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Roger Tomlinson, Geographer

By Jack Dangermond

It is with great sadness that I relay the sudden passing of our dear friend and colleague, Dr. Roger Tomlinson, on February 9, 2014, at the age of 80.

Roger was above all else a geographer and was always proud to say that. He loved GIS, the field that he invented, and was so pleased to come to Esri and help us in thinking through difficult problems. He had a passion for staying current with the most recent technologies and always had insights that none of the rest of us had. He also loved attending the annual Esri User Conference and the opportunity to both see and acknowledge the great work of GIS professionals from around the world. He always said that giving out the Special Achievement in GIS (SAG) Awards was his favorite day of the year.

Dr. Roger Tomlinson
(Photo: Tomlinson Associates.)

Roger both created and dignified our field with his strong yet graceful spirit and insight. He invariably knew what was important. His vision of first thinking about and then designing and building practical systems that created meaningful information products will be part of his legacy.

With his passing, a beautiful and bright light has gone out in the world. Nevertheless, I know that his spirit and passion will live on in all of us.

He was my friend. I will miss him greatly. And his spirit will be missed by all of us.

See Dr. Tomlinson's profile on page 3

Provide Open Access to Your Data Through ArcGIS Online

Opening Data to the People

Coming soon to ArcGIS Online is a new capability that will allow organizations to create custom websites to distribute their open data. Organizations with an ArcGIS Online subscription will be able to make their authoritative open data easily available to the public. Within minutes, organizations will be able to make their existing data in ArcGIS Online searchable, downloadable, and displayable on a map.

Organizations create and manage a vast amount of data. Many of these organizations, such as government agencies, desire or are required to share certain data with the public. This data, when freely available for people to obtain, use, and redistribute, is called *open data*. Open data is

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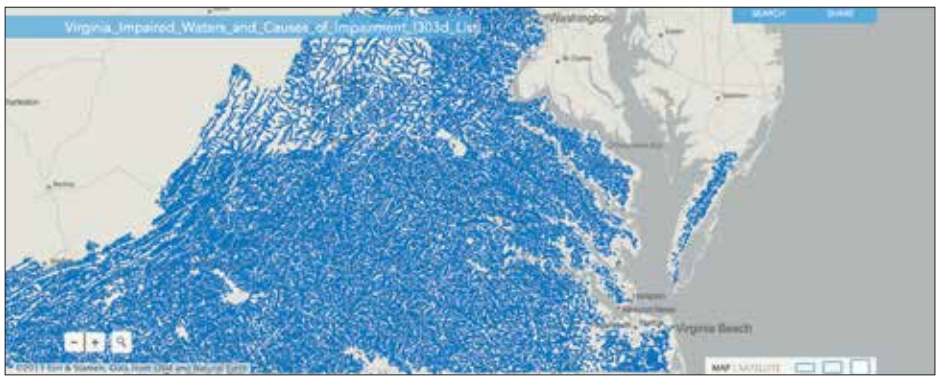
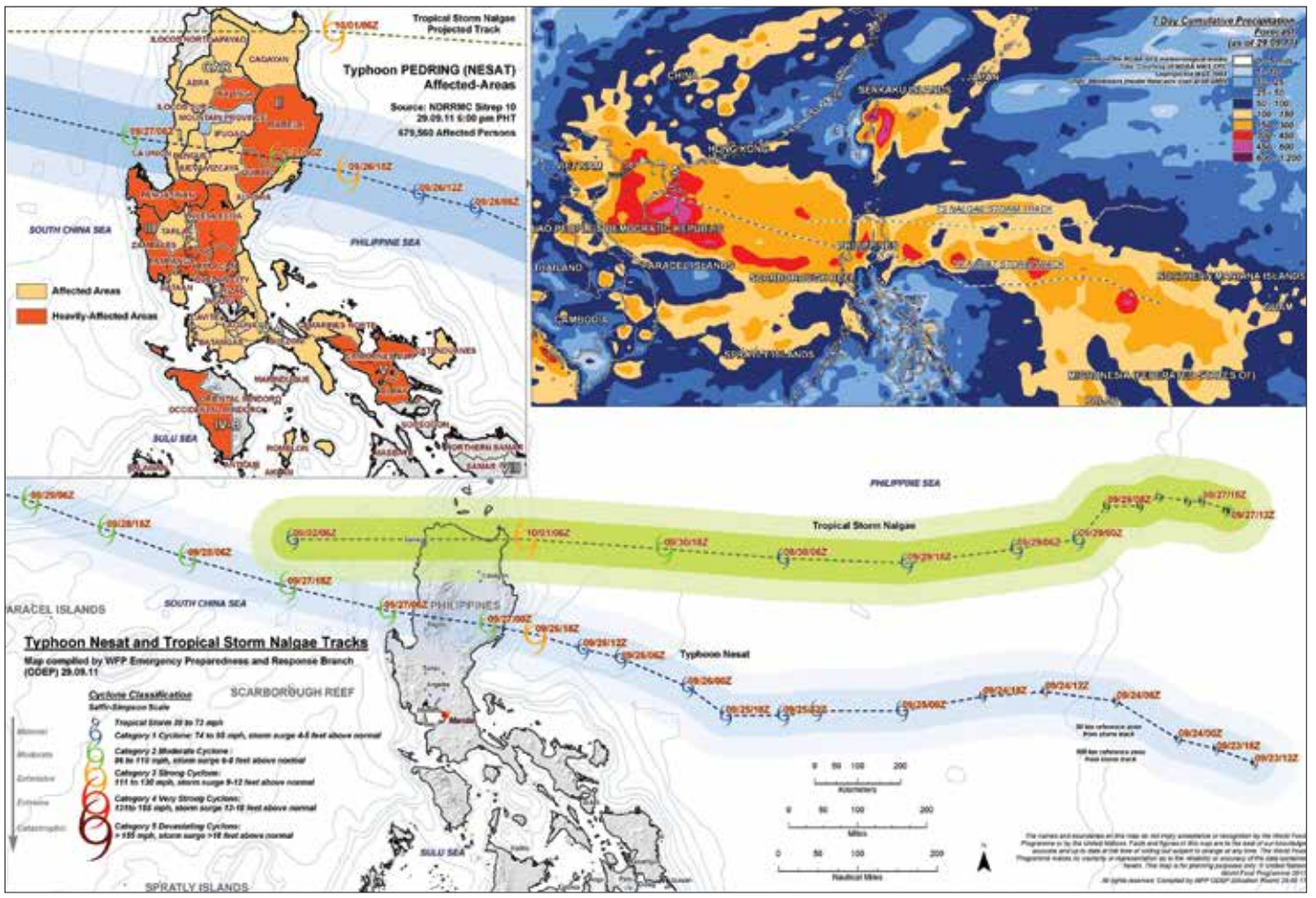


Open Data for ArcGIS (a new ArcGIS Online capability) makes data discoverable, accessible, explorable, and collaborative within minutes.

GIS Supports World Food Programme's Food Security Program



Typhoon and tropical storm tracking in the Philippines: The World Food Programme (WFP) uses ArcGIS to understand vulnerabilities among populations living in areas prone to natural disasters. Here the evolution of Hurricane Nesat and Tropical Storm Nalgae are shown in relation to affected areas along their tracks.

The World Food Programme (WFP) is the food assistance branch of the United Nations (UN). George McGovern, first director of the US Food for Peace Program, proposed the creation of WFP to the UN's Food and Agriculture Organization (FAO) in 1961. WFP was formally established in 1963 by FAO and the United Nations General Assembly.

Today, WFP is the world's largest humanitarian organization fighting hunger worldwide. Its primary mission is providing food to those who are unable to obtain it for themselves. On average, WFP delivers food to more than 90 million people per year, 58 million of whom are children. In addition to food security, WFP works to reduce child mortality, improve maternal health, and combat disease.

The organization's Operation Department of Emergency Preparedness (ODEP) actively supports various emergency relief efforts around the world with GIS analysis. To facilitate this work, it has developed a methodology using GIS to understand the higher vulnerabilities among populations living in areas prone to natural disasters. This analysis considers factors such as environmental degradation, food insecurity, malnutrition, and the historical occurrences of natural hazards. Satellite images are analyzed to identify poor growing seasons and years of low crop productions. The analyses help WFP quickly develop intervention strategies when disaster strikes.

In addition to data acquired from the host country and the data it collects, WFP obtains regular updates regarding seasonal food insecurity conditions throughout the world from the US Agency for International Development (USAID)

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Opening Data to the People

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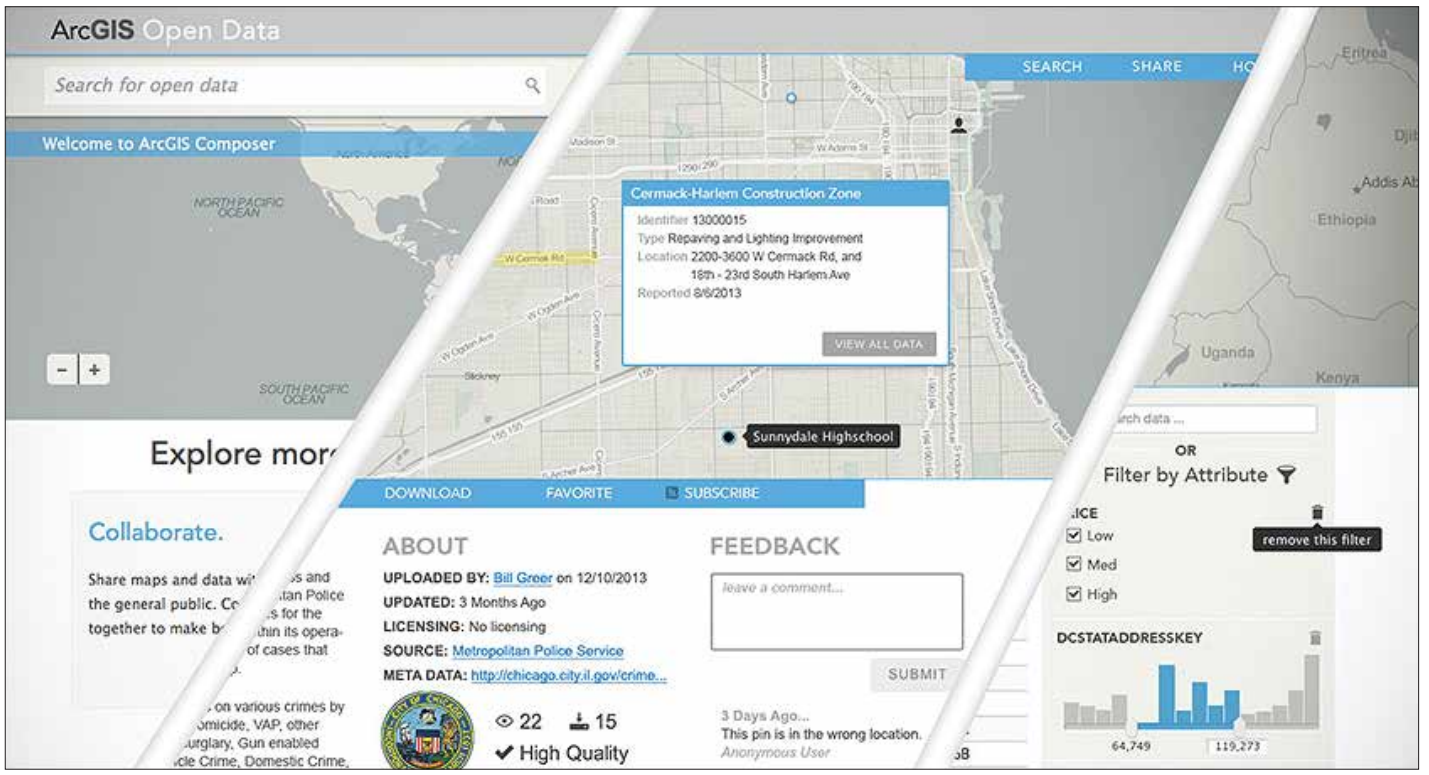
important for transparency and fostering innovation. Open data is also important for ensuring data integrity. To be useful, open data has to be discoverable and accessible. The open scientific data movement is motivated not only to ensure access to research data but also to minimize the risk of losing data. Open data is also important to other industries, such as public health, developers, commercial organizations, engineering, and utilities. Open data is most useful when it is discoverable, accessible, explorable, and collaborative.



Discoverable
People must be able to find the data. Open data made available through ArcGIS Online will be easily discovered by the public. Not only will ArcGIS Online provide a web interface where people can search for the open data they are interested in, it will also allow users to discover data through a general web search or by getting recommendations or notifications of new and relevant data.

Accessible
People must be able to access the data to freely reuse and integrate it into their own tools and applications. Data can be made available via a wide variety of mediums, such as APIs, web services, and common data formats. Ideally, the data is made available via multiple media that conform to open industry standards. Esri shapefile (SHP) is an open data format and industry standard. Additional open standards for geospatial data are managed by the Open Geospatial Consortium, Inc., and include KML. The widespread comma-separated value (CSV) data format for storing tabular data is also commonly used for sharing geospatial data. ArcGIS Online will be able to automatically make your data available in these common formats for anyone to use.

Explorable
People must be able to filter, visualize, and analyze open data, as well as combine it with other datasets, to answer questions and make new discoveries. The new open data enhancements in ArcGIS Online will be integrated into the ArcGIS platform, which will allow people to combine open data with other datasets in ArcGIS Online or to bring the data into ArcGIS for Desktop for advanced geospatial analysis. By adhering to the open standards mentioned above, the data will then also be usable in other programs, such as spreadsheet or statistics packages, for additional analysis.

Collaborative
People must be able to share the results of their exploration with the public and the data provider. The whole point of open data is to make it broadly available so more people have access to it and can derive real value from it and then share it back with the community. ArcGIS Online will include capabilities for sharing and disseminating open data, such as creating web and mobile applications. This will open up the results for feedback and improvements that lead to further exploration and analysis. Organizations and their data will become a larger part of the growing open data community.

Conclusion
These new open data enhancements will be part of ArcGIS Online, and organizations will not incur extra costs or service credits to publish their open data. Through a collaborative and social web application, data creators and publishers will be able to share their authoritative open data with the world quickly, reliably, and seamlessly from their existing ArcGIS Online infrastructure.

If you don't have ArcGIS Online and want to see how easy it is to share your data, sign up for a free 30-day trial at **esri.com/agoleval**.

Build a custom branded website to support open data initiatives.

Featured in This Issue

Regular Columns and Departments

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GIS Supports World Food Programme's Food Security Program

continued from cover

Highlights

- Vulnerabilities among populations prone to natural disasters are visualized with GIS.
- GIS is used extensively in the prevention step of the disaster cycle.
- ArcGIS helps forecast the impact of imminent natural disasters.

Famine Early Warning Systems Network. USAID analyzes the data it receives from US agencies, including the National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration, United States Geological Survey, and the United States Department of Agriculture, to produce its reports and forecasts, which it then provides to WFP and other relief agencies.

Managing the Disaster Cycle

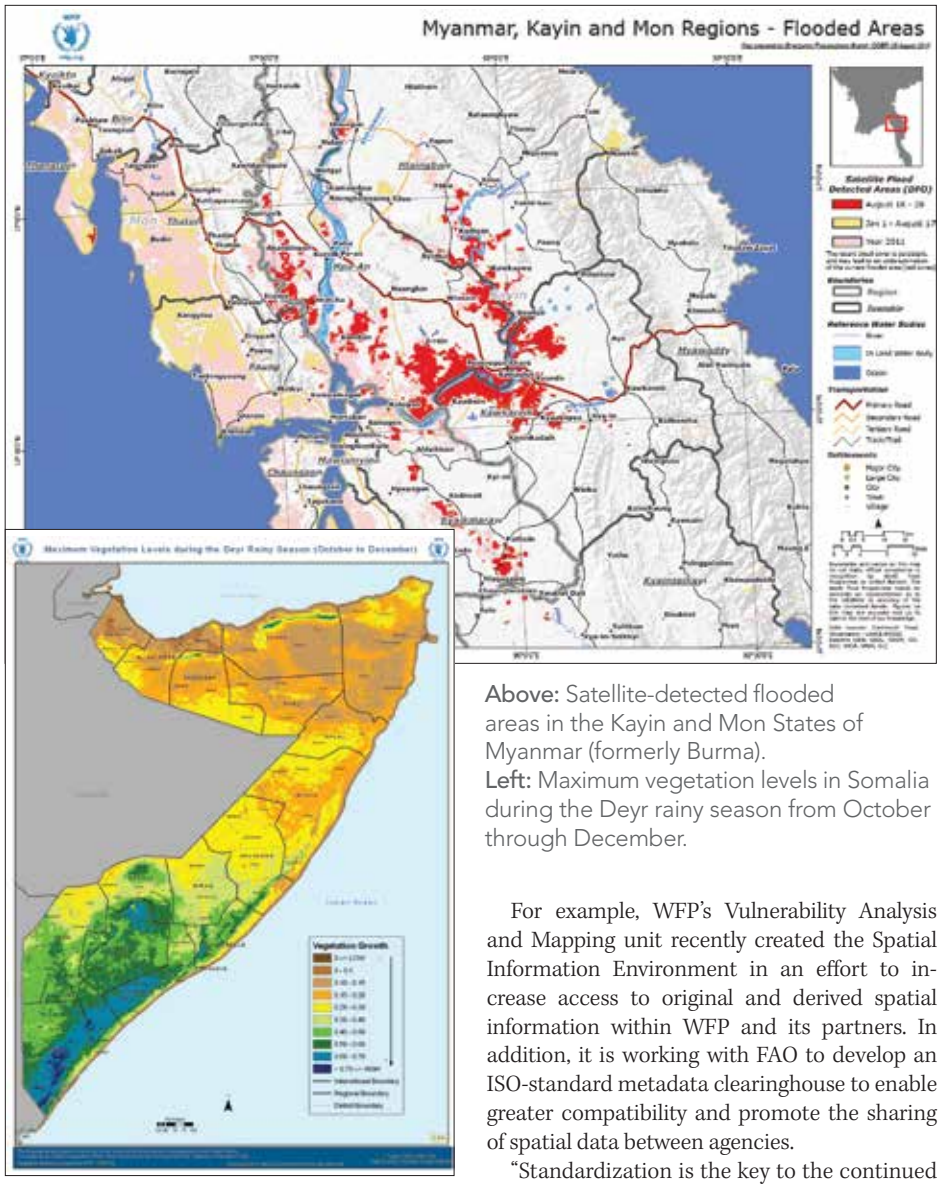
According to Andrea Amparore, GIS analyst in ODEP, WFP is a longtime user of ArcGIS software, which plays a strategic role throughout the entire disaster cycle. The four recurrent steps in the disaster cycle are prevention, preparedness, response, and recovery. Because it is cyclic, there is no actual beginning or end.

"GIS is used extensively in the prevention step of the disaster cycle," says Amparore. "Prevention includes the evaluation of man-made features, such as dams and levees, to make sure they can withstand rising floodwater, as well as determining the structural integrity of buildings, the reseeding of hillsides after deforestation to reduce mudslides, the evaluation of building codes and land-use zones to make sure they meet current safety standards, instigating community awareness campaigns to help residents better prepare themselves in the event of a disaster, and so on. Using GIS throughout this step provides management tools for project planning, review, and implementation."

Preparedness includes risk identification and assessment; the development and maintenance of emergency communication services; stockpiling essential food supplies, water, and medicine; and the establishment of evacuation routes. "GIS is used here in the evaluation and categorization of potential risks, as well as determining the optimum locations for emergency food stockpiles, the development of evacuation plans, and determining the optimum routes for refugees if it becomes necessary for them to evacuate," says Amparore.

Response requires real-time monitoring for disaster relief efforts, such as resource allocation, the status of transportation routes, and the relocation of civilian populations. ArcGIS is used for forecasting the impact of imminent natural disasters, tracking human and livestock migration, monitoring the effectiveness of relief operations, and allocating resources.

The recovery step includes the provision of temporary relief, such as food and shelter for disaster victims, as well as damage assessment, repair, and reconstruction. "GIS is ideal for logistics management and is used to determine where resources are needed so that recovery efforts can be prioritized," says Amparore. "It is also used to specify where distribution stations should be positioned; evaluate the condition of existing humanitarian corridors; and establish the location of refugee camps, emergency supply depots, and relief worker staging areas."



Above: Satellite-detected flooded areas in the Kayin and Mon States of Myanmar (formerly Burma).
Left: Maximum vegetation levels in Somalia during the Deyr rainy season from October through December.

The Future of GIS at WFP

Because ArcGIS is used throughout WFP, the organization decided to implement an enterprise system based on ArcGIS for Server technology to better organize and manage its expanding geospatial databases. This has stimulated new projects in the agency and an evaluation by WFP of how GIS can be better used by its departments and partners.

For example, WFP's Vulnerability Analysis and Mapping unit recently created the Spatial Information Environment in an effort to increase access to original and derived spatial information within WFP and its partners. In addition, it is working with FAO to develop an ISO-standard metadata clearinghouse to enable greater compatibility and promote the sharing of spatial data between agencies.

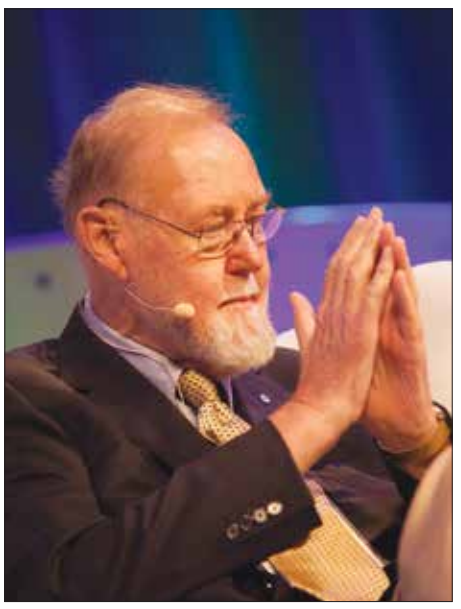
"Standardization is the key to the continued growth of GIS at WFP," concludes Amparore. "This will allow us to expand our analytical capabilities and adopt an even greater scientific approach to data analysis. I also think the involvement of local universities, when possible, would help facilitate our work and provide the host country with a greater sense of involvement in our relief efforts."

For more information, contact Jim Baumann, Esri (e-mail: jbaumann@esri.com).

"The Father of GIS"

Dr. Roger F. Tomlinson (1933–2014)

It was Dr. Roger F. Tomlinson who first coined the term *geographic information system* (GIS). He created the first computerized geographic information system in the 1960s while working for the Canadian government—a geographic database still used today by municipalities across Canada for land planning. Born in England, he settled in Canada after military service and attending university, where his work in geomorphology led to applying computerized methods for handling map information. Tomlinson has had a distinguished career as a pioneer in GIS and developed Tomlinson Associates Ltd., which provides geographic consulting services. For 12 years, he was chairman of the International Geographical Union GIS Commission. He was also president of the Canadian Association of Geographers and most recently was recipient of the prestigious Alexander Graham Bell Medal, awarded only once before by the National Geographic Society. Tomlinson was also the author of *Thinking About GIS: Geographic Information System Planning for Managers*, one of the most widely read books on the subject.



Dr. Roger Tomlinson

See Jack Dangermond's tribute on page 1

Redesigning Geospatial Education

By Anthony C. Robinson, Lead Faculty for Online Geospatial Education, Pennsylvania State University

Geospatial education is experiencing a new age of challenges and opportunities. Demand for a spatially aware work force remains strong, and the constant evolution of the geospatial domain provides an imperative for lifelong learning. To meet these challenges, geospatial educators are developing new approaches for teaching, ranging from intensely individualized lab experiences all the way up to Massive Open Online Courses (MOOCs), which reach thousands at a time around the world. While there is much promise in both the needs we face, as well as the means we have to meet it, there remains a critical challenge to appropriately design geospatial education experiences to reach their full potential in terms of quality, value, and access.

In cartography, we teach students to consider three key questions when designing maps:

- What is the purpose of the map?
- Who is the audience that will be using the map?
- What is the output format for the map?

In my view, the problem of designing effective geospatial education experiences can be seen through a similar lens. As our domain experiences rapid change through pressures imposed by new technical paradigms, new areas of focus for geospatial analysis, and new types of educational experiences, it is time for us to rethink the purpose of geospatial education, the learners we intend to reach, and the ways in which we engage with those audiences.

Bridging Competencies, Technologies, and Applications

While debate continues among educators and professionals regarding what ought to constitute a rich and rigorous geospatial education, there are three key areas of overlapping needs that all learners share. *Learner success in our discipline depends on achieving the right blend of core geospatial competencies, technical skills, and analytical practices grounded in real-world problems.* And each of these three areas is synthesized by mentoring through professional and academic advising.

Much effort has been made in recent years to develop and share collections of core competencies for geospatial professionals. The GIS&T Body of Knowledge (2006), offering more than 1,600 educational objectives, is now undergoing revision for its second edition (**gistbok.org**) and is expected to cover a broader range of areas than the original. The US Department of Labor has sponsored the development of the Geospatial Technology Competency Model (2010) and, more recently, the Geospatial Management Competency Model (2012) to describe core competencies for geospatial professionals, and the former model is now under further development. These resources provide important scaffolding for use in the development of new courses and the revision of existing curricula.

As nice as these basic competency sets are for setting the scene, they (rightfully) eschew much of the technology-specific capabilities that we expect learners to have in order for them to enter the work force. Academic purists will say that so long as a learner demonstrates core competencies, they will adapt just fine to whatever technology comes next. Employers, meanwhile, will often ignore submitted resumés that show no expertise with common and emergent industry technologies. In higher education, it remains a serious challenge to develop and sustain high-quality courses that introduce relevant contemporary technologies and best practices in the context of learning about core competencies.

What should make it possible to achieve both goals is to focus on the contexts of geospatial work—analytical practice that is grounded in real-world problems. Core competencies taught in a vacuum are unlikely to engage learners. Technology training alone is not sufficient to develop critical spatial thinking skills. The most positive synthesis of all three key elements comes when the focus of geospatial education is on solving relevant, real-world problems that require one to bring together technical skills and core competencies to actually achieve something.

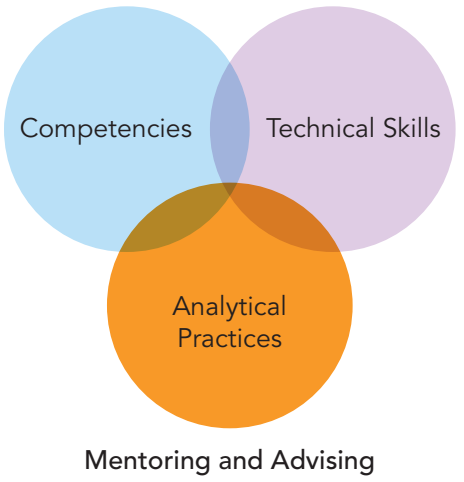
The way this combination can come to life for geospatial educators is through the deliberate evolution away from curricula centered on generic classes like Introduction to GIS and Advanced Spatial Databases toward courses that provide similar underpinnings in the context of problems that actually matter, like Understanding Disasters Using GIS or Geodesign to Improve Public Spaces. Instead of thinking of these application courses as mere electives that learners take long after they have made up their minds to study geography, we could begin to think of those grounded-learning experiences as parts of a new core for our learners from the very start.

Evolving Learner Engagement

The ways in which we engage with learners have changed dramatically in recent years. While distance education has precedents all the way back to surface mail correspondence courses, today's technologies make it possible to engage with learners on mobile devices and through web-based class experiences that challenge the established norms of same-time, same-place educational interaction. Learners have high expectations for us to develop flexible courses of study and to use flexible modes of engagement to access course content and interact with instructors. All the while, the potential audience for our courses has become far more diverse in terms of age, experience, and global reach.

At Pennsylvania State University, the vast majority of resident undergraduate students now take fully online or blended online/classroom courses as part of their normal semester course load. At the same time, the fastest-growing student population for us is our fully online cohort through Penn State World Campus. New educational paradigms, such as the MOOC, provide students with minimal barriers to entry and challenge instructors to develop content and assessments that will scale to tens of thousands of learners around the world. Geospatial education can (and already does) take place in each of these modes of learner engagement.

One challenge for us is to determine which instructional modes match well with particular pieces of the geospatial education experience. For example, my experience with teaching an MOOC on mapping (**www.coursera.org/course/maps**) leads me to believe that such courses will work well as teasers to draw new people into our discipline and get them up to speed on the basics but that MOOCs would not be good for tackling higher-order educational goals, such as the iterative refinement of a learner's cartographic design skills.



Learner success depends on achieving the right blend.

In addition to diversification in the ways we teach, what defines a student today is also increasingly hard to generalize. In the engagement types I reference above, students may include traditional 18- to 21-year-olds taking blended courses on campus, midcareer professionals taking fully online programs while working full time, and retirees who are exploring a topic for the first time in the form of an MOOC. Each of these groups can also be globally diverse. In the MOOC I taught, about 70 percent of the students enrolled came from outside the United States. In teaching students across the spectrum of age, background, and geography, it has become clear to me that we need to be much more explicit when we talk about designing classes and curricula to support students. We have to design geospatial education around which student cohorts we are trying to serve and to respond to their unique needs.

Flexible Futures

The good news is that we have a problem serving so many different types of people with quality geospatial education. Many other disciplines wish they had this problem. The bad news is that when we try to meet these needs today, we are often held back by inflexible legacy policies and frameworks that overlay our teaching. For example, credit hours are an antiquated way to measure the achievement of our learners. Schools like Western Governors University and the University of Wisconsin are using competency-based models in place of credit hours to certify that their graduates have demonstrated abilities in key areas of expertise in their field. There is also a wide range of new approaches for educational badging to show mastery of skills and methods regardless of where those skills have been obtained.

Whether or not badging and competency-based models become commonplace is not clear, as both methods have their own limitations. What seems clear to me, however, is that the future of geospatial education will require flexible views of what constitutes a course, what types of educational attainment will matter when one looks for a job, and in which life stages we expect learners to seek education. And yes, we can also expect there will be major changes in who is considered an educational provider. Students are already learning from each other through peer exercises in classes of all sizes, and professional expertise is increasingly valued in educational contexts, signaling a shift away from a value system that places formally trained educators at the top for every learning context.

It is hard to envision a future 15 years from now where most geospatial education happens when you are 18–21 years old, is delivered only in a physical classroom under the auspices of a traditional institution, is provided in semester-long chunks measured by the hours in which you spend taking that class, and is only auditable via a short title and letter grade on a paper transcript.

On the flip side, it is very exciting to imagine a future where geospatial education happens throughout your entire life, using a variety of modes, and is auditable based on the problems you are actually capable of solving. If the status quo in geospatial education is akin to command-line, desktop GIS software with a narrow user base, the future could be its web-based, scalable counterpart that is usable by everyone.

About the Author

Dr. Anthony C. Robinson serves as the lead faculty for Online Geospatial Education programs and assistant director for the Department of Geography's GeoVISTA research center at Pennsylvania State University. Robinson directs Penn State's Online Geospatial Education efforts, including its master of GIS and postbaccalaureate GIS certificate programs, which have served more than 5,000 students since 1999. Robinson teaches Maps and the Geospatial Revolution on Coursera, an MOOC that is now open for enrollments for its second offering beginning on April 30, 2014 (**www.coursera.org/course/maps**). For the GeoVISTA Center, Robinson's research focuses on the science of interface and interaction design for geographic visualization software tools. He has developed interface design and usability assessment methods for integrating geographic visualization tools with work in epidemiology, crisis management, and homeland security.

For more information, contact Anthony Robinson (e-mail: arobinson@psu.edu).

Earth Observation Platform Benefits Planet

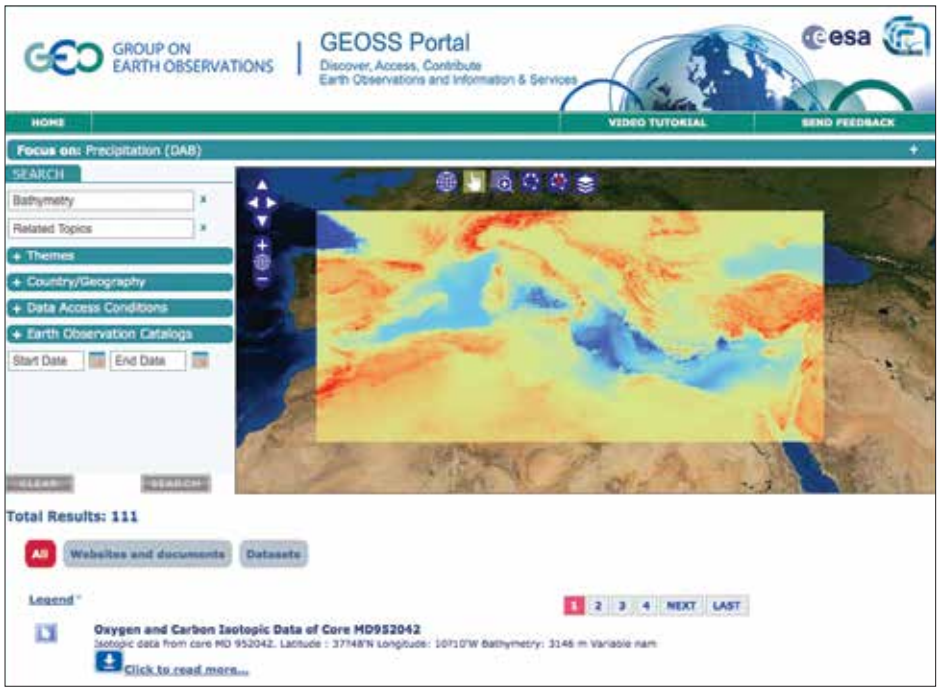
Highlights

- Esri joins GEO's effort to broker earth observation data.
- In progress is the development of an earth observation data service in ArcGIS Online.
- MOU between Esri and Italy National Research Council improves platform functionality.

Sensors, satellites, radar, and other earth observation technologies are used to monitor typhoons, oil spills, deforestation, and more. This data makes it possible to track, learn, and take action when events threaten the environment and human safety.

