ArcUser

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Special Section

On the Cover
Hummingbirds at Home is an Audubon citizen science initiative that will help scientists understand how climate change, flowering patterns, and feeding by people are impacting hummingbirds. The spatial data gathered for this initiative and other Audubon programs is vetted and managed in Audubon's enterprise GIS.

Enhancing Collaboration and Informing Decisions

By extending the ArcGIS information model to enable Web GIS, Esri greatly simplified the use and management of all types of geospatial content. Now geographic information products, such as maps and 3D visualizations, can be used in apps on any device and integrated into the workflows of organizations to improve communication and collaboration and inform decisions.

The National Audubon Society, which has spent more than a century protecting birds, implemented an enterprise GIS. It has improved the accuracy, management, and sharing of the organization's data without changing the way its decentralized structure works to harness the efforts of the volunteers in its hundreds of chapters. GIS has brought more opportunities to work collaboratively within chapters and between national, state, and local levels. The effects of integrating GIS with Audubon's processes are described in an article featured in the Special Section of this issue.

Another article in this issue, "A Platform for Coordinating Disaster Response," recounts how collaboration via an ArcGIS Online Group enabled local, state, and federal agencies to work together when responding to the 2014 South Napa Earthquake in California. Esri Story Maps that incorporated the most current data informed the public, media, responders, and government executives of the evolving situation. The California Governor's Office of Emergency Services (Cal OES), which made extensive use of ArcGIS Online and Esri Story Maps for briefing during the response, adopted this workflow as its standard operating procedure and the common operating picture for this event and subsequent disasters.

The ArcGIS platform is improving communication on the national level. The White House is using Esri Story Maps in its websites to introduce TechHire, Upskill, and other initiatives and explain complex issues. An ArcGIS Online Group, Mapping for Congress, makes available a collection of maps created by the offices of US Senate and Congressional representatives, who communicate information on specific issues to their constituents through maps.

By making data more accessible and usable, the ArcGIS platform is helping organizations gain a deeper understanding of issues and events and work together to overcome challenges and meet goals.

Monica Pratt
ArcUser Editor

editor's page

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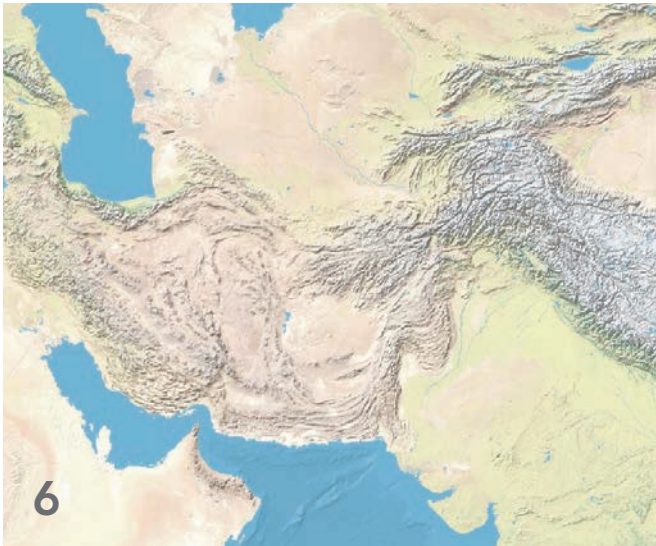
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Visit the *ArcUser Online* web pages (esri.com/arcuser) to read the article submission guidelines and copyright policy.

Departments

Welcome to the
Living Atlas of the World

Become a user *and* a contributor

The Living Atlas of the World, available through ArcGIS Online, provides easy access to one of the largest, highest-quality collections of ready-to-use geographic information that has ever been assembled. This collection is available from any device, anywhere, at any time and is constantly growing and changing as maps, apps, and layers are added or updated by Esri and the ArcGIS user community. One of the primary goals of the Living Atlas is to make the best information easy to discover and use.

