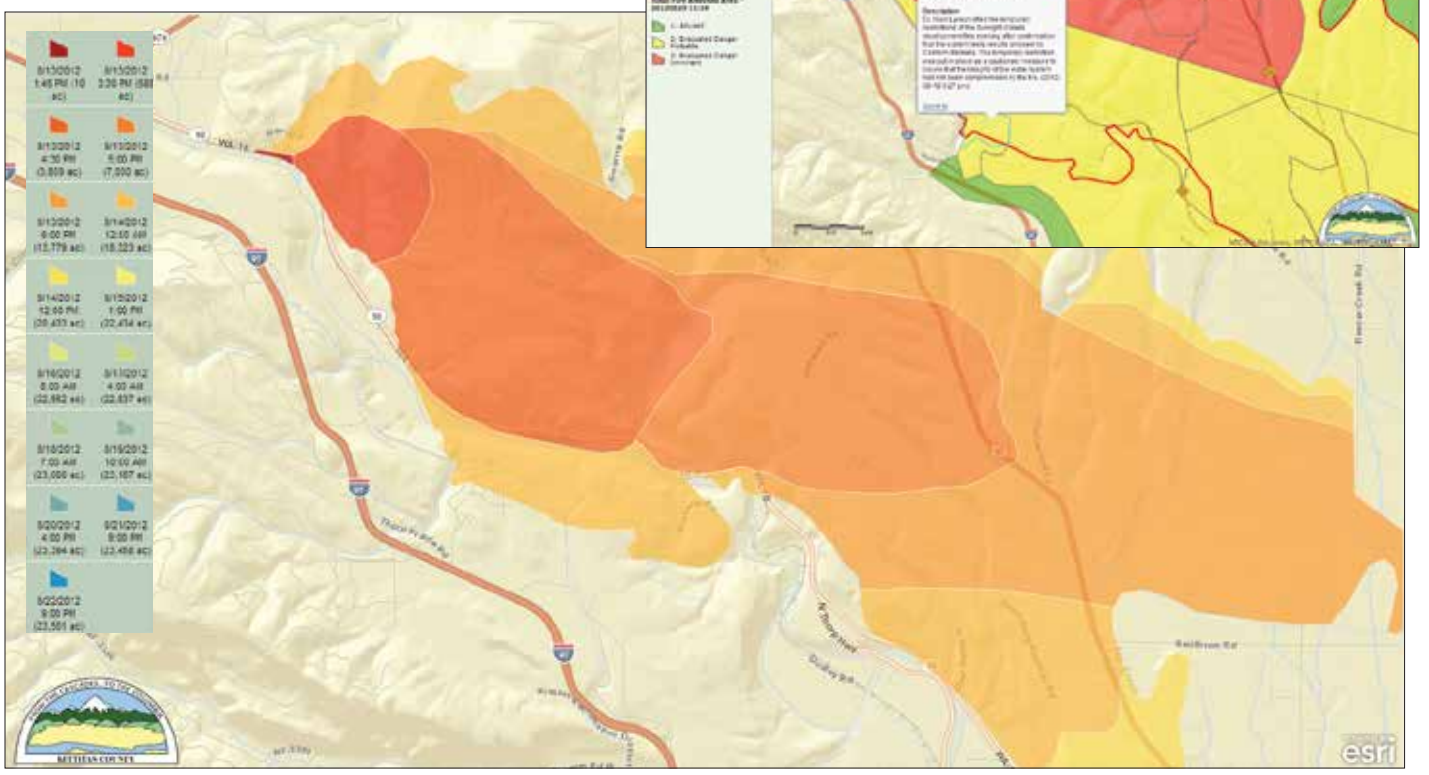
For more information, contact John Hessler, Library of Congress (e-mail: jhes@loc.gov).

Fire Response from the Cloud

ArcGIS Online Helps Kittitas County, Washington, Battle Blaze

Highlights

- Mapping by county staff provided first responders and fire crews with up-to-date, accurate information.
- The cloud offers flexibility that meets emergency response needs.
- ArcGIS Online has become the county's one-stop location for all GIS-related projects.



Above: An interactive fire progression map, built from a JavaScript API template, shows how rapidly the Taylor Bridge Fire spread. **Inset above:** The map was published to ArcGIS Online for up-to-the-minute evacuation zone, roadblock, and fire perimeter status.

For Kittitas County, Washington, better fire response isn't a matter of more hose lines and fire trucks. It's a matter of information. For every major incident, fire fighters need information, and so do command staff and the public. For everyone involved, providing continuously updated information to help battle the blaze and keep the public informed is paramount.

On August 13, 2012, the season's first major wildfire in Washington started between Interstate 90 and US Highway 97 in Kittitas County. Dubbed the Taylor Bridge Fire, it quickly burst out of control and spread, threatening homes and people. The fire was fully contained on August 28 after burning 23,500 acres and destroying more than 60 homes.

As terrible as the destruction was, it could have been much worse. Fire fighters battling the inferno had a secret weapon on their side—cloud GIS.

Using the ArcGIS Online platform, maps and data were quickly made available to field crews. Smart deployment of personnel and resources meant faster fire containment. Using accurate and high-resolution maps to support decisions, fire fighters were able to attack the right places at the right times to contain the fire and protect priority resources as quickly as possible.

"We are positioning to be a central repository for GIS data for surrounding agencies," says Jason Eklund, GIS coordinator for the Kittitas County Information Technology department. "With the Taylor Bridge Fire, there was an immediate need for mapping. We needed to get information out to the fire crews, the State of Washington Emergency Operations Center [EOC], FEMA [the Federal Emergency Management Agency], and the public."

Brenda Larsen, fire marshal for Kittitas County, said the mapping by county staff was instrumental in providing timely and accurate information about the fire footprint to first responders and fire crews, helping them work safely. "Our GIS mapping staff at EOC was indispensable, and their work made it easier for everyone involved in the fires," Larsen says.

Kittitas County and the Taylor Bridge Fire

With a population of more than 40,000, Kittitas County is located in central Washington State. It spans the lush, forested Cascade Mountains to the upper Yakima River Valley plains and the Columbia River. Its county seat is Ellensburg, which is also the county's largest city.

The county has used GIS for more than a decade. In 2007, GIS was moved into the IT department. At the same time, Eklund was hired to streamline and improve GIS infrastructure to better serve government needs. GIS had been functioning at the county for about eight years previously. He immediately worked to consolidate independent software uses and upgrade software to an enterprise ArcGIS deployment. The county transitioned to a distributed editing environment within a year. Today, the infrastructure supports the City of Ellensburg, which partners with the county for resources and maintains a failover redundant server at the city. The latest GIS innovation involved moving to ArcGIS Online, a cloud-based GIS environment. The county acquired the software just prior to the Taylor Bridge Fire. The goal was to use it as a central mapping platform for the public. It would provide an open, scalable, and intuitive method for managing GIS data and services.

When the fire occurred mid-August, the new system was ready. Web GIS served as the perfect platform to map the fire's perimeter, determine the terrain, and identify assets at risk, all of which were immediately delivered through the cloud to first responders.

Using GIS, Eklund published the feature service to ArcGIS Online, enabling command staff directing frontline personnel and resources to attack the fire to see what state, county, and federal assets were available and where they were located.

Within 20 minutes, Eklund configured a web map and shared it as an application available to those who were supporting the operation. It also meant that important information about the fire location, road closures, and shelters was more readily available to the public. Because it was in the cloud, it could scale quickly to changing demand.

"Having the service in the cloud took the pressure off our servers so we could continue to serve the public without downtime," says Eklund.

In addition, because it was in the cloud, any changes were quickly available to all users. The emergency command center oversaw the coordination of effort and used the online maps to track the progress of the event. The evacuation zones, roadblocks, closure boundaries, fire perimeter, and shelter locations were uploaded as a feature service and made available to fire fighters and the public.

"The interactive mapping allowed EOC to instantly update our emergency action plans," says Gene Dana, Kittitas County sheriff. "The maps were used at our responder briefings and at several town meetings to help illustrate the movement and hazards associated with the incident. Frequent status updates through maps to the media and incident command websites reduced the volume of phone calls to EOC and provided for a more informed public."

Prior to using web GIS, data updates and sharing would have been arduous, involving labor-intensive paper map production or e-mailing digital maps. GIS staff would also have had to use shapefiles that were compressed and sent as an e-mail attachment. The agencies would then have to decompress those files, add the shapefiles to their own GIS maps, symbolize accordingly, and print the new map. The only option for the public would have been to download a static map from the county website.

With online GIS, the feature service containing all the fire mapping layers could now be consumed by other agencies in ArcGIS for Desktop or their own web mapping applications and be updated in real time.

For instance, staff members viewed mapped evacuation center data in real time from their Internet-enabled computers to prepare evacuation strategies. When concerned citizens called the EOC hotline to ask if they were being evacuated, staff could easily look up their address and accurately respond to the question by viewing live and continuously updated evacuation-level information. In addition, online GIS mapping assisted with directing evacuees to the local shelters. Road closures were also mapped and managed via live mapping.

"As far as logistics, I found the system to be extremely useful," says Kelly Carlson, logistics manager, Kittitas County EOC. "The road closures feature was a crucial element on the live mapping since these were changing constantly as the fire moved. Again, this was extremely helpful as far as the EOC hotline was concerned in that we could give accurate information to the public."

The ArcGIS Online map was made available to the public via the county website (**www.co.kittitas.wa.us**) and provided a search function in the map that was used by EOC call center staff and everyday citizens alike. They could type in an address to see if they were in or out of an evacuation zone, view road closures and fire perimeters, and more. The county website also added links to download the ArcGIS app for mobile devices or smartphones.

"Fire mapping helped set up evacuations, send in supplies, identify vulnerable areas, set up staging areas, and more," adds Carlson. "Combined with fire behavior knowledge, it allowed commanders to strategize based on factors such as topography, natural vegetation, and natural barriers and provided a basis for wildland fire fighting. It showed key factors that affect ground crews and fire behavior and provided commanders with up-to-date fire movement information.

Eklund and Carlson agree that the cloud-based system is the scalable platform for future work.

For more information, contact Jason Eklund, GIS coordinator, Kittitas County Information Technology (e-mail: jason.eklund@co.kittitas.wa.us). View the Kittitas County maps portal at **www.gis.co.kittitas.wa.us/maps**.