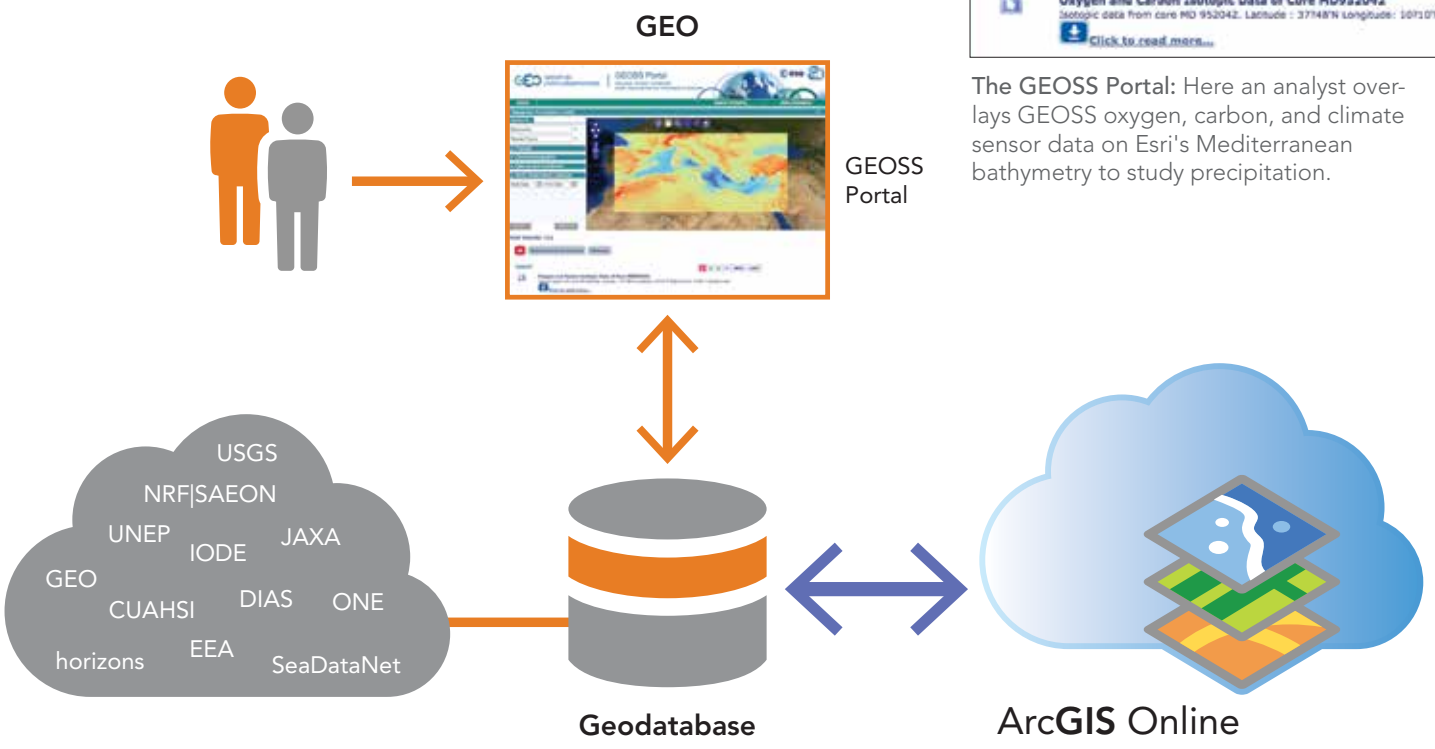
Esri recently entered into a partnership with GEOSS by way of a memorandum of understanding (MOU) between Esri and the Earth and Space Science Informatics Laboratory of professor Stefano Nativi at the National Research Council of Italy Institute of Atmospheric Pollution Research (CNR-IIA). CNR-IIA and Esri are designing brokering arrangements and direct dataset access technologies, as well as open standards for data interoperability and cataloging. Through this collaboration, ArcGIS Online will become one of the significant infrastructures brokered by the DAB. ArcGIS Online subscribers can discover and access the resources published by GEOSS, use GEOSS data services, and build applications.

GEOSS categorizes earth observation data into nine societal areas: sustainable agriculture, biodiversity conservation, climate change



The GEOSS Portal: Here an analyst overlays GEOSS oxygen, carbon, and climate sensor data on Esri's Mediterranean bathymetry to study precipitation.

Group on Earth Observations



Organizations can broker their earth observations through the GEOSS Portal, and users can combine data with Esri ArcGIS Online services.

Recognizing a growing and critical need for improved, near-simultaneous observation of the planet, many governments and organizations are collaborating to coordinate their earth observation systems. A voluntary partnership called the Group on Earth Observations (GEO) works together to share earth observation data and science. It includes 90 countries, the European Commission, and 77 intergovernmental, international, and regional organizations.

GEO initiated one of the most comprehensive efforts to monitor the entire face of the earth by building a Global Earth Observation System of Systems (GEOSS). The GEOSS program brokers various forms of earth observation data and information via its online platform and a Discovery and Access Broker (DAB). The platform interconnects relevant information systems and infrastructures throughout the world.

Esri has long contributed to GEOSS, primarily as a member of the Open Geospatial Consortium, Inc. (OGC). The company is now collaborating with GEOSS Earth to make observation data and services available to the ArcGIS Online community.

Many GEOSS contributors are already using Esri technology in their services, such as the European Environment Agency, the United Nations Environment Programme, and the Food and Agriculture Organization of the United Nations. This makes their systems and data inherently interoperable.

and its impacts, natural and human-induced disasters, ecosystem management, energy management, environmental sources of health hazards, water resources, and weather forecasting. Millions of Esri's GIS customers whose work intersects these societal areas will find GEOSS data directly applicable to their projects. They can use it to establish baselines, monitor change, analyze problems, and design solutions.

"GIS becomes a platform for understanding when people use it to build on top of existing knowledge and measurements and share new ideas," Esri president Jack Dangermond says. "We are trying to create understanding out of measurement, knowledge, and science so that people can act. These measurements provide the basis for interpreting science for design work such as land-use planning."

CNR-IIA and Esri are building a two-way interoperability technology between the GEOSS DAB framework and ArcGIS Online by way of the ArcGIS Online DAB APIs. Developers will engineer Esri and DAB interfaces and build interoperable web services that interconnect the two systems via several paths.

One path starts from an Esri portal and leads the user to discover the main systems of services provided by GEOSS. ArcGIS Online users will access networks brokered by GEOSS DAB, such as the Committee on Earth Observation Satellites (CEOS), the International Council for Science (ICSU) World Data Center PANGAEA, the National Aeronautics and Space Administration (NASA) Global Change Master Directory (GCMD), and the World Meteorological Organization's Information System (WIS).

Another path starts from the GEOSS portal, leading the user to discover Esri services. All public content from ArcGIS Online, such as Esri basemaps and imagery, freely contributed datasets and maps, and tools, will be discoverable through the GEOSS DAB. ArcGIS Online is a resource for authoritative basemaps for the world, as well as topographic and hydrographic imagery. Users can overlay operational data from the GEOSS on these basemaps, along with other ArcGIS Online datasets. This allows specialized communities to fuse knowledge atop common geography.

"I have often called GIS a platform for understanding," Dangermond says. "People use geographic measurements to create knowledge and take action. GEOSS serves as an earth measurement platform for monitoring change on the planet. Making GEOSS content available in ArcGIS Online increases opportunities for scientists and other communities to visualize information in greater context. Moreover, because the platform supports authoritative and crowdsourcing information, GEOSS members can build networks into other disciplines."

Because earth systems are interconnected, they challenge scientists to reach beyond their specialized domains. Designing technology that bridges scientific disciplines is complicated. Sensor data and sensor measurement systems are highly variable. Data capture, measurement, and quality differ. For instance, sensors and methods used to measure weather are quite different from those used to measure stream flow. Furthermore, scientists manage data differently. Some use manual approaches, and others patch together pieces of software to combine different datasets from different sources. Scientists should not have to spend time learning and modifying technology.

These concerns served to formulate Esri and CNR-IIA objectives for platform design. First, develop a specialized search engine for discovering datasets that allow users to obtain raw data for scientific or other work in a remote workstation or server environment. Second, design a flexible architecture that supports continual inclusion of interoperability with the DAB. Third, devise tools to transform data services that can be harmonized, making it possible to integrate sets of measurements.

"Basically, GIS takes different layers of information or scientific measurements and integrates them analytically, visually, and/or dynamically into various forms," Dangermond explains. "Fusing the platforms sets up a work environment to access data and information sets, see them in context with GIS, and use them for modeling or in various applications."

The GEOSS and ArcGIS Online service is unique. One reason is because GEOSS and Esri's relationship diverges from the traditional scientific relationships between government and public agencies. Since ArcGIS Online is operated by Esri, a private company, it has more flexibility than platforms offered by government-driven or single government initiative programs. Furthermore, ArcGIS Online holds shared geospatial and imagery data of the entire planet rather than for a specific region or area of interest. Data available in ArcGIS Online does not belong to Esri. Rather, the data belongs to hundreds of thousands of organizations that choose to share their basemaps and other kinds of information via the platform.

Esri customers are but one of the communities that GEOSS brings together. It connects atmospheric and biodiversity, as well as many other sciences. Bringing GEOSS data into ArcGIS Online will help these communities extend their scope and work together to meet some of earth's critical challenges.

Learn more about GEO and GEOSS at **www.earthobservations.org**. Use the GEOSS Portal at **geoportal.org**.

GIS Evangelist Tom McConnell Takes the Road Less Traveled

GIS Hero

Tom McConnell

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 Tom McConnell as a GIS hero.

In 1987, Tom McConnell, Operations Research manager with the Ford Motor Company, was in Los Angeles, California, on a business trip. Late one Sunday evening, he was reading a local newspaper and noticed an article about Esri and the User Conference it would soon be staging. McConnell impulsively called the company telephone number, hoping to get a recorded message providing details about the conference. It was 11:00 p.m., and Jack Dangermond, Esri president, answered the telephone and immediately urged McConnell to attend the conference, which he did. Thus began McConnell's second career—GIS evangelist.

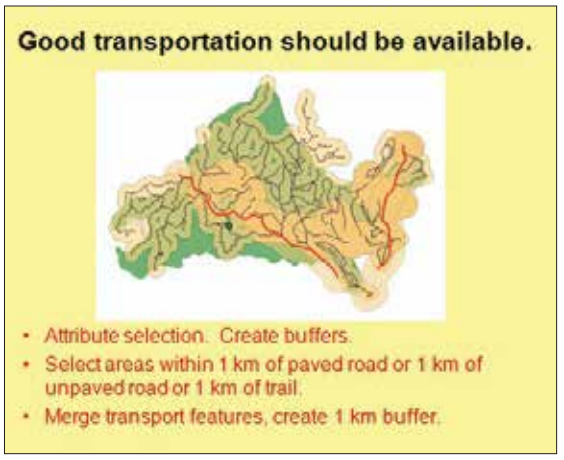
Shortly thereafter, McConnell encouraged fellow Detroit resident and high school science teacher Randy Raymond to apply for an Esri education license for his school. Later, they worked together to find paid internship opportunities for Raymond's urban environmental studies class, convincing the marketing research manager at Ford to fund a class project analyzing the future automotive market potential in India, China, and Brazil.

After nearly 25 years at Ford, McConnell began looking for new challenges. "I moved to Tucson and joined a GIS consulting firm, Global Systems Modeling Ltd., and worked as a consultant and marketing manager for several years," says McConnell. "When I decided to reduce my work hours, I switched to teaching GIS as an Esri authorized instructor."

As a GIS educator, McConnell's interests soon turned to volunteer work, particularly in Africa. In 2003, the International Executive Service Corps (IESC) supported his trip to Rwanda, where McConnell worked with others to create a site selection model for coffee washing stations. Ninety percent of Rwanda's population is involved in agriculture, and coffee is one of its primary crops. The next year, he returned to Rwanda under IESC sponsorship to develop a cluster analysis exploring regional marketing designations for coffee branding.

In 2007, Dangermond was invited to visit Rwanda and subsequently awarded the nation a countrywide education site license from Esri. McConnell returned to Rwanda once again, this time joining Stefan Kappeler and Martina Forster of Esri Deutschland GmbH to negotiate a memorandum of understanding with the country's Ministry of Education to establish a GIS program for all 1,500 secondary schools in the country. He also worked with staff at the Centre for GIS and Remote Sensing at the National University of Rwanda (CGIS-NUR) to develop an implementation plan for the site license. CGIS-NUR later received a Special Achievement in GIS Award for this work, which was presented at the Esri International User Conference.

"I believe there is a great need for educational research to support the use of GIS in schools," says McConnell. "This is a substantial challenge because few teachers have the resources to even begin using GIS, much less the opportunity and skills to conduct the kind of randomized controlled experiments that can quantify the value of GIS. This is an area where our universities should be investing, but that means funding is needed, and the only likely source is federal, which is currently focused elsewhere."



Mapping transportation, springs, and tree density in Rwanda was among McConnell's projects during his volunteer work.

McConnell believes that GIS can enhance K–12 science education by helping teachers explain concepts that are challenging for their students. "The exploration should be left to the student as much as possible so inquiry-based learning is enabled," says McConnell. "Experimentation should be encouraged, but sound science is essential. There should be an emphasis on data exploration, hypothesis formation, prediction, testing, and analysis."

McConnell sees many applications in biology in which GIS could play a critical part of K–12 instruction, including habitat studies, species distribution, and conservation planning. "It would be fun to look at evolutionary biodiversity in terms of spatial isolating mechanisms such as sky islands, seas, and mountain ranges," says McConnell. "I think neglected subjects that would benefit from including GIS as part of the instruction are in sociology and history. The availability of good online data and geospatial statistical tools looks highly promising as a way to change that. Story maps provide an excellent template for structuring student work."

Looking to the future, McConnell indicates that GIS will play an important role in preparing students for a new and different world. "The key skills needed for success will increasingly depend on problem definition, problem solving, and the ability to manage these two," says McConnell. "GIS is superbly suited to aid in developing and honing these skills. A major impediment to this development is the current political focus on testing, which has caused a narrowing of curriculum and a restriction in the flexibility good teachers need."

For more information, contact Tom McConnell (e-mail: gisprof@gmail.com).

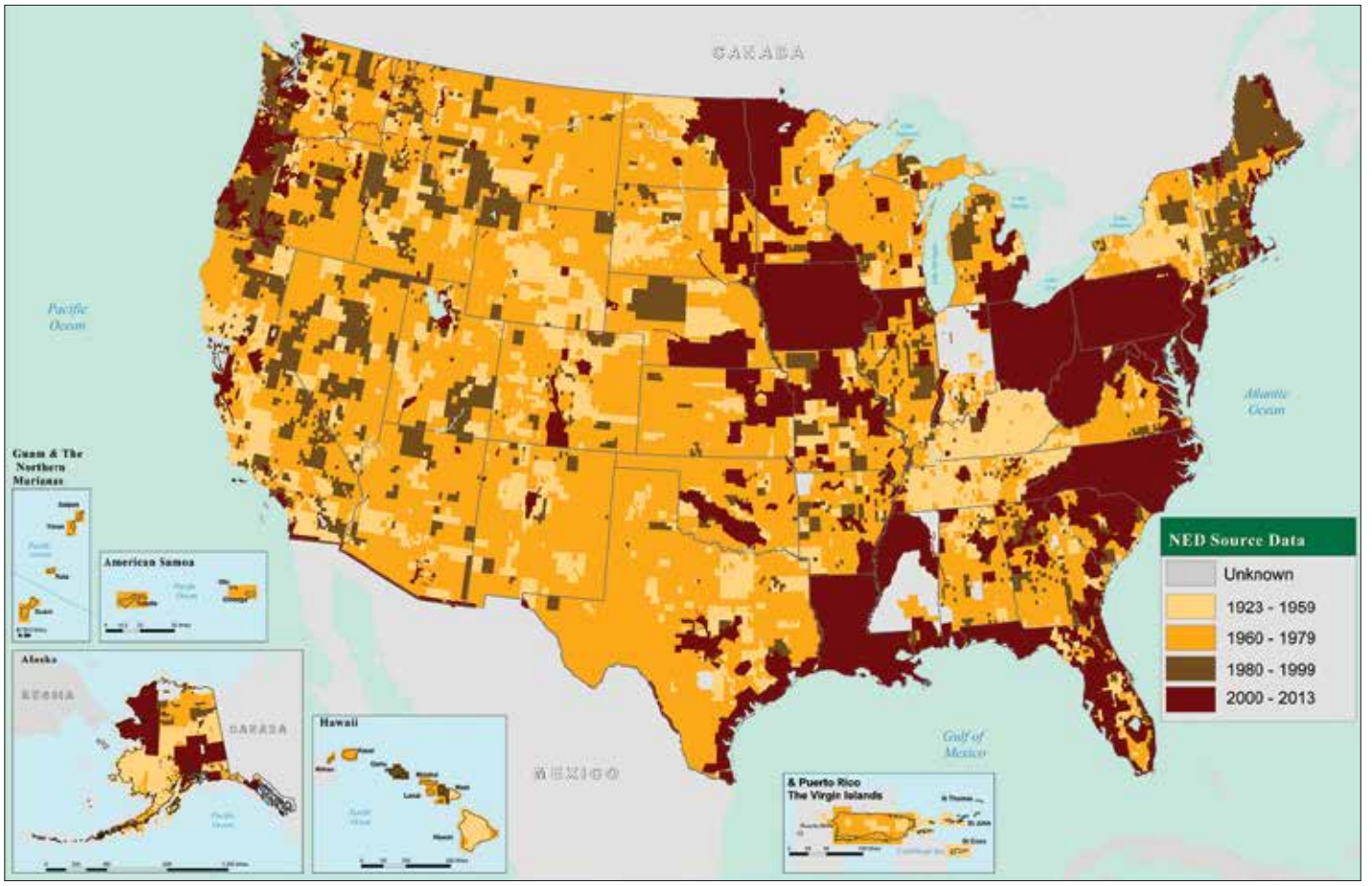
Above and right:
Trekking through Rwanda.

US Geological Survey to Lead Ambitious 3D Elevation Program

By Larry Sugarbaker, Senior Adviser, USGS National Geospatial Program

As the lead federal agency for terrestrial elevation data, the US Geological Survey (USGS) has managed the National Elevation Dataset (NED) and coordinated its activities through the National Digital Elevation Program (NDEP) for more than 15 years. The NED, managed as part of *The National Map*, has represented the standard of quality for elevation data in the United States during this time. Today, new elevation data is acquired using modern technologies to replace elevation data that is on average more than 30 years old. Through the coordinated efforts of the NDEP, a project-by-project data acquisition approach has resulted in improved, publicly available data for 26 percent of the conterminous United States and 37 percent of Alaska over the past 13 years.

The 3D Elevation Program (3DEP) is a call for action to accelerate the collection of high-quality light detection and ranging (lidar) data in the conterminous United States, Hawaii, and the US territories and interferometric synthetic aperture radar (ifsar) data in Alaska. Lidar and ifsar data will be available for the nation, and the NED will be completely refreshed with new elevation data products and services. The initiative is being led by USGS and includes federal agencies, states, and tribal partners, who will work together to build on existing programs to complete national 3D elevation data coverage in eight years. The 3DEP initiative is far reaching and strives to address national requirements through a partnership framework. The governance structure includes an executive oversight committee and a multiagency coordinating committee built on the committee structure already in place under NDEP. As proposed, a 3DEP effort would be supported at a total cost of $146 million annually. If fully funded, it is estimated that 3DEP could return more than $690 million annually in new benefits to the private sector directly and to citizens through improved government program services (see the National Enhanced Elevation Assessment [NEEA] report, **nationalmap.gov/3DEP**). Current investments in publicly available lidar and ifsar data are approximately $50 million annually.



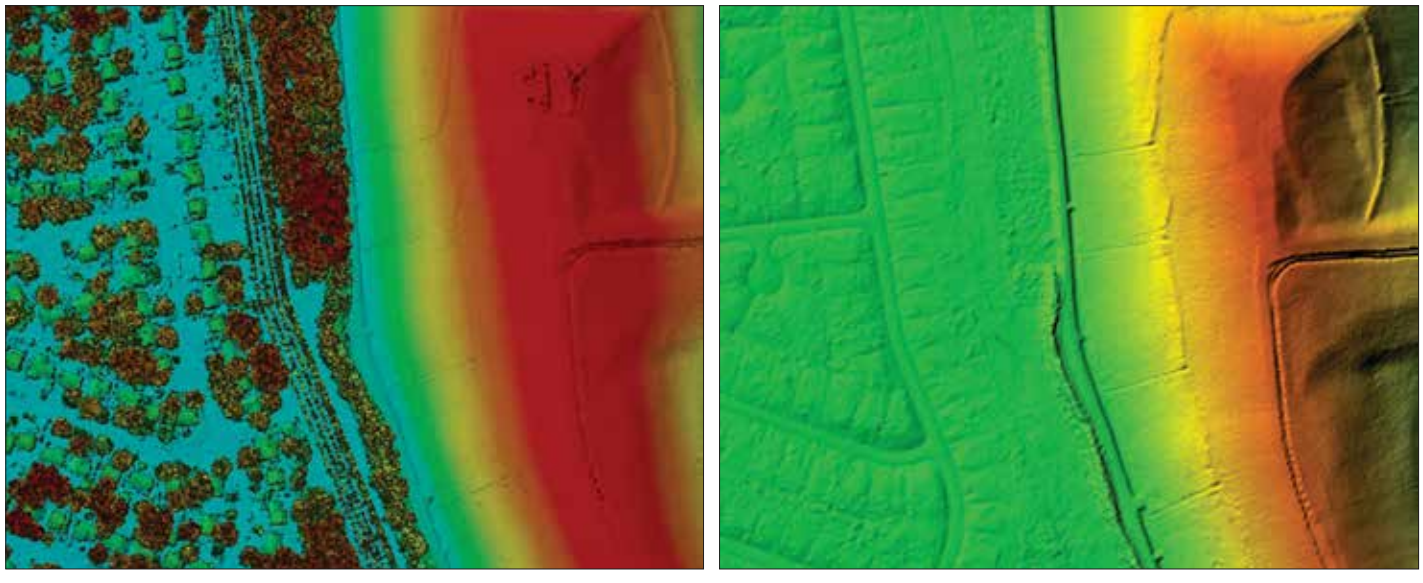
The National Elevation Dataset (NED) is maintained at multiple resolutions for the United States. Generally, digital elevation models (DEMs) are derived from lidar or ifsar (Alaska) data after 2000. DEMs created prior to 2000 are from scanned United States Geological Survey (USGS) topographic map sheet contours. NED status graphic is current as of December 2013.

The 3DEP initiative is based on the results of the NEEA that was funded by NDEP agencies and completed in 2012. The study, led by USGS, identified more than 600 requirements for 3D elevation data to address the mission-critical requirements of 34 federal agencies; all 50 states; and a sample of private sector companies, tribes, and local governments. Many requirements were identified where high-quality 3D elevation products would never be affordable if the data was acquired to solely meet a specific need. For example, the wind power industry requires volumes of very high-quality surface data over large areas to plan wind farms and to determine ideal placement of wind turbines. It would be costly for this industry to fund the acquisition of high-quality lidar data to solely support that purpose. Yet when all the overlapping needs from multiple users are considered, a national program is more than justified. The NEEA study identified many applications that are similar to the wind energy example. In contrast, funding for data collection today comes from government agencies where mission-specific needs are driving data acquisitions. While this data collection strategy has benefited individual projects and government programs, it cannot comprehensively address the needs or achieve the benefits as documented in the NEEA report.

In a resource-constrained environment, we cannot just rely on increased funding to advance the goals of 3DEP. Improved program efficiencies and advancements in technology to increase data collection rates will also be necessary. The 3DEP initiative will achieve a 25 percent efficiency gain by moving toward larger projects where data collection costs are inherently lower. To achieve this goal in eight years, however, investments and production rates will need to increase threefold. In order to create the level of participation from cooperating agencies and to ensure that mission needs can be addressed, the initiative proposes to

- Increase overall investments through budget and other initiatives in order to provide greater incentive for increased partner engagement.
- Ensure that the mission needs of partner agencies and states are addressed by incorporating their requirements into a three-year joint planning strategy.
- Encourage federal, state, and tribal government participation through advantageous partnerships that adhere to accepted quality standards while recognizing the need for flexibility among partners.
- Achieve efficiencies and lower costs through larger area acquisition projects.
- Manage 3D elevation data and make it freely available for everyone.

USGS has been designated by the Office of Management and Budget (OMB) as the lead federal agency for terrestrial elevation data (OMB Circular A-16). The 3DEP initiative is designed to fulfill that coordination responsibility and to ensure that the needs of the nation for high-quality lidar and ifsar data are being met. This role cannot be met by USGS alone, and the 3DEP initiative should not be considered to be solely a USGS activity. Partnerships with federal agencies, states, and tribes are a cornerstone of the planning and initiative development process. USGS and the National Oceanic and Atmospheric Administration work together to conduct annual inventories of available lidar and ifsar data.



The lidar classified point cloud on the left and digital elevation model (DEM) on the right are of a residential community in Norfolk, Virginia. The trees and homes can clearly be seen in the lidar image. The DEM is of the bare earth with trees and structures removed. The elevation is color coded by elevation, clearly showing the earthen flood control structure in red and the lower elevation residential streets in green. (Images courtesy of Dewberry, Inc.)

About the Author

Larry Sugarbaker is the National Geospatial Program senior adviser for the US Geological Survey, where he works on *National Map* policy-related issues and new program initiatives. He has been vice president and chief information officer for NatureServe and GIS manager for the Washington State Department of Natural Resources.

To find out where lidar and ifsar data is available, go to **www.csc.noaa.gov/inventory**. To download the most current digital elevation model data available from USGS, go to **viewer.nationalmap.gov/viewer**. To get involved, more information about 3DEP can be found at **nationalmap.gov/3DEP**.

Landsat 8 Imagery Available for Online Users

The Landsat program is a series of earth-observing satellite missions jointly managed by the National Aeronautics and Space Administration (NASA) and the United States Geological Survey (USGS). The first Landsat satellite launched in 1972, and the latest satellite in the series, Landsat 8, provides continuity, as well as improvements, on important global monitoring of our earth.

Landsat 8 was launched February 11, 2013, and contains two sensors. One collects 8-band multispectral imagery at 30-meter resolution, as well as panchromatic imagery at 15 meters. The other collects thermal imagery at 100-meter resolution. The orbit of the satellite results in it capturing 170-by-185-kilometer-sized scenes along a predefined path that returns to the same location every 16 days.

Landsat imagery has significant value in environmental and natural resource studies and research, such as agriculture and forestry. Both governmental and nongovernmental organizations interested in monitoring urbanization or analyzing concepts such as carbon sequestration will also find the continual monitoring of the earth at medium resolution to provide a wealth of information. The education aspects of the services are also boundless.

As with the other satellites, USGS manages the collection of imagery from Landsat 8. Every day, staff receive and process approximately 450 new Landsat 8 scenes. These scenes are available for download at no cost within 24 hours of acquisition. The current archive of Landsat scenes now contains more than four million scenes. Full-resolution, natural-color renderings of these are quickly accessible using LandsatLook (**landsatlook.usgs.gov**), which is powered by ArcGIS for Server.

Landsat 8 Now Available for ArcGIS Online Users

A new set of Landsat 8 services released by Esri provides access to the latest and best Landsat 8 scenes. These services make the valuable Landsat scenes from USGS quickly accessible as multispectral, multitemporal image services that can be used in a wide range of web and desktop applications.

Esri first released Landsat imagery services—more than eight terabytes—to ArcGIS Online users in 2012. These image services made the collection of Landsat Global Land Survey (GLS) scenes spanning the years of 1980, 1990, 2000, 2005, and 2010 accessible as more than 20 dynamic, multispectral, and multitemporal image services. These dynamic services enable a wide range of client applications, such as temporal access to any of the band combinations, as well as products such as Normalized Difference Vegetation Index (NDVI) without the need to download or locally process any data.

For the Landsat 8 services, Esri daily downloads the latest, approximately 300 Landsat 8 scenes and adds them to a set of image services that contain the best and most recent 50,000 Landsat 8 scenes, which require about 60 terabytes for storage. These scenes are hosted on Esri's cloud infrastructure and available for access in different modes.

By default, the user views the best scenes. The best scene is determined using a weighting of cloud coverage and age of the scenes. Users can reorder the scenes based on metadata attributes, lock onto a specific scene, or use a time slider to see how an area changes with time.

Not all scenes are kept; otherwise, the data volumes for storage would continually increase. Instead, older scenes are removed. Typically, the latest four scenes with less than 50 percent cloud coverage are kept, as well as the scene that is nearly cloud free and closest in date to the GLS 2000 scene, so as to aid in longer-term change analysis.

Services can be accessed in web maps but can also be used in a range of applications and ArcGIS for Desktop. A subscription to ArcGIS Online is required to access the services, but there is no charge for usage.

Many Services Available in the Cloud

A number of different image services are served from the same source. The most used is the Landsat 8 Views service. This allows users to view a range of different band combinations including natural color (bands 4,3,2) and color infrared (bands 5,4,3), which highlight photosynthesis in plants. The agriculture band combination (bands 6,5,2) highlights differences in various crop types. The SWIR band combination (bands 7,6,5) provides better penetration for clouds. The bathymetric option (bands 4,2,1) provides better water penetration and is especially useful for coastal applications.

Users can also select any user-defined band combination. The functions can be applied with fixed enhancements or with the Dynamic Range Adjustment Stretch, which requests the server to maximize the contrast so as to get the most out of the extended dynamic range of the sensors.

The Landsat 8 Views service also provides two indexes. The Colorized NDVI provides information on the health of vegetation, while the Colorized Normalized Difference Water Index highlights areas that have high moisture content.

The Pan-sharpened service provides enhanced natural color imagery by sharpening the natural color bands (4,3,2) with the 15-meter panchromatic imagery. The Panchromatic service provides access directly to the panchromatic imagery. Again, the dynamic range adjustment capability ensures that maximum information content is available even when used in web applications.

While all these services return 8-bit rendered versions of different products, the Analytic service enables applications to access the full range of data values that might be required for some analysis applications.

Powered by ArcGIS for Server

All these services are powered by ArcGIS for Server and the Image extension. Processing and dynamic mosaicking are performed on the fly, directly on the source data. All the processing is applied on the source imagery as it is accessed by the server, enabling the creation of multiple products, as well as enabling the full dynamic range of the imagery to be accessed even when using browsers that are limited to only 8 bit.

The server also applies user-controllable compression. This ensures that the data is transmitted back to the client application quickly, even over low-bandwidth networks. It is important to note that no lossy compression is applied on the stored images. This ensures that there is no data loss or compression artifacts in the processing.

Moving Processing from the Desktop to the Data

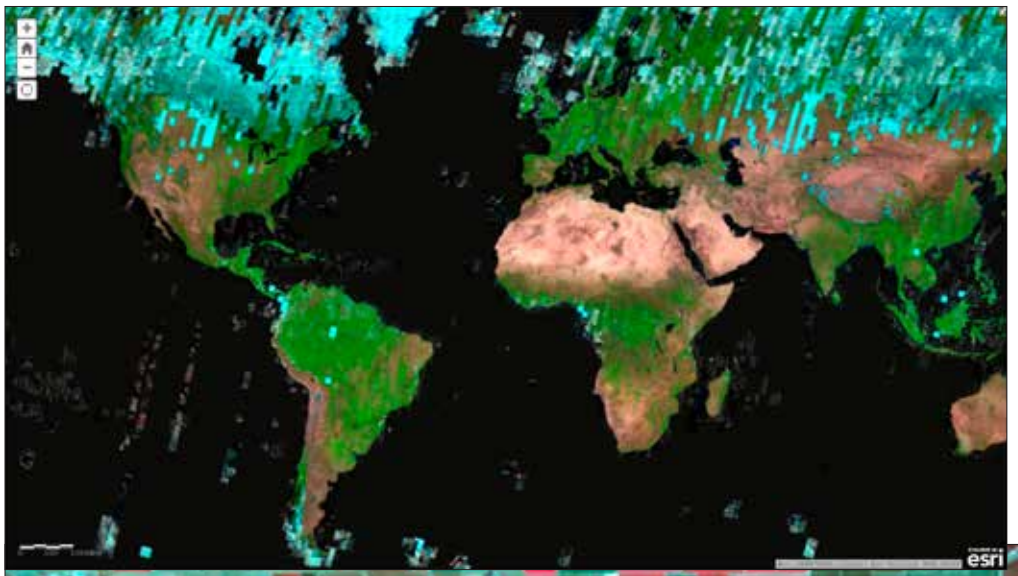
These services extenuate the cloud concept of "move the processing to the data, not the data to the processing." Users can define the processing to be applied on the Esri-hosted servers and receive only the results they want. There is no need to download the complete set of data used to get the results.

Since these servers are using the latest ArcGIS 10.2.1 for Server, developers can also define their own functions to be applied on the servers. This opens up the ability for remote-sensing experts to quickly test and apply a wide range of indexes and functions to the data. Results can be returned for any location on earth over multiple time instances.

The on-the-fly processing also includes supervised classification. This enables users to define training areas, with the server computing the signatures and then applying the appropriate supervised classification to return classified imagery. This can be used to quickly perform classification and create web maps or statistics on the result. For example, if the area of a burn scare or flooding needed to be approximated, Landsat 8 imagery can quickly provide answers.

Esri will continue to expand the services provided, including development of different applications and more advanced geoprocessing of the scenes. More capabilities and functionality will continue to enhance this great resource.

To access the services, search for Landsat 8 in ArcGIS Online or visit **esri.com/landsat-imagery.**



Left: Mosaic of the latest, most cloud-free (but not snow-free) Landsat 8 imagery covering the globe rendered using three different infrared bands 7,6,5.

Landsat 8 color infrared (bands 5,4,3) of Chowchilla, California, highlighting vegetation in red.

TED Founder Richard Saul Wurman Applies Singular Ideas to Projects Past and New to Enlighten and Engage

Understanding Precedes Action—And Geography Maps the Course

Among the heavily trafficked, wonderfully crafted exhibits on display at the 2013 Esri International User Conference Map Gallery, perhaps the most striking was the Urban Observatory.

The immersive experience took the ArcGIS location platform to new heights. People interacted with large screens and colorful maps to directly compare cities on numerous subjects, such as demographics, land use, infrastructure, and transportation. The Urban Observatory's creator, Technology/Entertainment/Design (TED) Conference founder Richard Saul Wurman, sought to build an experiential web application that would, as he put it, provide understanding through comparison and contrast to complex questions facing 21st-century life. Fellow creators Jon Kamen of @radical.media and Esri president Jack Dangermond also wanted to give attendees a visual context that gives way to meaning—and, most important, action.

"A map is a pattern made understandable," Wurman said. "And understanding precedes action. This is at the heart of the Urban Observatory. It's a simple idea."

Yet simple is not necessarily reductive. In fact, it can be edifying. That's how Wurman sees it. The simple phrase *understanding precedes action* was coined by Wurman years earlier in Kamen's office.

"I didn't make a big deal of it. I didn't think they were words coming down from Mount Olympus," says Wurman.

It's the idea behind the Urban Observatory. It buoyed projects past (like the WWW Conference) and new (Wurman's latest offering: 555 Conference 2015).

It's a principle for GIS professionals and anyone interested in maps. Esri's own mantra, Understanding Our World, is woven of the same fabric: carefully analyzing and viewing information first to make better, more accurate decisions.

"GIS is the key to the kingdom," says Wurman. "It brings mapping into a universal language and gives you the opportunity to ask questions and find answers visually."

Understanding the Meaning of *Understanding Precedes Action*

What does this expression mean, anyway?

Wurman has spent a lifetime mulling over how people can develop a language of performance in urban planning so that cities could consider unintended consequences.

A perfect example—for years, as cities incur more traffic, they add more freeways and highways. Yet does that actually solve the problem? Or does it spur the purchase of more cars, which keeps freeways congested with more vehicles while consuming more fuel and generating more pollution?