↑ The Living Atlas of the World makes available one of the largest, highest-quality collections of ready-to-use geographic information.

Over the past few years, Esri has been expanding the types of content that it makes available through the Living Atlas. Maps cover a wide range of topics related to people (human systems), the earth (physical systems), and life (natural systems). Human systems content includes demographic and lifestyle maps for the United States, Canada, and more than 120 other countries. A wide assortment of Esri Story Map apps, categorized by topic, can be accessed from the Living Atlas. Layer content includes multi-spectral imagery, elevation layers, and ecological land units.

What began as a way to build the best, freely available online basemaps is now a resource that extends far beyond basemap layers to encompass imagery, elevation, hydrology, 3D, and other content that can support a wide range of mapping and analysis activities.

The value of the Living Atlas has not only been recognized by the many users who have integrated Living Atlas content into their maps and apps but also by the larger mapping community. In late 2014, the International Map Industry Association (IMIA) honored the Living Atlas of the World with Best Digital Map Product, Best Overall, and the Global Award.
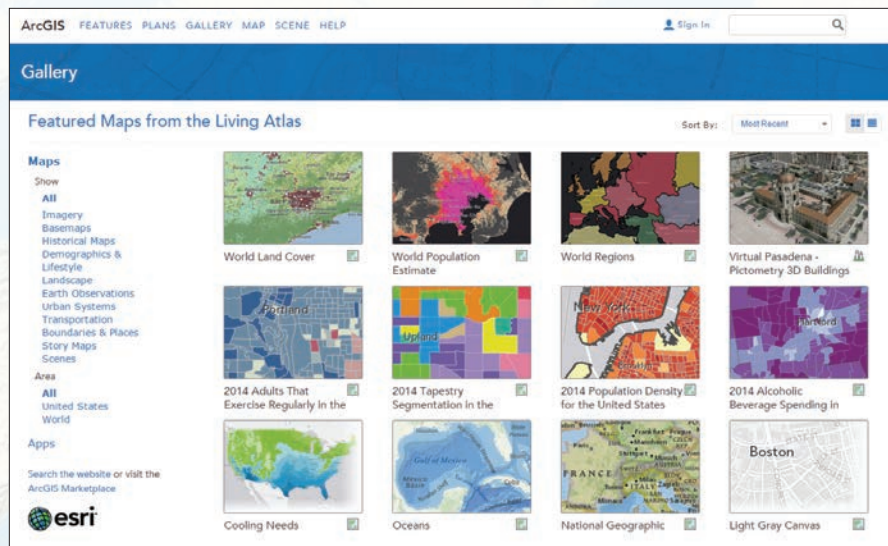
Exploring Content

Explore the Living Atlas by directly accessing its content through the ArcGIS Online Gallery featured content section. View the comprehensive set of maps, apps, and tools on a variety of themes available on ArcGIS Online or by using the Living Atlas of the World web app, available from ArcGIS.com.

Joining the Living Atlas Community

Content for the Living Atlas is constantly being improved through the efforts of contributors and curators. Members of the ArcGIS community can contribute to the Living Atlas directly by publishing content through ArcGIS Online or indirectly by participating in the Community Maps Program.

Initially, Esri provided ArcGIS Online users with a small set of basemaps and some foundational services such as geocoding and routing. This ready-to-use content was provided so users could easily publish and share maps and apps.