Santa Barbara Fire Paints a Clearer Incident Picture

City Uses Geoanalysis and Maps to Gauge Impact of Recession-Driven Decisions

Highlights

- ArcGIS was deployed to explore different variables and produce data-driven maps.
- GIS analysis was needed to determine the values at risk.
- GIS was used to present the information to stakeholders using a compelling, easy-to-understand method—maps.

When economic pressure presented the City of Santa Barbara, California, with difficult budget decisions, leaders searched for ways to save money, and that included examining fire department expenses.

The Santa Barbara Fire Department protects 100,000 residents spread across 26 square miles. It maintains eight fire stations providing all risk services. The agency protects urban interface, freeway corridors, community colleges, an active fishing and recreational harbor, miles of beaches, a growing airport, a nearby forest with hiking trails, urban wine production, and more.

"Like many municipalities, we were faced with a challenging economy," says Michael Hoose, city fire captain, who has worked in public safety since the late 1980s. "Early on, the fire fighters association targeted many ways to reduce costs, including concessions, and thus provide substantial savings to the city. The city administrator tasked the fire chief with a significant reduction."

One proposal that initially looked feasible involved closing one of the city's oldest fire stations. Surrounding fire stations appeared to be close enough to provide sufficient service if the one station were closed.

However, Hoose, who had been using ArcGIS since 2006, understood that analysis was necessary to determine the civilian, cultural, and economic values at risk by the proposed closure, as well as whether or not fire fighter safety would be compromised. "I knew that GIS would be able to tell us all the safety and protection implications," Hoose says.

Four-Minute Response Time

The National Fire Protection Association (NFPA) recommends a four-minute maximum response time for 90 percent of all calls. That means the time from when the first 911 call comes in to the time the first responder arrives for structure fire, traffic collisions, or emergency medical service (EMS) calls. Santa Barbara had an excellent record of meeting this standard.

The question was, if the centrally located Station 3 was closed, could the fire department continue to meet the standard? If this were possible, millions of dollars would be saved.

Providing Fact-Based Answers

Hoose worked with public safety GIS consultant Mike Price to perform a geographic data-based study of incident call times throughout the city. ArcGIS was deployed to explore different variables and produce data-driven maps. The maps were used to show assessed values, number of structures protected per engine, number of residents protected per engine, response times in various conditions, and more.

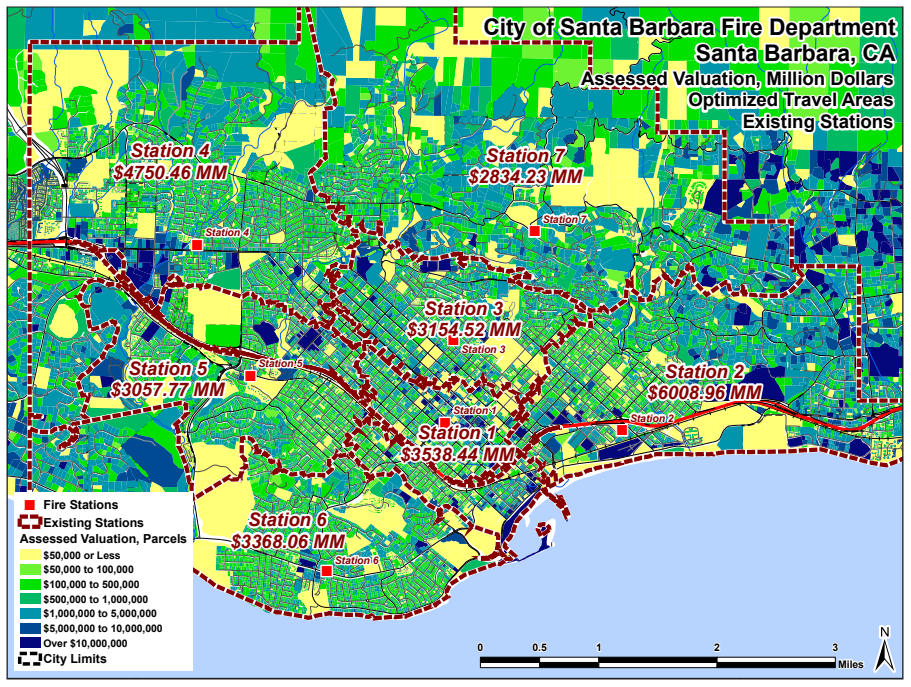
"Each map told a story of what would happen if Station 3 was closed," Hoose says. "We could show by multiple variables how each remaining station would be impacted."

Both Hoose and Price also looked at the distribution and concentration of response times and the department's ability to continue to meet NFPA requirements and American Heart Association guidelines on response.

The GIS analysis was clear: shutting down the fire station would prohibit the agency from achieving its previous high standard of 90 percent of calls responded to in four minutes or less. The impact would be significant for the entire city. Dozens of maps were generated and presented to city officials. After careful consideration, the decision was made to keep the fire station active.

"We were able to demonstrate that the proposed closure would result in a lapse in proper coverage," Hoose says. "GIS not only helped us with the analysis, it also helped us present the information using a compelling, easy-to-understand method—maps. We provided quick-snap views using industry-standard best practices and methodology."

For more information, contact Michael Hoose, fire captain, City of Santa Barbara Fire Department (e-mail: mikehoose@mac.com).



GIS displays the assessed value of parcels contained within the optimized travel areas of existing Santa Barbara Fire Department stations.

Preventing Home Fires Before They Start

City of Surrey Fire Service Focuses on Fire Reduction Education Programs

Highlights

- Using GIS, residential fire locations were plotted with data from the fire service's CAD system.
- The distributions of risk were blended within ArcGIS, and a set of high-risk zones were identified across the city.
- Location analytics helped target addresses used by fire crews to deliver education packages directly to each home.

In fire and rescue, prevention is the primary phase for creating safer communities. While focus is always on getting to the emergency faster and being better equipped, the new frontier is information sharing—and teaching people, businesses, nonprofits, and communities to understand how they can make their homes and offices safer. One agency in Canada—the Surrey Fire Service—is putting geoanalytics into this formula. The agency created a focused home inspection that resulted in fewer residential fires/emergencies.

Surrey Fire Service and the Surrey Fire Prevention Branch provide emergency response for fire and medical emergencies to the citizens of Surrey, British Columbia (BC), Canada. The agency has 17 stations covering 123 square miles with a population exceeding 450,000 people and worked more than 27,000 emergency and nonemergency incidents in 2011.

Deputy fire chief Larry Thomas has been with the service for 23 years, starting as fire fighter. While working with fire chief Len Garis on restructuring the Prevention Branch, the two discussed the need to find a more effective method for public fire prevention education. Like many fire departments, the approach of the day was very broad brush, primarily directed at educating children in school. Resources were dedicated to general fire prevention education with no real ability to measure if the education was effective or not.

Evolution

In 2007, the University of the Fraser Valley conducted research using the Surrey fire incident database covering a 20-year period. The research identified the most common types of fires and the demographics associated with the most common fires. The results painted a focused picture:

Young, elderly, and economically challenged residents were more likely to experience a fire than other citizens.

This problem statement led Thomas and Garis to devise a process for fire prevention education that could be measured. With the assistance of City of Surrey strategic analyst Dr. Joe Clare, they planned a study that directed fire prevention education to targeted homes and developed a means of measuring its effectiveness. They would measure over time if a reduction in home fires occurred in the targeted areas compared to similar demographic areas that didn't receive the education. To facilitate the study, fire education packages were developed to address the communities' most common fire causes to raise awareness among the most vulnerable.

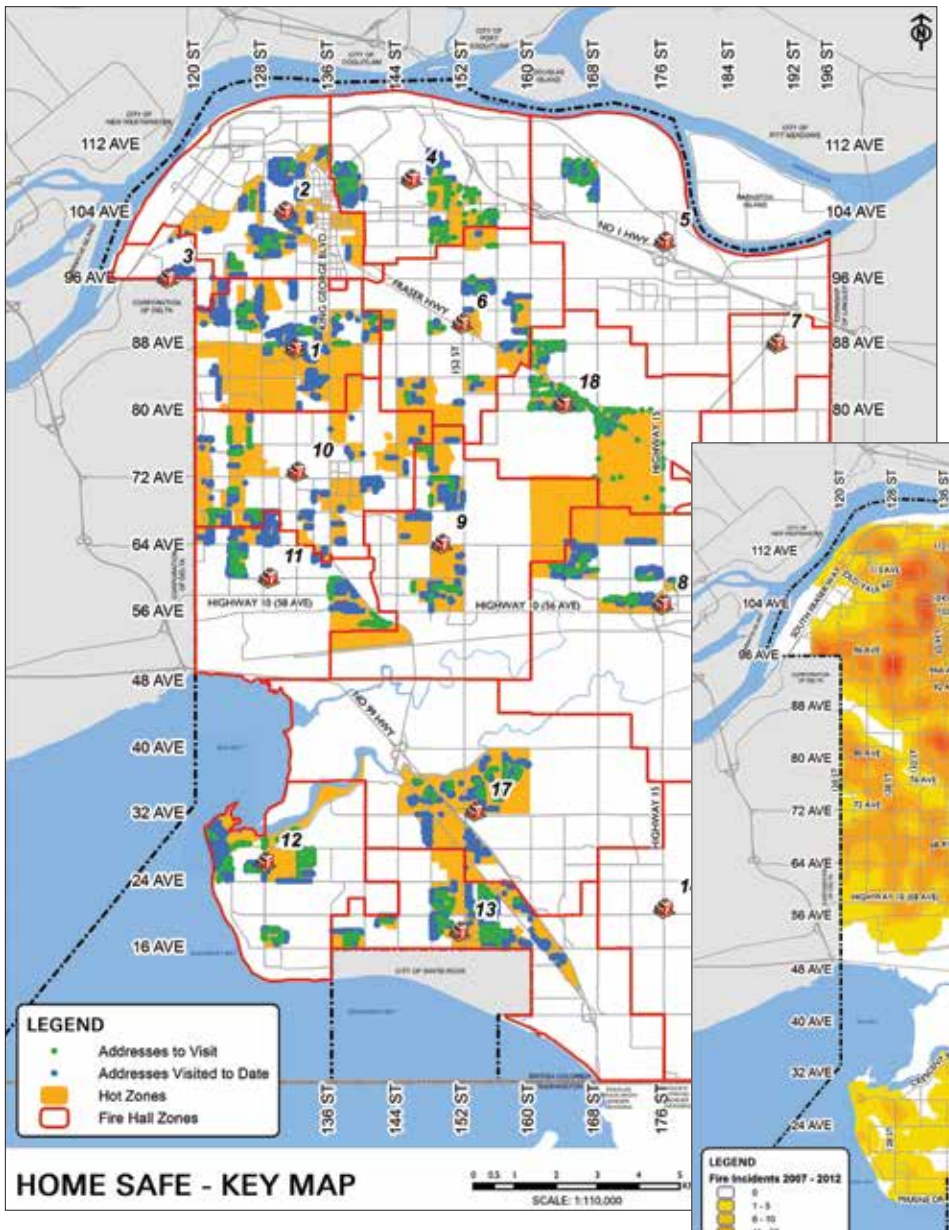
By this time, the team realized that an important tool in the research would be GIS, and it so happened that the City of Surrey GIS department had been using ArcGIS for many years and had won several Esri awards for excellence.