"Adding more lanes only invites more traffic," says Wurman. "The problem wasn't understood, but action was taken."

Above: The Urban Observatory.
Left: Jack Dangermond (left) and Richard Saul Wurman (right).

This is where geography and GIS help people develop a greater comprehension of issues before taking steps.

Perhaps the best explanation of the expression is an exploration of how the principle manifests itself throughout Wurman's work.

A prime example is the Urban Observatory. The exhibit and website made their debut at the 2013 Esri User Conference. More than 16 cities contributed data, and the creative and technical forces at @radical.media and Esri built the first iteration of the exhibit using the latest software, hardware, fiber optics, custom kiosks, and high-quality monitors.

ArcGIS Online allowed people at the exhibit to interact with datasets for each participating city. People used the Urban Observatory web application to easily compare cities on their own via a simple web browser. As an individual zoomed in to one digital city map, other city maps zoomed in parallel, revealing similarities and differences in density and distribution. For instance, what if you wanted to simultaneously view traffic density for Abu Dhabi and Paris? Or view vegetation in London and Tokyo? No problem. A mouse click and scroll was all that was needed.

The Urban Observatory exhibit and application are continuing to evolve beyond the first prototype. From concept to creation, the goal has always been to provide a clear grasp of modern challenges facing today's cities. And supplying that awareness to people, government, and business prior to making decisions was a central driver.

"There's a notion that the more you put on the map, the better the map is," says Wurman. "There's a case where the opposite is true. Put two patterns together and you'll discover a third. The maps where you pile more and more information on them, you can't discover a pattern at all."

Then there's the WWW Conference. The event, hosted by Esri, was a type of "anticonference." TED talks today have a polished and somewhat scripted approach that's different from their initial iteration in 1984. The WWW Conference sought to achieve "intellectual jazz" through improvised conversation.

The conference provided three days of dialog featuring dozens of celebrities and thought leaders. Wurman paired individuals together to spark conversation with a simple question, idea, or premise. Then he let the conversation evolve, naturally and organically, without rehearsal, preparation, or planning of any sort. Participants faced each other, not the stage.

Dangermond, a keynote speaker, spoke with botanist and environmentalist Peter Raven. The two discussed biodiversity, sustainability, and climate change.

Understanding—and geography, science, GIS, and mapping from human cells to space to the atom—were themes and topics of their conversation and of multiple speakers.

The success of the WWW Conference served as the springboard for the 555 Conference, which is scheduled for the first quarter in 2015. Featuring five speakers in five cities located around the world, the conference will showcase experts sharing their predictions five years in the future. Each of the people making a prediction would be given as much assistance as desired to develop a presentation and take advantage of video, slides, data analysis, and visualization (including GIS). The forum for speakers would be spontaneous—not read or rehearsed but natural conversation backed up by extraordinary audiovisual elements.

Then 555 will help launch the WWW2 Conference, which will build on its original concept of bringing in artists, entertainers, scientists, and others to talk about the predictions revealed at 555. The thought leaders and icons could then talk about the unintended consequences that could result from the five-year forecasts.

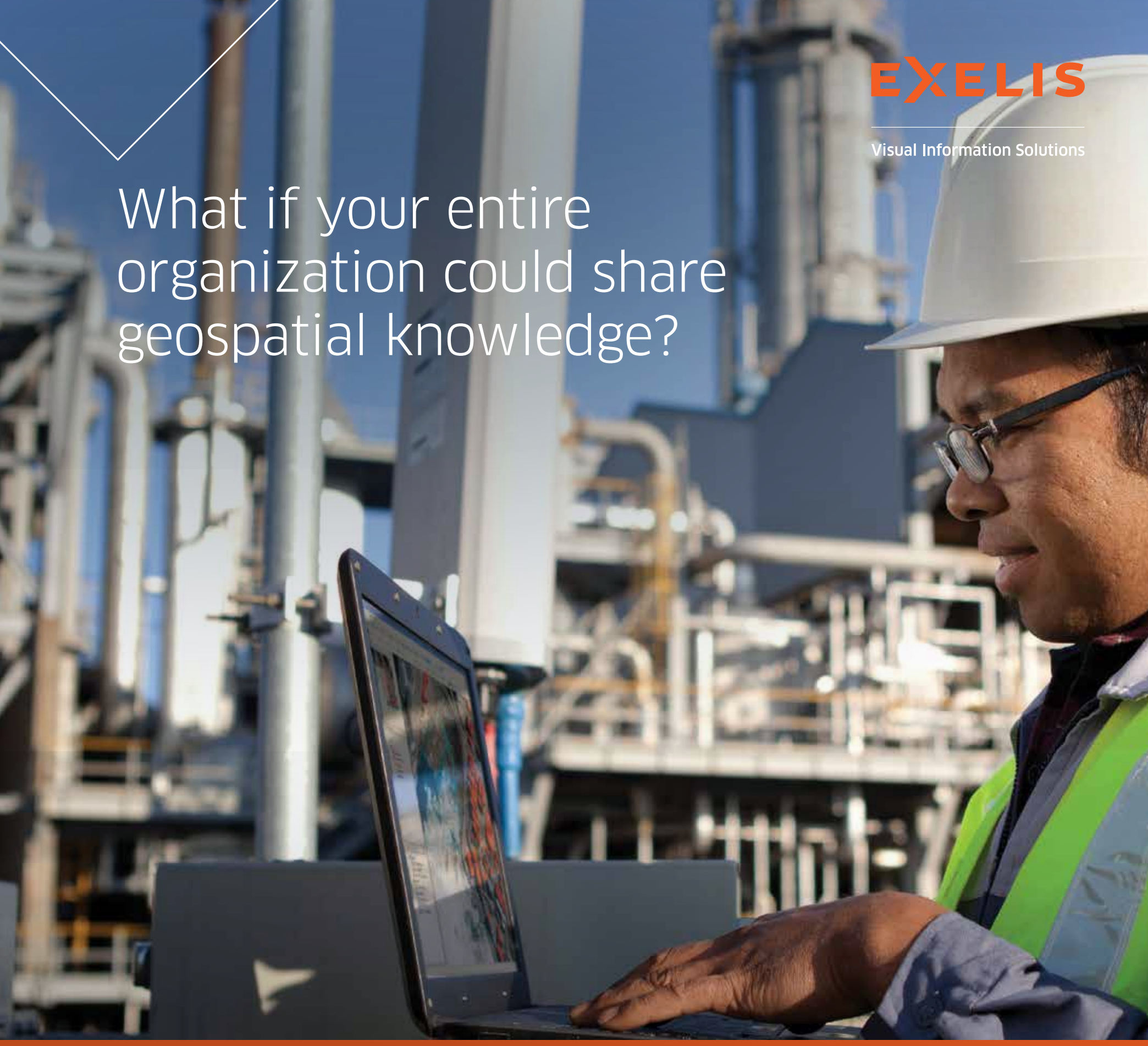
Which takes us back to the beginning. Whether it's Urban Observatory, 555, WWW2, or Wurman's yet-to-be-named next creation, the axiom that *understanding precedes action* is at the core. And GIS, mapping, and geography are the underpinnings.

For more information, contact Jesse Theodore, Esri (e-mail: jesse_theodore@esri.com).

EXELIS

Visual Information Solutions

What if your entire organization could share geospatial knowledge?



Sharing can be a challenge. Especially when your workforce is scattered across geographic locations, and they all have different methods for accessing the geospatial information they need. ENVI for ArcGIS® allows everyone from your organization to use geospatial imagery and data, such as SAR and LiDAR, to enhance their GIS applications. And, since ENVI products are fully integrated with ArcGIS, whether your team is analyzing imagery from a desktop computer, or they need to share the latest advanced image analysis tool with their colleagues via ArcGIS for Server we have the imagery software to suit your needs. Now with ENVI, sharing just got a little easier.

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Start-up Apps Connecting Communities

Start-up businesses are creating hundreds of web services and apps to help governments, businesses, and organizations get more value from ArcGIS Online and their ArcGIS platforms. Their seamless software integrations extend GIS to a wider audience. Some of these new businesses are shooting to the forefront of the GIS market, and *ArcNews* will highlight a few in a new regular feature. These start-up companies below have developed apps used by local governments.

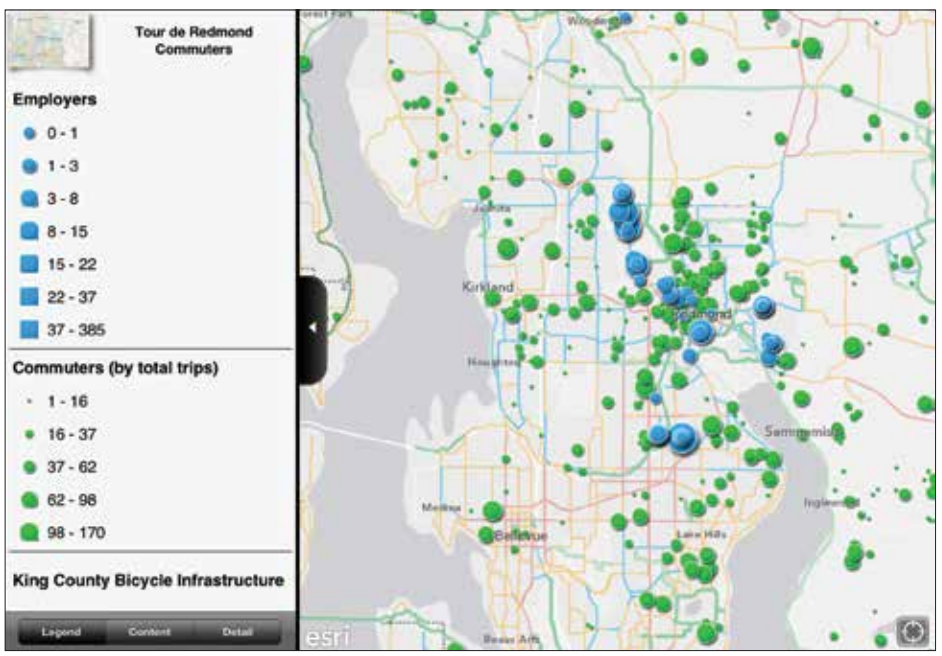
MindMixer
MindMixer bolsters community engagement by bringing the town hall experience online. City administrators post discussion topics on an interactive engagement platform. Citizens give feedback on focused topics, from library hours to proposed transportation corridors. In addition, an aggregator gleans and analyzes concerns that community members have posted on social media. Three examples of MindMixer projects are My Downtown West by Calgary, Alberta, Canada; chiParks by Chicago, Illinois, United States; and ImproveSF by the City of San Francisco, California, United States.
mindmixer.com

The MindMixer app integrates with Chicago's existing system to provide an interactive platform for community dialog.

CitySourced
CitySourced invites citizens to identify concerns, such as potholes and graffiti, and use their smartphones to report issues to city government. The information comes into the city's GIS, which shows the exact location of the problem in real time. CitySourced integrates with the city's existing system. Some interesting CitySourced services are Harford County Connect by Harford County, Maryland; Can-Do Honolulu by Honolulu, Hawaii; and CitySend by Longview, Texas.
citysourced.com

The citizen reports a problem using a CitySourced app on a smartphone. City staff see a real-time map showing a reported incident.

RideAmigos Corp.
The RideAmigos app classifies fast, efficient, and affordable transportation options, including walking, biking, driving, public transit, and car pooling/vanpooling. A virtual dashboard displays commute options in terms of cost, time, carbon emission, and health benefits. Organizations use it to encourage health, reduce traffic, evaluate travel expenditures, plan trips, and more. Notable projects are GoMIO by Barcelona, Spain; ExperienceLA Integration by Los Angeles, California, United States; and the Tour de Redmond by Redmond, Washington, United States.
rideamigoscorp.com

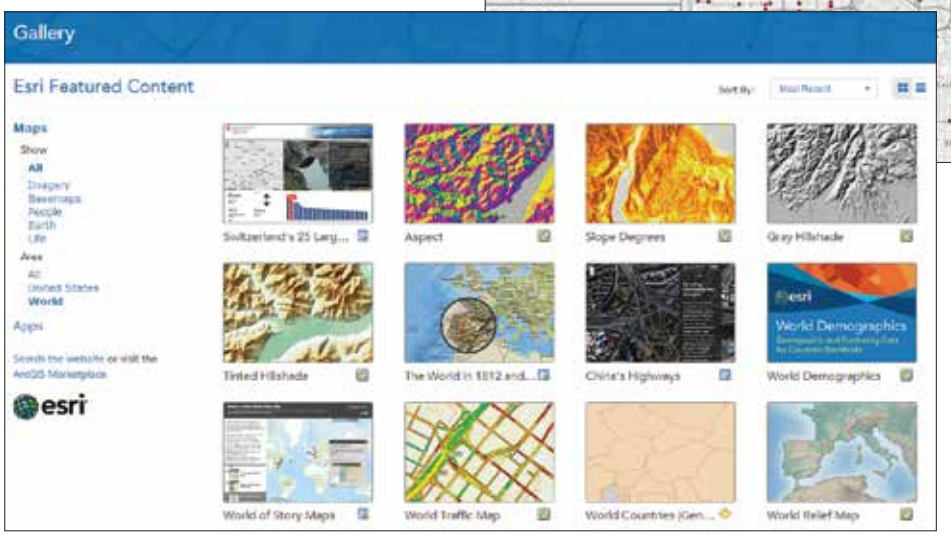


A RideAmigos map shows the King County Bicycle Infrastructure, the location of employers, and the total trips of commuters in Redmond, Washington.

Listen to Esri Podcasts

Esri podcasts are a free and easy way to listen to users share their experiences, get news and information from Esri, and learn software tips. Esri Speaker Series podcasts feature GIS technology insights from users and Esri Partners and staff. To check the availability of new podcasts and subscribe to the podcast feeds, visit **esri.com/podcasts**.

ArcGIS Online What's New?



Above: With the new Find Existing Locations analysis tool, you can query spatial and nonspatial attributes in your data.
Left: Now there is an easy and fast way for you to view your favorites and find featured content from your organization and Esri in the Gallery.

The December 2013 update to ArcGIS Online included new features and important enhancements for authoring web maps, configuring apps, administering your ArcGIS Online organization, and more.

Map Viewer

You now have the ability to copy a layer in your map; configure different properties on the copied layer, such as pop-up windows and symbols; and save the layer as a new item. You can also save layers imported into your map, such as CSV files and map notes. Administrators can configure the default map units for the scale bar, measure tool, directions, and analysis. ArcGIS Online members can set the units they see through their own profile page. More options to change symbols have been added, such as rotating point symbols, normalization of your data, changing the width of lines, and the ability to use size to display a graduated point symbol over a polygon. Time-enabled layers now include an option to disable the time animation so the time slider does not appear on the map. Map authors can choose whether or not to allow others to save a copy of their map. A simplified map viewer opens if a user is not signed in. This makes it easier to explore maps for casual, anonymous users.

The simplified viewer includes tools to show tables, edit features, change symbols, share, view data through time, and so on. On the public ArcGIS Online map viewer (**arcgis.com/home/webmap/viewer.html**), authoring capabilities, such as adding layers and configuring pop-up windows, can be enabled by clicking Modify Map next to the Sign In button. There is no option to save the map unless you are signed in. The Modify Map option does not appear in the map viewer if a map author has enabled Save as protection on the map. For organizations that allow anonymous access, a simplified map viewer opens, but there is no option to modify the map (users must sign in to see all the tools).

Web App Templates

App template code can now be downloaded from GitHub so you can use it to create customized apps that are hosted on your own server. You can now create configurable apps and group gallery apps from Esri-featured app templates in the Gallery. The Basic Viewer, Social Media, Legend, and Panels Geocoder templates now show a list of suggestions as you type in your search term. The GPX template has been retired from the Esri default map viewer template gallery. You can still use retired templates to create and publish apps by sharing them (and any other Esri template) to your custom template gallery.

The profile template has been updated with the latest ArcGIS Online Elevation profile service, which is free. This worldwide service is based on the GEBCO data at 30-arc second (approximately 1,000-meter) resolution and worldwide between 60 degrees north and 56 degrees south based on the 3-arc second (approximately 90-meter) resolution Shuttle Radar Topography Mission dataset. In the continental United States, the service is available at 10-meter and 30-meter resolution based on the US Geological Survey National Elevation Dataset (NED).

Analysis

Spatial Analysis—With the Enrich Layers tool, you can now select a group of data variables (data packs) or individual variables from each group. You can map the results from the Summarize Data tool using the new proportional symbols and get better visual clues for understanding your organization's data.

You can use the Extract Data tool to export a CSV file of feature attributes from area and line layers.

We've also added a new tool, Find Existing Locations, which allows you to query both spatial and nonspatial attributes in your data. And finally, you'll now see the consumption of service credits ahead of time for Enrich Layers and Create Drive-Time Areas.

Network Analysis—We've reduced Multi-Vehicle Route service credits usage by 50 percent. Content has been updated and enhanced for India and Thailand. Live traffic is now available for visualization and analysis in Argentina. The Location-Allocation service is in beta. Developers can include this service in their applications, and ArcGIS for Desktop users will see it as one of the ready-to-use services. There is an option to use live traffic in the Directions tool, including Drive Time Areas, Finding Nearest, and Summarize Nearby.

ArcGIS Online Account Administration

To make it easier to manage your ArcGIS Online subscription, we have added a number of enhancements. You now have the ability to use your own custom geocoding services to find places and addresses. Custom geocoders can be useful for batch geocoding or geocoding your own data. We also added a setting for the default basemap in the map viewer to open at a default extent set by the organization. And you now have a setting to add Esri basemaps and templates to configure groups so you can automatically include the Esri default basemaps and default templates. We added a custom contact link in the footer of your ArcGIS Online website. Under My Organization, administrators can now see the date when members last logged in. Administrators also have a new tool for resending and removing invitations and disabling member logins.

Other Enhancements

Several enhancements have been made to the Esri CityEngine Web Viewer. Search has been improved to deliver search results faster, and results are now highlighted in the 3D view. We also added new search tokens for attribute filtering, a new screen shot tool, and a new dedicated comments pane with filter for author and nonauthor comments. The Share dialog box has been improved. Experimental support for Internet Explorer 11 has been added.

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

The Gallery has been redesigned so that now you will see an Esri featured content section, as well as your organization's own featured content section. In addition, ArcGIS Online for Organizations subscribers will now see items they've designated as a favorite in their My Favorites section. The Gallery also includes better tools for sorting and filtering items. You can add items to your favorites that you find in search results or the Gallery or that you've added to your content. You can view your favorites in a new My Favorites section of the Gallery and search your favorites to add layers to your map. In addition, when adding layers to your map, you can search for layers from your favorites.

You can change the URL of an ArcGIS for Server service layer you've moved to a different server by editing its details.

When you add a CSV file to ArcGIS Online and share it with everybody (public), the details page now displays the URL. You can then use the URL to reference the CSV file as a layer in web apps, pop-up windows, and so on.

Item details now include an option to protect against deleting the item. And now you can store items with the same title in the same folder.

Two new regions have been added: Greece and South Africa.

Help has been reorganized to better highlight the main workflows of ArcGIS Online. This is part of an ongoing effort to improve the usability and attractiveness of the site.

ArcGIS Online Content Updates

MapmyIndia—ArcGIS Online basemaps for all of India were updated in January with content from MapmyIndia at scales from ~1:288 k to ~1:4 k nationwide and at ~1:2 k and ~1:1 k in urban areas. We are working on providing complete nationwide coverage at zoom levels 18 and 19 in an upcoming release.

Demographic & Lifestyle Maps—We added 20 more countries, bringing the total to more than 120 countries. The Demographic & Lifestyle Maps group features maps using the latest demographic data from Esri and other sources. You can browse maps about household size, purchasing power, population density, and more.

Dark Canvas Basemap—This new basemap is currently in beta at small scale (~1:577 k), and we will update it and expand coverage to larger scales worldwide in upcoming releases. The Dark Canvas basemap was developed from the Light Gray Canvas basemap and gives you the opportunity to use a different type of color palette for all kinds of maps, from locator to thematic maps.

World Topographic Map—New and updated content received through the Community Maps Program was added to the World Topographic Map for Europe, the Arabian Peninsula, Canada, and the United States. New content for Europe at ~1:9 k scale includes contributions for Galati and Oradea, Romania. Updated content for Europe at ~1:9 k scale includes the Netherlands and Albertov University and Masaryk University, Czech Republic. Content updates were also made for Switzerland and the Principality of Lichtenstein at ~1:36 k scale and the United Kingdom at ~1: 577 k scale. For Kuwait, we made a content update at ~1:577 k scale. Content for Canada includes 17 new and 52 updated contributions for municipalities, cities, and universities. New content for the United States at ~1:9 k scale was contributed for Tulsa, Oklahoma. Content was updated for the following cities, also at ~1:9 k scale: Carrboro, North Carolina; Chatham County, Georgia; Chula Vista, California; Oregon Metro, Oregon; Mecklenburg County, North Carolina; Dedham, Massachusetts; and Old Dominion University, Virginia.

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

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 a number of productivity apps as part of your trial, including 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**.

Mapping Assets for the Tampa Bay Region

ArcGIS Online Was Just the Ticket

By Dave Sobush, Certified Economic Developer and Business Intelligence Manager, Hillsborough County, Florida

Highlights

- Tampa Bay's industry, work force, and research asset map was created with GIS.
- The ArcGIS Online solution led to the development of three distinct asset workflows.
- The interlinked tasks of asset inventory and map application development were streamlined with ArcGIS Online.

The Tampa Bay Partnership, the regional economic development organization for the eight counties of west central Florida, was founded in 1994 by business, civic, and government leaders to promote Tampa Bay as a business destination. In the course of nearly two decades, the efforts of the not-for-profit partnership have paid off handsomely, as Tampa Bay is well known nationally as a premier business location.

For the bulk of its history, the partnership focused on messages related to low costs of business, specifically, taxes and wages that leveraged quality-of-life imagery. By 2008, the Internet and global business locations across the globe had undercut much of Tampa Bay's traditional advantages, and partnership leaders astutely recognized the need for a research-based, next-generation blueprint for economic development.

From this recognition, a 16-initiative, 72-activity *Regional Business Plan for Economic Development in the Tampa Bay Region* was released in 2011, and among these, "Initiative 1, Activity 1" called for the development of a GIS-enabled asset map depicting Tampa Bay's industry, work force, and research assets along key target sectors (Applied Medicine & Human Performance; Business, Financial & Data Services; High-Tech Electronics & Instruments; Marine & Environmental Activities) to promote a renewed identity of the Tampa Bay region as an integrated, innovative economy.

The Enormous Challenge

As the Tampa Bay Partnership's professional staff contemplated the enormity of the task—as well as that of the opportunity—that this asset map represented, several constraints were quickly identified. Primary among them was limited human capital that could be deployed in developing and keeping the asset map content across a 6,500-square-mile, 4.3-million-population footprint relevant and up-to-date. Furthermore, while the target sectors had been primarily generated using data available at the aggregate (i.e., county-level industry statistics) and illustrated by some already well-known firms, there was no comprehensive list of "assets"—specific companies—at hand.

In short, the two-person business intelligence team at the partnership faced two distinct but interlinked tasks: asset inventory and map application development. On the inventory side, the partnership had its eponymous partners that could provide trusted, street-level intelligence on assets resident in their communities, but for data quality purposes, the organization was wary of opening the inventory to nonknown entities without performing due diligence. An additional concern regarding the shared refinement of asset inventories was how to stay out of the "weeds" of data entry, as most assets suggested by external parties would arrive one by one as opposed to in bulk. Finally, almost no task this side of the Manhattan Project operates absent financial constraints. In summary, an asset map solution for the Tampa Bay Partnership needed to be publicly accessible (it's a marketing activity after all), accommodating relevant feedback and relatively inexpensive beyond anticipated initial development costs.

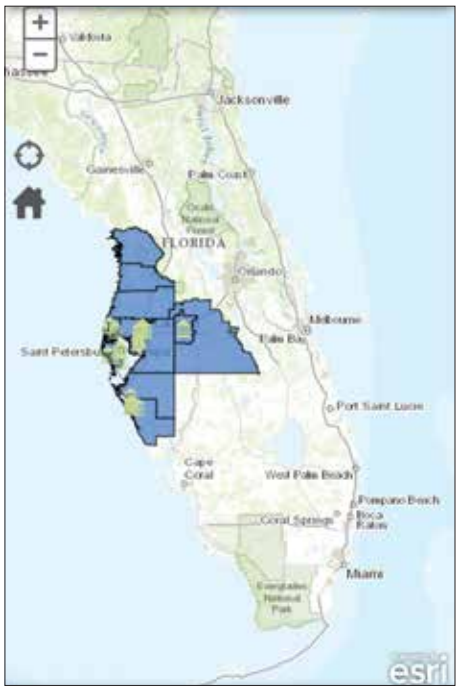
The Ideal Solution

The partnership research team possessed basic knowledge of GIS concepts and passing familiarity with the Esri suite of products, and the team's investigations led to the then recently released ArcGIS Online. With the hunch that ArcGIS Online would be the optimal solution, the partnership reached out to Esri Partners based in Florida through **esri.com/partners**. After reviewing several competitive proposals, the Tampa Bay Partnership selected Esri Silver-Tier Partner URS Corporation of Tampa, Florida, to develop the partnership's next-generation economic development tool. Overall project management and select technical activities were handled from the Tampa office, with the bulk of application development supported by the Germantown, Maryland, office of URS.

The ArcGIS Online solution crafted by URS led to three distinct workflows developed using custom ArcGIS Online templates. The Asset Submission Portal permits external parties to suggest or recommend a relevant asset (e.g., a business, an educational program) for inclusion in the asset map. The submission portal encourages volunteered geographic information and utilizes drop-down menus to both ease and guide data entry for required fields. A critical required field is the e-mail address of the individual submitting an asset for review. Upon completion of the required fields and submittal, the external party receives an e-mail message requesting confirmation of the submission. Once confirmed, the business intelligence team is able to see the suggestion in the Asset Verification Portal.

The initial screen of the verification portal shows the asset name and the e-mail address of the external party, permitting administrators to quickly verify assets submitted by trusted, known, external parties. Once verified, assets are published to the Asset Viewer, the public face of the asset maps. For the viewer application, the business intelligence staff worked closely with the URS team to develop an enhanced user-defined experience, including point-within-polygon selection, and download options in a "briefcase" utility. These enhancements democratize the audience's ability to probe and understand the regional economy. Also, to ensure maximum accessibility, the Asset Viewer was developed with responsive design techniques so that it's usable on mobile devices with no loss in functionality.

The Tampa Bay Partnership launched its Applied Medicine & Human Performance Asset Map, available at **map.tampabay.org**, in conjunction with BioFlorida's (a statewide industry association) annual conference in September 2013 to wide acclaim, and the map serves as a centerpiece of the partnership's marketing efforts for 2014. Thanks to the flexibility of both ArcGIS Online and the applications developed by URS, the partnership envisions deploying asset maps that go beyond the marketing message and are instead more focused on transactional economic development activities, such as reducing procurement leakage from the region, by helping manufacturers find and be identified as qualified vendors.

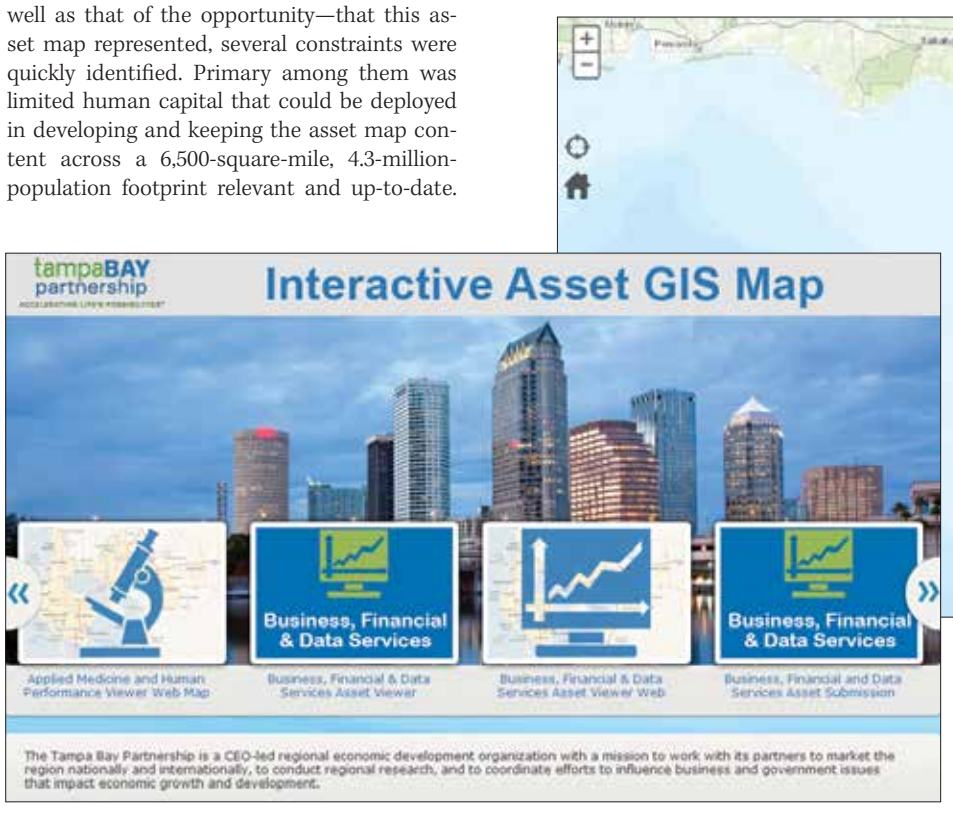


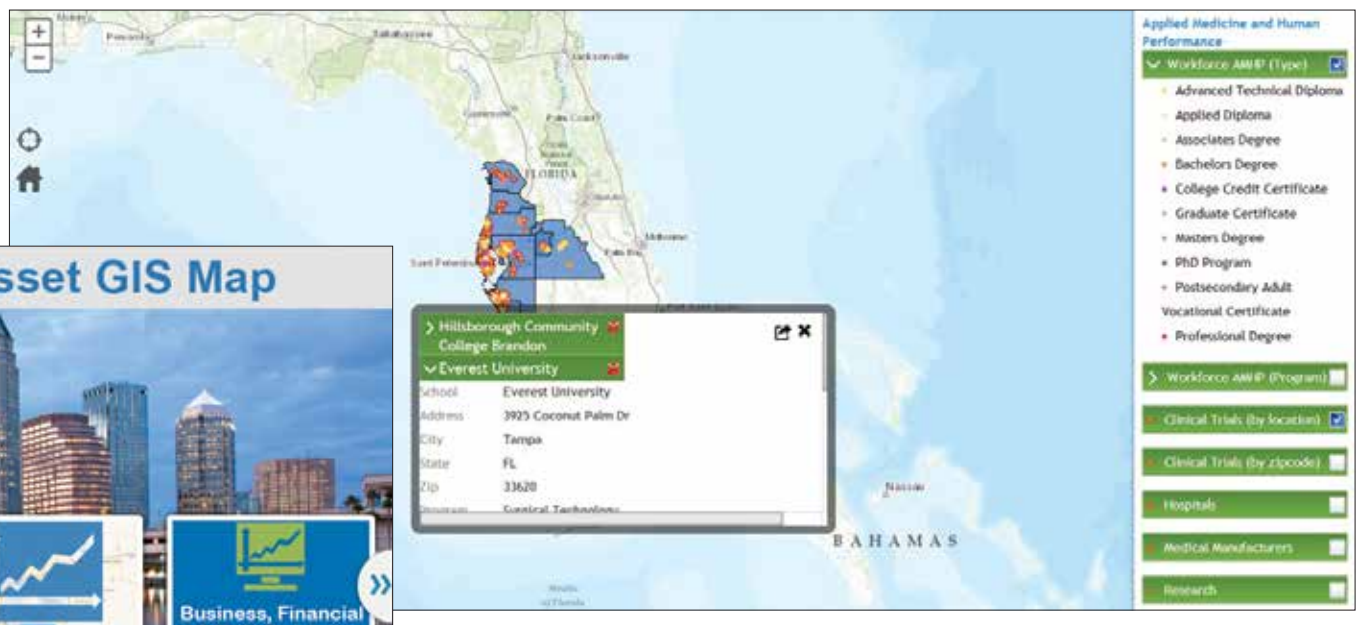
Above: The Asset Viewer as seen on a mobile device.

About the Author

Dave Sobush is a certified economic developer and business intelligence manager for the Hillsborough County, Florida, Economic Development Department. Formerly, he served as vice president of Regional Business Planning & Development for the Tampa Bay Partnership.

For more information, contact Katie Franco, senior vice president, Regional Initiatives, Tampa Bay Partnership (e-mail: kfranco@tampabay.org), or visit **www.tampabay.org**, or contact Carrie Aurit, GIS manager, URS Corporation (e-mail: carrie.aurit@urs.com), or visit **www.urscorp.com**.





Above: The Asset Viewer displaying the selection of assets added to the "briefcase" for download.
Left: Asset Map ArcGIS Online landing page.

Maximizing Public Input for a City Development Plan

In the Middle of the Czech Republic, GIS Makes Alerting Citizens Simple

Highlights

- Municipality needs to keep track of 78 development plans for 78 towns.
- Using GIS, drafts of city development plans are distributed to the widest audience.
- ArcGIS API for Flex was instrumental in building the dissemination app.

Above: Web mapping application shows the City of Jihlava development plan in an interactive form.
Left: The web map shows the layer menu and provides handy instructions after loading.

The very first public development plan was created in ancient Mesopotamia. From that time, civilization has come a long way, and public development plans are now essential for the growth and changes in every city.

The City of Jihlava is a regional center in the middle of the Czech Republic and home for 50,000 people. Multiple-level catacombs, mighty town walls, and many magnificent churches prove the long history of the town that dates back to the Middle Ages. It used to be an important mining center, with rich deposits of silver, and thanks to its position near the busiest Czech highway, it remains an important industrial center.

Surrounded by hills and natural beauty, the Jihlava municipality governs 78 towns and villages, every one of which needs its own development plan, an essential document for growth that can help attract investors. Taking care of nearly 80 plans is a difficult task that cannot be completed without proper standardization, workflow, and *technology*. GIS is a natural choice there. It has tools for importing information from various data sources; storing data in a standardized environment; and visualizing them in a clear, attractive, and comprehensive way.

Creating a development plan of the city is a complex task carried out by the city architect, who is cooperating with engineers of various specializations. But the design isn't just a theoretical project separated from reality. This document will affect the lives of all the citizens. Thus, people from the city must have the opportunity to discuss drafts of the plan and must have a chance to provide their remarks and objections.

Distributing the draft of the plan to the widest audience and providing an easy way for submitting objections was the mission that the Jihlava GIS department had to solve. It chose to publish the data with the help of ArcGIS for Server. The goal was to simplify the workflow, increase the efficiency of the planning department, and raise the common citizens' awareness of the new development plan. Objections could be submitted anytime from anywhere.