Subsequently, many ArcGIS users offered to share their geographic data with Esri to enhance the coverage and overall quality of the available content. This led to the Community Maps Program, which has significantly improved the quality and coverage of the Living Atlas over the last four years. Several hundred organizations have been sharing their authoritative content and making it accessible to the entire GIS community. By the end of 2014, more than 134 million features had been added through Community Maps contributions. *[To learn more about contributing content to the Community Maps program, see "Contributing to Community Maps Made Easy" in this issue.]* In addition, many ArcGIS users began
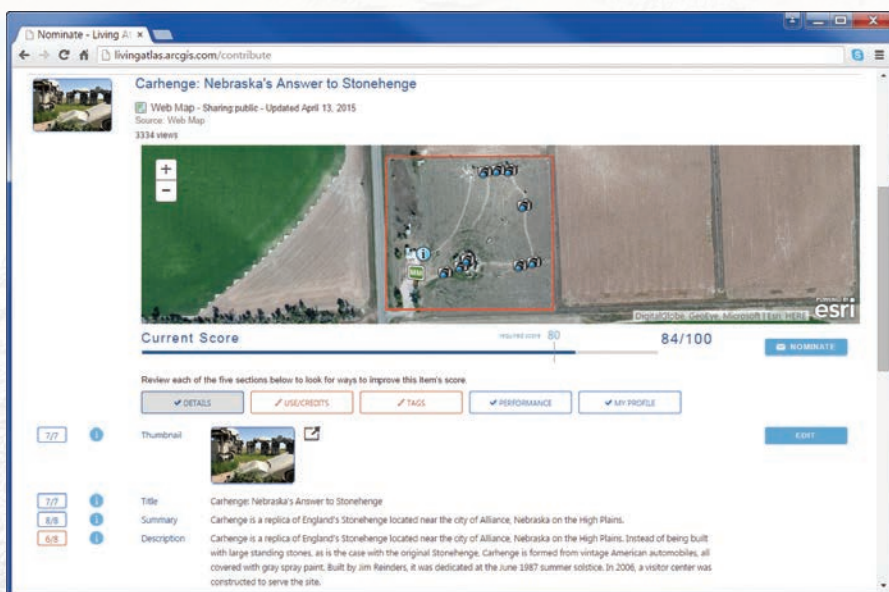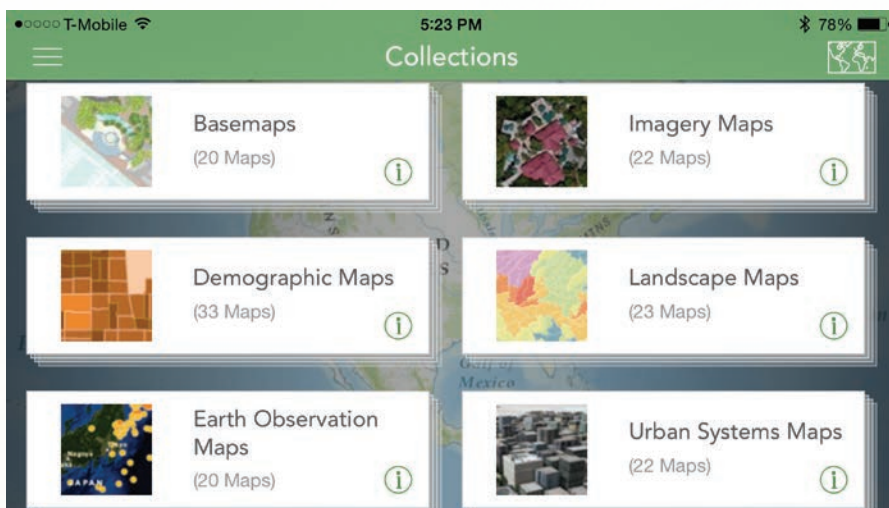
↑↑ Browse the Living Atlas of the World from mobile devices.

↑ Content submitted to the Living Atlas is reviewed by curators who ensure that it is useful, reliable, and adds value.

publicly sharing maps and layers created in ArcGIS Online for use by others, substantially expanding content for the Living Atlas.

Content submitted to the Living Atlas is reviewed by curators. These curators, who are Esri staff and other GIS professionals from around the world, review content to ensure that it is useful, reliable, and adds value. Each theme in the Living Atlas has its own curator. Content that meets the acceptance criteria is included in the Living Atlas and featured in ArcGIS Online for other users to discover and access.

Scoring Items

The new Living Atlas Contributor app (livingatlas.arcgis.com/contribute) allows Esri customers, partners, and staff to nominate their ArcGIS Online items (apps, maps, layers, and scenes) for the Living Atlas of the World and streamlines the review process.