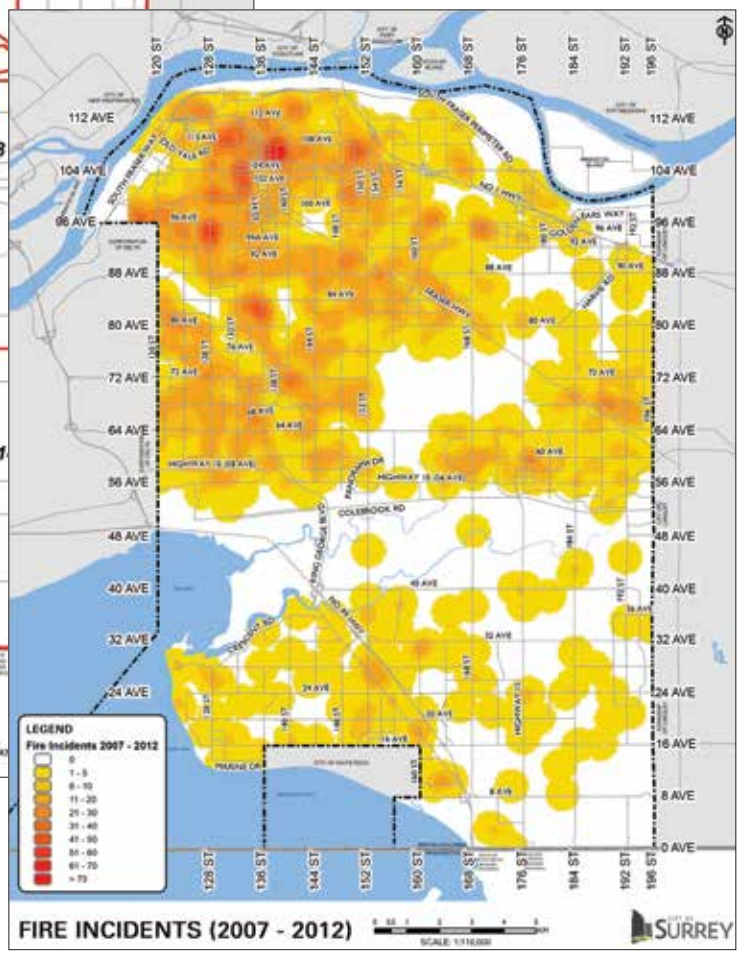
"So contacting our GIS department for support was essential for the success of our program," says Thomas. Staff needed to identify targeted and nontargeted areas of similar high fire risk. They used ArcGIS to plot residential fire locations with data from the department's computer-aided dispatch system. Then census information was used to locate children under 6 years old, adults over 64, single-parent families, and unemployed residents. Census data about dwellings was also used to capture the risk posed for residential structures, such as building age. City zoning data was used as a layer to ensure single-family residences were targeted.

This was achieved by identifying areas of the city with a large proportion of dwellings constructed prior to 1991. The distributions of risk were blended within ArcGIS, and a set of high-risk zones was identified across the city. Location analytics helped target addresses used by fire crews to deliver fire prevention education packages in person, door to door.

"GIS played an extremely important role in identifying the specific high-risk locations so a targeted study could be measured," says Thomas. "GIS allowed us to use demographic data to identify locations that met the study parameters for risk. It has provided us with the ability to test our theories, measure them, and reduce home fires by using targeted education at high-risk locations. It has given us another tool to help apply a cost-benefit analysis to education initiatives." The study lasted 25 months, and more than 18,000 homes received the education packages. The results were amazing. Areas that received educational packets delivered door to door experienced a 63.9 percent reduction in home fires compared to preintervention rates of fire per 1,000 homes.

"Prior to using GIS data, we would rely on anecdotal experience by administrators to target at-risk neighborhoods utilizing a shotgun approach," says Thomas. "The ability to measure change was not practical."





Above: Identifying risk for fires and layering over areas with at-risk residents.
Right: Residential fire incidents in the City of Surrey for a six-year period.

Reporting the Results

The results of the GIS work were cataloged, quantified, and distilled into a detailed report written by Clare. "It documents measurable results that clearly communicate the process so it can be implemented virtually anywhere," says Thomas. After peer review, the *Journal of Safety Research* published the report. "The mechanism for delivering preventive interventions in the home and the approach with GIS," continues Thomas, "will drive target selection for future iterations of this home education campaign."

According to Surrey Fire, the mapping process used to identify where to target prevention efforts could also be enhanced by building on the hot spot identification and demographic locations of high-risk citizens. Such a strategy would ensure that prevention efforts are continually focused on the areas of the community with the greatest need. Indeed, there are benefits from sharing information among service providers who work with high-risk members of the community and the fire service. The range of social service infrastructure could include police, health bodies, voluntary organizations, community outreach teams, and local advocates, all working in partnership with the fire service.

"Our next application will be to refer those at greatest risk of residential fire to have smoke alarms installed free of charge," explains Thomas. "Canadian estimates suggested present and functioning smoke alarms can reduce occupant death by up to 42 percent, while the US Fire Administration suggests this reduction can be as large as 63 percent. As we further develop our program, we are planning to look at fall prevention and other education awareness initiatives for seniors."

For more information, contact Larry Thomas, deputy fire chief, City of Surrey (e-mail: lsthomas@surrey.ca).

First Esri All-Africa Event Set for May 2014 in Cape Town

Esri Regional User Conferences Draw Thousands of GIS Professionals to Lima, Munich, and Singapore

October to November 2013 was a busy event season abroad for Esri. Three major regional user conferences (UC) drew more than 3,100 software users, partners, and exhibitors on three continents for several days of ArcGIS software-focused inspiration, training, networking, fun, and a chance to see the best minds in the field show off and explore state-of-the-art software and gadgetry.

LAUC Hosts 19 Nations in Peru

More than 600 attendees from 19 countries across Latin America took part October 16–18 in the Esri Latin America User Conference (LAUC), making this the most important GIS event in the region, according to Renzo Vidalón, marketing manager for TELEMATICA, S.A., Esri's official distributor in Peru.

Esri and TELEMATICA, S.A., experts presented demonstrations of the latest Esri technology and ArcGIS as a platform, followed by the Latin America Special Achievement in GIS Awards. Cited for making good use of GIS technology, award recipients included Dirección General de Control de Tránsito Aéreo (Argentina), Aguas Andinas (Chile), Servicio Geológico Colombiano (Colombia), Ministerio de Hacienda (Costa Rica), Instituto Geográfico y Catastro Nacional (El Salvador), Instituto Geológico Minero y Metalúrgico (Peru), and Petróleos de Venezuela (Venezuela).

Attendees visiting the GIS Solutions EXPO explored booths that displayed products and services sponsored by members of the Esri Partner Network.

During the second and third day, LAUC offered approximately 106 concurrent seminar and technical workshop sessions.

Said Vidalón: "Attendees of the 2013 Latin America User Conference met, collaborated, joined a geospatial community, and networked with GIS users and Esri staff from all over the region. They also learned how the ArcGIS platform can facilitate the use of GIS across their departments, saving both time and money."

The 2014 Esri LAUC, hosted by Esri official distributor Imagem, will be held September 25–26 in São Paulo, Brazil.

For more information, visit esri.com/lauc.

2013 Esri EMEAUC—How Is GIS Transforming the Planet?

Organized by Esri Deutschland GmbH, the Esri Europe, Middle East, and Africa User Conference (EMEAUC) took place October 23–25 in the International Congress Centre in Munich, Germany. This event attracted more than 2,000 attendees from 70 countries. The main message of the conference was how GIS is evolving into web GIS and is leveraging the cloud and big data to transform our world.

The first conference day started with Expert Round Tables about energy and infrastructure, land use and environmental protection, e-government and open data, smart cities, national security, and outreach. Experts from all over the world discussed solutions, current applications, and future challenges.

In the afternoon, the Opening Plenary Session included a welcome and introduction by Gerd Buziek and Peter Ladstätter of Esri Deutschland GmbH, a presentation by Jack Dangermond on "GIS—Transforming Our World," a technical demonstration by the Hamburg Port Authority about real-time GIS, and keynote speaker Felix Finkbeiner on his initiative "Plant for the Planet." Keynote speaker Prof. Franz Josef Radermacher talked about "Globalization Sustainability Future—Balance or Destruction," and the third keynote by Mojib Latif was entitled "The Challenge of Long-Term Climate Change."

Over three days, Esri staff, customers, and partners presented more than 130 industry tracks and technical workshops.

The 2014 Esri Middle East and Africa User Conference, hosted by Esri official distributor Openware, will be held in Kuwait City, Kuwait, October 20–22. Further information is available at esri.com/meauc.

The 2014 Esri European User Conference, hosted by Esri official distributor GDi GISDATA, will be held in Split, Croatia, October 13–15.

For more information, visit esri.com/euc.

Asia in Transformation Explored at 2013 Esri APUC in Singapore

A three-day celebration of all things GIS, the Esri Asia Pacific User Conference (APUC)—hosted by Esri South Asia (Esri Singapore)—was an opportunity for more than 500 of the region's users to gather, collaborate, and share their knowledge and experiences with GIS technology at the Suntec Singapore International Convention and Exhibition Centre.

In line with the APUC theme—"Asia in Transformation"—Singapore Land Authority (SLA) chief executive Mr. Vincent Hoong delivered the opening keynote speech, providing a glimpse into how fundamental GIS technology has spread across all facets of the work the SLA undertakes.

APUC also provided a look at the role of spatial technology in the realms of academia, including a presentation on the world's latest education phenomenon: Massive Open Online Courses (MOOC). Dr. Anthony Robinson from Pennsylvania State University spoke on a MOOC called Maps and the Geospatial Revolution, through which he taught geospatial skills to more than 48,000 students from over 150 countries simultaneously.