Therefore, a web mapping application became essential for collecting objections. A lot of attention had to be paid to the application's design and usability. Most of the application's users, the citizens, would have no experience with GIS. ArcGIS API for Flex was chosen as the technology, and development of the application was carried out by Esri Silver Tier Partner T-MAPY of Hradec Kralove, Czech Republic, which already had experience in a similar project for the country's capital. The design was simple: users could examine various versions of the plan and comment on parcels they selected. After the final check of the entry, the objection was sent into the system, returning a PDF report with the documented objection to the user.

Although the process was fairly simple from the users' point of view, the back-end technology was performing complex tasks. The data was stored in a Spatial Database Engine geodatabase, and the PDF report was created with the department's document record management system. Receiving objections via web application meant they arrived in the proper format with the required data, which saves the time of users and resources of the office staff. GIS serves as a platform for communication with town office and various IT systems.

How to Get GIS to Users?

To get the most participation that it could, the GIS department took steps to publicize it. The campaign involved newspaper articles, flyers, announcements in transit vehicles, posters on bus stops, online resources, and social media. As a result, the city development plan soon became one of the most visited pages on the town's website.

Over a four-month period, the system recorded hundreds of objections and was used for a second round during the winter. Now, the application is used for every new project in Jihlava municipality.

Jihlava's application was named best electronic service in a regional competition, the Golden Coat of Arms. Jaroslav Vymazal, Jihlava mayor, says, "It was a fortunate choice to use this technology. We are getting satisfied feedback from citizens, parcel owners, investors, and other organizations. It is a modern and, most importantly, effective method to involve the public in forming the future of the town."

The project also received *eGovernment* magazine's Best 2013 Award in the category of town projects. *eGovernment* focuses on IT in local and national government.

For more information, contact Jan Souček, ARCDATA PRAHA, s.r.o. (e-mail: JSoucek@arcdata.cz).

Silicon Valley of India Flies High with GIS

Indian Local Government Improves Governance and Service Efficiencies

Highlights

- Automated workflows and GIS reporting with detailed dashboards facilitate better-informed decision making.
- The ArcGIS software-based system helps users analyze pending projects and track them through completion.
- With the use of GIS, tax revenues nearly tripled in just six years.

Bengaluru (formerly known as Bangalore) is the third most populous city, the fifth most populous urban agglomeration, and the second fastest-growing major metropolis in India. Its government, Bruhat Bengaluru Mahanagara Palike (BBMP), Karnataka, is India's fourth-largest local government.

A demographically diverse city, Bengaluru is well known as the hub of India's information technology sector and has shown tremendous growth in the sector, accounting for more than 35 percent of India's software exports. Because of its position as the nation's leading IT exporter, Bengaluru is regarded as the Silicon Valley of India. Furthermore, the city is home to many well-recognized educational and research institutions in India, and it is therefore also known as the knowledge capital of the country. So it is no wonder that Bengaluru is rated among the top 10 preferred entrepreneurial locations in the world (*Economic Times*, April 2012).

Business Situation

Critical governance decisions being largely dependent on geographically disparate data, BBMP realized the importance of GIS for efficient information collection, management, and analysis. The city, having always been a promoter of advanced technology, was looking to leverage the best of GIS technology for its transformation initiative. Given this background, BBMP reached out to CyberTech Systems and Software Ltd., an Esri Gold Tier Partner headquartered in Trevose, Pennsylvania, with offices worldwide, including Thane West, Maharashtra, India. The company's long-standing partnership with Esri made the CyberTech-Esri combination the preferred choice for BBMP. It made sense to leverage the GeoCivic platform, CyberTech's ArcGIS software-based application suite that caters to the end-to-end needs of local governments in India, to drive the GIS transformation initiative.

The Bengaluru government identified the following functions as key drivers of the city's social and economic growth:

- Property tax management
- Road infrastructure management
- Road cutting approval system
- Optical fiber cable (OFC) license issue management
- Citizen complaint redress
- Birth and death registration

These functions were thus chosen as the primary candidates for the GIS transformation drive, and CyberTech helped the government capture the locational intelligence residing in the data.

Property Tax Management

BBMP has geoenabled all properties in its jurisdiction. CyberTech is now providing all the necessary tools to efficiently administer and monitor the collection process. The tools and analytical engine will provide the data in a GIS for optimal and efficient management. Through improved record keeping of properties and increased tax compliance, the GeoCivic framework will help BBMP maximize coverage and thus augment government revenues.

One of the major benefits of the system was seen by the significant increase in the realized revenues. In 2007–08, 740,000 properties were covered with revenue collection of 4.48 billion rupees. In 2012–13, after the GIS transformation, the figures shot to a total of 1.62 million properties identified with revenue collection of 13.5 billion rupees. The current target is 20 billion rupees.

The system also brings about the much-needed transparency in property tax levy and collection. Automated workflows increase process efficiencies, while advanced analytics and GIS reporting with detailed dashboards facilitate better-informed decision making.

BBMP, with the help of the system, can now also offer advanced services to help citizens view their property information and pay their property taxes online.

Road Information System

Through the GIS transformation, BBMP is better managing its nearly 13,500-kilometer road network, providing a more organized management of geographically diverse road information. The system provided centralized, dynamic registration of accurate spatial and linear locations of road assets, enabling easy recording and modification of data. These asset attributes can now be visually represented through dynamic, thematic maps to help provide more efficient planning and predictive road maintenance. This not only saves a lot of time and effort, it also gives better control over project execution and saves a significant amount of maintenance costs.

An important aspect of this transformation was the dynamic road history update and maintenance. It helped BBMP officials keep track of road asset history, including all spatial and nonspatial changes made to the assets so far, thus helping them further ensure accurate and timely planning decisions.

Road Cutting Approval System

BBMP, on a regular basis, also had to manually manage the permissions and monitoring of road cutting activities carried out by various service providers (telecom, electricity, water supply, etc.) and by private property owners. The move to GeoCivic and the ArcGIS platform automated and streamlined the entire road cutting approval and management process. Through high-quality vector maps, the system now gives BBMP an integrated, spatial view of the proposed roadwork and helps officials approve, monitor, and maintain road cutting activities. Through advanced GIS and management information system reports, the system also helps users analyze pending projects and track them through completion, consequently enabling better-informed planning decisions.

Optical Fiber Cable Management

Over the past few years, the city had seen a tremendous increase in the laying of optical fiber cables by various service providers. Earlier, BBMP engineers and authorities faced numerous issues in continuously keeping track of these activities. BBMP officials can now easily track and monitor such projects, thereby enabling efficient revenue assessment and recognition. The ArcGIS software-based OFC Monitoring and Tracking System receives applications from prospective firms, manages approvals, accurately assesses revenues, and automatically issues demand notices. It is also integrated with the organization's payment gateway, thus taking care of the entire process life cycle. With minimized revenue losses, this proved to be one of the major benefits of the GIS transformation.

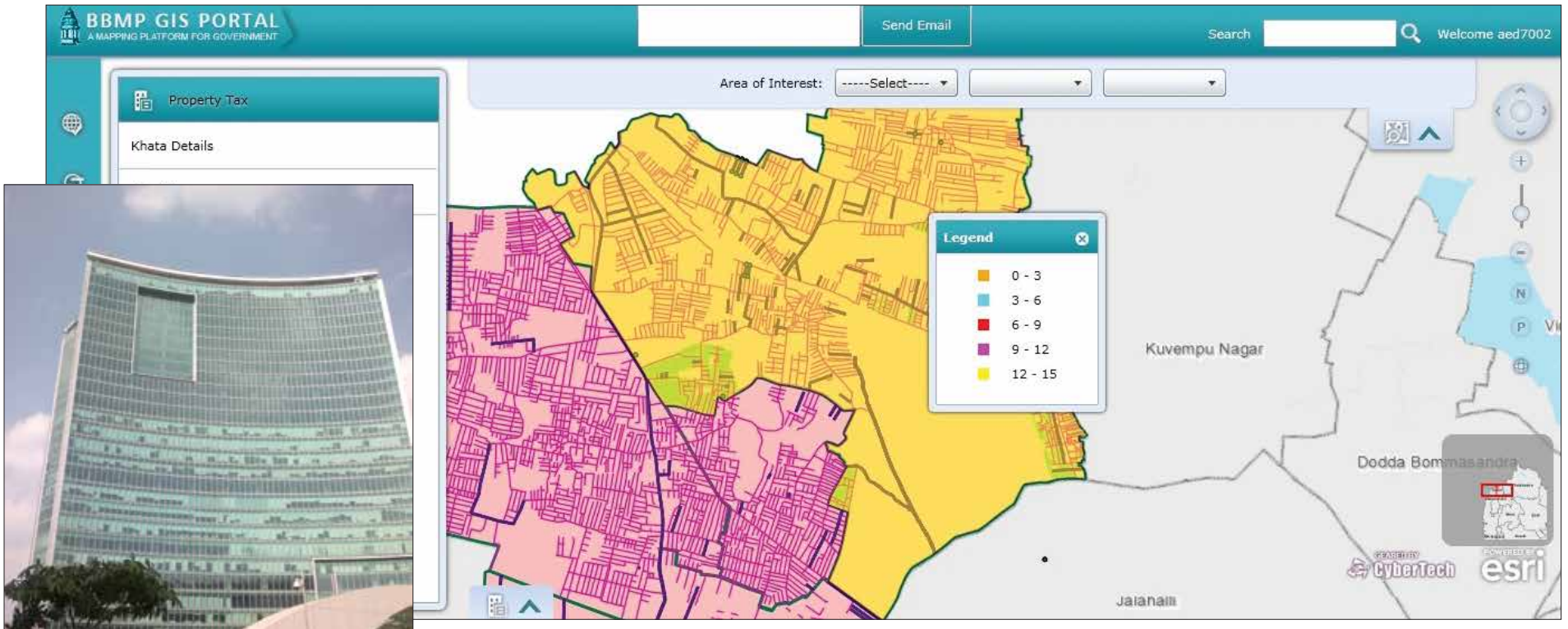
Citizen Complaint Redress

BBMP now has an integrated geoenabled platform for easy and transparent citizen-government engagement. The application enables citizens to report and track service complaints and feedback through an easily accessible web portal. The system incorporates the geographic aspect of population spread to enhance and speed up the process of complaint redress and service provision. This not only made life more convenient for citizens, it also increased the public trust in the city government.

Birth and Death Registration

The GIS deployment also covered automation of birth and death registration processes with advanced thematic mapping and spatial analysis of the types and distribution of births and deaths across all zones in the city. This provided an important set of inputs for better public health administration in the city.

For more information, contact Sheshadri T., IT adviser, Bruhat Bengaluru Mahanagara Palike, Bengaluru (e-mail: sheshadrit@gmail.com, web: www.bbmp.gov.in) or Vishal Bargat, director and head of India Business Unit, CyberTech Systems and Software Ltd. (e-mail: vishal.bargat@cybertech.com, web: www.cybertech.com).



Above: Property Tax Penalty Report across a particular zone.
Left: World Trade Center Bangalore.

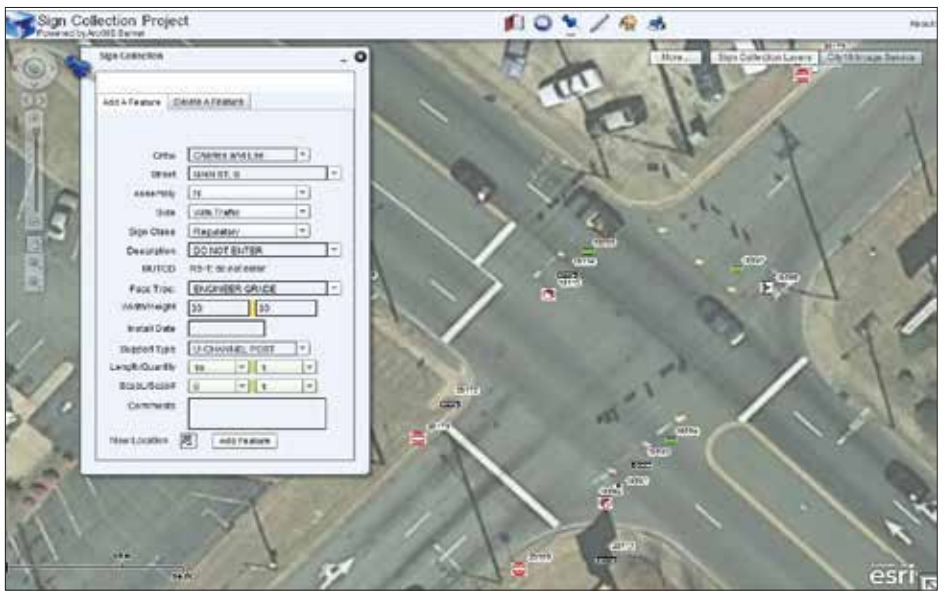
City Develops In-House Solution to Fulfill Federal Reflectivity Standards

North Carolina Furniture Manufacturing Hub Simplifies Sign Inventory

Highlights

- A web-based collection application using ArcGIS API for Flex was used to inventory the city's traffic signs.
- With the in-house solution based on ArcGIS API for Flex, the city unlocked a wealth of information about its existing signs.
- Using aerial imagery and GIS, the city now budgets how to upgrade the necessary signs for retroreflectivity standard compliance.

The City of High Point, North Carolina, received its name due to its once being the highest point on a stretch of the North Carolina Railroad. It evolved into a hub of furniture manufacturing and is currently home to the largest furnishings industry trade show in the world. The show attracts more than 90,000 people twice yearly, which impacts both the city's population of more than 100,000 (virtually doubling the city's population every six months for a week) and its infrastructure, including its streets, which include more than 22,000 signs.



Using ArcGIS API for Flex, the GIS Department created an Internet-based collection application to inventory signs.

Beginning in January 2011, the High Point Department of Transportation (HPDOT) began to explore how to comply with the new traffic sign retroreflectivity requirements adopted by the Federal Highway Administration (FHWA) to improve nighttime visibility. Under this rule, transportation agencies had to bring their traffic signs into compliance under the following schedule:

- *By January 2012*—Implement an assessment or management method that is designed to maintain traffic sign retroreflectivity at or above the established minimum level.
- *By January 2015*—Replace regulatory, warning, and ground-mounted guide (except street name) signs that are identified using the assessment or management method as failing to meet established minimum levels.
- *By January 2018*—Replace street name signs and overhead guide signs.

Retroreflectivity is a measurement of the amount of light that is reflected back to the viewer, making what is seen appear brighter and easier to read. Traffic sign sheeting materials are infused with small glass beads or prismatic reflectors that allow light from vehicle headlights to be reflected back to the driver's eyes, thus making the sign appear brighter and more visible. Because the retroreflective properties of traffic control signs deteriorate over time, active maintenance of signs is needed to ensure that they are clearly visible at night.

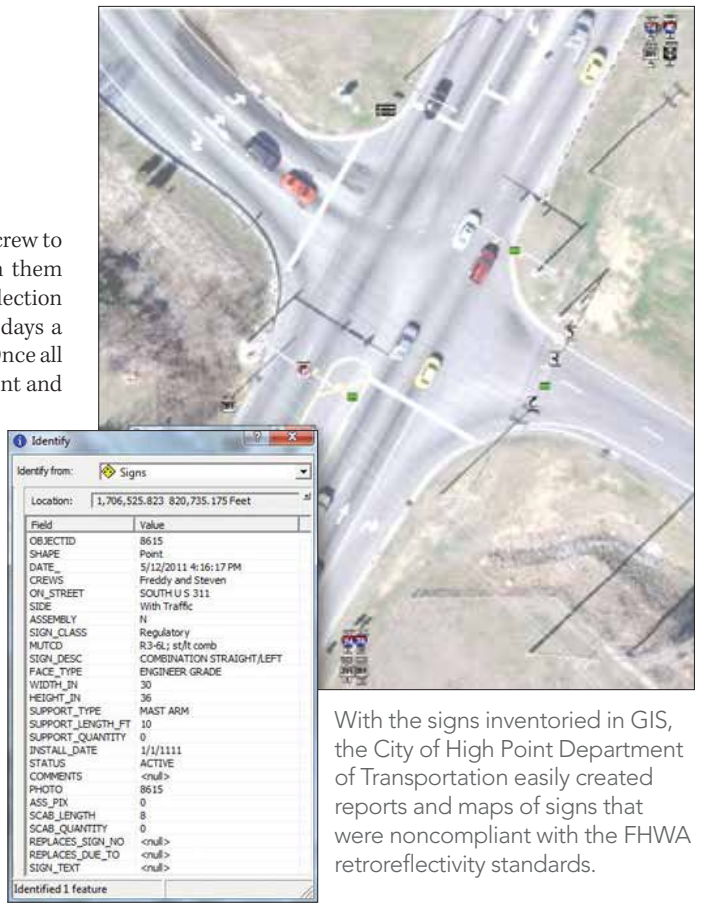
HPDOT had been keeping track of its traffic signs through a card file system—each time a sign was installed or replaced, the administrative assistant would write on an index card the date, street location, and a description of the sign and work done. However, there was no index for the card file to search for certain types of signs and their location, much less what sheeting type was used for the sign face to identify the sign's retroreflectivity. To identify which signs needed to be upgraded, the sign shop staff had been testing sign retroreflectivity using vehicle headlights.

"We would work three to four hours' overtime to drive around at night and test the retroreflectivity of signs using our truck's headlights," recalls Landy Peace, traffic sign technician. "We would dictate the sign type and location into a digital recorder and transcribe the information into a Microsoft Excel spreadsheet the next day." The method was slow and inaccurate. HPDOT needed a better method of updating signs to meet FHWA's deadlines.

The City of High Point has an extensive Esri GIS database, but there was no traffic control sign layer. Unsure of how to compile a traffic sign inventory, HPDOT approached the GIS Department to discuss potential solutions. GPS was considered an option, but it was a costly and time-consuming solution that was subject to multipath interference and unreliable satellite visibility. The city had recently acquired three-inch resolution aerial imagery that provided sufficient landmarks and detail to locate traffic signs with submeter accuracy. Fortunately, the GIS Department had recently built an Internet-based collection application using ArcGIS API for Flex that was being tested by the Fire Department for preentry data. Using a modified version of this application and a laptop with an air card, HPDOT began to inventory the city's traffic signs in April 2011. In addition to locating the signs, each sign was attributed with sign type, size, reflectivity, installation date, support type, and Manual on Uniform Traffic Control Devices codes. Assemblies of multiple signs were photographed to show the layout of the signs.

The Sign Shop is divided into three crews of two technicians. Each week, the HPDOT GIS planner went out with a crew to collect data and to train them on the application. Collection was scheduled for three days a week, eight hours a day. Once all three crews were proficient and additional air cards purchased, multiple crews collected data each day while also fulfilling their routine responsibilities.

"Getting the crews on board with the new project and technology was slow at first, but something about male competitiveness really moved the collection progress along after the first month or so," quips Gwen Ford, Transportation GIS planner. The collection was completed in September 2011 with a total of 22,470 signs. There were a few streets that were under construction during the collection period, so the Sign Shop crews collected those at a later date.



With the signs inventoried in GIS, the City of High Point Department of Transportation easily created reports and maps of signs that were noncompliant with the FHWA retroreflectivity standards.

With the inventory complete, HPDOT identified 355 stop signs and 187 yield signs that needed to be replaced at a total estimated cost of US$38,000 for materials. Another 12,753 signs were found to be noncompliant with the new retroreflectivity requirements and would need to be scheduled and budgeted for replacement.

Annually, the Sign Shop does sign replacements during the winter, so the inventory was completed just in time to begin changing signs. To replace the stop and yield signs, HPDOT crews used ArcGIS to modify their street atlas to show the location of those signs. The crews divided up the pages among themselves and replaced all the yields and half of the stops over three months. The remaining stops were replaced the following year. Before GIS, when the Sign Shop crews relied on the cruise-by-night method, they were able to change an average of 26 signs a month. Using ArcGIS to identify the noncompliant signs and their locations, the Sign Shop crews replaced about 120 signs per month.

In May 2012, FHWA revised the retroreflectivity compliance regulation to extend the compliance date for implementation and continued use of an assessment or management method to June 13, 2014, and refined the compliance date of 2015 to only apply to regulatory and warning signs. The final rule eliminated the target compliance dates for replacement of guide signs.

In five months, the City of High Point Department of Transportation staff drove approximately 750 miles and inventoried more than 22,000 traffic signs using an in-house solution based on ArcGIS API for Flex that required only the purchase of air cards and a wireless plan. As a result, HPDOT has unlocked a wealth of information concerning its existing signs. It can now plan and budget how to upgrade the necessary signs for FHWA retroreflectivity standard compliance and begin to efficiently maintain all its signs.

"This program has demonstrated how technology and teamwork together can create more efficient maintenance practices," says Mark McDonald, the city's transportation director. "Beyond that, it tackles a problem that has troubled us for years by resolving compliance and budgeting issues. We are all very pleased with its outcome, and we'll soon be exploring how the program can be applied to other work processes."

For more information, contact Gwen Ford, Transportation GIS planner, City of High Point (e-mail: Gwen.ford@highpointnc.gov, Twitter: @gisgwen).

University Researchers Document Tour Bus Operations in US Capital

GIS Helps Inform Key DC Transportation, Tourism, and Enforcement Stakeholders

Highlights

- GIS helps tourism planners understand urban transport patterns to optimize tour bus routing.
- Policy changes based on spatial analysis and mapping enhance visitor experiences.
- ArcGIS offers a variety of symbology choices to help visually represent statistical data.

Transportation planners in urban tourism destinations around the globe are confronted with the task of creating routes and associated policies that will minimize congestion and optimize traffic flows. Washington, DC, is home to the United States government, bringing in commuters from near and far while simultaneously acting as a global tourist destination to millions of visitors wishing to experience the historical and cultural landscape. As such, DC can act as an exemplar for transportation planning processes from which other urban destinations can benefit.

Much of DC tourism is concentrated within and directly surrounding the highly recognized and iconic National Mall and Memorial Parks (National Mall). The National Mall is 684 acres of dedicated parklands and home to many memorials that honor significant individuals and events in US history. In its 2010 National Mall Plan, the National Park Service (NPS), the government agency that manages the National Mall, reported more than 21 million visits annually to the parklands, with as many as one-third of visitors arriving via tour buses. Visitor statistics released by Destination DC, a private, nonprofit marketing organization supporting DC travel, report that tourism adds more than $6 billion to the local economy and supports more than 76,000 jobs annually. These same statistics forecast that visitation levels will continue to rise.

With concerns regarding carrying capacity and resource degradation in mind, DC policy makers and tourism planners are looking for ways to improve visitor experiences while preserving a national landscape. While recognizing positive economic impacts of group travel via tour bus, these benefits do come at a high price paid in traffic congestion, air pollution, pedestrian conflicts, traffic accidents, infrastructure deterioration, view obstruction, neighborhood disruptions, and parking shortages. These are some of the issues NPS and other stakeholders are trying to address as they plan for the future of the National Mall.

Researchers at George Mason University (GMU) in Fairfax, Virginia, were contracted by NPS to document existing conditions relating to current tour bus operations and make specific recommendations informing policy makers on improvements to the efficiency of tour bus transport. As such, GMU researchers are using GIS technology to collaborate with key DC transportation, tourism, and enforcement stakeholders in conducting a multiphase study that will ultimately be integrated into a comprehensive plan of action for short- and long-term improvements in tour bus operational efficiency within the National Mall. The current application is specific to assessing ingress patterns through spatial analysis.

Tour bus operations and flows are spatial problems that cannot be solved without integrating and understanding route choice patterns. Esri has entered into a cooperative agreement with GMU and other Virginia universities to license its ArcGIS suite of products, which allowed GMU researchers to visualize, analyze, and convey ingress patterns to all stakeholders. Of particular benefit was the ability to quickly understand and map the relationships present in the data using statistical and graphical functions available in GIS.

The number of private and public buses and motor coaches entering DC was counted at 13 select locations. Counts were made and initially tabulated by the Metropolitan Washington Council of Governments, a nonprofit regional planning agency for DC, Maryland, and northern Virginia. These entry point locations were chosen to represent the main routes of tour buses transporting visitors to DC. GMU researchers then used ArcGIS as an exploratory data analysis tool to uncover spatial and statistical patterns inherent in the data that are not readily apparent when simply reviewing spreadsheet data.

Using ArcGIS, GMU researchers were able to spatially document and translate the variations in number and composition of buses entering at each location, thus highlighting the entry points that are most influential in bringing tourism to DC. While trying to understand relationships from the spreadsheet of raw values was proving difficult, simple spatial analysis techniques clarified the varying attributes at each location and aided in determining where resources should be allocated to reduce traffic congestion.

Using map services published through DC GIS, which provides government agencies and the public with access to DC geospatial data, an updated standard basemap was consumed. The analysis map was then developed by overlaying entry point locations. A review of the distribution of geographic locations in conjunction with temporal data regarding when counts were taken allowed GMU researchers to identify areas

In 2010, the National Park Service reported more than 21 million visits annually to the DC parklands, with as many as one-third of visitors arriving via tour buses.

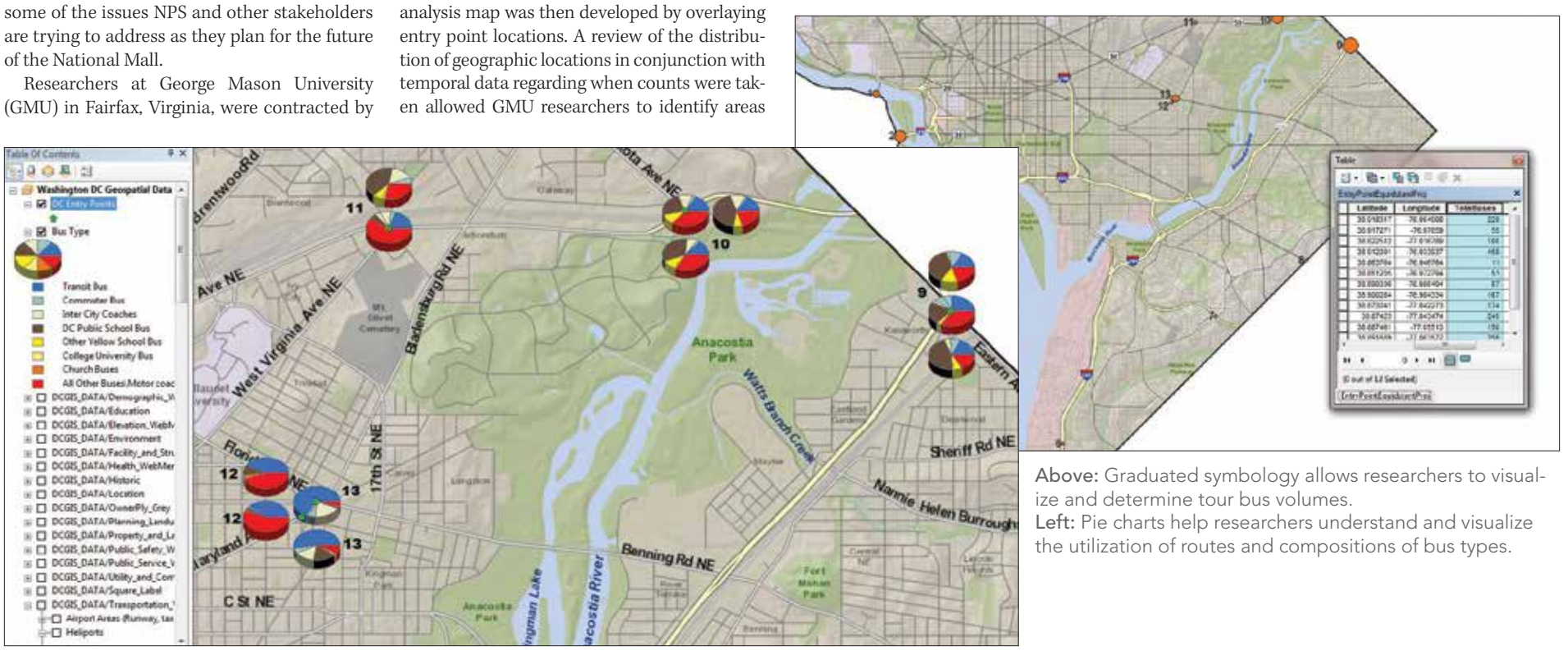
where double counting may have occurred, thus influencing overall counts and suggesting the need for additional data collection to cross-check select sites. This important methodological information was found to be much easier to glean once the data was mapped using ArcGIS.

Next, researchers used normalized data and graduated symbols to understand and represent differences in volumes. A graduated symbology with natural breaks was found to be effective for determining and visualizing tour bus volumes. Mapping the average number of buses passing each location, researchers were easily able to distinguish and visualize the routes that were most heavily utilized by tour buses; this information was used as a proxy for carrying capacity.

ArcGIS offers a variety of symbology choices to help display statistical data. Utilizing the ability to generate pie charts based on multiple attributes of discrete features, GMU researchers were easily able to understand and convey the variability between different locations. While documenting the percentage of buses utilizing different routes was instructive, what proved to be most revealing was the composition of buses that were using select entry points. For instance, it was found that many locations that initially had the highest volumes of buses were actually being influenced by a propensity of school buses transporting students, not tourists, into DC from the north. Such a trend was easily discernible by charting the composition of buses observed at each site.

The framework discussed in this article was used by researchers to help understand the route choice decisions, carrying capacity, and composition of buses entering DC. The findings, combined with spatial data regarding tourist loading zones, parking data, and tour itineraries, will inform planners' and policy makers' decisions regarding tour bus routing in and around DC. Other major urban tourism destinations can use GIS technology and apply similar techniques to improve operational efficiency for drivers and thus increase the overall satisfaction of the visiting public.

For more information, contact Rodney Vese Jr., MS, research assistant, George Mason University, School of Recreation, Health, and Tourism (e-mail: rvese@gmu.edu), or Margaret J. Daniels, PhD, associate professor, George Mason University, School of Recreation, Health, and Tourism (e-mail: mdaniels@gmu.edu).



Above: Graduated symbology allows researchers to visualize and determine tour bus volumes.
Left: Pie charts help researchers understand and visualize the utilization of routes and compositions of bus types.

Human Services Agencies Use GIS to Keep Clients Safe from Catastrophic Events

National Council on Crime and Delinquency Partners with 54 California Counties

Highlights

- GIS helps give agencies accurate information quickly so that they can respond immediately to protect clients.
- Using maps to locate clients in need of assistance means huge time savings.
- In a stringent fiscal climate, the GIS mapping approach reaps multiple benefits.

Human services agencies are responsible for the safety and welfare of clients under their care. Child welfare agencies protect the safety and welfare of children in foster care. Agencies providing supportive services to the elderly must safeguard their clients' well-being. A given California county may be responsible for thousands of children and adults in homes and facilities spread out over a large geographic area.

When emergencies or natural disasters strike—flooding, fires, and industrial accidents, among other examples—these agencies must quickly communicate with their facilities to keep their clients safe. In California, where wildfires and earthquakes are unfortunately common, this can occur several times a year.

In the past, agencies accomplished this by comparing the map of the emergency-affected area with lists of facilities, sorted by ZIP code—a time-consuming and often imprecise solution. Tony Muga, a child welfare data analyst in San Bernardino County, notes, "Some of these ZIP codes are so large that we couldn't tell right away which addresses corresponded to an area that was immediately threatened by a fire. So we ended up calling people who were not in any danger at all."

San Bernardino County is one of 54 California counties that partner with the National Council on Crime and Delinquency (NCCD) for child welfare data monitoring and analysis through an NCCD service called SafeMeasures. SafeMeasures uses near real-time data to help child welfare agencies in California prioritize work and identify potential gaps in services before they lead to negative outcomes.

In 2006, NCCD added mapping to SafeMeasures, geocoding the addresses of all clients and foster homes in the process. NCCD identified sources of GIS data—such as the National Oceanic and Atmospheric Administration, the United States Geological Survey, and the California Department of Forestry and Fire Protection (CAL FIRE)—that could provide up-to-date information about the location and extent of wildfires, earthquakes, and other disaster situations. Layering client and event information together on a single map created a consolidated source of impact information that made it possible for NCCD's client child welfare agencies to discard the manual process they had previously used.

In 2013, NCCD moved to Esri GIS products to improve SafeMeasures mapping. For geocoding, NCCD chose StreetMap Premium for ArcGIS because of its accuracy and coverage, both of which are critical to ensuring that a human services agency reaches all clients potentially affected by a disaster.

NCCD works with client, foster home, care facility, and other addresses from multiple states. Because of the confidential nature of this data, NCCD needed to develop a custom, in-house geocoding solution. On a typical day, NCCD geocodes 5,000 to 6,000 addresses. Some days, it geocodes more than 100,000 addresses. ArcObjects, in conjunction with StreetMap Premium data, provides a high-speed, low-cost, automated solution that handles this load quickly and accurately.

ArcGIS API for JavaScript provides the clean, easy-to-understand user interface that NCCD wanted for its clients. Standout features included better basemap imagery than NCCD's prior tools—less cluttered at higher scales and more consistent in how it displays landmarks. NCCD uses custom and open-source code to access, organize, and render data for display, using standards like Web Map Service (WMS) to integrate this data into the map.