Each item being evaluated for nomination is given a score based on the presence of key elements, such as the summary, description, and custom thumbnail, and characteristics such as drawing performance, cartography, and other characteristics. An item must have a minimum score before it can

be nominated for the Living Atlas. Scoring before nominating eliminates numerous emails and phone calls between the item's owner and the Living Atlas curator.

Even if content is not going to be nominated for the Living Atlas, scoring can be a valuable tool for evaluating and improving content before sharing. Anyone can use the Contributor app to score content from a best practices perspective.

Once nominated, Living Atlas curators see the item, review it, and share comments with the item owner. Often these comments identify missing requirements or make pragmatic suggestions. After the contributor and curator agree the item is complete, it is accepted for immediate inclusion in the Living Atlas.

Take Advantage of These Resources

Improve the information products your organization produces with the Living Atlas. Using this resource will help you more quickly create apps; improve analyses and gain insights by using current, authoritative data; and enhance story maps and presentations. Start exploring it on ArcGIS Online.

Enrich Public-Facing Maps and Apps

ArcGIS Online subscribers have access to a number of content layers, such as demographics, imagery, elevation, landscape, and historical maps. In some cases, such as demographics, these map layers consume ArcGIS Online credits and would be considered premium content services. In most cases, however, these layers are available at no additional cost to your ArcGIS subscription.

These content layers can be used in the maps and apps accessed by named users in an organization and can also be included in public-facing maps and apps.

ArcGIS Online subscribers can also use the content layers in maps and apps that they create and share with external users, such as customers, partners, or the public, who access them anonymously.

For example, subscribers can take advantage of a dynamic image layer from the National Agriculture Imagery Program (NAIP) or Landsat 8 imagery when working with other agencies or partners that need periodic access to this information but are not ArcGIS users. During a natural disaster, users may want to support response activities by including a reliable and scalable map layer that shows a live feed of the incident alongside other geographic information they are publishing such as open shelters or evacuation routes.