Another popular presentation came from the Earth Observatory of Singapore, with Research Associate Humza Akhtar delivering a presentation showcasing GeoTouch—a giant interactive touch screen powered by GIS technology.

Finally, the event provided a fascinating glimpse into the latest technological advances, with Jack Dangermond giving attendees a sneak peek at what's coming in ArcGIS 11 and the technology's future role in our lives.

The 2014 Asia Pacific User Conference will be held in Hong Kong and will be hosted by Esri China (Hong Kong).

More information is available at esri.com/apuc.

Inaugural Esri Africa User Conference Expecting Nearly 1,000 in May

Coverage of the regional UCs wouldn't be complete without a preview of Esri's first-ever all-Africa conference scheduled for next spring in Cape Town.

Tech-savvy GIS users, technical experts, and decision makers from across Africa and beyond will converge in the Cape Town International Convention Centre May 6–8 for the 2014 Esri Africa User Conference (AUC).

Nearly 1,000 registered attendees will participate in several days of seminars, technical workshops, and demonstrations led by top Esri experts. They will learn the latest GIS skills and important industry issues that will enable them to function more productively on their GIS projects in their organizations and communities.

"It will be the first-ever Esri Africa User Conference—it's San Diego comes to Cape Town!" observes Lauren Sweidan, spokesperson for Esri South Africa, which is hosting the event.

In addition, users can attend paper presentations by peers who will share GIS success stories and techniques. Registered attendees are encouraged to submit abstracts of their papers for consideration, Sweidan says. The Call for Papers includes topics such as industries, government, resources, utilities, education, aid and development, mapping, SDI, agriculture, mining, forestry, planning, oil and gas, electricity/water/wastewater, and health.

Visit esri.com/auc for more information on the Call for Papers and how to register for this major regional GIS event.

The Cape Town International Convention Centre.

GIS Day and Geography Awareness Week 2013

Inspiring More Than 100,000 Worldwide

For more than 100,000 people around the world, November 17–23, 2013, was more than an ordinary work or school week. It was a time to celebrate GIS and geography at more than 1,000 GIS Day and Geography Awareness Week celebrations. The following are a handful of GIS Day festivities that in several magical hours educated, entertained, and inspired those who attended this year.

The Regional Municipality of York—Canada

The Regional Municipality of York—situated in Newmarket, about 47 kilometers from Toronto—celebrated GIS Day on November 15 at the York Regional Administrative Centre, says event coordinator and master of ceremonies Debra Kelloway, manager of GIS Partnerships and Special Projects for the Geographic Information Services branch of the Regional Municipality of York.

York has celebrated GIS Day nearly continuously since 2003. The goal has been to put GIS in the hands of all regional employees as tools they use in their daily activities.

GIS Day is part of a wider event called Get Informed, focused on the importance and power of information, technology, and analytics, as well as centralizing access to regional information. The celebration had 14 booths. Location analytics was one of the most popular, along with booths on privacy, interactive web mapping, and story maps—described by Kelloway as a "huge hit."

"This whole area of mapping and analytics is something we spend a lot of time on," according to John Houweling, director of the Geographic Information Services Branch. "We want to get story maps into the hands of users so they can start doing that."

Centro de Engenharias Doctum—Brazil

Centro de Engenharias Doctum, Minas Gerais, Brazil, held its second annual GIS Day November 18–21. Following the same plan as last year, the engineering college had lectures by GIS professionals from three campuses. About 700 students between the ages of 18 and 30, as well as some high school students, participated, says Jordan Henrique de Souza, the center's director. Engineering course coordinators and instructors planned the event, which took months of preparation.

Twelve thematic lecture rooms on campus offered students a variety of fascinating topics related to civil engineering, as well as electrical, environmental, and production themes. These ranged from remote sensing for unmanned aerial vehicles and analysis of wildfires by geoprocessing to selection of areas for hydropower by geoprocesssing.

The Memphis Area Geographic Information Council—Tennessee

The Memphis Area Geographic Information Council (MAGIC) held its 13th annual GIS Day Conference November 14–15. GIS professionals, students, and end users came together to learn and share their expertise and experiences. Along with a keynote luncheon and multiple paper sessions, the MAGIC GIS Day included a $2,000 scholarship competition for undergraduate students, a map gallery competition, and social events.

Nadika Senadheera (see the GIS Hero article in the Fall 2013 *ArcNews*) helped orchestrate a GIS Day 2013 celebration at Mayo Primary School in Juba, South Sudan. She also visited Amboseli National Park in Kenya, where she provided a teaching session for the Maasai community.

This year the event was held at the Bridges Center in downtown Memphis, which is operated by BRIDGES USA, a nonprofit dedicated to inspiring young people to become leaders in the mid-south region.

The 2013 theme was "Decision Making Using GIS," says Andrew McColgan, a computer software specialist with Memphis Light, Gas & Water Information Services, the event sponsor.

"This broad topic enabled us to invite and engage members of not only the technical GIS community but also the local government, utility, nonprofit, and private sectors," McColgan says. "In addition, of the over 150 attendees, almost one-third were students from local colleges and universities."

A new, very popular session this year, called "The Doctor Is In," allowed attendees with a particular GIS" problem or question to sign up for small-group or one-on-one counseling and how-tos by local experts.

The City of Palm Bay—Florida

The City of Palm Bay, Florida, hosted its 7th Annual GIS Day event inside city hall on November 20. The celebration, scheduled after working hours, was a "great success," says event coordinator DeAnna Krishak, GIS technician III with host Palm Bay Utilities.

Palm Bay's local high school outreach throughout National Geographic Geography Awareness Week and GIS Day enabled the agency to interact and speak with about 800 local citizens and professionals—"the crowd we aimed for," Krishak says.

For more information on GIS Day, visit **gisday.com**.

Subscribe to Esri Publications

To **subscribe** to Esri publications, visit **esri.com/subscribe**.
To **unsubscribe** from Esri publications, visit **esri.com/unsubscribe**.
To **update your mailing address**, visit **esri.com/coa**
or use any of these e-mail, phone, or fax options.
Outside the United States, contact your international distributor to subscribe, unsubscribe, or change your address.
For a directory of distributors, visit **esri.com/distributors**.
Requests for back issues, missed issues, and other circulation services may also be sent via requests@esri.com; 909-793-2853, extension 1-2778; or faxed to 909-798-0560.

New Training and Certification Offerings from Esri

Training

New Instructor-Led Courses and Workshop

Market Analysis Using Esri Business Analyst—This course is for market analysts and other professionals with limited GIS experience who want to unleash the power of location analytics to increase understanding of their customers and competitors and uncover market opportunities. You will learn best practices to work with the Esri Business Analyst system to visualize and analyze demographic, consumer, and business data and effectively share your analysis results with decision makers.

Practicing Geodesign Using ArcGIS—By providing a framework and robust tools to create and quickly evaluate design alternatives, geodesign supports sustainable planning that meets the needs of local, regional, and global communities today and in the future. This course teaches planning and design workflows to iteratively model, visualize, and assess the impact of individual decisions on an overall design plan. You will learn a GIS-driven workflow to help guide a design project from start to finish.

ArcGIS 10.2 for Desktop: Quick Start for ArcGIS 9.x Users—This full-day workshop is for experienced ArcGIS Desktop 9.x users who are transitioning to ArcGIS 10.2. You will learn about interface enhancements and simpler workflows designed to make your GIS mapping, editing, and analysis tasks faster and easier. New capabilities for imagery and 3D visualizations are also covered. You will also see how the integration of ArcGIS Online into the desktop environment makes accessing and sharing GIS data, maps, and analysis results a seamless part of your GIS workflow.

Find more information about these offerings and view the complete catalog of Esri training options at **esri.com/coursecatalog**.

Certification

At each ArcGIS release, the Esri technical certification team coordinates an extensive review of all existing exams to evaluate the impacts of the release on exam content. The four technical certification exams below have been updated for ArcGIS 10.2, and the 10.2 exams will be released publicly in the coming months.

- Web Application Developer Associate
- Desktop Developer Associate
- Enterprise System Design Associate
- Enterprise Administration Associate

As shown in the table below, four certification exams were minimally impacted by changes introduced at version 10.2. Because the knowledge and skills measured by the 10.1 exams remain relevant at version 10.2, these certifications will not have a version 10.2 exam. Individuals who are using ArcGIS 10.2 and would like to become certified in ArcGIS Desktop or Enterprise Geodatabase Management should take the version 10.1 exam.

		ArcGIS 10.2	ArcGIS 10.1	ArcGIS 10.0
Desktop	ArcGIS Desktop Associate	No Update	Available	Available
	ArcGIS Desktop Professional	No Update	Available	Available
Developer	Web Application Developer Associate	Beta January 2014	Available	Available
	Desktop Developer Associate	Beta January 2014	Available	Available
Enterprise	Enterprise Geodatabase Management Associate	No Update	Available	Available
	Enterprise Geodatabase Management Professional	No Update	Available	Available
	Enterprise System Design Associate	Beta December 2013	Available	Available
	Enterprise Administration Associate	Beta December 2013	Available	Available

For detailed information about the Esri Technical Certification Program and exams, visit **esri.com/certification**.

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 website:	**esri.com/certification**
Esri Technical Certification exam registration site:	**pearsonvue.com/esri**
Esri Technical Certification prep resources:	**esri.com/skillsreview**

Esri Partner Offerings

Esri maintains relationships with more than 1,800 partners around the globe that provide solutions and service-based solutions to our mutual customers. In this issue, we highlight four of these organizations. For a complete list and description of partners and their offerings, visit the Esri website at **esri.com/partners**.

Government

Cloudpoint Geographics Inc.
cloudpointgeo.com/d-maprack
Digital MapRack
As an ArcGIS Online specialist, Cloudpoint Geographics has been successful in setting up ArcGIS Online for a number of customers with both internal and external uses. One of the core values of Cloudpoint is its ability to tailor specific geospatial services and technology for each and every client. Its Digital MapRack is not a boxed product. Rather, it is a solution that combines available Esri technology with the company's training and expertise to come alongside client staff to close that office-to-field loop. Cloudpoint can implement an ArcGIS Online or Portal for ArcGIS deployment for an organization including custom embedding and branding for a client site.