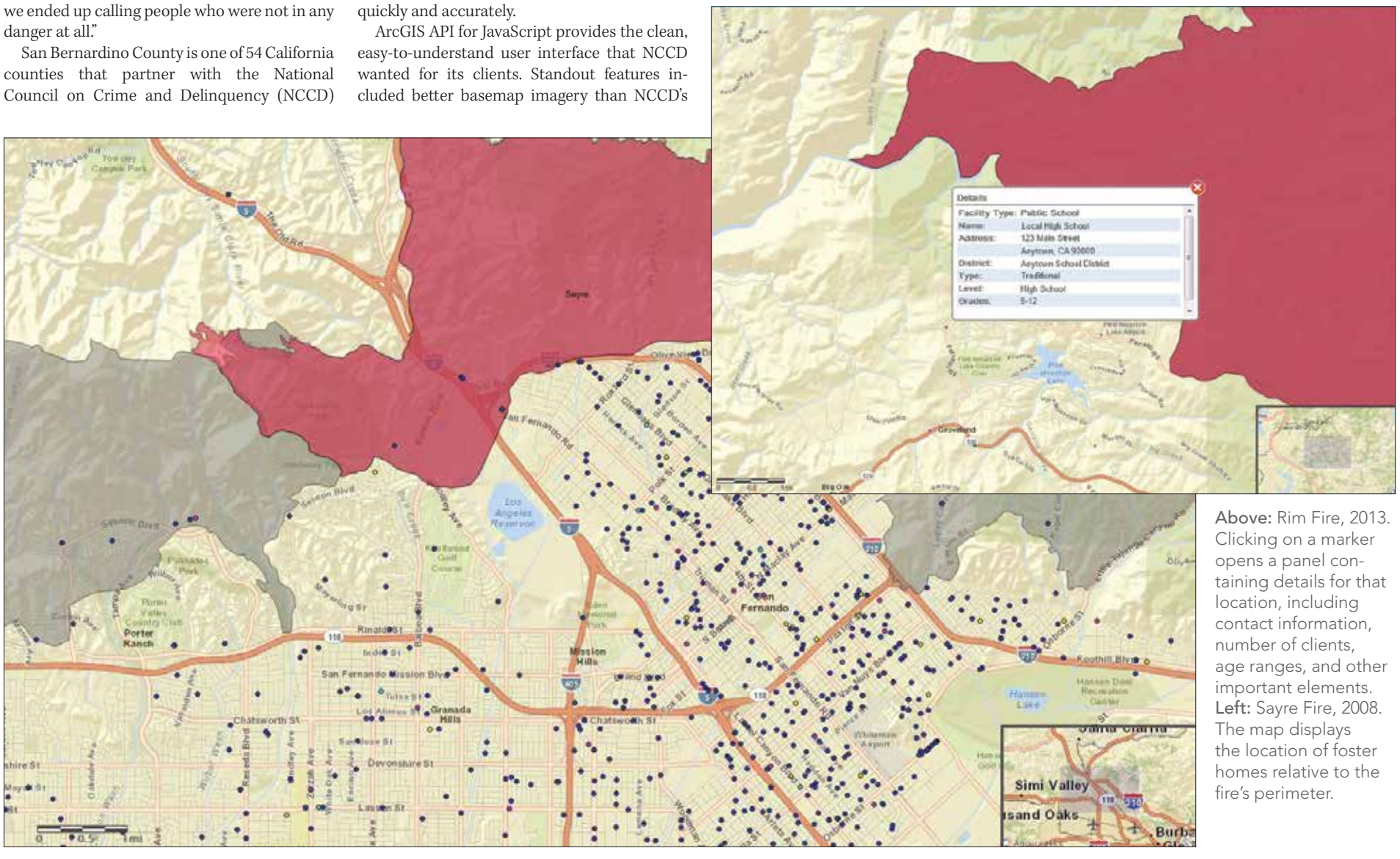
With the improved SafeMeasures maps, California child welfare agencies have an agile, streamlined process with which to keep clients safe in the face of an unfolding emergency. As Luis Fernandez, a data supervisor in San Diego County, explains, "Now we can see exactly where the kids are, and the map shows where the disasters are, so it's simplified it quite a bit." In the event of a fire, Fernandez states, "We go to that map, see where the fire is, and see the dots of placements near it. We can use that map to contact those foster homes."

In a stringent fiscal climate, the GIS mapping approach reaps multiple benefits. Fernandez notes that in the past, data requests and regular reports were put aside when agency personnel had to find clients affected by an emergency. "Now, it takes only 15 percent of the time it took before because we don't have to cast as wide a net."

Other human services agencies are also beginning to use mapping. The Community Care Licensing Division of the California Department of Social Services is responsible for licensing nearly 67,000 facilities serving about 1.4 million California residents. These facilities include child care facilities, foster family homes, children's residential group homes, and nonmedical out-of-home options for adults.

The advent of mapping "has been met with enormous appreciation," says Central Operations Branch chief Kathi Mowers-Moore. "It's huge for us and for our constituents."

For more information, contact Timothy J. Connell, PhD, director of Application Development, NCCD (e-mail: tconnell@nccdglobal.org, web: www.nccdglobal.org).



Above: Rim Fire, 2013. Clicking on a marker opens a panel containing details for that location, including contact information, number of clients, age ranges, and other important elements. **Left:** Sayre Fire, 2008. The map displays the location of foster homes relative to the fire's perimeter.

GIS Reveals Basis for Ancient Settlement Location

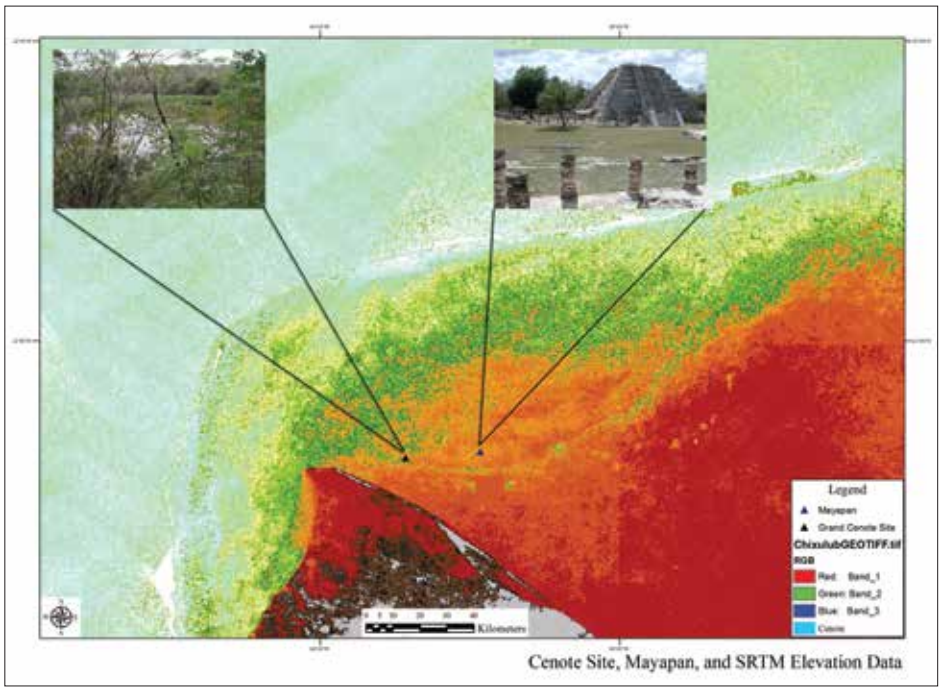
By Dr. Terance L. Winemiller, Associate Professor of Anthropology and Geography, Auburn University at Montgomery, Alabama

Highlights

- The physical surface expression of the Chicxulub crater was revealed using vector and raster data analyzed in GIS.
- ArcGIS revealed conditions that set the basin zone apart from other parts of the peninsula.
- Surface analyses in the GIS revealed hot spots where the highest frequencies of features occur.

Access to water for drinking and agriculture is widely regarded as a determinant of settlement for early civilizations. The ancient Mayas who occupied much of Mesoamerica, a region that extends from the Valley of Mexico into the Yucatán Peninsula, modern-day Guatemala, Belize, western Honduras, and beyond, were no exception. They located settlements near rivers, caves, and *cenotes* (natural water-filled sinkholes); modified the landscape by creating wells, *chultunes* (cisterns), and *aguadas* (culturally modified lakes); and ditched swamps for agriculture. Due to a scarcity of rivers or other surface water features and greater aridity, adaptive options were limited in the northwestern Yucatán as compared to other portions of Mesoamerica. The apparent absence of accessible water sources predicts a less dense settlement pattern than other parts of the region; however, the area contains significantly higher numbers of archaeological sites. The impact of the Chicxulub meteor in shallow gulf waters covering the modern-day northwestern coast of Yucatán, Mexico, approximately 64 million years ago and subsequent formation of a 180-kilometer-wide sedimentary basin appear to have contributed to the development of a highly desirable environment for living in a region where surface water is all but nonexistent. Today, a ring-shaped zone of water-filled sinkholes, *dzonot* in Mayan, marks the location of the crater rim. The ring of cenotes spans approximately 244 kilometers along an arc projecting roughly 82 kilometers inland at its southernmost apex.

Auburn University at Montgomery, Alabama, has a university site license and offers instruction in Esri products for GIS certificate and degree programs. The power of ArcGIS and its spatial analytical tools provided the ideal means to model and investigate a variety of geospatial factors that might have contributed to the relic built environment, which remains on the arid northwestern Yucatan Peninsula at present. A variety of vector and raster data was collected, processed, and analyzed in ArcGIS to reveal the physical surface expression of Chicxulub characterized by a relatively flat zone bounded by concentric crescent-shaped shallow troughs and a ring of cenotes and a relic cultural landscape of ancient settlements situated within the basin area. Analytics created in ArcGIS revealed a statistically significant, geospatially patterned distribution of two water management strategies. Settlement locations plotted over a layer of aquifer depths interpolated from data collected in the field provide additional evidence that the Chicxulub basin area was a preferential location to establish settlements in ancient times.



Cenote Site, Mayapan, and SRTM Elevation Data

Screen shot of false color SRTM elevation data in ArcGIS (green-red-black = low elevation to high) with insets for a rim *cenote* and Mayapan, which is located inside the basin close to the rim. (SRTM image by permission Gary L. Kinsland [2003].)

Approximately 64 million years ago, a sizable meteor impacted in shallow gulf waters covering the modern-day northwestern coast of Yucatán, Mexico. The resultant crater, called the Chicxulub crater, is a 180-kilometer-wide sedimentary basin, which appears to have contributed to the development of a highly desirable environment for living in a region where easily accessible surface water would otherwise be all but nonexistent.

Ancient Maya Settlement Choices

The ancient Mayas populated the Yucatán Peninsula by applying a range of adaptive strategies to cope with a scarcity of surface water. The idea that the Mayas purposely established settlements near sources of water and the significance of cenotes to settlement distribution are widely accepted. The modern Mayas continue to construct dwellings above the remains of ancient settlements.

Field surveys on the Yucatán Peninsula during 1999 and 2001 revealed that for each visible cenote in or near the ring, many others are either too small to provide a return in remote sensors or concealed by dense vegetation. For example, the walled area at Mayapan, an ancient settlement located 4 kilometers north of the ring zone, covers approximately 5.5 square kilometers. More than 30 cenotes of varying sizes have been reported at Mayapan, while none are detectable as a water feature in satellite data. Cenotes or natural wells, like those found at Mayapan, are ubiquitous on the surface of parts of the peninsula inside the ring of cenotes. Today, the indigenous inhabitants often modify cenotes with small openings by constructing well curbs and installing winches to draw water from the vast network of underground water-filled chambers.

The Chicxulub Meteor Impact and Water

The dataset for this research contains the geographic locations for 1,694 known archaeological sites and 7,430 modern populated places located on the Yucatán Peninsula. A region of interest (ROI) was defined that contains 1,152 ancient settlements and 1,458 modern populated places distributed among 588, 39.7-square-kilometer quadrats in a graticule created to accomplish point pattern analyses. The region of study covering most of northwestern Yucatán, Mexico, has been intensively surveyed over the past 150 years.

Using visual and computer-assisted classification techniques for remote-sensing data, 211 cenotes were identified along the trough that defines the ring of cenotes. While studies have shown that the Mayas consistently built their communities proximal to *small* cenotes, spatial queries in ArcGIS indicate that a significant number of known archaeological sites in the database do not occur adjacent to or near the *large* cenotes that form the ring zone. In effect, the ring of cenotes bisects the northwestern peninsula into two subregions with proportionally different settlement densities, one inside the Chicxulub area and the other south of the ring in a hilly area known as the Puuc. Of the 211 cenotes identified in remote-sensing data within the narrow ring zone, 5 (2.4 percent) are within half a kilometer of documented sites. That number increases to 12 (5.7 percent) when the distance is increased to 1.0 kilometer. An undetermined (but, in all probability, small) number of cenotes known to exist today were almost certainly not fully developed 1,000 to 2,000 years ago. Additional potential causal factors are discussed below. Nevertheless, the findings suggest that *large* cenotes located in or near the trough marking the ring feature itself were not overly attractive sites for settlement, as opposed to *small* cenotes.

A total of 754 settlements representing 65.45 percent of the known archaeological sites in the ROI are located within the 294, 39.7-square-kilometer quadrats falling inside the Chicxulub basin area. The remaining 398 (34.55 percent) are situated in the 294 quadrats outside the area. Variance-mean ratios (VMR) were calculated to determine if observed spatial patterns of locations in the ROI are statistically significant. The VMR of 3.359, corresponding t-statistic of 57.545, and p-value of less than 0.0001 for ancient settlements indicate a significant nonrandom pattern exists in the distribution. Based on a larger 56.1-square-kilometer quadrat size, the VMR for ancient sites is 4.425 with a t-statistic of 62.977 and p-value of less than 0.0001. The distribution favors the Chicxulub basin area and argues for the presence of an underlying benefit the ancient Mayas derived by establishing settlements there. To calculate VMR, formulas were written in a summary table containing the inventory of archaeological sites per quadrat in the ROI. A difference test was applied to establish the statistical significance of the VMR. The null hypothesis assumed randomness—thus,

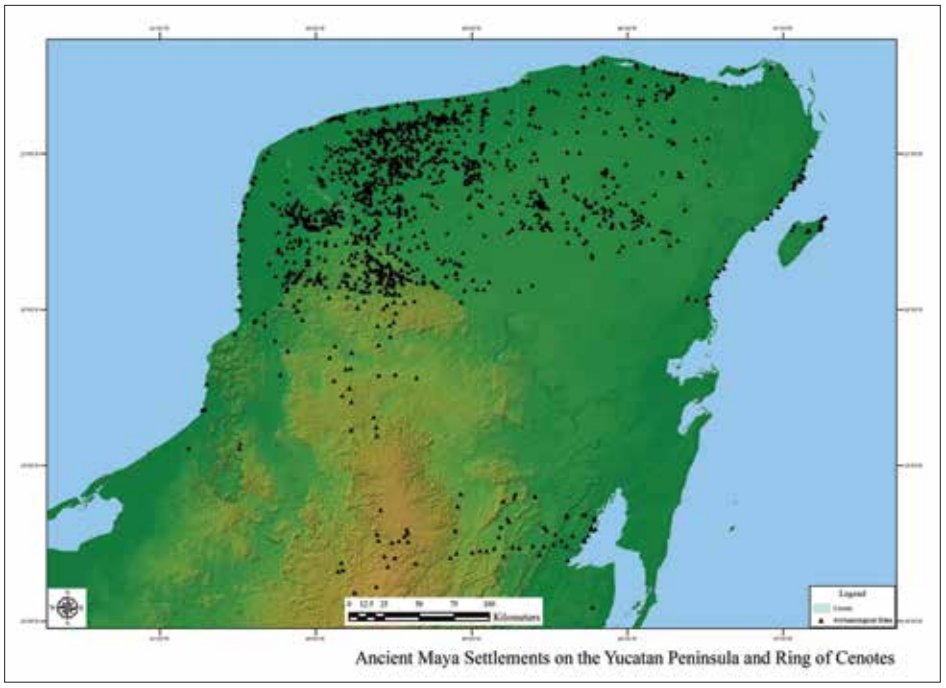
Chichen Itza, Yucatán, Mexico, a large site outside the Chicxulub basin site that relied on water from a cenote, wells at the bottom of *reholladas*, dry sinkholes, and *chultunes*. (Photo: fotolia.)

no difference between observed and expected frequencies by quadrat. For testing purposes, no major physical evidence was present to suggest the remains of ancient settlements should be clustered. Consequently, a nondirectional, two-tailed test using the chi-square of the VMR was selected. Nearest neighbor analysis conducted in ArcGIS for site locations in the ROI returned an observed mean distance of 0.0168 and an expected mean distance of 0.0210 with an R-statistic of -0.8014. The statistic indicates a low probability that the pattern is random.

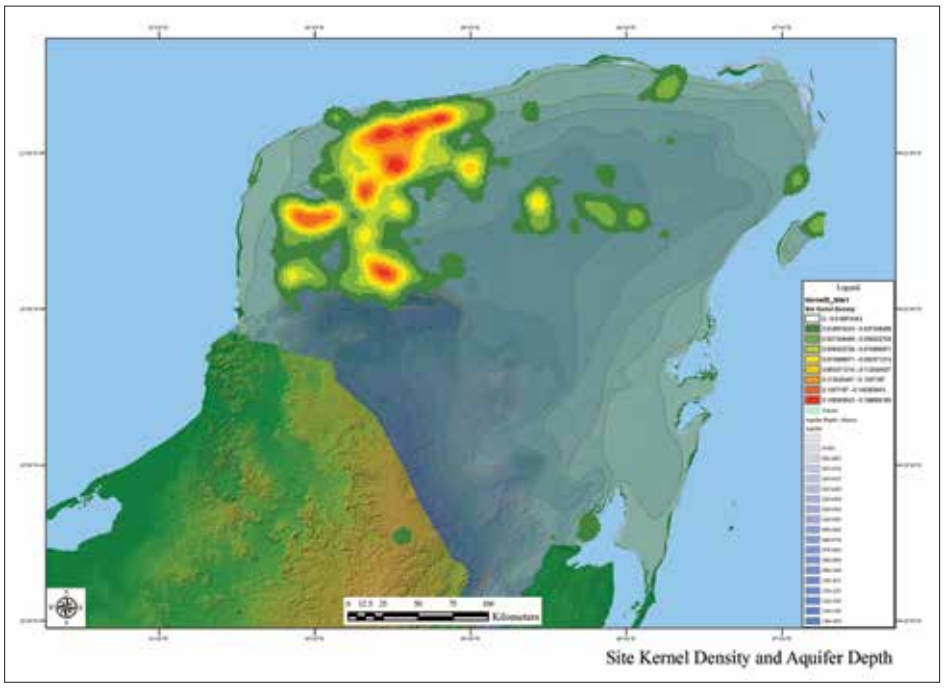
Further analyses in ArcGIS revealed no additional causal relationships between any single factor, such as rainfall, climate, or soil type, and ancient settlement location except access to water. The relatively higher site density inside the Chicxulub area suggests that access to water was less problematic in that location. A layer for aquifer depth zones was created in ArcGIS using well and cenote ground-to-water surface depths collected during fieldwork. The layer turned out to be a key piece of evidence to explain why settlements cluster inside the Chicxulub basin area. Shallow aquifer depths, normally found along the peninsular littoral, extend inland across a major portion of the Chicxulub basin area. The 10- to 15-meter zone skirts the northwestern section of the Ticul fault, then tracks inland along the crescent-shaped ring of cenotes, creating an anomalous inland area of locally shallow readings covering nearly 1,700 square kilometers. Widespread access to the shallow aquifer is a major environmental feature that distinguished northwest Yucatán from other physical zones in the Maya lowlands and attracted the Mayas to the area.

Natural or artificially excavated ancient wells and chultunes occur in dissimilar patterns that correspond to variations in aquifer depths throughout the ROI. Higher frequencies of naturally occurring small cenotes and artificially constructed shallow wells are found at archaeological sites inside than outside the basin area. Surface analyses in ArcGIS reveal hot spots where the highest frequencies of both features occur. The number of shallow wells at archaeological sites inside the basin area totals 195 at 80 sites. Only two wells have been reported for locations outside the area but in the ROI. Ancient wells are occasionally found outside the ROI but typically are located at the bottom of dry sinkholes or depressions where the aquifer is a few meters below the surface. No chultunes were documented for basin area settlements, whereas 707 were found at 63 non-basin area sites in the ROI. An abrupt falloff in the presence of wells takes place within the 15- to 20-meter aquifer depth zone. Chultunes begin to appear where depths range from 20 to 30 meters. The absence of wells in this section of the ROI and the apparent 20-meter threshold suggest that the Mayas were limited by their technology to a maximum depth at or near 20 meters.

Small cenote found on the Yucatán Peninsula. (Photo: Virginia Ochoa-Winemiller.)



Maya sites in the study with cenotes marking the buried rim of the Chicxulub impact crater plotted over SRTM elevation data in ArcGIS.



Kernel density of ancient Maya settlements in the region of interest accomplished in ArcGIS reveals significantly higher frequencies of ancient settlements inside the Chicxulub basin.

Conclusion

The Chicxulub basin area is a setting where, over time, karstic processes produced abundant small cenotes that intersected the shallow aquifer and served as natural wells. ArcGIS revealed two conditions that set the basin zone apart from other parts of the peninsula: high frequencies of natural wells or cenotes and shallow aquifer depths. The ancient Mayas were acutely aware of this unique environment and thus took advantage of cenotes or shallow wells as reliable and constant sources of water. Where static levels exceeded the Mayas' technical capabilities, they employed a less desirable but effective alternative, excavating chultunes to capture and store rainwater for use during the dry season or transporting water drawn from sources accessible by foot, such as caves or open cenotes in the area.

Acknowledgments

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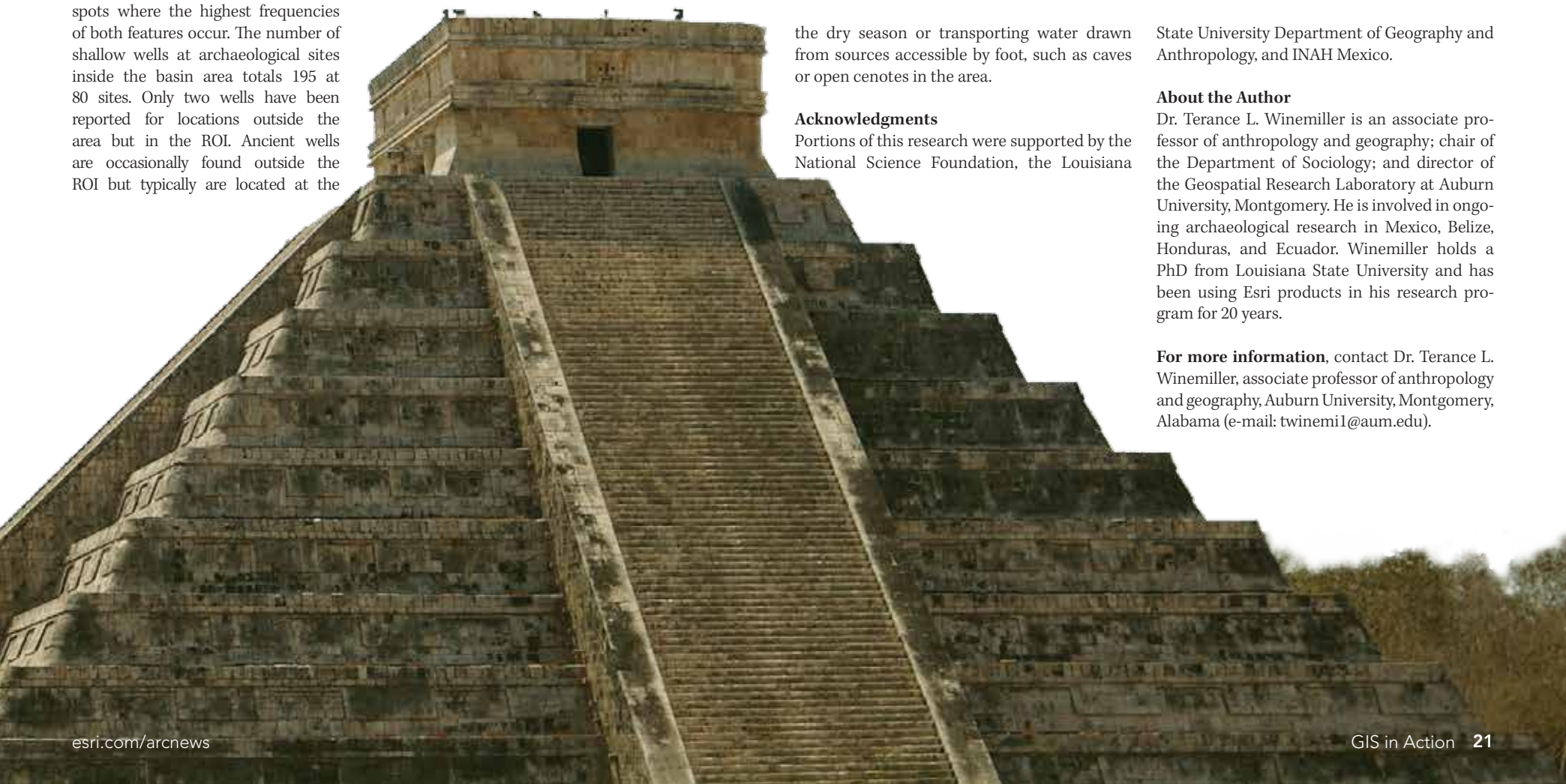
About the Author

Dr. Terance L. Winemiller is an associate professor of anthropology and geography; chair of the Department of Sociology; and director of the Geospatial Research Laboratory at Auburn University, Montgomery. He is involved in ongoing archaeological research in Mexico, Belize, Honduras, and Ecuador. Winemiller holds a PhD from Louisiana State University and has been using Esri products in his research program for 20 years.

For more information, contact Dr. Terance L. Winemiller, associate professor of anthropology and geography, Auburn University, Montgomery, Alabama (e-mail: twinemi1@aum.edu).



Assessing Threats to Wildlife

Spain Seeks to Manage and Conserve Its Biodiversity

By I. Iglesias, I. Asensio, F. Esperon, J. Bosch, A. De la Torre, M. Carballo, and M. J. Muñoz,
Epidemiology and Environmental Health Department, Animal Health Research Center, Madrid, Spain

NGO Non-Governmental Organization

Highlights

- A better understanding of threats to wildlife is possible by using ArcGIS.
- Spatial analysis of information of wildlife rescue centers helps define specific corrective measures.
- GIS models a risk prediction map of wildlife threats.

One of the aims of the Epidemiology and Environmental Health group from the Center for Animal Health Research (CISA) of the National Institute for Agricultural and Food Research and Technology (INIA) of Spain is to develop research in epidemiology and risk factors for wildlife.

Spain is a recognized European biodiversity hot spot, hosting a large number and extraordinary variety of species, especially of birds. Unfortunately, many species are considered threatened at the European level by direct or indirect human impact. Information as to what, where, and how threats produce the most intense damage is the key to adequate management in the conservation of natural areas. However, this information is incomplete and has many gaps.

Wildlife Rescue Centers

Wildlife Rescue Centers (WRC) play an important role in natural conservation. They recover and care for injured wild animals, promoting conservation and providing valuable information about the health condition of wildlife. This information provides accurate data, giving an environmental indicator of habitat conservation and the presence of threats in an area.

This study used WRCs as sentinels of the health status of local wildlife. WRC information (coordinates, species, causes of recovery, date, etc.) was spatially analyzed. For that purpose, ArcGIS software was selected because it includes a wide range of options for spatial analysis and geostatistical tools, allowing users to identify spatial risk patterns of wildlife threats, to explore their association with anthropogenic and environmental features, and to model a risk prediction map of wildlife threats.

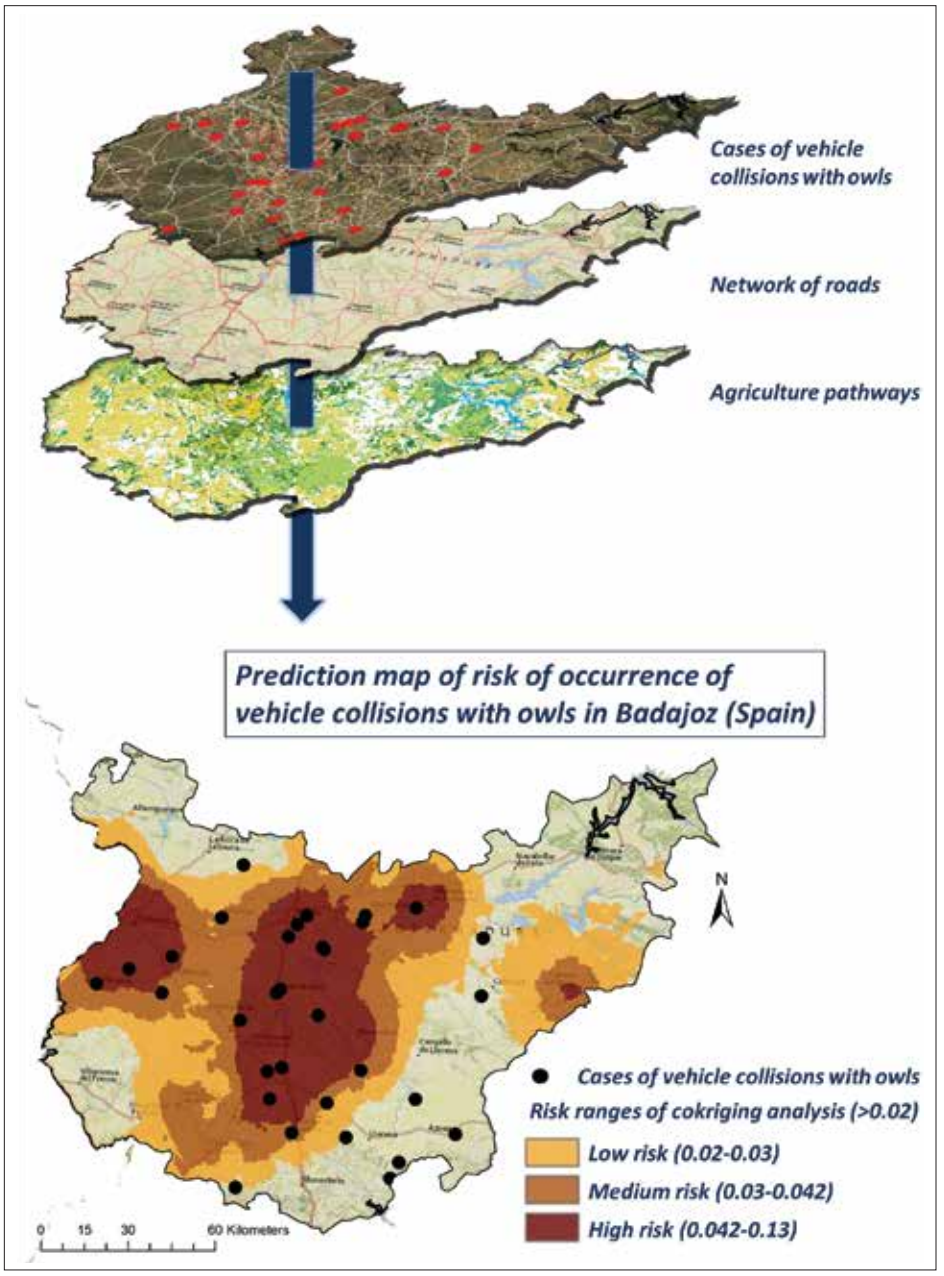
WRC's Action for Wildlife World (AMUS) is a nongovernmental organization (NGO) located in the Spanish province of Badajoz, which cooperates actively in this project, transferring information about recovered animals (more than 2,000 cases in three years). The analysis was focused on birds because they were the most affected species (96 percent of cases) during the period of study (2009–2013).

Spatial relationships between location of cases, species, and multiple anthropogenic and environmental variables (land use, vegetation, climatic data, human activities, roads, population density, etc.) have been analyzed to explore their potential association.

One of the most significant results shows a heavy association between damages to owls with two anthropogenic causes, that is, vehicle collisions and animals snagged on barbed wire fences. Fatalities in the period of study include 90 birds affected by these threats, most of which were owls (84 percent of cases).

Entanglement in Barbed Wire Fences

Larger species, such as Real Owl (*Bubo bubo*), cannot avoid impact and subsequent entanglement in fences, being the species with a higher incidence of entanglement in barbed wire fences (57 percent). A relation between owls entangled in barbed wire fences and certain agricultural land use (specifically meadows, which represent 37 percent of cases; vineyards; and olive trees) has been identified.



Map of prediction of risk of occurrence of vehicle collisions with owls in the study area.

Vehicle Collisions

Most collisions occur when owls fly low over the roads or are blinded by car headlights. A kernel density analysis of the Badajoz road network was developed and overlapped with cases of vehicle-owl collision fatalities using ArcGIS. Results show a high similarity in the spatial pattern of greater confluence of cases and increased road density.

A risk prediction map of vehicle collisions with owls was developed using cokriging analysis (ArcGIS geostatistical tools). Networks of roads and agriculture paths were used as covariables. The identified areas of greatest risk of car collisions coincide with areas of higher population density and higher roads density.

The study showed that the species Little Owl (*Athene noctua*) has the highest incidence of vehicle collisions (51 percent).

Conclusion

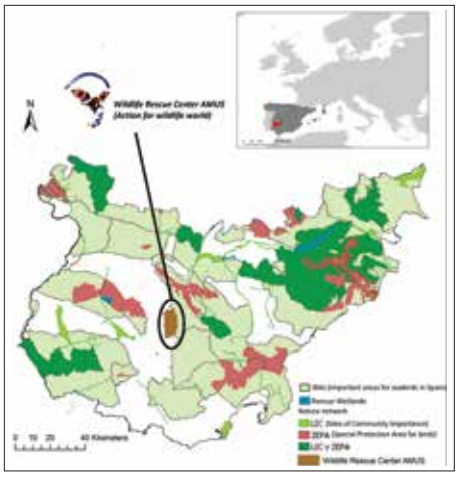
This study shows how to use GIS technology to allow a better understanding of threats to wildlife species and their association with human activities. This information would help define specific corrective measures enabling focus and prioritization of environmental conservation resources and management action in those areas where the most affected species are and help to implement the measures. This scheme of study could be transferred to other WRCs to assess specific threats in specific areas and species through this passive surveillance of incidence of threats to wildlife.

About the CISA Epidemiology and Environmental Health Group

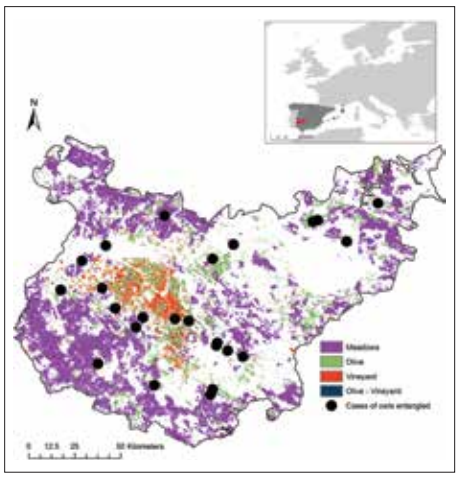
The main objectives of the Epidemiology and Environmental Health group are

- Epidemiology of animal infectious diseases mainly focusing on environmental parameters as risk factors and wildlife as disease reservoirs.
- Spatial analysis of the introduction and spread of diseases.
- Advances in the diagnosis of emerging diseases and those shared by wild and domestic animals.
- Environmental impact assessment of veterinary medicines.

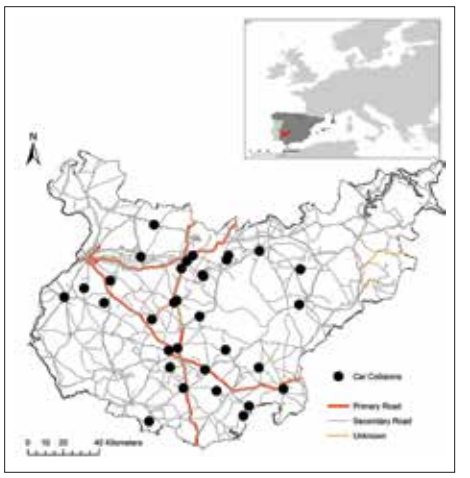
For more information, contact Dra. María Jesús Muñoz Reoyo, head, Group of Epidemiology and Environmental Health (e-mail: reoyo@inia.es), and Dra. Irene Iglesias Martín, GIS specialist and wildlife veterinary epidemiologist (e-mail: irene_iglesias@yahoo.es and iglesias@inia.es). For information about CISA-INIA, visit **www.inia.es/IniaPortal/goUrlDinamica.action?url=http://wwwsp.inia.es/en-us/Investigacion/centros/cisa**.



The different protected areas of the Spanish province of Badajoz and where the Wildlife Rescue Center AMUS is located.