WorldView Solutions
www.worldviewsolutions.com
Jumpstart Solution for ArcGIS Online
ArcGIS Online Specialty partner WorldView Solutions presents its Jumpstart Solution for ArcGIS Online. The Jumpstart Solution is intended to provide organizations with guidance, instruction, and support to realize early, meaningful success in the implementation of ArcGIS Online, an integral part of the ArcGIS product line, housed in Esri's secure cloud. The ArcGIS Online entitlement program extends availability of this platform to any organization with current maintenance on ArcGIS for Desktop or ArcGIS for Server. The Jumpstart Solution for ArcGIS Online is a turnkey, project-focused package that provides organizations with an ArcGIS Online road map, as well as the data, tools, and workflows needed to achieve immediate success.

Real Estate

Beitz and Daigh Geographics, Inc.
www.beitzanddaigh.com
Real Estate Research and Marketing/Opportunity Grid
Beitz and Daigh Geographics provides research and marketing support for real estate organizations looking to develop, sell, or lease real estate. Specializing in retail, Beitz and Daigh works with shopping center owners, brokers, and developers to research as well as market locations to retailers for development and/or lease transactions. Studies and marketing packages are created with drive times, the latest demographics, high-resolution aerials, thematic color-coded maps, traffic counts, and competition mapping. In the case of marketing, these materials are customized by the client's specifications to tell the unique story of location and why the location is best suited to a particular land use. Beitz and Daigh also provides an Esri ArcGIS Online solution called the Opportunity Grid. This web-mapping solution uses ArcGIS Online as a portal for real estate decision support. Users can view this location-based data at their workspace or in the field via a smartphone or tablet.

IT Consulting

Rolta
www.rolta.com
Rolta Geospatial Fusion
GIS capabilities are embedded in the very foundation of Rolta, a leading provider of enterprise GIS and IT services. Advancements in Esri technology combined with Rolta's Geospatial Fusion technology and industry expertise provide a strong solution framework that businesses can leverage to achieve real operational return on investment and value to their stakeholders. Rolta extends the benefits of traditional GIS to the enterprise through its deep IT services expertise, providing the integrated IT, GIS, and analytics/business intelligence solutions that businesses need to achieve operational performance objectives and support critical decision making.

Government Agency, Young Professional, and Educational Institution

URISA Introduces New Membership Options

In response to frequent requests, the Urban and Regional Information Systems Association (URISA) has introduced new categories of membership for 2014. In addition to professional and student membership and partner opportunities for private sector companies of all types and sizes, URISA is pleased to announce a tiered Government Agency Membership, based on a jurisdiction's population; a Young Professional Membership category for individuals aged 35 and under; and an Educational Institution Membership to support outreach to the academic community.

A URISA **Government Agency Membership** is designed specifically for city/county/regional governments that wish to provide a professional membership for their GIS staff whether they are clustered in one department or spread out across a number of departments (assessor's office, public health, planning, etc.). This enterprise membership is an opportunity to streamline an agency's URISA membership while taking advantage of cost efficiencies. This group membership includes additional features, such as URISA Certified Workshop licenses for on-site training and URISA annual conference group registration deals.

For a number of years, URISA has demonstrated its commitment to young professionals through the introduction and support of the Vanguard Cabinet. To further appeal to the next leaders of the organization, URISA is pleased to announce a **Young Professional Membership** at a $50 annual savings.

Most of URISA's founding members were esteemed faculty within urban planning departments. A targeted and continuous recruitment campaign for student members is high on URISA's agenda. An **Educational Institution Membership** is now available to faculty and staff at colleges and universities at a single location. This option includes membership for two faculty members and up to 10 student members at a discounted package price.

Now is the time to check out URISA membership! Review all the options and details online. If you have any questions at all, contact any URISA staff member (tel.: 847-824-6300, e-mail: info@urisa.org).

"Crossing Borders"

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

Racism, Social Justice, and GIS

Geographic information systems have long played a significant role in efforts to understand and address racial discrimination and related social justice issues, ranging from urban housing redlining to historical GIS research of reconstruction following the US Civil War. This year marks the anniversary of the Martin Luther King Jr. March on Washington for Jobs and Freedom. Fifty years have passed since that landmark event, and many commemorative addresses acknowledge the considerable progress that has been made with respect to civil rights over the past half century. Nevertheless, recent history shows us clearly that the road is still long and there is still much to do.

Thus, one core theme of the Association of American Geographers (AAG) Annual Meeting this coming April in Tampa, Florida, will be "Racism and Violence in America: Fifty Years since the March on Washington for Jobs and Freedom." This featured theme for the AAG Annual Meeting provides an opportunity for us to explore past, current, and potential future contributions of geographic research and GIS tools and analysis to understanding and addressing current needs in these and related areas. It will also enable all of us to reflect on our personal actions and commitment to reducing racism and violence. Dozens of plenary sessions and public events are planned around this featured theme, and we welcome your input, suggestions, and participation in these sessions.

GIS now plays a key role in helping to understand the interactions of race, ethnicity, and place in our society, and there are many ways in which the GIS community can constructively engage these issues, from community and participatory GIS projects to research programs that examine the role of race and ethnicity in geographic patterns of difference and opportunity around the world. I encourage the Esri community to share and discuss your GIS analyses and project work on these topics at the AAG Tampa meeting, which will be held April 8–12, 2014.

Julian Bond to Speak at AAG Meeting in Tampa

As part of this focus on racism at the AAG Annual Meeting and to commemorate the Civil Rights movement in the United States, the Association of American Geographers is also pleased to announce that Professor Julian Bond, a renowned civil rights pioneer and political leader, has been named the third recipient of the AAG Atlas Award. Bond will receive the award at the AAG meeting on Friday evening, April 11, 2014, where he will deliver a presentation, "Race Around the World," focusing on how civil rights figures and organizations have shaped and changed American foreign policy. More than 8,000 geographers, GIScientists, GIS specialists, and others from around the globe, including the media, are expected to attend the AAG meeting.

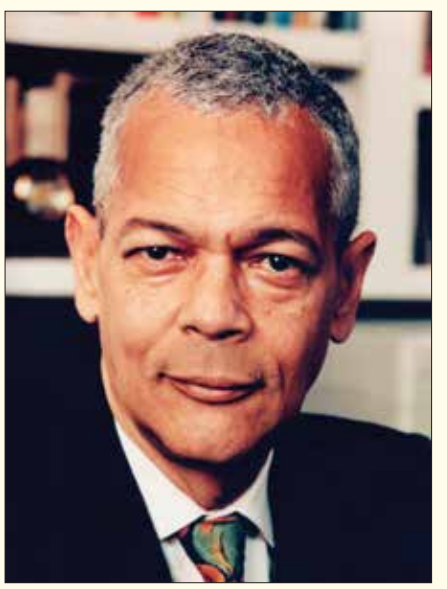
Bond has played and continues to occupy a central role in the US civil rights movement as a leading figure in the Student Nonviolent Coordinating Committee and as cofounder and first president of the Southern Poverty Law Center. Bond was repeatedly elected to the Georgia General Assembly for 20 years, including six terms as a state senator. More recently, he has served as chairman of the National Association for the Advancement of Colored People (NAACP) for 12 years, from 1998 to 2010.

Bond is the son of former college and university president Horace Mann Bond, and he has built his own record as a celebrated educator, having held appointments at several leading institutions, including American, Harvard, and the University of Virginia. He has been awarded more than 20 honorary degrees throughout his career.

Bond embodies the ideals and goals of the AAG Atlas Award, which is designed to recognize and celebrate outstanding accomplishments that advance world understanding in exceptional ways. The image of Atlas bearing the weight of the world on his shoulders is a powerful metaphor for this award program, as the AAG's awardees are those who have taken the weight of the world on their shoulders and moved it forward, whether in science, politics, scholarship, the arts, or war and peace. In addition to a substantial cash prize, an Atlas statuette will be presented to Bond as a compelling keepsake and an inspiring symbol for the award program itself. Author and scientist Jane Goodall and human rights leader Mary Robinson are the previous recipients of the AAG Atlas Award.

We invite you to join Bond and the AAG in Tampa to celebrate his extraordinary accomplishments and to discuss with him and others from around the world the future of civil rights and social justice. For more information or to attend the meeting, visit **www.aag.org/annualmeeting**.

Doug Richardson
drichardson@aag.org



Civil rights pioneer Julian Bond.

Visit *ArcNews Online* at esri.com/arcnews.

NATIONAL GEOGRAPHIC™

"Geo Learning"

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

Defining Geography for Education

Odds are that if I ask you and the person in the next office to describe the field of geography, I will get pretty different answers. And if I were to ask other members of your family—your mother, your brother, your spouse—I would get an even broader range of answers. And if I were to ask the people next to you on your morning commute, the answers would be more diverse still.

This diversity is, of course, an inherent property of human psychology. We all carry around our own personal understanding of words and concepts that result from our own particular set of experiences.

In most cases, the fact that there is such a broad range of definitions for the field of geography isn't a problem, but there is one place where it is a serious issue—in conversations about geography education.

In more than a decade of talking to people about how to improve geography education, I have learned that it is important to be explicit about the definition of geography that I am using.

While there are, of course, as many definitions of geography as there are people, there are three clusters that are important for discussions about geography education. I call these clusters of definitions "geographers' geography," "the popular perception of geography," and "school geography."

Before I go on, I should note that these definitions are all specific to the United States. From talking to geography educators from other parts of the world, I believe that these clusters exist elsewhere, but I have also learned that the specific definitions in each cluster and the similarities of the clusters to each other differ from place to place.

"Geographers' Geography"

While there can be no "correct" definition of a field, the cluster of definitions that I think of as geographers' geography has a status that sets it apart from the others. It reflects the way experts and practitioners in geography think of their field. Because geographers' definitions of geography are the product of academic study and discussion, they cluster around a set of conventional definitions, including geography as the study of place and space and geography as the study of spatial patterns and processes at the earth's surface. Geographers also commonly describe geography as encompassing human geography, physical geography, and human-environment interaction.

Unlike nongeographers, who often define maps, mapmaking, and map interpretation as the defining characteristics of geography, geographers tend to talk about maps as being instrumental to geography but not the defining feature. In my experience, geographers describe maps as tools that they use to understand and communicate about space and place.

The benefit of being able to refer to geographers' definitions of geography in discussions about education is that they make it easy to describe the specific advantages of geography in contrast to other subjects of study, and they highlight the societal goals that geographic understanding and practices support. It is easy to connect geographers' geography to the myriad activities of commerce, government, and community life.

"The Popular Perception of Geography"

Unfortunately, the popular perception of geography is very different. I find the understanding of geography that I encounter on a daily basis to fit the stereotype that geographers refer to as "place-name and location" geography frighteningly often. Most people I encounter, regardless of their level of educational attainment, view geography as a body of discrete knowledge about the world that includes names and locations of countries, cities, bodies of water, and major geological features and facts about those places.