Agricultural land uses associated with cases of owls entangled on barbed wire fences.



Owls affected by vehicle collision in the Spanish province of Badajoz.

For information about WRC's AMUS, visit **www.amus.org.es/index.php?lang=en**. Part of this work was financially supported by Foundation MAPFRE.

Geoenabling Marine Water Quality Monitoring in Abu Dhabi

Highlights

- GIS classification enables the public to distinguish marine water safety on color-coded maps.
- Marine water quality of various areas in the Emirate of Abu Dhabi can be viewed by anybody.
- Building EAD Enviroportal on Esri Geoportal Server enables future management, analysis, and dissemination of data through maps.

Although *Abu Dhabi* in Arabic means the *father of deer*, deer are not the only species Abu Dhabi is famous for. The capital city and largest emirate of the United Arab Emirates (UAE) hosts a stunning variety of habitats that support a vast array of species. Its rich marine habitats are home to endangered species, such as hawksbill and green turtles, four globally threatened shark species, and three threatened ray species. It is also home to the world's second-largest population of dugongs, said to be the mammal behind the famous mermaid legend. Such a unique environment calls for dedicated attention. Therefore, Environment Agency—Abu Dhabi (EAD) was established in 1996, aiming to preserve and conserve this unique biodiversity and provide a clean and healthy environment for all.

EAD's mission revolves around safeguarding environmental sustainability, preserving the environment, and ensuring that the realization of Abu Dhabi's economic vision is aligned with the protection of its natural heritage. Having the right information at the right time is critical in achieving these objectives.

With the unprecedented economic development and associated socioeconomic changes in Abu Dhabi, certain negative impact on the marine and coastal environment was expected. This eminent risk brought forward a need for a comprehensive long-term marine water quality monitoring program. Under this program, marine water quality is monitored on sites in close proximity to public beaches, harbors, industrial areas, disposal sites and sewage outlets, desalination plants, and dredged channels. EAD had a need to manage the data and make it available to its stakeholders, including decision makers, specialists, academia, and the public. It is against this backdrop that EAD decided to develop a Marine Water Quality application using its existing Enviroportal platform to manage, analyze, and disseminate relevant data in the form of maps, charts, and reports. The application was also expected to replace the existing paper-based sample management with an electronic workflow.

After responding to a request for proposal, Esri Northeast Africa was awarded the project to develop the geospatial solution with Esri Geoportal Server, building on the Enviroportal, which is linked to EAD's Environmental Database (EDB) that hosts more than 140 data layers across various environmental themes. The Marine Water Quality system, built on the ArcGIS platform, leverages the different data analysis tools to present data and information as multiple map layers depicting marine water quality of various areas in the Emirate of Abu Dhabi. The system has the ability to manage the entire life cycle of samples, including data analysis and, more importantly, dissemination.

Marine Water Quality Dissemination

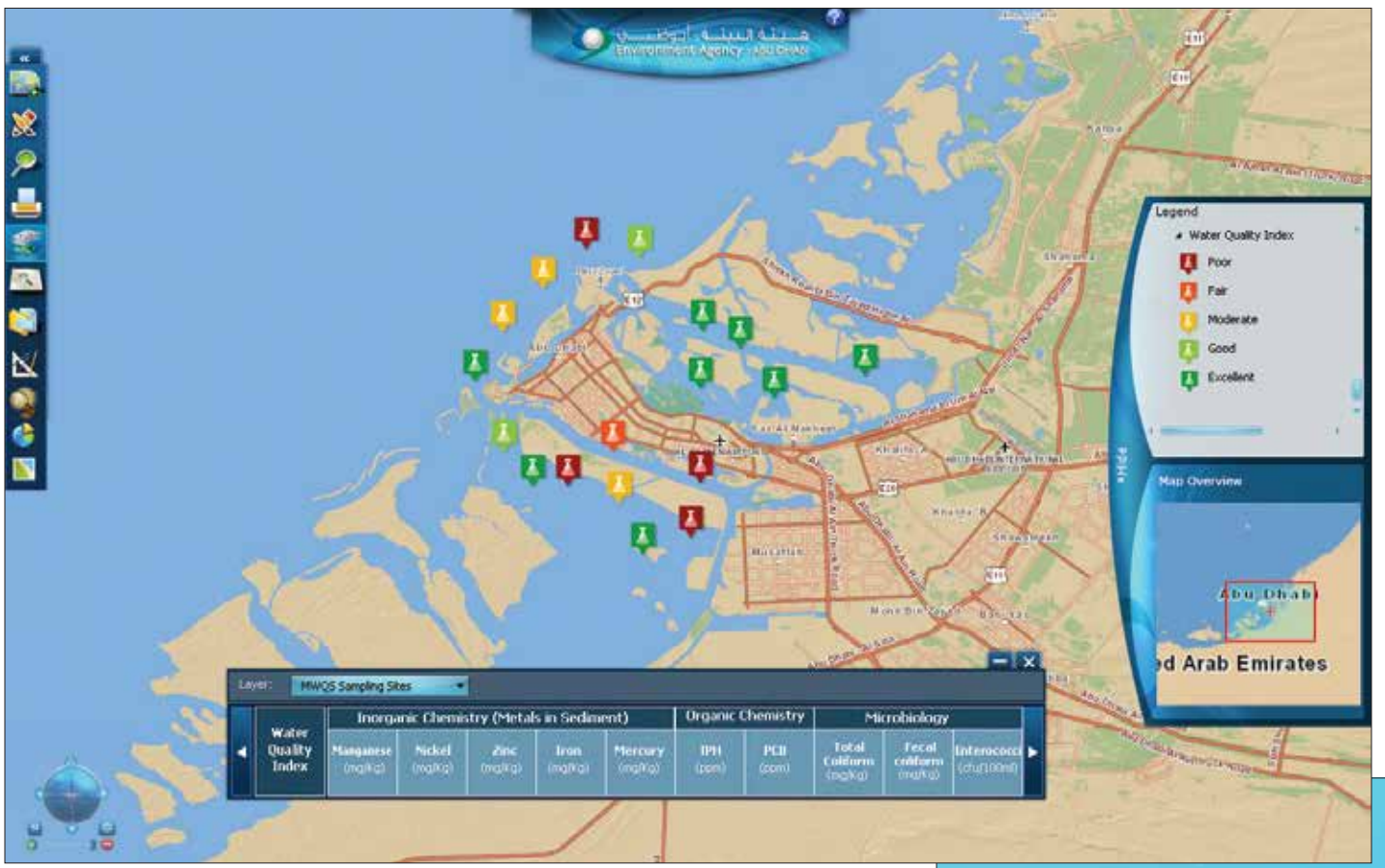
The system tools enable informative mapping of the local marine environment. Using the classification capabilities of ArcGIS, the quality of marine water is represented through symbols that allow visual differentiation, enabling scientists to easily view the parameters that are exceeding their safe limits, along with their degree of exceedance. The public, on the other hand, can easily differentiate safe from threatening water quality in public beaches by a color-coded representation of marine water quality index (MWQI) on the map. The MWQI is automatically calculated by the system according to international standards and best practices.

Says Anil Kumar, director, Environment Information Management Division, EAD, "Providing such easily understood indication of water quality does not merely feed beach visitors' interest in the safety of beaches they might visit, but it gradually builds the relation between the public and the environment."

Policy makers can easily understand marine conditions through reports equipped with charts, statistics, summary tables, and maps. They can get immediate access to the updated data on exceeding parameters, complete sample details, parameter variation trends, and annual summary of marine water quality status.

"The direct integration between these reports and the water quality published at the end of a sample workflow guarantees accurate and immediate follow-up on water quality management and supports EAD's long-term marine water quality monitoring program," says Kumar.

Parameter variations over time are made available through intuitive, multilevel, customizable charts. Beach visitors interested in tracking marine quality over the past years, months, or even weeks, as well as scientists keen on observing parameter variation, can review and compare the quality of one or more parameters at one or more sites as an average annual value, decomposed into monthly values or even weekly values for detailed investigation. The Marine Water Quality system has helped EAD in managing the entire life cycle of the marine water quality sample right from the collection of samples to analysis and eventually dissemination in an efficient manner. It also assists EAD and its stakeholders in making better-informed decisions and increasing awareness on issues related to marine water quality.



Above: The interactive map presents the marine water quality index for sampling sites in the Persian Gulf water of Abu Dhabi.

Sample Life Cycle Automation

The system's workflow automation enabled the direct update of sample test results to the EDB from authorized labs using standardized templates carefully designed to accommodate all required sample details. The system supports two types of users: data entry operators and supervisors. The data review and validation by the supervisor has been automated by cross-checking parameters against configurable thresholds. The supervisor's decision is supported by an array of controls that enable a bidirectional workflow of acceptance or different types of rejection (Resample, Retest, Reject). The information management team controls the dissemination of sample test results according to a targeted audience (internal publishing to EAD users or publishing online to the public) and geography (one sampling site or all sampling sites in one area).

"The sample workflow," says Kumar, "especially the review period, has been slashed significantly. Our staff are now able to focus on more valuable work."

Marine Water Quality Data Analysis

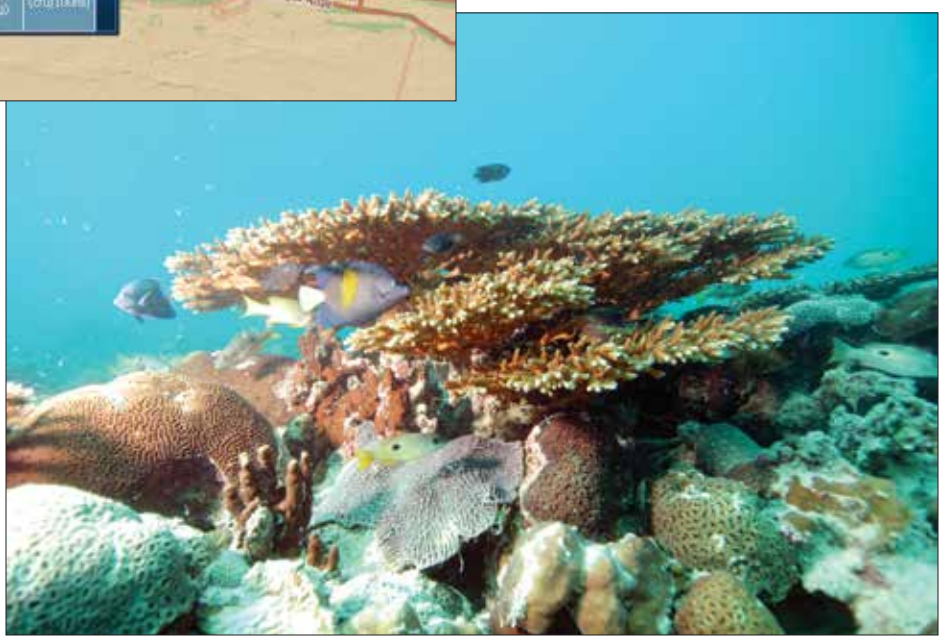
Technical users are able to identify threshold-violating samples through instantaneous color scheme and timely automatic alerts on the map.

"The presentation of the violating sample on the map not only draws attention to the violation," continues Kumar, "but also enables the user to relate the risk to the neighboring environment by manipulating the different environment map layers."

Managers can identify workflow areas of deficiency by dynamic reporting of sampling volume in different workflow phases and at different roles, per a department, an area, or even a sampling site, through a statistical infograph.

"The integration of such a performance management tool extends the value of the system's contribution to the overall marine water quality program as it provides a means of generating insights on continuous improvement by detecting potentially flawed workflow activities," concludes Kumar.

For more information, contact Anil Kumar, TP, director, Environment Information Management Division, EAD (e-mail: akumar@ead.ae, web: **enviroportal.ead.ae/mapviewer/Default.aspx** and **www.ead.ae**), or Nahla El Banhawy, Esri Northeast Africa (e-mail: Nahla.ElBanhawy@esrinea.com).



Below: Ras Ghanada, the largest coral reef in the UAE and the Gulf region, supports a flourishing marine life, including turtles, dugongs, sea snakes, and clownfish. (Credit: Edwin Grandcourt, ©EAD.)

GIS Streamlines Insurance Claims Adjustment

Highlights

- With GIS, PLRB has realized its goal of providing member services on the go via smartphones and tablets.
- Members can combine their own policyholder data with visualization of other member portfolios.
- Members can analyze historical perils, such as tornadoes, floods, and severe storms, stretching back to 1950.

The Catastrophe Services division of the Property & Liability Resource Bureau (PLRB), a trade association for the insurance industry located in Downers Grove, Illinois, provides its members, which are insurance companies, with access to educational and technical support resources that help improve productivity in the claims adjustment process.

PLRB staff answer critical questions about where policyholders are located, how loss might aggregate, and how exposure is quantified for severe weather events, such as tornadoes, high winds, and hail. Other natural and man-made sources of potential loss, including hazmat releases, terrorism, floods, and wildfires, also are discovered and analyzed.

"Supporting our members' needs is central to PLRB's mission," says Hugh Strawn, vice president of Catastrophe Services, PLRB.

One of the most frequent and high-priority member requests has been for a comprehensive tool to visualize, analyze, and quantify portfolio risk and compare that risk to current, past, and future peril data. Members also identified how the latest imagery from impacted regions would allow them to instantly compare situations before and after an event. Finally, members wanted an intuitive way to collaborate and share information with key stakeholders in their organizations that enabled them to quickly and easily tell the stories they needed to convey.

While PLRB was looking for both a partner and a base solution that could be configured and customized to its business process and practices, Esri Gold Tier Partner GeoDecisions (Camp Hill, Pennsylvania) was recommended due to its record of building applications based on ArcGIS for Server. GeoDecisions created a solution for PLRB called PLRB Map on the ArcGIS platform. From the beginning, PLRB Map was designed to be accessible via traditional desktop web browsers and mobile devices. This ensures that members get the information they need anywhere, whether in the office or in the field. It also simplified the needs for sharing and accessing information by requiring members to log in on approved devices that are connected to PLRB's secure servers.

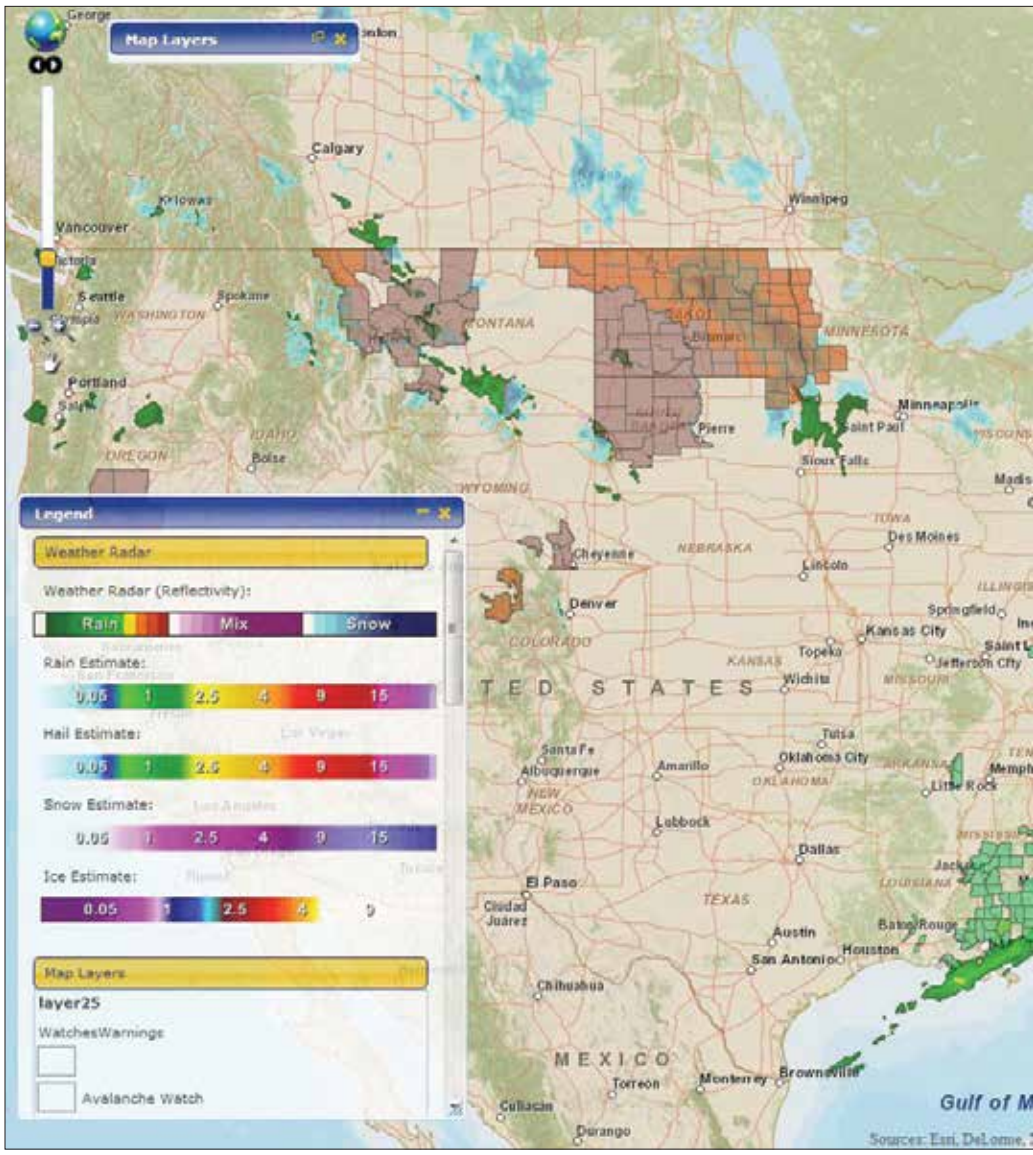
This solution houses data securely and internally at the association's headquarters while still providing member access to external data sources and important real-time information. It is easily customized and can expand to ensure future needs and scalability are fulfilled.

Gathering Data, Building Insight

Says Strawn, "PLRB needs constant performance and data access, independent of the number of members using the application, even during the biggest event or when teams of adjusters are deployed in the field."

To support its visualization and analysis needs, the project team identified and gained access to a wealth of rich and varied event- and insurance-focused data. PLRB Map provides access to current and historic weather and cartographic data, sourced from both public and commercial domains.

Meteorological events play a large part in catastrophe modeling, so PLRB uses its solution to deliver real-time radar reflectivity, including detailed patterns of precipitation falling at the present time, as well as future precipitation estimates for national-level forecasts of rain, hail, snow, and ice based on different time periods. The solution also tracks curated wind conditions, a highly specialized service that includes current wind conditions. Should a severe event occur, such as a tornado or microcell, PLRB members can use PLRB Map to retrieve a geographic representation of the intense rotational and wind conditions.



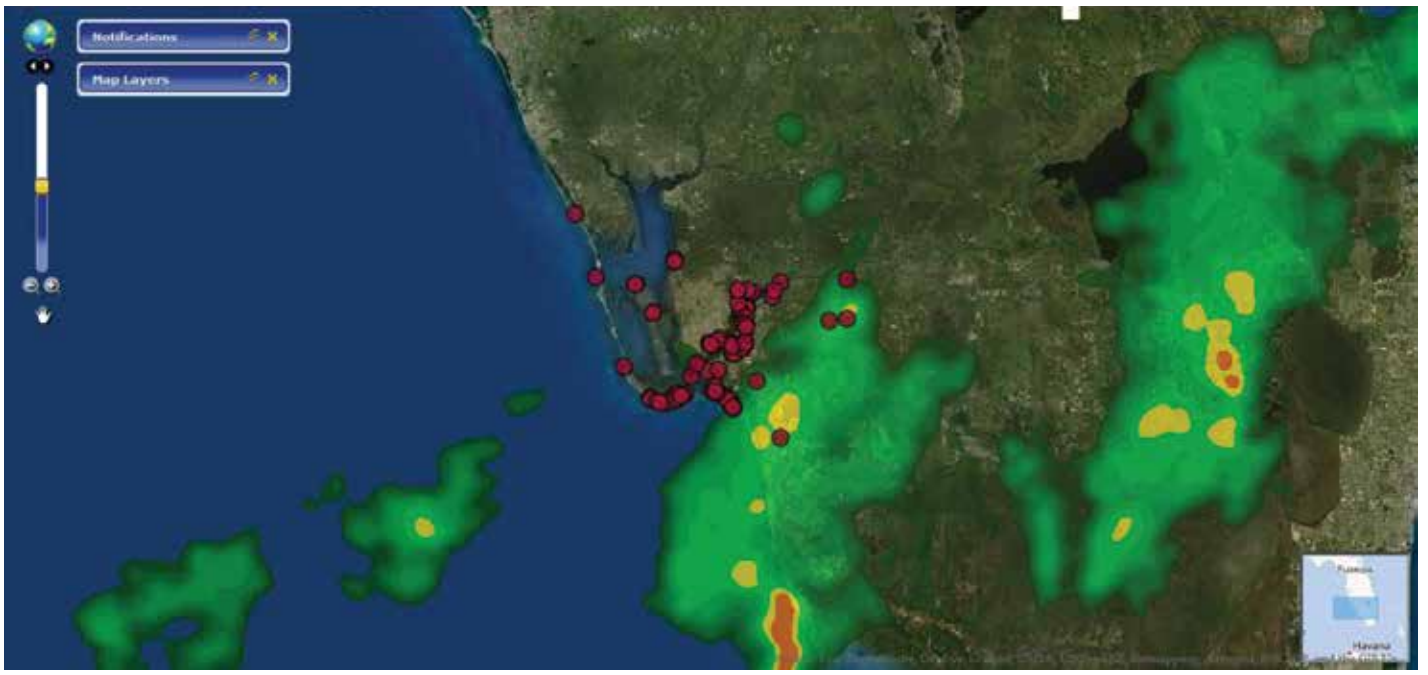
PLRB Map delivers real-time radar reflectivity, including detailed patterns of precipitation falling at the present time, as well as future precipitation estimates for national-level forecasts of rain, hail, snow, and ice based on different time periods.

Analysis in North America wouldn't be complete without detailed information on tropical weather—which drives many incidents in the Gulf and East Coast—such as authoritative real-time and historic data from the National Hurricane Center, including areas that are under tropical storm watch or warning, hurricane track points, lines, and the "cone of uncertainty," as well as storm surge projections.

"These can all be used to predict future extent and location, especially when used together with wind speeds and hurricane category overlaid with labels and the 72- and 120-hour forecast periods," says Strawn.

Members also can search for and analyze historical perils, such as tornadoes, floods, and

severe storms, some of which are contained in an archive stretching back to 1950. The historic overlay and insight allow users to gain perspective on long-term risks and trends. Any of these layers can be displayed against multiple basemaps, including streets, satellite imagery, topographic details, and landscape and hybrid maps. Premium DigitalGlobe satellite imagery is provided to members for postevent analysis. Available within 24 hours after a catastrophe event, users can log in and get an aerial overview of an affected area, which can be compared against the portfolio or any of the other PLRB datasets.



Adjusters can easily view their own policyholder data and combine this with visualizations of other member portfolios, as well as catastrophe events.

Answers—Anywhere, Anytime

In early 2013, PLRB realized its goal of adapting GIS to provide member services on the go via smartphones and tablets. An adaptive, mobile-specific version of PLRB Maps delivers simple, responsive access to the application for field operations, particularly in claims adjustment situations. Adjusters inspecting claim reports at specific locations can use their in-device GPS or address search to quickly access, summarize, and visualize any of the map data to help verify claims. For example, an adjuster dealing with hail damage can generate a list of all hail or any other peril reported nearby, which they can then overlay on the map or satellite imagery. Sharing the information and map views is built into the application, so colleagues receive valuable reports via e-mail without the need to use other plug-ins or installations.

Perhaps the most significant benefit provided by PLRB Map is the ability for member organizations to leverage analysis of their own policyholder data and combine this with visualization of other member portfolios relative to catastrophe data or events. By providing secure, temporary access to commonly held data, PLRB members can visualize and analyze risk specific to each member's portfolio. Catastrophe managers are able to make strategic decisions about the risk and impact on their portfolio days in advance of upcoming events by using forecasts and other data services.

Other advantages include the ability to identify areas with high rotational wind probability, often a precursor to tornado events, within minutes of an occurrence.

"Typically, there is a 24- to 48-hour period between the event and ground-verified damage assessment," says Strawn. "Members can now quickly assess potential paths and impact against different portfolios and make plans to respond to potential and actual damage."

Assessing lightning strike probability for any location and date also is an advantage. PLRB Map users can generate indicative statistics on the probability that a cloud-to-ground lightning strike occurred.

"The ability to do this enables the claims departments to more easily assess the veracity of any claim," says Strawn.

Investigating a particular claim or pattern of claims based on historical weather events is another advantage. By using a date range, the type of hazard(s), and a specific location, the solution will map or list the events so that further investigation, exploration, or analysis can be performed.

It provides tools that leverage the full depth and richness of policyholder address data. Rather than work on a single address or event region, the system lets users map, identify, and understand the patterns and probabilities for each and every policy in the area. These probabilities can even be appended to the data for use outside the app in any popular spreadsheet format, which can later be used in other tasks.

PLRB ensures the privacy and security of its members' policyholder records and has designed the application accordingly.

For more information, contact Hugh Strawn, vice president, Catastrophe Services, Property & Liability Resource Bureau (e-mail: hstrawn@plrb.org, tel.: 630-724-2230), and Brian Smith, director, Commercial Solutions, GeoDecisions (e-mail: bjsmith@geodecisions.com).

CDC Aims at Reducing Annual Heart Disease- and Stroke-Related Deaths in the US by 200,000

The New Interactive Atlas Uses GIS Throughout, from Data to Presentation

By Rachel Ankersen

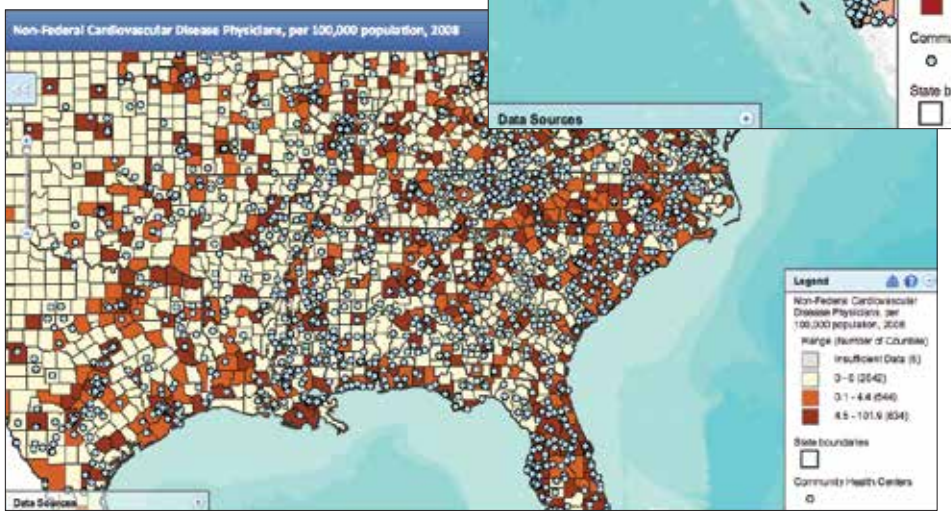
Highlights

- Built with ArcGIS, the *Interactive Atlas of Heart Disease and Stroke* offers a clearer picture of where cardiovascular disease is prevalent.
- The GIS-based application works for users with all levels of knowledge of either geography or cardiovascular disease.
- Insights from the interactive atlas help tailor resources to the needs of specific geographic areas.

Does whether you have a heart attack or stroke have more to do with your ZIP code than your genetic code?

The *Interactive Atlas of Heart Disease and Stroke* application (**nccd.cdc.gov/DHDSPAtlas**) built for the Centers for Disease Control and Prevention (CDC) could help answer this question and others related to cardiovascular conditions.

Cardiovascular disease, including heart attacks and strokes, is the leading cause of death each year in the United States for both men and women. According to a report recently released by the CDC, more than 800,000 people die from cardiovascular disease each year—that's one in every three deaths. Many of these deaths, especially those of people under age 75, could be prevented.



This shows a US map with county data of nonfederal cardiovascular disease physicians per 100,000 population between 2008 and 2010.

The report says that cardiovascular disease deaths among those younger than age 75 vary by geography. Rates of preventable death from cardiovascular disease were the highest in the South. To view and analyze this data more closely, the CDC knew that a GIS component was necessary. Through a competitive quotation process, it chose Esri Platinum Tier Partner Geographic Information Services, Inc. (GISi), headquartered in Birmingham, Alabama. Together they built the interactive atlas application using the Esri ArcGIS platform. Information about cardiovascular health can be viewed and queried on a map.

The CDC developed the atlas to give US residents and public health officials at the state, county, and local levels the tools they need to investigate where high rates of heart disease and stroke exist and who is mainly at risk. This is particularly important because the CDC report found that as many as 200,000 deaths that were attributed to cardiovascular disease could have been prevented.

"Too many lives are being cut short due to heart disease and stroke," says Linda Schieb, an epidemiologist at the CDC and lead author of the report. "Many of these deaths could be prevented by improving health care systems, creating healthy places to live and play, and supporting healthy lifestyle choices."

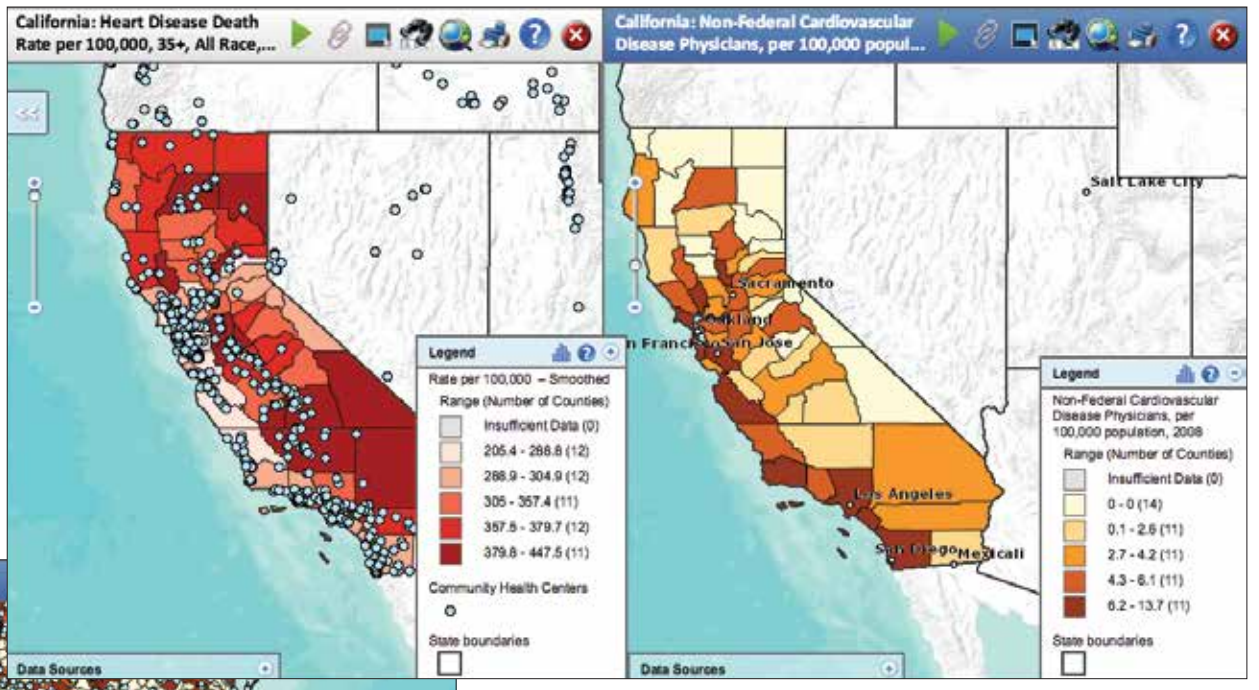
The hope is that by providing this data in an easy-to-use format—through a map that can be explored—it will be clearer to see where cardiovascular disease is more prevalent and which population groups are at high risk for problems such as hypertension, coronary heart disease, acute myocardial infarction (heart attack), heart failure, and ischemic or hemorrhagic stroke. The overarching goal? To help doctors, health administrators, and public health officials, as well as the general public, better focus preventive education and programs in these areas.

"We are quite proud of the work we have done with the CDC team," says Dan Levine, chief technology officer and federal program manager for GISi. "Not only are we helping make this data widely available and understandable by using the mapping medium, we have also simplified the back-end administration so that the CDC scientists can manage the site themselves by adding new data, changing map content and display, and adding user tips and tricks."

Flexing Health Data

Built using Esri ArcGIS for Server and ArcGIS API for Flex, the atlas provides a map-based view of where cardiovascular disease is occurring. The data comes from the United States Census Bureau, the National Center for Health Statistics, the Centers for Medicare and Medicaid Services, and other sources and is stored in Microsoft SQL Server. Geospatial data includes state and county boundaries; roads and streets; health care centers and hospitals; and retail outlets, such as grocery and convenience stores and fast-food restaurants.

To start using the atlas, select a geographic area to view, either at the state or county level. Next, choose a health indicator from a list of different types of heart and coronary diseases and strokes or preventable/avoidable death. Then select an outcome from the indicator: mortality, hospitalizations, or hospital discharge status.



With the side-by-side map view, users can easily view two geographic areas on the map for the purpose of comparison.

Apply sociodemographic filters, including race or ethnicity, such as all race, white (non-Hispanic), black (non-Hispanic), Hispanic, American Indian and Alaskan Native, or Asian and Pacific Islander; gender; age; and a time period, such as 2005–2007, 2006–2008, 2007–2009, and 2008–2010. Age ranges to select from include all, 35 and older, 65 and older, and premature. Premature deaths are defined as deaths of people aged 75 years or less.

Other options that can be selected to visualize on a map include determinants of health and health services and aspects of the community that may affect health, such as poverty, education, or the percent of the population aged 65 or older. Health services include the number and location of hospitals with services related to cardiovascular disease and the number of pharmacies in a county.

Mapping the State of Heart Health

Here's an example of how the application works. Perhaps you want to find out the death rate for all heart disease by state in the United States. You can view a national map and select the death rate for all heart disease for both men and women of all races, 35 years of age. The map shows that the death rate is highest in the Southern states of Arkansas, Oklahoma, Louisiana, Mississippi, Alabama, Tennessee, Kentucky, and West Virginia. But check out states like New York, too, where the death rate also is high.

Now look more closely at the same data but focus on counties in the state of Oregon. Yamhill, Washington, and Clackamas Counties—all located near the major metropolitan area of Portland, Oregon, in the northwest corner of the state—have a low death rate from heart disease. On the other hand, Harney and Malheur Counties—located in the opposite corner of the state from Portland, in southeastern Oregon—have some of the highest death rates in the state. Is there a reason for these variations in death rates from heart disease? This atlas can display different variables so that users can explore these types of questions.