Most people I talk to consider map reading and wayfinding to be the only skills that geography teaches, and if they are aware that one can study geography at an advanced level or practice geography professionally, they believe the focus of that geography is mapmaking.

From the perspective of geography education, the popular perception of geography is as pernicious as it is widespread. People are increasingly aware that factual knowledge is of limited value in the Internet age, so it is difficult to have a productive conversation about the value of geography education with someone who believes geography is about factual understanding and thinks its usefulness for careers is limited to the obscure profession of cartography. Unfortunately, it can be very difficult to change this perception of geography, especially in a single conversation, when the individual has had no personal exposure to systematic geographic reasoning or problem solving.

"School Geography"

The third cluster of definitions I encounter is what I call "school geography." This is what is taught in schools under the label of *geography*. School geography is typically a little broader than the popular perception of geography but dramatically narrower than geographers' geography.

In the United States, the overwhelming distinction between school geography and geographers' geography is that school geography focuses almost exclusively on human geography. To the extent that physical geography is taught as geography in the United States, it is taught as background and context for human geography. This is not to say that physical geography is not taught in American schools. Some physical geography is taught, but it is taught under the labels of *earth science*, *environmental science*, and *geoscience* rather than *geography*. Anything that is taught with the label *geography* is taught as part of the social studies curriculum and focuses on the geography of people.

The second characteristic of school geography is that it focuses primarily on factual knowledge. It would not be fair to modern curriculum designers, textbook authors, or teachers to say that geography education today focuses exclusively on facts, but it is fair to say that school geography is so dominated by the teaching of facts that it has not done anything to change the popular perception of geography as being about knowledge of discrete facts.

Geographers and geography educators have worked hard to change the definition of school geography through the development and dissemination of standards that reflect the subset of geographers' geography they believe K–12 students should learn. However, the impact of these efforts on the geography that is taught in schools is still limited.

Like the popular definition of geography, the school definition of geography is a problem for conversations about geography education. It leaves out the critical component of physical geography and makes it difficult to talk about the study of human-environment interaction. Likewise, the focus on factual knowledge makes it hard to make the case of the importance of geography education in our modern world.

The bottom line here is that the differences between these definitions represent both a challenge and an opportunity. The challenge is that it is very difficult to have productive discussions about improving geography education when the participants in these conversations have definitions that are limited to either the popular perception of geography or the school definition of geography.

On the other hand, it exposes an opportunity in the form of a specific issue to work on. If we could bring the geographers' definition of geography to a larger audience, it could make it much easier to bring about change in geography education. While it is difficult (I can't count the number of times when I have explained to people what I mean by *geography*, only to have them revert to their old understanding of geography a few minutes later), people can learn new definitions. It requires deliberate effort and clever communications strategies, but it can be done. In fact, I believe that it must be done if we ever are to make significant progress on the challenges of improving geography education and geographic literacy.

For more information about the efforts that the National Geographic Society, the Association of American Geographers, the National Council for Geographic Education, and Esri are making to increase popular understanding of geography, visit **GeographyAwarenessWeek.org**.

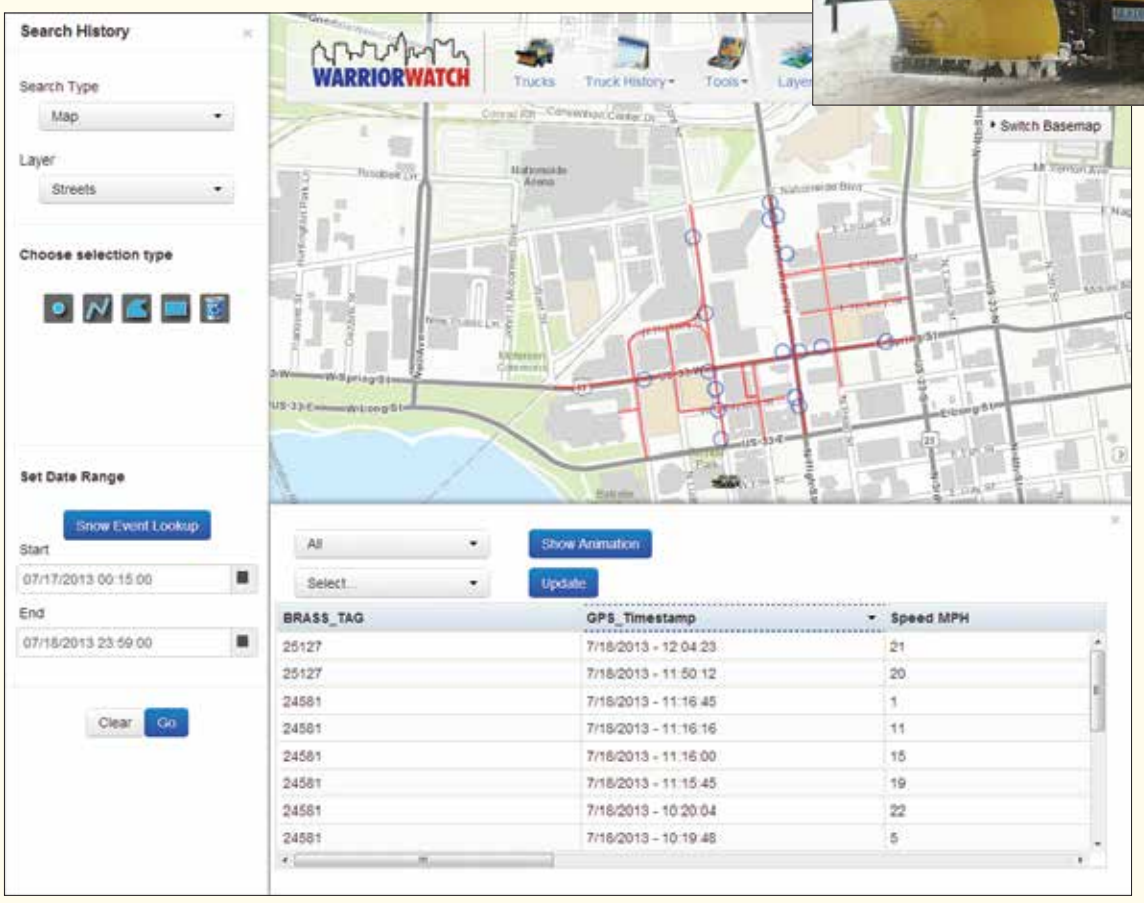
"Managing GIS"

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

URISA
The Association For GIS Professionals
www.URISA.org

Managing GIS Operations for Snow Removal for the City of Columbus—Warrior Style

By Darlene Magold Scott, GISP



Left: Warrior Watch searches by map to show history of plow data (location, plow up/down, salt spreader) in a specific area. **Above:** A City of Columbus snowplow.

It may take a village to raise a child, or a team to win a championship . . . but it takes a group of organized "Snow Warriors" to get commuters to work on time during the wintry months in Columbus, Ohio. Managing the complexities of new GIS software, three consultants, more than 100 snow operation vehicles, and a street network of approximately 2,000 miles is a daunting task. The City of Columbus Department of Public Services (DPS) has found a way to provide a management formula that creates, tests, and implements this task.

Background

The unpredictable nature of snow and ice events makes it difficult to track costs, measure resources, and monitor where and how these resources are distributed throughout the city during an event. Like most public service departments, Columbus DPS staff manages transportation infrastructure and all the operations and maintenance that go with it, including snow and ice. To be prepared for this year's snow season, the DPS Snow Warriors are using a new GIS web application they named "Warrior Watch," which utilizes the Esri ArcGIS GeoEvent Processor for Server. This new GIS technology will internally monitor both real-time and historical performance of the city's snow and ice removal activities.

DPS staff worked closely with the city's Department of Technology (DoT) GIS staff to help manage the behind-the-scenes architecture necessary for deployment of the plan. Successful deployment also consisted of a team of consultants that included T&M Associates (Columbus, Ohio), Esri Silver Tier partner Network Fleet (San Diego, California), and Esri. DPS had to devise a system that efficiently and seamlessly managed all the diverse personnel and special expertise involved in the task.

Managing for Success

The successful implementation of this new technology required successful management and clear communication between and among all the Warriors in the plan, such as the following:

Define Internal and External Roles and Responsibilities

When working with numerous consultants and multiple departments, it is important that everyone knows his or her role. DPS management procured the project so that roles of the consultants were clearly and contractually defined. It created a team that used the strengths of each vendor and city department. Network Fleet provided the GPS data from the vehicles to feed the GeoEvent Processor. Esri assisted with the GeoEvent Processor configuration and geoprocessing tools. T&M Associates acted as the project coordinator and developed the web interface as the front end of the application. The city DoT provided general GIS support, as well as server configuration and testing for all phases of the project.

DPS managers coordinated through weekly meetings and e-mail updates with the entire project team.

Determine the Operations Staff Workflow and Verify It Through Testing

It is easy to get management's point of view on how operations should flow, but the real information comes from the staff who is working with the data on a daily basis. The project team worked with the staff to determine both common operating and emergency procedures to create tools and reports that will assist them during a snow event.

The DPS staff required that the application display the current location of snow operations vehicles and any additional sensor information in 15-second time intervals. This included heading, speed, whether the plow is up or down, and whether the salt spreader is activated.

Snow Warriors performed dry runs on actual snow routes to test the GPS and provided real data so that the application was tested and validated. They carefully documented and quantified results so that the project team could modify the application for final delivery.

Create an Application That Is User-Friendly and Relevant

There is no need to add complicated tools or widgets to an application that has a specific goal. A user-friendly and relevant application made it easier to keep the roles defined and the task manageable. The city was wise to keep this application separate from others so that it can be used for snow event operations. However, the project team had the foresight to build this initial system in a modular fashion so it could quickly and efficiently add additional vehicles and custom reports to the application and expand the functionality to meet the changing needs of the Department of Public Services while still controlling all aspects of management.

The basic functions of the application are

- Displaying real-time vehicle location data provided by Network Fleet (15-second intervals).
- Allowing users to search historical vehicle activity by a location on the map or by information, such as brass tag, street centerline, or street maintenance zone.
- Providing standard reports for route completion, customer service requests, and truck activity summary.

The Nerdy Details of Successful Management

A JavaScript framework was employed for the web application, which enables users to access the application without the need for separate, desktop browser plug-ins. The application allows users to search vehicle activity using the map or entering information into a standard search form and provides custom reporting capabilities that are easy to access. The application also takes advantage of modern web browser support of WebSockets, which enable real-time, two-way communication between servers and browsers. This enables truck information to be updated in real time within the browser without having to refresh the map or poll the server for new information. Additional Python geoprocessing tools were developed to run on the server to enhance the information provided by the vehicle sensors, which could not be performed using the GeoEvent Processor. For example, a scheduled Python script runs at a regular frequency to add the street name and snow maintenance zone that each vehicle location is associated with. The server architecture uses a combination of Microsoft SQL Server, Oracle 11*g*, and ArcGIS 10.2 for Server running on Windows Server 2012 R2.

Conclusion

Implementing new technology is always a challenge, but DPS management and operations staff accomplished the task with an efficient and methodical management style. By engaging DoT staff at the beginning of the project and choosing a team of consultants who were able to work constructively together, they created an environment that was both cordial and professionally productive.

The City of Columbus can now efficiently coordinate resources during snow events and track information associated with cleanup efforts.

About the Author

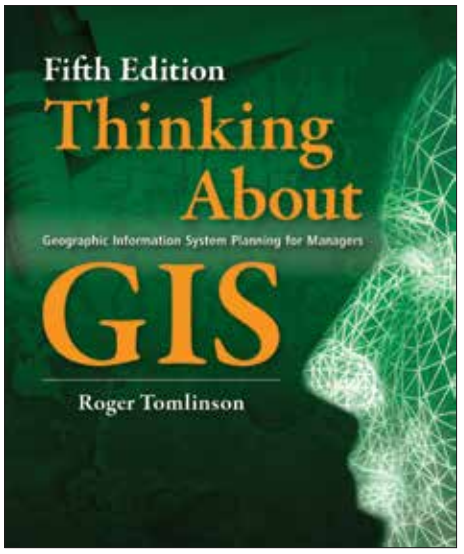
Darlene Magold Scott, GISP, is the GIS director for T&M Associates and is located in Columbus, Ohio. She has worked with the City of Columbus DPS and DoT for the past seven years.

Contributors

Erick Lobao, GISP, is a GIS manager for T&M Associates and is the project manager for the Warrior Watch project. He successfully led this project with a talented team of application developers, Jesse Glascock, GISP, and Jon Woyame. City of Columbus DPS project managers Rick Garrabrant, PS; Shane Mark, MS; and Elizabeth Jones led the project and the Snow Warriors using GIS technology. The City of Columbus DoT; Shoreh Elhami, GISP; Brian Nemec, ME, GISP; and Rob Parsons, GISP, assisted with the implementation and management of the new GIS technology.

For more information, contact Darlene Magold Scott (e-mail: dmagoldscott@tandmassociates.com).

Roger Tomlinson's *Thinking About GIS*, Fifth Edition, Now Available



Esri Press has released the fifth edition of *Thinking About GIS: Geographic Information System Planning for Managers*. This seminal book on planning and implementing a GIS is authored by Dr. Roger Tomlinson, widely recognized as "the father of GIS."

The fifth edition has been updated with new resources including case studies, tips, and terminology definitions that reflect the latest advances in GIS technology and information. The accompanying DVD includes examples and templates, exercises, and videos of the seminar "Planning and Managing a GIS" from the 2012 Esri International User Conference.

Drawing from decades of Tomlinson's consulting experience and worldwide GIS seminars, this new edition bridges the communication gap between the senior managers who oversee information technology systems and the technical specialists who design and implement the systems. The book provides a common ground for both groups so that each clearly understands the methodology needed to implement and maintain an effective GIS.

"Successful GIS implementation depends on a well-thought-out and executed plan," says Esri president Jack Dangermond. "If you follow the methodology presented in this book, you will be on the track to success. I hope that you find Roger Tomlinson's work as informative and beneficial as my colleagues and I have."

Tomlinson created the first computerized geographic information system in the 1960s while working for the Canadian government. He is a former chairman of the International Geographical Union GIS Commission, a past president of the Canadian Association of Geographers, and the second-ever recipient of the prestigious Alexander Graham Bell Award from the National Geographic Society.

Thinking About GIS: Geographic Information System Planning for Managers, Fifth Edition (ISBN: 9781589483484, 280 pages, US$54.95), is available at online retailers worldwide, at **esri.com/esripress**, or by calling 1-800-447-9778. Outside the United States, visit **esri.com/esripressorders** for complete ordering options, or visit **esri.com/distributors** to contact your local Esri distributor. Interested retailers can contact Esri Press book distributor Ingram Publisher Services.

Online-Only Articles
More *ArcNews*

The Winter 2013/2014 issue of *ArcNews* Online (**esri.com/arcnews**) presents the following special online-only articles:

- Queensland's Department of Natural Resources and Mines Responds to Catastrophes
- Into the Smithsonian WILD
- GIS Tools Empower San Francisco's Green Retrofit Campaign

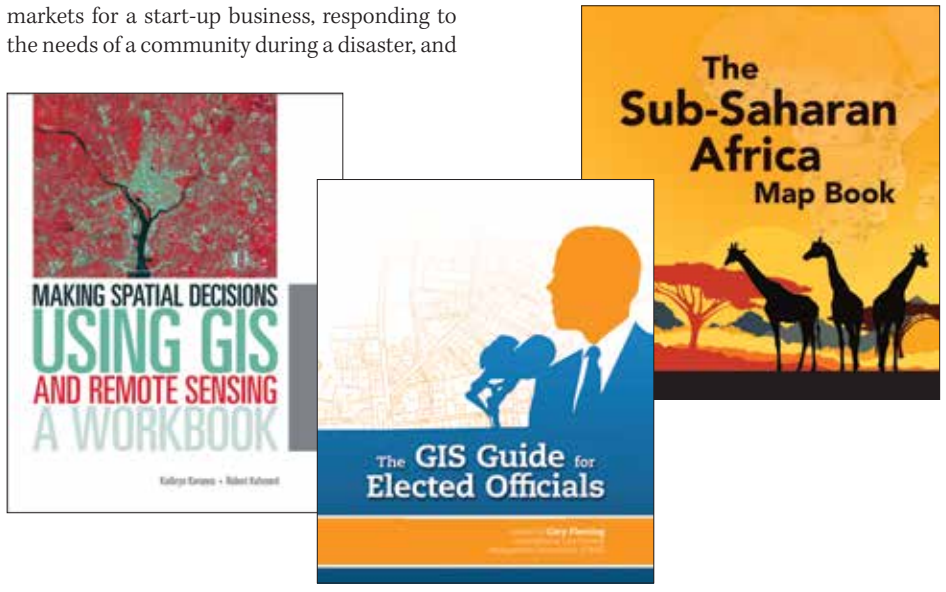
New from Esri Press

Making Spatial Decisions Using GIS and Remote Sensing: A Workbook
By Kathryn Keranen and Robert Kolvoord
This is the first workbook to highlight the image processing capabilities inherent in ArcGIS software. Designed to complement remote-sensing textbooks in an undergraduate curriculum, this workbook teaches students image processing and analysis skills with ArcGIS 10.1 for Desktop. *Making Spatial Decisions Using GIS and Remote Sensing: A Workbook* uses step-by-step instruction, guided activities that reinforce learned concepts, and independent projects that encourage students to solve problems using local data. Landsat imagery and other data accompany the book on DVD. A 180-day trial of ArcGIS 10.1 for Desktop Advanced software is also included. Instructor resources are available. November 2013. ISBN: 978-1-58948-336-1, 288 pp., US$79.95.

The GIS Guide for Elected Officials
Cory Fleming, Editor
The GIS Guide for Elected Officials is a valuable resource for government officials who want to better understand how to use GIS technology to answer location-based questions. The use cases in the book show the wide range of problems GIS can help solve, including determining potential markets for a start-up business, responding to the needs of a community during a disaster, and identifying urban food deserts. Designed to enable governments to learn from the experience of others, this volume also includes a review of what it takes to build and maintain a strong GIS program in light of rapidly changing technology and shrinking government budgets. January 2014. E-book ISBN: 978-1-58948-353-8, Print ISBN: 978-1-58948-272-2, 212 pp., US$19.95.

The Sub-Saharan Africa Map Book
Esri
The Sub-Saharan Africa Map Book illustrates how GIS technology is currently being used in Africa to manage economic instability, social conflict, health care, conservation planning, and global warming. The maps feature the work of geoscientists throughout the region and cover a wide range of topics, such as managing rangeland in Senegal, forecasting climate change in Nigeria, and conserving wildlife in Kenya. December 2013. ISBN: 978-1-58948-338-5, 96 pp., US$24.95.

Check out the Esri Bookstore app to access free and for-sale Esri Press e-books at **esri.com/bookstoreapp**. For information on all Esri Press books, visit **esri.com/esripress**.



A Beautiful Day in Utah—Another Esri T-shirt Stands Out!

Lara Oles, GIS training specialist, United States Forest Service, wore her new Esri "Map Girl" T-shirt right after attending the 2013 Esri International User Conference. She is shown here posing on her horse Slater near Heber City, Utah. She tells us, "In 2006 I was in a freak skiing accident, which left me with a paralyzed right arm and stroke-like symptoms in my right leg. I am now a para-equestrian training for a chance to represent the United States in the 2016 Paralympics in Rio de Janeiro, Brazil."

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. Upload digital photos at *ArcNews Online* or send them via e-mail (tmiller@esri.com). Digital images are preferred, but prints or slides can be sent to *ArcNews* T-shirt Feature, Esri, 380 New York Street, Redlands, California 92373-8100 USA. See *ArcNews Online* at **esri.com/arcnews**.

Lara Oles near Heber City, Utah.

Esri Corporate Headquarters

380 New York Street
Redlands, CA 92373-8100 USA
Tel.: 909-793-2853
E-mail: info@esri.com
Web: esri.com

Esri Technical Support
Tel.: 888-377-4575
E-mail: support@esri.com
Web: esri.com/support

Esri Desktop Order Center and Software Information
Tel.: 1-800-447-9778 (USA only)

Esri Store
Web: esri.com/store

Esri Developer Network
Web: edn.esri.com

Esri Customer Service
Toll Free
Tel.: 888-377-4575
E-mail: service@esri.com
Web: esri.com/customerservice
Customer Care Protal: customers.esri.com

Esri US Regional Offices

Boston
Middleton, MA
Tel.: 978-777-4543

California
Redlands, CA
Tel.: 909-793-2853, ext. 1-1906

Charlotte
Charlotte, NC
Tel.: 704-541-9810

Denver
Broomfield, CO
Tel.: 303-449-7779

Minneapolis
St. Paul, MN
Tel.: 651-454-0600

Olympia
Olympia, WA
Tel.: 360-754-4727

Philadelphia
Chesterbrook, PA
Tel.: 610-644-3374

San Antonio
San Antonio, TX
Tel.: 210-499-1044

St. Louis
St. Charles, MO
Tel.: 636-949-6620

Federal Office
Washington, DC
Vienna, VA
Tel.: 703-506-9515

For additional information about Esri US regional offices, visit esri.com/usa.