One way to compare data between two different locations is to split the screen into two maps. With a push of a button, you can view different factors, such as heart disease mortality and a determinant of health such as a social environment, race/ethnicity, or physical environmental factors. For example, a map of Oregon counties and death rates from heart disease can be viewed next to a map of Oregon counties and the percentage of people living in poverty for all ages. It appears that the counties that have the lowest percentage of deaths from heart disease also have the lowest percentage of people living in poverty. Is there a correlation? The atlas helps people to find out if there is a possible relationship between health indicators and other characteristics in the community.

Give Your Neighborhood a Health Check

After selecting health information, that information can be overlaid with major highways, large cities, congressional districts, hospital referral regions, and state boundaries. This map can be viewed again at a later time, including setting the national map to a predefined location for easier viewing.

Clicking the Maps Over Time button provides an animated time series for the map so users can view the change in data over time for three-year periods from 2005 to 2010. The change in data can be viewed for a quick, holistic understanding of how disease and disease factors have changed in certain areas. And when you are finished, you can print a report directly from the map.

Global Access and Recognition

People in all 50 states and more than 100 countries have used the *Interactive Atlas of Heart Disease and Stroke* application since January 2013. With this innovative application, the CDC garnered Esri's 2013 Special Achievement in GIS Award at the Esri International User Conference in San Diego, California, July 2013.

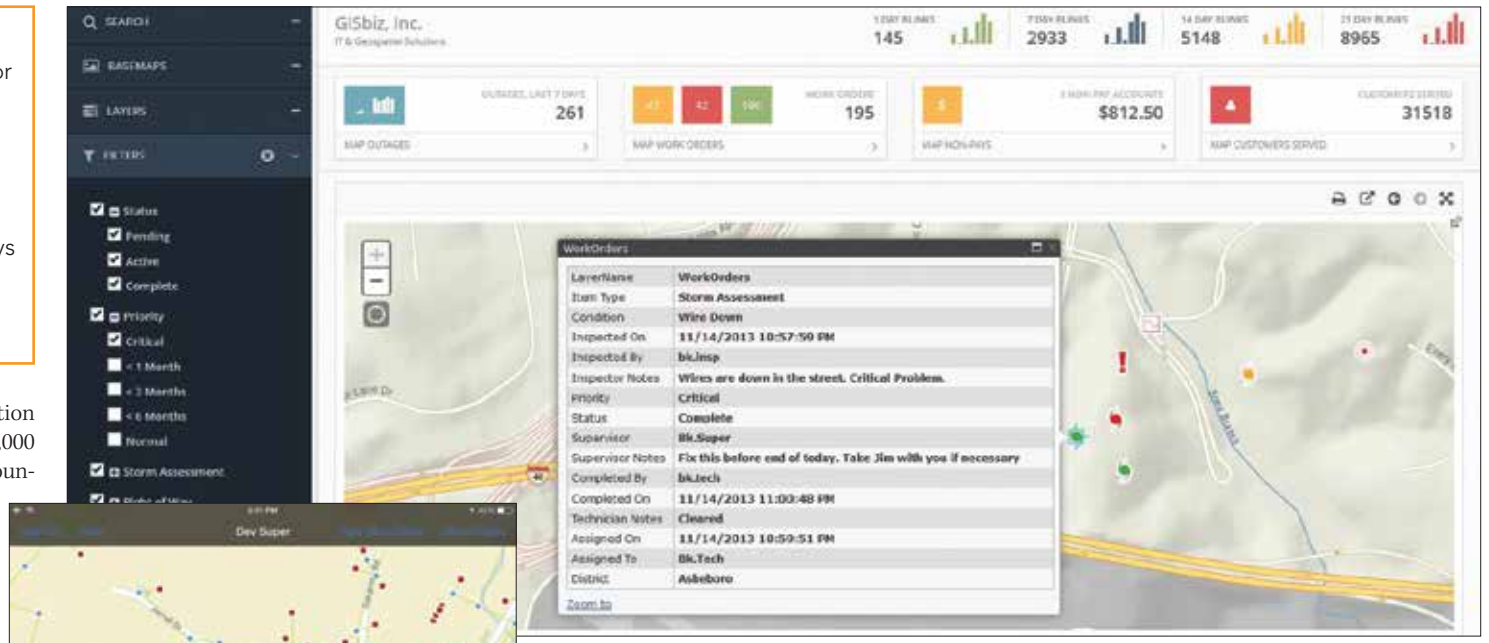
For more information, contact Linda Schieb, CDC/ONDIEH/NCCDPHP (e-mail: lschieb@cdc.gov); Dan Levine, chief technology officer/federal program manager, GISi (e-mail: dlevine@gisinc.com); or Rachel Ankersen, marketing coordinator, GISi (e-mail: rankersen@gisinc.com), or visit **nccd.cdc.gov/DHDSPAtlas**.

Randolph EMC Integrates ArcGIS and iOS Technology for Field Inspections

By Robert Ealy, Brandon Fyffe, and Makensie Coslett

Highlights

- Randolph EMC's solution is built for Apple iOS devices and leverages ArcGIS for Server and its iOS SDK.
- The app keeps track of inspection reports being created in the field throughout the network.
- A web map dashboard app displays all work orders on a map with symbols and colors showing job types and status.



Above: Operation dashboard web application used for tracking the status of field applications in office. Left: Randolph's asset information as shown on a mobile device. Field inspections change from orange to red to green as they are unassigned, assigned, and completed.

Randolph Electric Membership Corporation (EMC) currently serves more than 31,000 consumer-members in the North Carolina counties of Randolph, Moore, Montgomery, Chatham, and Alamance. This service area covers more than 4,100 miles of lines through rolling hills, river valleys, and forestland located approximately at the geographic center of the state.

Randolph EMC performs routine inspections and storm assessments of its field assets. These inspections ensure safety and reliability of the network, thereby increasing customer satisfaction. Traditionally, these inspections were done using a paper-based system. Randolph's inspectors reported various issues by using paper documents, which were reviewed by supervisors and given to technicians who were responsible for fixing those issues. Randolph found it difficult to track the status of all the work orders that were initiated by the field inspections. It also wanted to reduce the time required to resolve any complaints from customers. So, it decided to seek a replacement for the legacy system that depended on paper documents, spreadsheets, e-mails, and telephone and radio calls with a modern solution that uses mobile devices.

Randolph EMC evaluated a few solutions and decided to implement geoOrganizer, developed by Esri Silver Tier Partner GISbiz of Nashville, Tennessee. This solution is built for Apple iOS devices and leverages ArcGIS technology.

Dennis Mabe, vice president of Engineering and Operations for Randolph EMC, says, "The main concern we were experiencing was that problems would get called in or written on paper. Maybe they'd get fixed, maybe not. There wasn't a record of it. But this new app resolves all this."

The implementation consisted of an iOS application that works on iPad/iPhone natively and a web GIS dashboard application. This solution enables Randolph EMC to keep track of inspection reports being created in the field and also which employee was creating, working on, or completing a field inspection throughout the Randolph EMC asset network. The solution leverages the latest capabilities of Esri's ArcGIS for Server and its iOS software developer kit (SDK), thereby supporting enterprise data integrations without compromising the usability of the solution.

"Having this application also helps us look up legacy information and re-create old problems and the resolution," says Mabe. "This is especially handy in training and resolving new problems based on old experiences."

GISbiz's geoOrganizer streamlines the communication between different groups of personnel involved in utility field operations. Randolph EMC organized its field staff into three groups, namely, field inspectors, supervisors, and technicians. The workflow starts with a field inspector who finds an asset that is in need of repair or maintenance. This could be anything from a broken pole to sagging power lines. Then the inspector takes notes and photos of the problem and assigns it a criticality level.

Because this is a native iOS application, one immediate solution is that all the documentation can be done with or without Internet connectivity (called "disconnected mode"). Once within range of a Wi-Fi or data network, the inspector simply taps a button to send the inspection report to the supervisor.

The supervisor can review the photos and notes and assign a technician in the area to address the problem. The technician gets notified of this assignment in real time. The application provides turn-by-turn driving directions to any of the inspection report locations that are documented. In addition, a web map dashboard application shows all these work orders on a map with easily identifiable symbols and colors indicating their job types and status. Once the technician completes the job, the supervisor gets notified immediately. The inspector and supervisor have the option to complete the work orders as well.

Mabe says, "With this mobile solution, everyone sees the asset that needs to be fixed, and a line superintendent can notify a nearby crew to fix it. It saves us a lot of time and money that were wasted trying to find things based on pole number and paper records."

Mabe continues, "Implementation of this mobile solution was very easy. Seventy percent of my linemen were already taking iPhones/iPads into the field, and they could use this app on those devices."

Using these tools, Randolph EMC was able to streamline the field inspection process, monitor operations effectively, and provide value to consumer-members.

About the Authors

Robert Ealy is a GIS analyst and geospatial consultant at GISbiz in Nashville, Tennessee. Brandon Fyffe and Makensie Coslett are business development managers at GISbiz.

For more information, contact Dennis Mabe, vice president of Engineering and Operations, Randolph EMC (e-mail: Dennis.Mabe@randolphemc.com), and Brandon Fyffe, business development, GISbiz (e-mail: Brandon.Fyffe@gisbiz.com).

Esri Technology Helps Colorado Ski Resort Conduct Searches

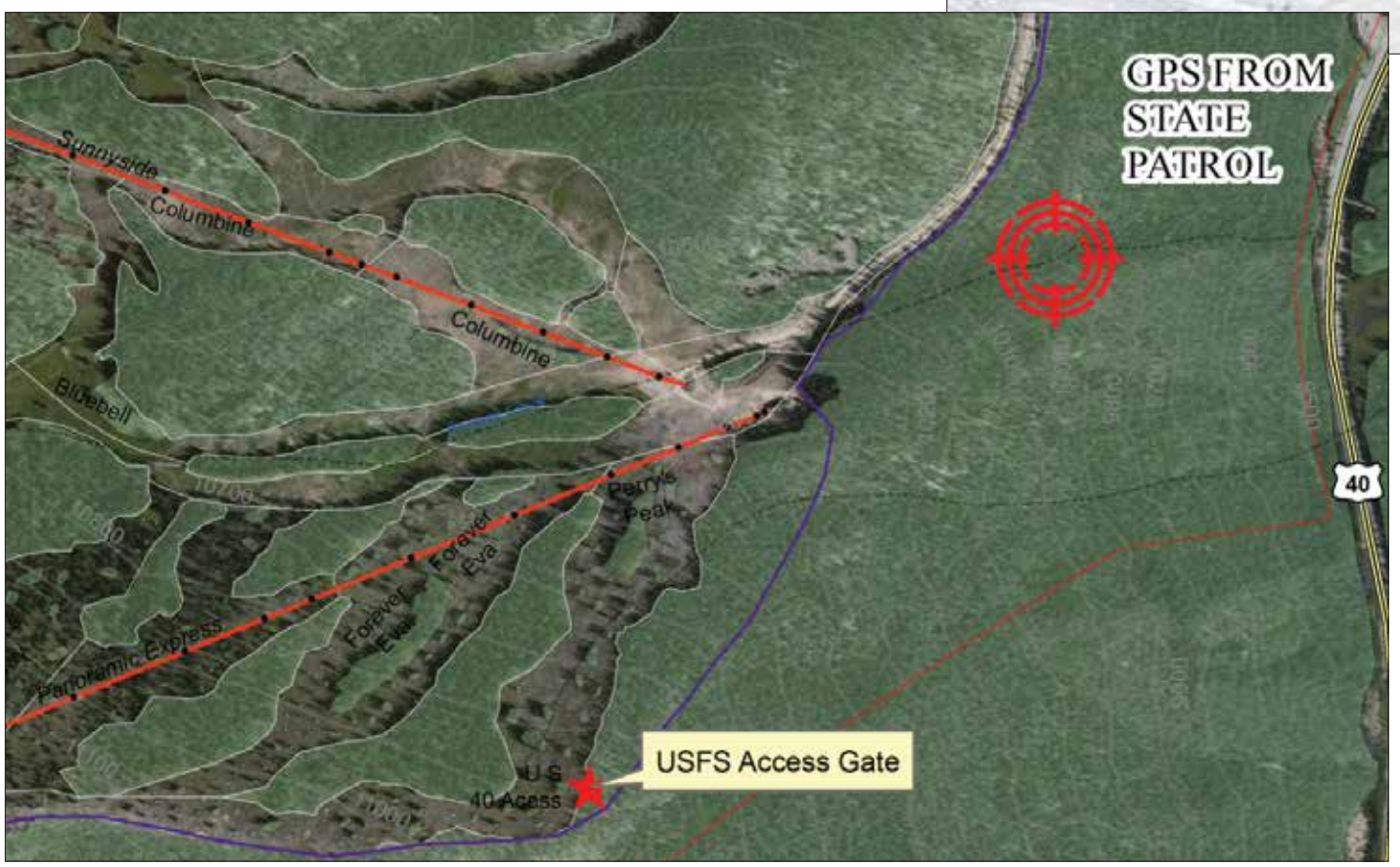
GIS to the Rescue

A frantic cell phone call from a snowboarder came into Colorado's Winter Park Ski Resort in the Rocky Mountains northwest of Denver at 4:00 p.m. on Valentine's Day, 2012. The 20-year-old man left the boundary of the ski resort and went into an area known as the side country—ungroomed terrain with deep powder, fallen trees, and other hazards. He was disoriented and uncertain of his location, so he called for help.

The first two ski patrol teams dispatched to find him came up empty-handed. The area he was lost in covered more than 250 acres, and with night looming and temperatures falling, time was of the essence.

While a larger-scale search was organized with 40 members of the Winter Park Professional Ski Patrol, Grand County law enforcement agencies ascertained the lost man's GPS location. Law enforcement officers determined the phone's latitude and longitude via GPS and then sent the coordinates to the GIS analysts at Winter Park. The snowboarder's location was then mapped using ArcGIS for Desktop software.

Once Winter Park staff members could see the area where the snowboarder was located on the map, Lloyd Lochridge, a GIS technician and ski patrol member at Winter Park, dispatched



Above: Ski patrol members carrying radios can be tracked using ArcGIS even while they patrol remote areas like the Cirque Territory. The Cirque gives expert skiers and snowboarders a challenging backcountry experience on ungroomed slopes.
Left: Esri ArcGIS Tracking Analyst software helped Winter Park Resort's staff monitor the whereabouts of the searchers who went to look for a lost snowboarder.

his rescue crew to the exact spot where the snowboarder was lost. By 6:30 p.m., the rescue team had found the snowboarder. The man was cold, but hypothermia hadn't set in, and he was healthy enough to be guided out under his own power instead of being airlifted. Lochridge continued to track his team's progress via ArcGIS Tracking Analyst software and lead them out of the area safely.

"Watching them move in real time on the map, I could tell them, 'head east and south, or you'll end up in the creek again,'" says Lochridge. "This is nasty terrain—downed timber and steep drops. Using GPS and GIS technology, we were able to find this man in only 25 minutes, instead of five or six hours. Lost in these types of conditions, this was truly a lifesaving situation."

Real-Time Tracking Makes the Slopes Safer

Ski patrol members literally operate in the dark: they are sent into woods wearing headlamps, with nothing more than radios for communication. Given the circumstances, even the savviest outdoorsmen might have trouble knowing where they are when they are on the slopes or in the woods.

Today the whereabouts of Winter Park employees, such as ski patrol members and trail groomers, are tracked through the resort's Motorola radio system. Signals from the vehicles' radios provide their locations, and these are mapped as dots in ArcGIS for Desktop using the ArcGIS Tracking Analyst extension. This improves operational safety, providing an up-to-date view of where members of the ski patrol members are located at any given time.

The dispatcher now can look at a map and watch in real time as patrol search teams deploy. The dispatcher can use the map to help guide the ski patrol members to various locations and ensure they return safely.

The ability to track the staff out on the mountainside has improved operations, especially during night searches for lost skiers and snowboarders. Being able to map the locations of either people being rescued or the team rescuing them has significantly reduced the amount of time spent on these operations.

"This is a reduction in manpower [of about] 150 percent," says Lochridge. "But most importantly, it means we can get to people more quickly and ensure they are brought off the mountain to safety."

Tracking helps during the daytime as well. If the resort is short-handed, the dispatcher can see what staff members are out in the field and guide them accordingly to make sure the mountain is adequately covered (ski patrol members do not find themselves bunched up in only one area of the resort) in case of an emergency.

Real-time tracking has helped the resort open up more of its extreme terrain to skiers and snowboarders. "This is very valuable information to us," saya Lochridge. "Not all [ski] patrol members are well acquainted with the newly opened areas. Tracking where ski patrol and resort visitors are means we can open up the area and ensure everyone's safety because the dispatcher can keep an eye on them."

For more information, contact Lloyd Lochridge (e-mail: LLochrid@winterparkresort.com).

Ski Resort's Trails Stay in Top Shape with GIS

Delivering an Alpine High

How does Winter Park, Colorado's longest continually running ski resort, keep more than 3,000 acres of skiable terrain groomed and ready for visitors each day? With GIS—and snowcats too, of course.

With ArcGIS software and the ArcGIS Tracking Analyst extension from Esri running on their computers, supervisors can track the 20 trail groomers and 20 snowmakers working each night. They can see which trails were groomed and which weren't before the resort opens daily. This is important information that will help visitors decide where they will ski and snowboard each day.

GIS helps trail groomers be more efficient. The locations of the snowcats can be viewed as lines on the map as they move along the mountain. Snowcat operators receive warnings via radio in real time if they are overlapping tracks or covering up previously groomed trails.

ArcGIS has also helped them train new grooming machine operators. Staff can pinpoint which trails were well groomed and use them as examples to teach new operators good trail-grooming techniques.

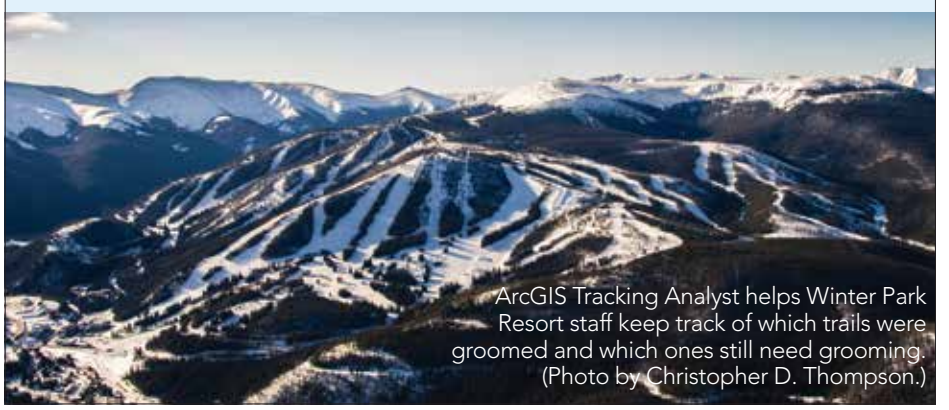
"Grooming is a big deal," said Lloyd Lochridge, the ski resort's GIS technician. "Sometimes plans change and groomers don't go where you think they did. If we tell the public the wrong information about the trails—whether you are looking for groomed or powder trails—everyone will be disappointed. We take great pride in being able to publish our maps each morning, confident that we will meet their expectations."

Best of all, supervisors can continue to monitor the operators at night from home using ArcGIS on their laptops. This ensures that the information is as up-to-date as possible and that any problems occurring during the night can be dealt with immediately.

At first, the thought of others keeping tabs on them in the field didn't sit well with some employees, especially the groomers.

"That's human nature, right?" said Lochridge. "But once they need help and you can give them real-time support because you know exactly where they are—like, 'Go left to dodge that cliff that is right in front of you'—feelings change. And it only takes one time. Safety is a good thing."

For more information, contact Lloyd Lochridge (e-mail: LLochrid@winterparkresort.com).



ArcGIS Tracking Analyst helps Winter Park Resort staff keep track of which trails were groomed and which ones still need grooming. (Photo by Christopher D. Thompson.)

Esri UC Offers Insights, Innovation, and the Chance to Come Together

United We Map!

Every summer in San Diego, the geospatial community unites for the Esri International User Conference (Esri UC). This year, Esri anticipates at least 15,000 attendees for Esri UC, to be held July 14–18. The event promises to spotlight 900 real-world projects, 300 technical workshops, and the world's largest Map Gallery.

Esri UC is a chance to meet and learn from thousands of people, including technology innovators and industry trendsetters, who share a passion for GIS. It's also a place to get started with GIS, get training, and get excited. Esri president Jack Dangermond unveils exciting new technology and shares his vision for the future. Esri partners and experts provide one-on-one assistance with specific solutions. Esri users from around the world share their experiences and challenges.

Jack Dangermond welcomes 15,000 geospatial professionals at the 2013 Esri International User Conference.

What's in Store at the 2014 Esri UC?

The ArcGIS Platform: Learn to use ArcGIS as a platform across your organization, where you can compile and manage geographic data, work with advanced maps, perform spatial analysis, and conduct GIS projects. At Esri UC, you will see how to use your network or the cloud to create and share useful maps and apps with end users. You will also find the latest web and mobile apps included in ArcGIS, ready-to-use geographic content, and GIS services designed to get you started quickly.

Web and Mobile Apps: Extend the reach of GIS while using existing enterprise workflows. See how to take advantage of mapping applications and developer-focused software developer kits (SDKs). These apps make it faster and easier for field and office staff to collaborate and get real-time information.

Open Data: Through a new open data initiative, Esri makes it easy for you to discover, explore, access, and share open data. You will learn how to make your data available to the public or find and improve data for your applications *(see cover story)*.

Big Data: Data, data, everywhere can become unruly. But when that big data is corralled and put to good use, it can drive better decisions for disaster relief, finance, government, natural resources, retail, utilities, and business. At Esri UC, you will learn GIS techniques to tame big data and put it to work.

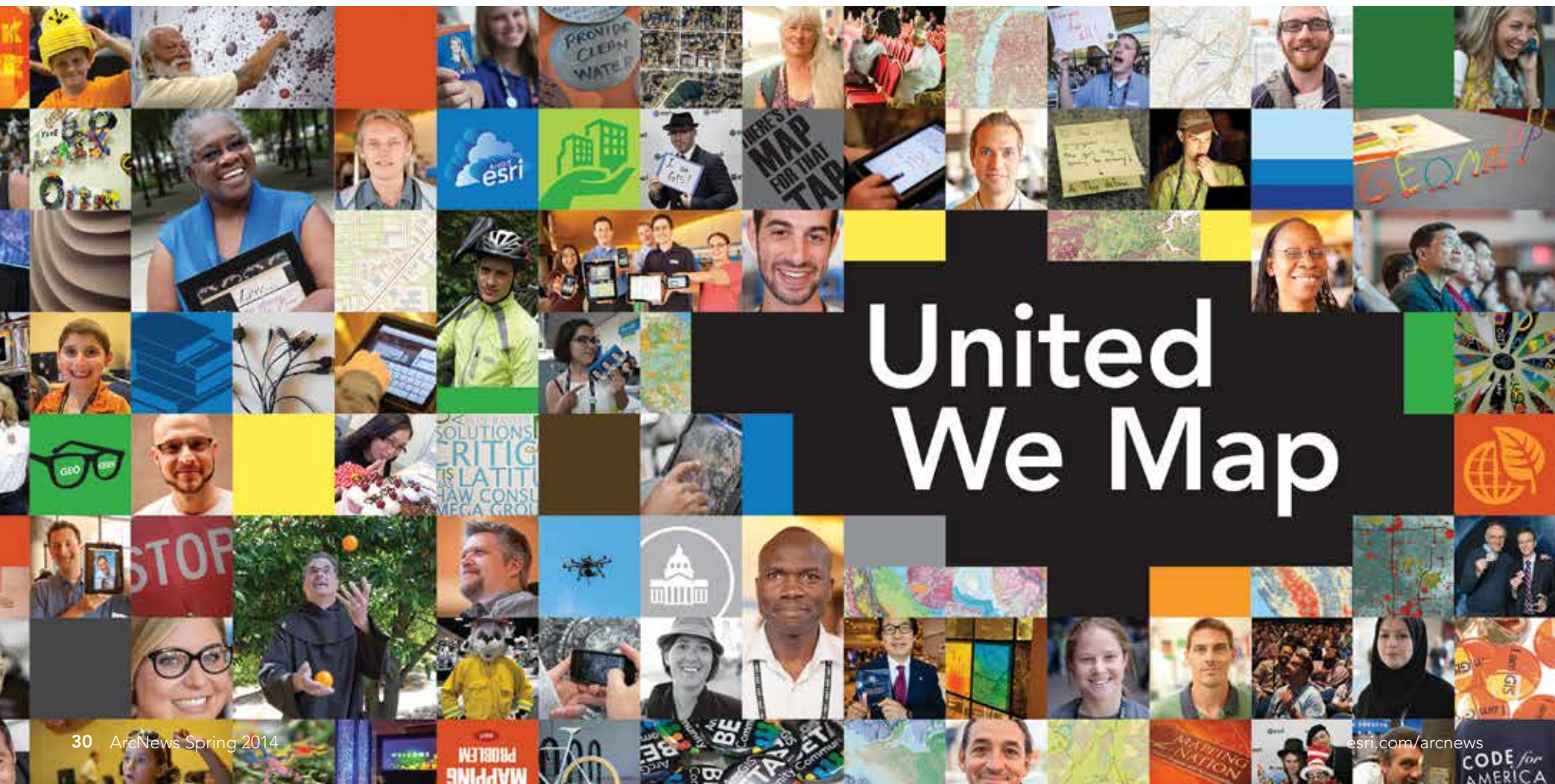
Real-Time GIS: New technologies are combining to enable real-time collection and sharing of data. At Esri UC, you will see how to connect with real-time data; how to get started with geofencing using the Esri Geotrigger Service; and how to deploy Operations Dashboard for ArcGIS, as well as the Collector for ArcGIS app. You can also expand into mapping social media data for insight into what people are saying and where they are saying it.

Location Analytics: Discover new patterns and answers to any business challenge and share those insights across your organization. Location analytics solutions enable you to inject mapping and location into existing IT, such as Microsoft Office, Microsoft SharePoint, IBM Cognos, SAP, Salesforce.com, or MicroStrategy. Or you can design a custom solution.

ArcGIS for Developers: Esri UC introduces developers to simple, configurable APIs and SDKs, as well as ready-to-use content and geospatial web services. Build apps as an internal developer in an ArcGIS organization, sell to existing ArcGIS organizations, or create apps for the community at large. Plus, there is the opportunity to meet and mingle with Esri's growing developer community.

Spatial Analysis: With spatial analysis services, you can analyze the data hosted in ArcGIS Online to answer such questions as, Where is the best location for a new school or retail store? or How many crimes have occurred within my city? Then, share those results with others in your organization or with the public. At Esri UC, you will hear the latest in ArcGIS Online, as well as tips and tricks for better spatial analysis.

Register for Esri UC today at **esri.com/uc**.



Esri Distributors in South Africa, Brazil, Croatia, and Kuwait to Host 2014 Regional UCs

From May to October, several thousand GIS users across the globe will be converging on Cape Town, São Paulo, Split, and Kuwait City—disparate points of the compass that share one huge distinction—all are venues for Esri's 2014 regional user conferences.

These annual forums of all things GIS are the biggest GIS technology exhibition, training, and networking events outside of the Esri International User Conference held in San Diego each year.

It doesn't matter if you're a novice GIS user or an experienced developer or analyst; attending a regional user conference will offer you opportunities to learn the latest technology from the best minds in the field, share your success stories with regional peers, and network with colleagues and exhibitors. You'll return home energized, inspired, and armed with new confidence, tools, and techniques that will help your organization maximize its leverage of GIS applications in pursuit of its goals.

Here are highlights of what is planned at this year's regional user conferences:

Esri Africa User Conference, Cape Town, South Africa

Excitement is mounting as the inaugural 2014 Esri Africa User Conference (AUC)—to be held May 6–8 in Cape Town, South Africa—draws near.

"This will be the first gathering of all Esri users in Africa along with leading Esri experts," says Esri South Africa marketing executive and organizing team member Lauren Sweidan. About 700 attendees are expected from key countries, including South Africa, Rwanda, Kenya, Ghana, Namibia, and Angola. Conference organizers anticipate that some sessions will be conducted in French.

Hands-on training will be a highlight of the conference as users take advantage of this opportunity to develop and build skills. Another highlight: this will be the first time many users will hear Esri founder and president Jack Dangermond speak, as well as other international guests, Sweidan says.

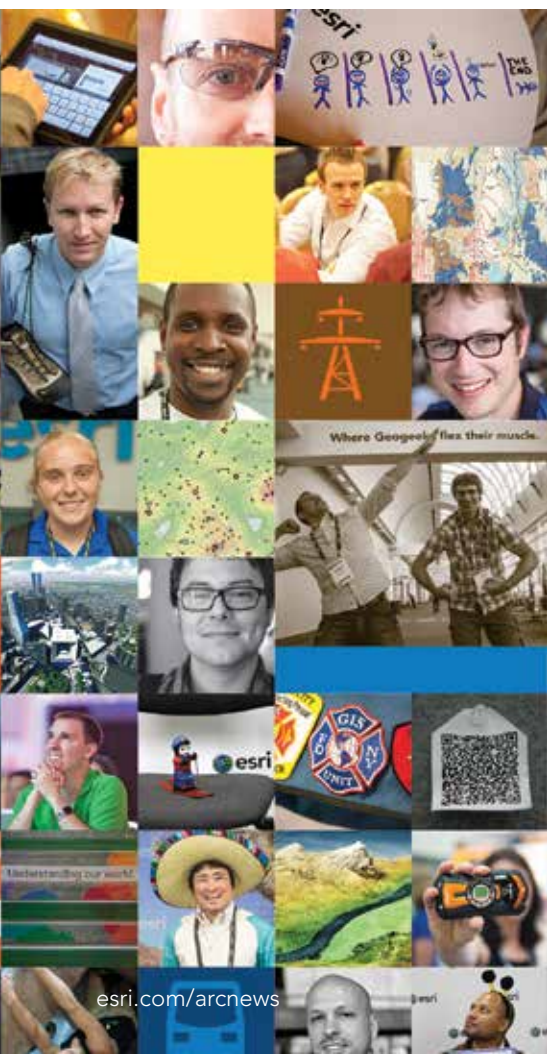
Paper sessions will allow the sharing of experiences, lessons learned, and best practices. But their biggest value will be to share challenges users face in similar environments, she says.

"Take this unique opportunity to share our story with other Esri users, so that all of Africa can benefit from your experiences," says Patrick McKivergan, managing director, Esri South Africa (Pty) Ltd. "This is an ideal time for knowledge transfer in Africa."

According to Sweidan, the EXPO area and Esri Showcase will provide an excellent opportunity for users to meet and exchange ideas in an informal setting. In addition to the many networking lounges, delegates will be able to relax and enjoy social functions to be held on Tuesday and Wednesday evening. With Table Mountain as a backdrop, delegates will enjoy magnificent views while meeting new faces.

"For the first time, users from diverse countries in Africa will be able to network," Sweidan says.

To register, visit **esri.com/events/auc/registration**.



Esri Latin America Conference, Campinas, São Paulo, Brazil

An infectious samba beat will welcome GIS users arriving at the Royal Palm Plaza in São Paulo, Brazil, site of the Esri Latin America User Conference (LAUC), to be held September 25–26.

Imagem Geosistemas e Comércio Ltda., Esri's official distributor in Brazil and the host, is expecting attendees from all over Latin America. In addition to Brazil, Colombia, Chile, Peru, Mexico, and Argentina will be well represented, says Imagem spokesperson Izabel Cristina Costa.

As the host city, São Paulo has major credentials, having become Brazil's economic powerhouse with an increasingly vibrant nightlife, food, and fashion scene. The 2014 World Cup to be held in June and the 2016 Olympics in Rio on the horizon will only heighten Brazil's appeal.

Notables scheduled to speak include Eneas Brum, Imagem's CEO; Leandro Rodriguez, manager, Esri in Latin America; Ismael Chivite, Esri ArcGIS for Server product manager; and Deilson Silva, Esri ArcGIS platform technical evangelist.

LAUC 2014 will have more than GIS technology, Costa says. "We will have people talking about the benefits of using the ArcGIS platform along with the main business tools in Latin America," she says. "It will be all about benefits."

Paper sessions, technical workshops, Lightning Talks, and user stories will give attendees many opportunities to share their work. The conference's main thrust will be on understanding the value of good applications focused on business challenges, she says.

"Latin America is going through a season of change," explains Costa. "Subjects such as sustainability, poverty reduction, quality of life, and economic growth are the most powerful instruments of this change."

Costa urged users to submit their paper abstracts: "Be the best of the best! Don't miss the opportunity to share your success with others in the GIS profession."

To register, visit **esri.com/events/latin-america/registration**.

Esri European User Conference, Split, Croatia

Nearly 1,000 GIS aficionados from across Europe have their sights set this fall on the beautiful and historic Mediterranean city of Split, Croatia, site of the 2014 Esri European User Conference (EUC).

GIS innovation and discovery will come together October 13–15 at the seaside Hotel Le Méridien Lav where attendees will spend three days learning directly from Esri staff, networking with GIS colleagues and exhibitors, and getting current on crucial industry issues.

"The hope is to blend this passion for learning about GIS technology advancements with 'a joy of life' and a wonderful Mediterranean setting for a remarkable conference," says Boran Loncaric, CEO of Esri official distributor GDi GISDATA LLC—the EUC host.

According to Loncaric, Croatia as host nation—along with nearby Slovenia, Hungary, Serbia, Bosnia, Herzegovina, Montenegro, Macedonia, and Albania—will provide the most participants. However, he expects many attendees from Italy, Austria, Germany, Sweden, Norway, UK, Spain, Greece, Poland, Russia, Turkey, and even the Middle East and Africa.

The key topic—technology platforms, whether on-premises or in the cloud—will be covered by leading presenters from Esri, he says.

The opening Plenary Session will feature Dangermond and European, Mediterranean, and regional keynote speakers, along with best practices demos. Users will hear about the latest industry trends and what to expect in coming years. An awards ceremony will honor top achievements in GIS technology, he says.

"The technical Plenary Session is always the highlight of the conference, as users expect a lot of new things on display related to the Esri platform," Loncaric says. "Because Esri staff is participating, this session shouldn't be missed and should be treated as a once-in-a-lifetime experience."

Expert round tables will feature moderated sessions with top experts. Paper sessions will offer a range of subjects, including some especially strong coastal and marine topics this year, such as solutions for regulating, tracking, and managing fisheries; navigation safety; coastal ecosystems; nature preservation versus tourism; and industry-and-port-driven coastal development.

Loncaric encourages registrants to submit their abstracts. "Come and show others the best way forward in using GIS technology and demonstrate your successes to all of Europe and the Mediterranean," he says.

Two evening parties will show off traditional Croatian hospitality, Loncaric says. One will be a real Mediterranean-style party on the beach of the Hotel Le Méridien Lav, with lots of festive music, fish, and Mediterranean food to help celebrate GDi's 25th anniversary. On the evening of the second conference day, guests will go into the historic city of Split itself to see almost 2,000 years of history and wonderful romantic settings. The main official social event will be held at the Croatian National Theater in Split, where a rich cultural program and dinner will take place.

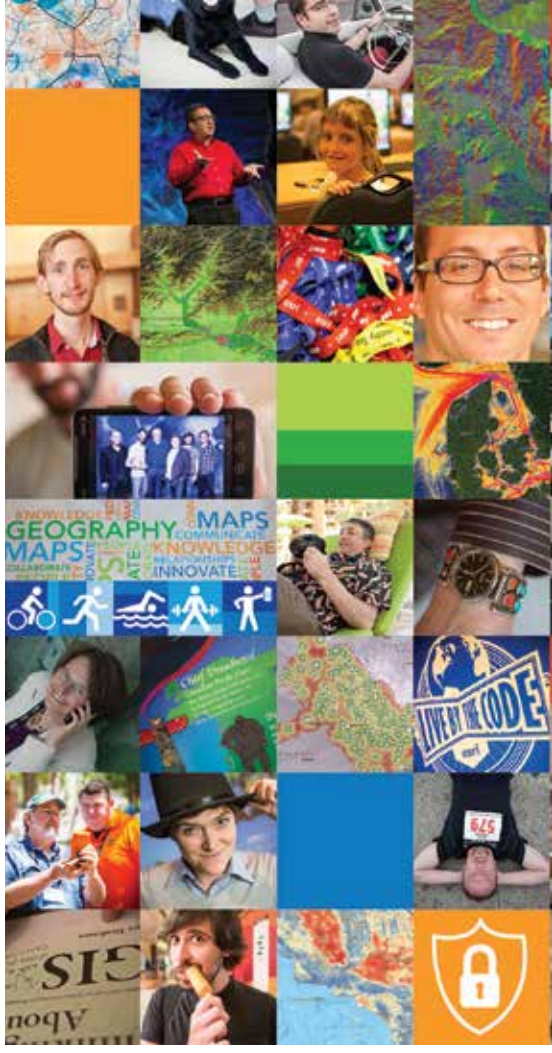
To register, visit **esri.com/euc**.

2014 Esri Middle East and Africa User Conference, Kuwait City, Kuwait

OpenWare Information Systems Consulting Company, Esri's official distributor in Kuwait, will host the 2014 Esri Middle East and Africa User Conference (MEAUC), to be held October 20–22, in Kuwait City.

GIS users from Kuwait, Saudi Arabia, United Arab Emirates, Qatar, and beyond will be there to learn firsthand about the latest advances in Esri technology; hear Dangermond share his vision about the future directions of GIS; strengthen their knowledge and skills; and connect with Esri product specialists and GIS professionals from the Middle East and around the world.

"Join us for the biggest GIS and Esri event in the region this year," says OpenWare general manager Eyad Arab. "Governments from the region will have an opportunity to exhibit GIS for their entire countries, highlighting their achievements in integrating GIS practice across multiple applications and industries."



Governments will show GIS applications in action for workers and decision makers, as well as the general public, with industry tracks and user group meetings for the region's wide spectrum of industry users.

"Please make sure you submit your abstract before the deadline [check the MEAUC website for updates] to get a chance to place your work and experience under the spotlight," Arab says.

To register, visit **esri.com/meauc**.

Mark Your Calendars for November 19—GIS Day 2014 Is Coming Up Fast

GISday

It's not too soon to start making plans for the 16th annual GIS Day, an international celebration of GIS technology and its ability to make a difference in our society.

Last year, more than 1,000 hosts registered GIS Day events, with more than 105,000 people attending celebrations in 98 countries worldwide—one of the biggest GIS Days ever.

GIS Day 2014—officially to be held November 19—traditionally takes place each year during the National Geographic Society-sponsored Geography Awareness Week.

Each year, GIS users invite guests to GIS workshops, tour map galleries, watch hands-on GIS technology demonstrations, learn about educational and career opportunities, hold rallies, and much more.

If you're interested in hosting an event, visit the GIS Day website (www.gisday.com) to register. You'll find plenty of free resources to help you put together a fun and successful celebration—logos, flyers, posters, postcards, PowerPoint presentations, web templates, desktop backgrounds, certificates of participation—plus giveaway items, including coloring pencils, magnets, and water bottles. In addition, there are free sets of age-appropriate activities to use during your GIS Day festivities, such as historical maps, geocaching, and e-books.

If you're looking for ideas and inspiration, check out these examples of successful events from last year:

Uherské Hradiště, Czech Republic

GIS Day was held at the Faculty of Logistics and Crisis Management in the city of Uherské Hradiště, a part of Tomas Bata University in nearby Zlin, Czech Republic.

The event was hosted in partnership with Uherské Hradiště and the city's Students Association, according to Dr. Jakub Trojan, deputy of the faculty's Department of Environmental Security.

"The most popular topics were about GIS innovations and teaching at universities, and GIS in the cloud," Trojan says. "The workshops were focused on work with ArcGIS Online and web map service data access. This kind of solution based on the cloud was very popular."

Lecturers came from the university, the city, and environmental nongovernmental organizations. "The morning focused on workshops and seminars for secondary school pupils, aged 17–19. About 160 students and their teachers were on hand. The afternoon was devoted to lectures for the public and regional government," he says.

Trojan says that special GIS Day activities included a large, high-resolution orthophoto of Uherské Hradiště by day, prepared by the city to display its new concept of spatial planning. A night scene allowed GIS Day participants to use their awareness of places in the city and create a mental perception map.

Arlington, Virginia, United States

Blue Raster, an Arlington, Virginia-based custom web applications developer and Esri Partner, celebrated GIS Day by inviting GIS students from Washington-Lee High School to spend the day. For the second year, Blue Raster has hosted the class, giving students insight into how GIS professionals are making a positive impact on the world and enriching people's lives.

Blue Raster developers invited the students to use Instagram to connect to other GIS Day celebrants around the world and created a GIS Day global map. Students immediately saw the future prospects of geospatial technology.

The Blue Raster development team shared real-world GIS success stories with a round of Lightning Talks about ongoing projects and then challenged the students' analytical skills with a geography challenge, says teacher Ryan Miller.

"We wrapped up with a talk about GIS careers and enjoyed some pizza and prizes. A great GIS Day," says Miller.

Lake County, Florida, United States

Lake County, Florida, organized several government departments, including GIS, Water Authority, Public Safety, and School Authority, to put on a GIS Day event for high, middle, and elementary schools in the county.

Left: The Czech Republic.
Bottom: Lake County, Florida.

"We feel that GIS Day is an excellent demonstration of how GIS users can get together and try to teach the next generation about the potential of GIS and cloud technology," says Brandon Barnett, GIS analyst at the Lake County Office of Information Technology.

Assisted by eight volunteers and armed with an assortment of knowledge ranging from how GIS is used in public safety to its use in maintaining tax data, the team showed students the variety of disciplines into which GIS can be integrated.

"We tried to specifically focus on ArcGIS Online, how students can create accounts for free, and how they can use these accounts to better document their life and *their* world," Barnett says.

Chicoutimi, Québec, Canada

The Centre de géomatique du Québec (CGQ), based in Chicoutimi, celebrated its 15th anniversary November 20, 2013, by hosting a GIS Day event at the Cegep de Chicoutimi, a French-language general and professional educational college. Sixty-eight people from universities, colleges, industries, and the general public attended to celebrate the company's evolution as a nonprofit organization. Its mission is to promote wider use of geomatics, also known as geoinformatics, in Québec's business world, says event organizer Karine Jean, a geomatic analyst with CGQ.

Geomatics involves the science and technology of gathering, analyzing, interpreting, distributing, and using geographic information. The field encompasses a wide range of disciplines, including surveying and mapping, remote sensing, GIS, and GPS.

"This was our fourth edition of GIS Day, and the most popular one of all," Jean says.

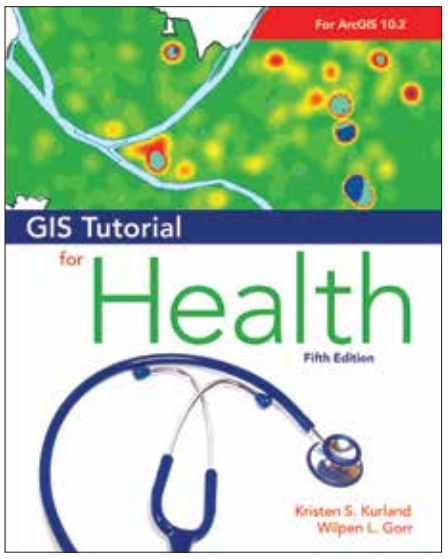
According to Jean, company staff were with participants at the college in the afternoon to discuss geomatic equipment and the kinds of projects it is possible to achieve. After 5:00 p.m., the public was invited for an evening of information and networking. On display were pieces of geomatic equipment dating from the 1940s through today.

"It was very interesting to see the evolution of this equipment over time," Jean says. "The civil engineering and forestry departments of the Cegep de Chicoutimi lent us some total stations used in surveying." Patrice Fradette, a former geomatic analyst at CGQ, and André Goderre, an informatics analyst at CGQ, spoke on the evolution of real-time monitoring over the past 15 years. The GIS Day event also included some project posters about research CGQ had conducted in recent years.

E-books from Esri Press—Coming to a Mobile Device Near You

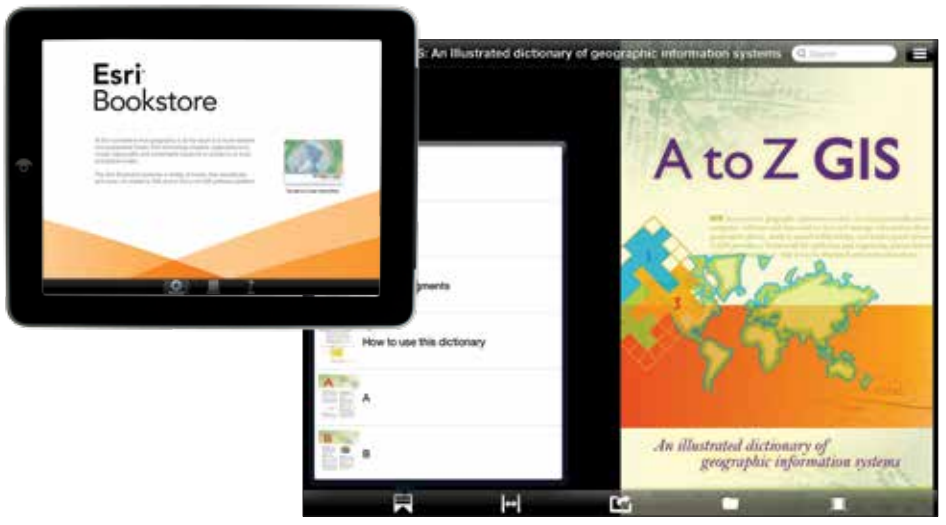
In 2014, you can look forward to reading many new books from Esri Press, and not just in paper- or hardback but in multiple digital formats, including ePUB; Kindle; and Esri's digital reader, the new Esri Bookstore app. With the Esri Bookstore app, you can engage in a new level of interactivity with select texts, watching a related video or viewing live maps and apps. Want more information on that map or how it was created? Simply click the web link from within the application and get instant access to the host website.

Forthcoming books this year will cover Python, GIS technology updates, classic maps, and more—and all available digitally. E-books offer easier portability and access, so we invite you to try reading your favorite Esri Press reference, tutorial, or map book on the go.



New This Month

***GIS Tutorial for Health*, Fifth Edition**
By Kristen S. Kurland and Wilpen L. Gorr
Learn how spatial analysis can help you better manage health services and support policy and decision making with *GIS Tutorial for Health*. This long-standing workbook from Esri Press provides structured exercises so that health professionals and students can develop competencies in GIS. Readers will create, visualize, and assess issues ranging from cancer mortality rates to food-borne illness outbreaks. The fifth edition is compatible with ArcGIS 10.2 for Desktop and is available in print and as an e-book. Exercise data is available for download. Instructor resources are available separately. April 2014. 460 pp. Paperback (ISBN: 978-1-58948-372-9, US$79.99) and e-book (ISBN: 978-1-58948-373-6, US$59.99).



Esri Press e-books are available on the Esri Bookstore app (**esri.com/bookstoreapp**) or through online retailers. For information on all Esri Press publications, visit **esri.com/esripress**.

Get Recognized! Apply for a URISA Exemplary Systems in Government Award

The Urban and Regional Information Systems Association (URISA) is accepting applications for its Exemplary Systems in Government Awards through April 11, 2014. The awards recognize exceptional achievements in the application of geospatial information technology that have improved the delivery and quality of government services. The award competition is open to all public agencies at the federal, state/provincial, regional, and local levels.

Applications may be submitted in the following two categories:

- **Single Process Systems**—Systems in this category are outstanding and working examples of applying information system technology to automate a specific single process or operation involving one department or subunit of an agency. The system application results in extended and/or improved government services that are more efficient and/or save money.
- **Enterprise Systems**—Systems in this category are outstanding and working examples of using information systems technology in a multidepartment environment as part of an integrated process. These systems exemplify effective use of technology yielding widespread improvements in the process(es) and/or service(s) involved and/or cost savings to the organization.

Applications must be submitted by April 11, 2014. Winners in each category will be recognized during GIS-Pro 2014: URISA's 52nd Annual Conference, September 8–11, 2014, in New Orleans, Louisiana.

For details, application requirements, and past winner testimonials, visit **www.urisa.org/awards/exemplary-systems-in-government**.

New Training and Certification Offerings from Esri

Training to Come

New! Developer Bootcamps
Experienced developers have a new option to learn best practices for integrating geospatial data, maps, and ArcGIS capabilities into native Android and iOS apps. Instructor-led bootcamps are designed to immerse students in problem-based learning. Facilitated by the instructor over three days, the class learns how to use ArcGIS Runtime SDK to geopower mobile apps and support connected and disconnected workflows. All the code you build in class is yours to keep. Get details and register for a bootcamp at **esri.com/devbootcamps**.

Ease the Transition from ArcGIS 9.x to ArcGIS 10.2
While ArcGIS 10.2 was released last summer, some organizations have technology life cycle policies that delay version upgrades. A new, one-day instructor-led workshop is geared to GIS staff at organizations planning to migrate from ArcGIS Desktop 9.x to version 10.2 in 2014.

ArcGIS 10.2 for Desktop: Quick Start for ArcGIS 9.x Users is designed to help GIS professionals get the key information they need to be productive right away with ArcGIS 10.2. The instructor will demonstrate the significant enhancements and new capabilities, and attendees are encouraged to actively participate in open question-and-answer sessions. Workshop attendees receive a set of step-by-step ArcGIS exercises with data for hands-on practice after the workshop. Learn more and register at **esri.com/coursecatalog**.

Training Benefits for Small Enterprises
Small government organizations and utilities that have an enterprise license agreement (ELA) are eligible for a 5 percent discount on instructor-led courses and a complimentary Virtual Campus annual user license. By taking advantage of the training benefits included with these programs, managers can make sure their staff have the skills needed to efficiently deliver high-quality GIS products and services.

Small ELA organizations are also eligible for specially priced 15-, 21-, or 30-day training packages that provide even greater savings on instructor-led training—good news if your organization is planning a technology upgrade or important GIS project in 2014.

To learn more about training benefits for small enterprises, contact **GIStraining@esri.com**.

Certification

New Exam Releases
Version 10.2 of the ArcGIS Desktop Developer Associate, Web Application Developer Associate, Enterprise System Design Associate, and Enterprise Administration Associate certification exams are in the final stages of development. Public registration is expected to open in April and May.

Exam-Preparation Resources
A group of no-cost, self-paced web courses designed to help certification candidates prepare for desktop, developer, and enterprise exams is available on the Training website. The web courses provide sample questions that mimic the structure of actual exam questions and the rationale behind each sample question's correct answer. Tips for exam-taking strategies and links to additional preparation resources are also included. View the list of available web courses at **esri.com/skillsreview**.

The *Esri ArcGIS Desktop Associate Certification Study Guide*, authored by Esri instructor and certified ArcGIS Desktop Professional Miriam Schmidts, includes step-by-step exercises and access to ArcGIS for Desktop 180-day trial software. View detailed study guide information at **esri.com/esripress**.

To view the skills measured by each exam and get the latest registration information, visit **esri.com/certification**.

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Geodesigning Our World with Nature and Technology

Geoempowering Design

Above: This urban landscape, including the flowers, was generated using tools in Esri CityEngine. **Left:** Kongjian Yu.

Kongjian Yu is the son of a Chinese farmer. He grew up on a commune and worked in the rice, wheat, and sugarcane fields with his father until he left for college at age 17. Today Yu, 50, is a well-respected, award-winning urban designer and landscape architect whose firm Turenscape often turns neglected land and polluted waterways into wetland parks filled with flowers and teeming with fish and birds.

Yu showed photographs of these lush parks during his keynote talk at the 2014 Geodesign Summit at Esri, where he advocated for a fresh way of thinking in landscape architecture and design: Use geodesign, which incorporates design, geography, and geospatial technology such as GIS, to help create an ecological infrastructure for communities.

An ecological infrastructure reflects the natural environment rather than something built out of concrete and steel. Many of Turenscape's park projects in China let nature take its course. Rather than diverting storm water from a river during the rainy season with pipes or channels, it's captured and filtered in ponds in a terraced wetland system. Areas that flooded historically are allowed to flood again. Nature takes hold, and reeds and flowers spring to life. Birds flock to these wetlands again, and so do the bird watchers, Yu said.

"Design for an ecological infrastructure to create an ideal relationship between man and nature," said Yu. "It's a new way to make a beautiful landscape."

Geoempowering Design

Yu and a roster of other speakers gave presentations to almost 300 people from diverse fields, such as architecture, academia, urban design, ecology, health, banking, biology, mining, and marine sciences. Nearly half were new to the event, now in its fifth year. Geodesign Summit organizers believe that reflects a deepening interest in geodesign.

Emcee Thomas Fisher, dean of the College of Design at the University of Minnesota, said the definition of geodesign continues to be shaped but offered one of his favorites. "It's a marriage of the incredible spatial power of GIS, geography, and design. It marries the data-rich analytical power of GIS with the creative synthesizing methods of design. GIS helps us understand what is and design what could be."

Esri president Jack Dangermond spent about 30 minutes outlining why he thinks using geodesign—whether in urban planning or other fields—will be a linchpin in solving sustainability issues, including the changes that population growth is having on land use and the climate. "What is the counterbalance to these trends?" he asked. "I think it's in this emerging world of geodesign. Collectively we need to create a better future."

Dangermond said geographic information system (GIS) technology is essential as a foundational technique to geodesign. "GIS provides a platform for the integration of science, providing the practical means for geoempowering design."

Esri staff gave the audience a short demo of the geodesign tools in Esri CityEngine, which creates 3D models of buildings and entire urban landscapes using procedural rules. Eric Wittner, the 3D technology evangelist at Esri, and the 3D team also previewed the 64-bit ArcGIS Pro, a desktop application with fast displays, 2D and 3D views, and powerful spatial analysis. ArcGIS Pro is slated for release later this year.

In the demo, the team showed how it was possible to use Pro to design a green rooftop garden. For example, they used tools in the application to add a glass fence to the perimeter of the roof, access for an elevator, shrubs, and a fountain. "This will be a new tool to do design and blend the 2D and 3D world," Wittner said.

Esri technology evangelist Bern Szukalski demonstrated a new browser-based web app called Esri Landscape Planner that will be available soon in ArcGIS Marketplace. This ArcGIS Online powered app contains sketching and analysis tools and gives designers the ability to bring in landscape and demographic layers and imagery. The app also lets them collaborate together and edit designs.

Szukalski used the app's tools to sketch a park and a proposed light-rail line in a town. "I think this will be an exciting piece of technology to add to your geodesign portfolio," he said. "Landscape Planner helps put all the pieces together to create a true, open geodesign platform."

Designing with Nature in Mind

Though technology was front and center at the summit, the idea of designing with nature in mind was omnipresent in the Esri auditorium.

Online-Only Articles

More *ArcNews*

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

- Riverside County Takes GIS to the Next Level
- Integrated Web Map Aids Sandy Relief Efforts
- Calfornia Healthcare Atlas Offers Single Easy-to-Use Portal

Renowned biologist and natural sciences writer Janine Benyus took the stage to talk about biomimicry, a science in which nature provides a model for landscape and urban design. "I live in the Bitterroot Valley in western Montana," she said showing pictures of the bucolic rural countryside. "It's so healthy . . . when I walk back there, I see what we could be," she said.

Benyus said much can be learned from nature about how to design for urban areas. "It's nature as mentor," said the author of the book *Biomimicry: Innovation Inspired by Nature*. "What would it take for a city to function as elegantly as a forest?"

She spoke about how plants and animals evolve and adapt to a changing and often harsh environment, using a 1,500-year-old tree with strong, deep roots and branches that are designed to shed as an example of the resiliency in nature. "That 1,500-year-old tree—it has seen many hurricanes," she said. "Generosity is one of the standards of nature. How does nature create more and more opportunities for life?"

In a follow-up conversation with Dangermond and Fisher, Benyus said that metrics need to be collected in order to create ecological performance standards for designing sustainable cities. She also envisions the creation of an in-depth database or information portal that inventors, designers, and others involved in biomimicry could access to obtain scientific information about their areas of interest. Benyus said she looked forward to learning more GIS and the role it could play in developing and hosting a business information system.

"You've been searching for GIS for a long time," said Dangermond.

The Art of Survival

Yu learned to use GIS two decades ago, and today his staff at Turenscape uses Esri ArcGIS software for topographic modeling and analysis.

Before he founded Turenscape in 1997 and became professor and dean of the College of Architecture and Landscape Architecture at Peking University, Yu attended Harvard University, where he earned a doctor of design at the Harvard Graduate School of Design. He also interned at Esri, working in the prototype lab.

Yu said geodesign using GIS technology is essential to the work of his company, which has completed 1,300 projects in 200 cities, including China Town Park in Boston. But he credits his early years working on the commune with a grounding in geography, topology, and soil. The words *Tu Ren* in Turenscape mean "earth man."

The man did not really wander far from the farm.

"Many of these designs are inspired by my experience on the farm," said Yu. "In the city, you don't know how to grow rice. You don't know how to work with dirt; you don't know how to irrigate."

He said he and Dangermond are sympatico when it comes to believing that geodesign will change the world for the better and that our survival will depend on it.

For example, geodesign played a role in cleaning up a once polluted waterway in Liupanshui City, China, and creating a biodiverse wetland park.

Turenscape used geodesign to develop the Shuicheng River and Minhu Wetland Park project. Concrete embankments along the river were removed, and natural vegetation was planted and allowed to thrive. Storm water is no longer diverted away from the river. Water no longer goes to waste. A once polluted waterway is fishable again. People stroll along walkways that wind around terraced ponds. Beautiful orange flowers flourish around the wetland's perimeter.

"Now, it's become a beautiful place," Yu said. "People love it. The biodiversity has increased. It has now become a national wetland."

"Crossing Borders"

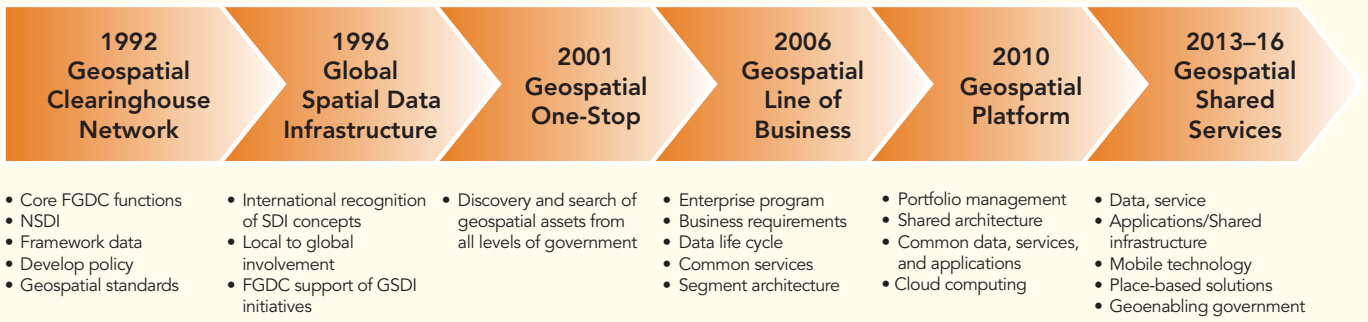
A column by Doug Richardson,
Executive Director,
Association of American Geographers

Planning an NSDI for the Future

The creation and continuous evolution of the United States National Spatial Data Infrastructure (NSDI), under the leadership of the Federal Geographic Data Committee (FGDC), has provided a crucial foundation for the development of today's GIS community and the many GIS applications that now abound in our world. Planning is now under way for a new NSDI future, one that responds to evolving mobile GPS/GIS data collection and use technologies and the resultant explosion of real-time spatiotemporal data availability and its dynamic, interactive applications. One step in adjusting the NSDI to this changing world of pervasive real-time geographic data is the recent Strategic Planning process undertaken by FGDC for the NSDI.

The National Spatial Data Infrastructure has been defined as "the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data." (Executive Order 12906: "Coordinating Geographic Data Acquisition and Access," 1994.)

For the past two decades, FGDC has worked to develop policies and partnerships to advance the development of the NSDI. To achieve this, FGDC has contributed to the evolution of federal and national geospatial initiatives. Several of these initiatives have been sponsored as US governmental priorities, and their milestone evolution and key themes are highlighted in the following figure:



A New NSDI Strategic Plan*

As Anne Castle, assistant secretary of the Interior Department and a leader throughout the NSDI strategic planning process, points out, "the NSDI strategic plan describes a broad national vision for the NSDI and includes goals and objectives for the federal government's role in continued sustainable development of the NSDI. The plan has been developed with input from a variety of sources, including FGDC member agencies and geospatial partner organizations. The National Geospatial Advisory Committee (NGAC) has played a critical role in the development of the plan by providing extensive input and comment."

The plan is thus a collaborative effort, led ably by FGDC but involving many federal agencies, the private sector, and state and local governments, among others. The plan recognizes the revolutionary changes in geographic science and technologies and the growing applications of geospatial information across all sectors of the global economy. In response, US public sector agencies must realign their geospatial strategies and investments to meet the needs of rapidly expanding real-time geospatial information and technology users. And increasingly, citizens expect governments to provide geospatial data and services to them in their specific areas of interest or need.

The new NSDI plan focuses on adapting to a rapidly changing set of external factors, such as these ongoing and future trends:

Work Force: There will be increasing demand for skill sets positioned at the intersection between the traditional IT and geospatial realms, such as application and services development, geoinformation fusion, crowdsourcing, social networks and human geography, identity management, visual analytics, and forecasting/modeling.

Technology: Geospatial technologies will be called upon to organize a much larger information domain, provide trusted analysis of complex "big data" holdings, and effectively visualize and communicate knowledge so that it can be turned into operational efficiencies. The "Internet of Things" will connect billions of stationary and mobile sensors with human users.

Communications: Systems for information delivery will become ubiquitous and highly mobile, will utilize web-based services, and will be integrated components of more advanced information workflows. Harnessing content provided by sensors and social media, particularly in the form of feedback to enhance authoritative processes and products, needs research and strategy. Additional attention is needed with regard to the measurement and expression of the uncertainty inherent in geospatial information and related analytical products.

Legal and Policy Contexts: State, tribal, regional, and local geospatial resources will continue to improve and, in many areas, may provide the best sources for ongoing current and accurate information. Integrating these diverse datasets involves coordinating numerous legal and policy frameworks. Thoughtful approaches are needed to develop consensus terminology; develop policy; and educate citizens and decision makers with regard to geospatial data gathering, dissemination, and usage. Geolocation privacy, confidentiality, and security issues may need to be addressed for sensitive geospatial information.

Full details on the assumptions, analysis, and recommendations of the new NSDI Strategic Plan are available online, and the plan itself can be accessed at **www.fgdc.gov/nsdi-plan/nsdi-strategic-plan-2014-2016-FINAL.pdf**. While this plan focuses primarily on the federal role in achieving the shared national vision for the NSDI, the successful implementation of the specific goals and objectives in the plan will require coordination with a wide range of nonfederal partners and stakeholders, including you.

How You Can Help Shape the Future NSDI

FGDC plans to work closely with NGAC and other organizations and individuals to collaboratively develop and maintain the nation's critical geospatial infrastructure. Anne Castle emphasizes that "we will work with FGDC member agencies and partners to develop more detailed project plans and milestones for the goals and objectives in the [NSDI] plan." I join Assistant Secretary Castle in inviting all of you in the Esri GIS community to participate in the ongoing process of developing implementation plans for the NSDI. Contact FGDC or members of your GIS community on the National Geospatial Advisory Committee to make your voice heard. (Additional information about NGAC, including a list of committee members, is available at **www.fgdc.gov/ngac**.) I now serve on this committee, and Jack Dangermond has provided highly valued guidance to this committee for many years.

And, perhaps most importantly, continue to push forward with all the innovative GIS development work that has long characterized the vibrant Esri GIS community, as it is with our continued work to create and innovate and develop the field of GIS and geographic technologies, and their new applications, that we will most directly shape, tangibly and on the ground, the future of the NSDI.

Doug Richardson
drichardson@aag.org

*Federal Geographic Data Committee, 2013, National Spatial Data Infrastructure Strategic Plan 2014–2016: Reston, VA; Federal Geographic Data Committee, 19 p. **www.fgdc.gov/nsdi-plan/nsdi-strategic-plan-2014-2016-FINAL.pdf**. Some of the descriptive text and the figure contained above in this column are from the final plan.

"Managing GIS"

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

URISA
The Association For GIS Professionals
www.URISA.org

Managing Your Ambition: Contributions to Professional Organizations

By Ryan E. Bowe, GISP, and Wendy Peloquin, GISP

Word on the street is that professional organizations are dying. One would think that in this unstable economic time, professional organizations would be thriving. Not only do they provide a common place to meet other professionals with similar interests, they also provide connections to career opportunities. One of the major concerns is that they are becoming irrelevant, especially when there are many organizations doing ostensibly the same thing. This concern resulted in several professional organizations reinventing themselves to focus on their "brand." But many individuals are no longer able to justify the cost of being part of an organization in the absence of tangible benefits.

Sometimes advantages made through professional organizations are direct (career listings, resumé boards, mentoring); other times, benefits are more subtle. Many professional organizations provide professional development through certifications and continuing education programs. Beyond opportunities for career connections and professional development, these organizations also provide camaraderie in the form of a friendly environment to test ideas. Although you may not want to take your work home with you, there are few times when a GIS professional can sit down with someone who has the same base level of knowledge. Many of these organizations are also the first place to learn of new technologies and trends within the industry. They help disseminate information by publishing journals and newsletters highlighting the innovative use of technology by their members.

Professional organizations are vital to the life of the profession itself. Many professional organizations take the lead in developing industry standards. For example, the Urban Regional Information Systems Association (URISA) authored and maintains The United States Thoroughfare, Landmark and Postal Address Data Standard, and the American Society for Photogrammetry and Remote Sensing (ASPRS) standards committee has authored Accuracy Standards for Large-Scale Maps, LAS specifications (Version 1.4-R12), and Vertical accuracy reporting for LiDAR (Version 1.0). If industry experts do not take the initiative to develop and set standards, who will? These organizations also provide a unified voice for their members by advocating for issues within the industry.

No one ever wants to be in a position where they have to use a safety net, but it is comforting to know one is there. Building connections within a professional organization allows people to become familiar with your work ethic. In return, your list of potential references should continue to grow. Organizations are all looking for contributors who do more than pad resumés.

Not convinced you should join a professional organization? Not sure how or where to start? Here are a few tips on how to become active within professional organizations:

Do your research. Are there professional organizations that are tailored to your interests within the GIS industry? Spatial professionals are needed in what may seem obscure places, such as the Association for Unmanned Vehicle Systems International. Maybe some organizations fit your personality more than others. When you research the different opportunities, you are going to feel as if you are in the land of alphabet soup with all the different acronyms. Be patient, though, and look at each organization's mission statement to see if it is going to advocate for your concerns.

Start local. It helps to be able to get to know people face-to-face. And, it is possible to get a good idea of the "mother" organization through the local groups. However, this is not always the case. If there are no local professional organizations in your area, consider working with colleagues to champion a local chapter or organization.

Check for reduced membership rates. Many organizations are also offering student or young professional discounted rates. You can also check to see if your school or employer may already have a membership or sponsorship, as you may be able to become a member through your organization without paying a dime!

Go to a conference. Conferences are a great place to meet people with similar interests. It is common for user groups to have a meeting during a conference. Many conferences have mentoring opportunities, physical resumé boards for employers who are looking to hire, or employer meet and greets. Giving a presentation may help your current employer justify sending you to the conference, and it will definitely help build your credibility within the profession. It is also another opportunity to gain valuable critiques from your peers.

Become involved. Are you currently a member of a professional organization or looking to get more involved? Scour their websites for working groups and initiatives; organizations are always looking for free labor since essentially none of the professional organization positions are funded. If you volunteer and do what you say you are going to do, providing a quality "product" in a timely manner, more opportunities will become available. Consider sitting on the conference planning committee (once you've attended one, of course). Most of the time, professional organizations will put out a call for participants in their initiatives. These calls will often be on their website or monthly newsletter. If you can't find something that fits, try to contact an active member in the organization. How do you find them? Their name will be on the website! People who are passionate about their professional organizations will be more than happy to talk to you and may also be able to help find a place for you because they may know about initiatives that are just beginning.

Do not overcommit yourself. Most organizations will let you sit in on conference calls or group meetings at conferences to see if they fit you. Have a goal in mind of how much time you are willing to spend with the organization. Know your limits. Once word gets out that you are not only willing to volunteer but you also provide quality input, others will come knocking on your door. But that knocking will stop if you don't show up and deliver what you promised!

To help restate one of the points of this article, this very article itself only came about because we met through URISA: yet another example of the camaraderie that comes about from participating in professional organizations!

Many good things can come from professional organizations, but in order to continue to be relevant, they need volunteers who are passionate and not just there to advance their personal agenda, or professional organizations really will become extinct. Professional organizations are realizing that networking is not the only selling point to retain and attract new members. Now is the time to become involved and help shape the professional organizations into something that is truly for the profession!

About the Authors

Ryan E. Bowe, GISP, has been working at Photo Science, a Quantum Spatial Company, for eight years as a GIS technician, as well as an alternate sensor operator. She was recently recognized as URISA's Young Professional of the Year for 2013. Wendy Peloquin, GISP, is a GIS analyst at RS&H in Jacksonville, Florida. She serves as a member of URISA's Vanguard Cabinet, Georgia URISA's Event and Conference chair, and Florida URISA's northeast regional director.

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The Pipeline Data Maintenance Tools (PDMT) ArcToolboxes are a set of tools designed to automate the loading of data into the ArcGIS Pipeline Data Model (APDM) or PODS Esri spatial geodatabases. With these tools, users can create customized geoprocessing workflows within Esri ModelBuilder, integrating Esri toolboxes; Eagle toolboxes; and Python to edit, manage, and load their pipeline data. Visit Eagle's website to learn more!

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