Esri Distributors Worldwide

Esri Australia Pty. Ltd.
Brisbane
Tel.: 617-3218-4100
E-mail: connect@esriaustralia.com.au
Web: www.esriaustralia.com.au

Esri BeLux N.V.
Wemmel, Belgium
Tel.: 32-2-460-7480
E-mail: info@esribelux.com
Web: www.esribelux.com

Esri Bulgaria Ltd.
Sofia
Tel.: 359-2-964-0850
E-mail: info@esribulgaria.com
Web: www.esribulgaria.com

Esri Canada Limited
Toronto, Ontario
Tel.: 416-441-6035
E-mail: info@esri.ca
Web: www.esri.ca

Esri Chile S.A.
Santiago
Tel.: 56-2-481-9000
E-mail: info@esri.cl
Web: www.esri.cl

Esri China Information Technology Co. Limited
Beijing
Tel.: 86-10-5763-2288
E-mail: info@esrichina.com.cn
Web: www.esrichina.com.cn

Esri China (Hong Kong) Limited
Hong Kong
Tel.: 852-2730-6883
E-mail: info@esrichina.hk
Web: www.esrichina.hk

Esri Colombia SAS
Bogota
Tel.: 571-638-7272
E-mail: hgutierrez@prosis.com

Esri Eastern Africa Limited
Nairobi, Kenya
Tel.: 254-20-271-3630
E-mail: sales@esriea.co.ke
Web: www.esriea.co.ke

Esri Finland Oy
Espoo
Tel.: 358-207-435-435
E-mail: info@esri.fi
Web: www.esri.fi

Esri France S.A.
Meudon
Tel.: 33-1-46-23-6060
E-mail: info@esrifrance.fr
Web: www.esrifrance.fr

Esri Deutschland GmbH
Kranzberg
Tel.: 49-89-207005-1200
E-mail: info@esri.de
Web: www.esri.de

NIIT GIS Limited (Esri India)
Gurgaon
Tel.: 91-124-4002702
E-mail: info@esriindia.com
Web: www.esriindia.com

Esri Italia Sp.A.
Rome
Tel.: 39-06-406-961
E-mail: info@esriitalia.it
Web: www.esriitalia.it

Esri Japan Corporation
Tokyo
Tel.: 81-3-3222-3941
E-mail: esri_general@esrij.com
Web: www.esrij.com

Esri Korea, Inc.
Seoul
Tel.: 82-2-2086-1900
E-mail: info@esrikr.com
Web: www.esrikr.com

Esri Lebanon sal
Beirut
Tel.: 961-1-844944
E-mail: info@esrilebanon.com
Web: www.esrilebanon.com

Esri Muscat Co LLC
Muscat, Oman
Tel.: 968-24693723
E-mail: info@esrimuscat.com
Web: www.esrimuscat.com

Esri Nederland B.V.
Rotterdam
Tel.: 31-10-217-0700
E-mail: gisinfo@esri.nl
Web: www.esri.nl

Esri Northeast Africa
Cairo, Egypt
Tel.: 202-2271-9350
E-mail: info@esrinea.com
Web: www.esrinea.com

Esri Panama, S.A.
Panama City
Tel.: 507-297-4063
E-mail: atrejos@esri.com

Esri Polska sp. z o.o.
Warsaw
Tel.: 48-22-390-4700
E-mail: esri@esri.pl
Web: www.esri.pl

Esri Portugal—Sistemas e Informação Geográfica, S.A.
Lisbon
Tel.: 351-2-1-781-6640
E-mail: market@esri-portugal.pt
Web: www.esri-portugal.pt

Esri Romania S.R.L.
Bucharest
Tel.: 40-21-231-1422
E-mail: esri@esriro.ro
Web: www.esriro.ro

Limited Liability Company ESRI CIS
Moscow, Russia
Tel.: 7-495-988-3481
E-mail: yulia@esri-cis.ru
Web: www.esri-cis.ru

Esri Saudi Arabia Ltd
Riyadh, Saudi Arabia
Tel.: 966-1-416-2600
E-mail: info@esrisaudiarabia.com
Web: www.esrisaudiarabia.com

Esri South Africa (Pty) Ltd.
Midrand
Tel.: 27-11-238-6300
E-mail: info@esri-southafrica.com
Web: www.esri-southafrica.com

Esri Southern Africa
Ebene, Mauritius
Tel.: 27-11-238-6300
E-mail: info@esri-southernafrica.com
Web: www.esri-southernafrica.com

Esri South Asia Pte. Ltd.
Singapore
Tel.: 65-6742-8622
E-mail: connect@esrisingapore.com.sg
Web: www.esrisa.com

Esri España Geosistemas S.A.
Madrid
Tel.: 34-91-559-4375
E-mail: informacion@esri.es
Web: www.esri.es

Esri Sverige AB
Gävle, Sweden
Tel.: 46-771-984800
E-mail: info@esri.se
Web: www.esri.se

Esri (Thailand) Co. Ltd.
Bangkok
Tel.: 66-2-678-0707
E-mail: krairop.l@cdg.co.th
Web: www.esrith.com

Esri Bilgi Sistemleri Muhendislik ve Egitim, Ltd.
Ankara, Turkey
Tel.: 90-312-233-5050
E-mail: mtankut@esriturkey.com.tr
Web: www.esriturkey.com.tr

Esri (UK) Ltd.
Aylesbury
Tel.: 44-1296-745-500
E-mail: info@esriuk.com
Web: www.esriuk.com

Esri Ukraine Ltd.
Kiev
Tel.: 380-44-502-4121
E-mail: info@esri.ua
Web: www.esri.ua

Grupo Esri de Venezuela, C.A.
Caracas
Tel.: 58-212-285-9394
E-mail: esriven@esriven.com
Web: www.esriven.com

Esri has more than 80 distributors in other countries around the world. For more information, contact Esri (tel.: 909-793-2853, ext. 1-1235; fax: 909-307-3070) or visit esri.com/distributors.

Career Opportunities at Esri

Esri is actively recruiting smart people with all levels of experience who get the job done. These positions represent openings at our headquarters in Redlands, California, as well as our regional offices, and offer you a great opportunity to work with the best in our profession. We provide exceptional benefits, competitive salaries, profit sharing, a collaborative team environment, and much more. Join Esri and make a difference.

Software Development and ArcGIS Product Development

Software Developer, Desktop—Use your knowledge of 3D visualization, spatial analysis, imagery, user experience, animation, geoprocessing, or network analysis to design and develop leading-edge 3D GIS software.

Content Management Product Engineer—Make GIS content more ready to use for map authoring, analysis, and sharing workflows in ArcGIS for Desktop and throughout the ArcGIS platform.

Geocoding Testing Product Engineer—Are you passionate about analyzing results, discovering patterns, and constantly improving quality? Help build the next generation of geocoding for the ArcGIS platform.

Product Manager, 3D—Support the use of 3D technology in the ArcGIS platform by being the primary product interface for working with Esri staff, international distributors, and partners.

GIS Services

Microsoft Web Applications Developer—Use your web development expertise to become part of a leading team of developers using the latest Esri and web technologies.

Senior Project Manager—Do you have strong leadership and project management abilities? Apply these skills to support our clients through their implementation of Esri software solutions.

Educational Services and Technical Support

Training Solution Sales Representative—Leverage your consultative sales experience to drive strategic conversations with all levels of contacts to promote and secure training packages.

Course Developers—Work with the latest Esri software and subject matter experts to assess, design, develop, maintain, revise, and validate instructor-led and web-based training materials.

Support Analysts—Provide high-quality support to end users of Esri software to solve technical problems quickly and effectively.

Sales

Account Manager, Veterans Affairs—Work directly with the United States Department of Veterans Affairs to facilitate information sharing, understanding, analysis, and decision making through the application of GIS technology.

Account Executive, Location Analytics—Leverage your sales know-how and love of data analytics to develop and present integrated business intelligence and GIS solutions to organizations.

Partner Development Manager—Actively seek and develop partnering relationships in the commercial sector with primary focus on the transportation and manufacturing industries.

Presales and Solution Engineering

Solution Engineer, Location Analytics—Demonstrate how companies can realize the business benefit of location analytics by developing and presenting integrated business intelligence (IBM Cognos) and Esri GIS solutions.

Solution Engineer, Intel—Help shape and deliver on a strategy to demonstrate how the Esri ArcGIS platform can enable organizations to discover, use, make, and share maps for any device, anywhere they are.

Technical Marketing Specialist, Telecommunications—Apply and showcase Esri technology as a critical asset in decision making in all aspects of the communications service provider business.

Marketing

Industry Solutions Managers (Hospitals and Health Systems, Retail, Defense/Intelligence)—Leverage your previous domain experience to oversee marketing strategy, business development, and customer advocacy.

Publications Writer/Editor—Do you find technology exciting? Join the team that produces *ArcNews* and *ArcUser* and share the stories of Esri customers who are changing the world through their use of GIS.

Product Marketing Specialist, Developer Products—Develop and implement effective marketing plans that increase awareness and adoption of Esri's web and mobile mapping technology.

esri.com/careers Follow @EsriCareers on Twitter

2014 Esri UC

United We Map

July 14–18, 2014 | San Diego

900 real-world projects. 300 technical sessions. 15,000 geogeeks.

Map, app, and have a good time. See amazing demos, showcase islands, and the world's largest Map Gallery. The greatest geospatial minds come together for the biggest geoevent of the year.

Esri International User Conference. United We Map!

Register today at esri.com/uc

esri®

Subscription Additions and Address Changes or Deletions

E-mail: requests@esri.com

Fax: 909-798-0560

Subscribe on the web: **esri.com/subscribe**

Subscribe outside the US: Contact your local distributor.

Unsubscribe on the web: **esri.com/unsubscribe**

Update information on the web: **esri.com/coa**

To request other publication services: See page 32.

139555

380 New York Street
Redlands, CA 92373-8100

Presorted
Standard
US Postage
Paid
Esri