There are tools and workflows available through ArcGIS Online for creating maps and apps that use an organization's accounts to access content layers on behalf of its users. Learn more at goto.arcgisonline.com/premium/share.
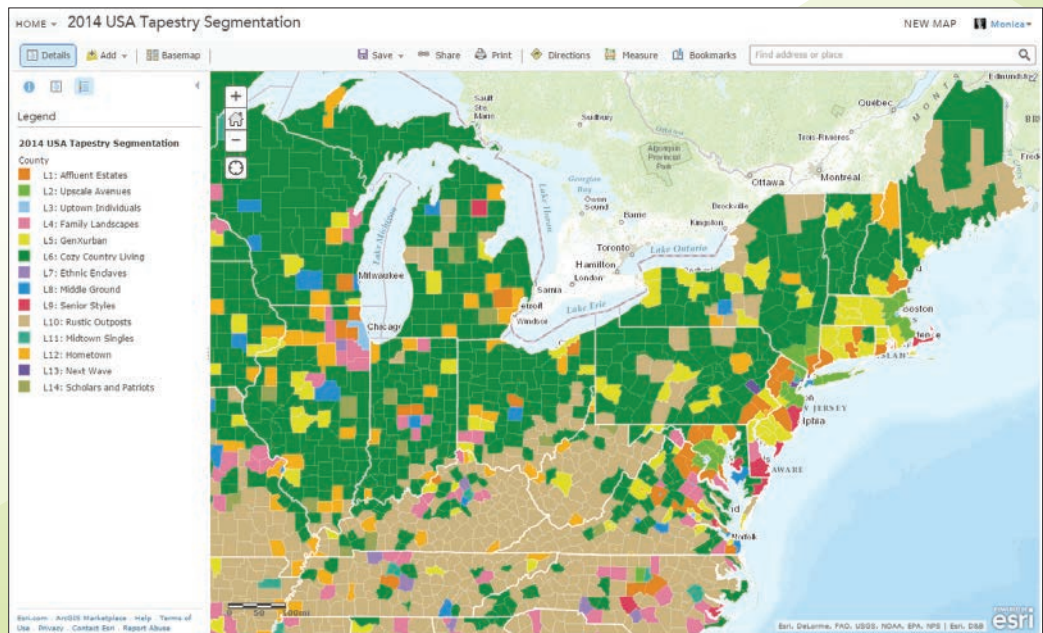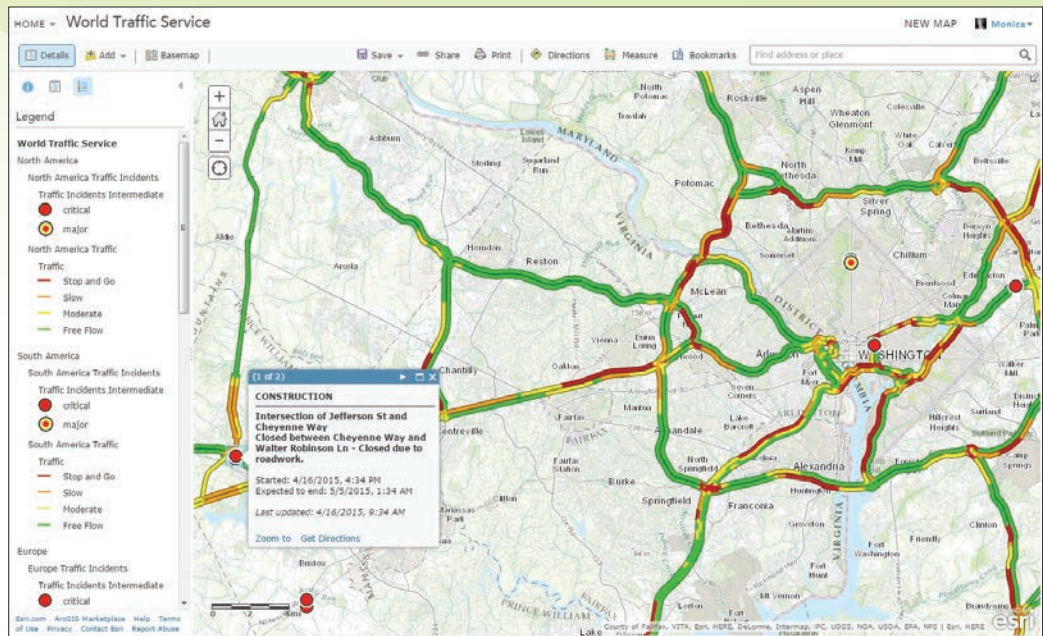
↑ Premium content, such as live traffic feeds, can make local maps more valuable by helping people avoid traffic congestion and construction projects.

↑ Some premium content, such as demographic layers, do use ArcGIS Online credits but provide additional information.

Microsoft Azure

Stay productive with the power of the cloud

Azure is an open and flexible cloud platform that enables you to quickly build, deploy and manage applications across a global network of Microsoft-managed datacenters. You can build applications using any language, tool or framework. And you can integrate your public cloud applications with your existing IT environment.

Microsoft

ArcGIS Server on Microsoft Azure

ArcGIS 10.3.1 for Server is now available on the Microsoft Azure cloud platform, allowing you to quickly deploy ArcGIS for Server applications and services to the Azure cloud rather than buying and maintaining infrastructure. ArcGIS Server on Microsoft Azure consists of Esri virtual machine images and the ArcGIS Server Cloud Builder on Microsoft Azure.

Esri customers can use existing ArcGIS 10.3.1 for Server Standard or Advanced licenses to activate the Esri-created Microsoft Azure images containing ArcGIS for Server, Portal for ArcGIS, ArcGIS Data Store, and ArcGIS Web Adaptor (IIS) that are available from the Microsoft Azure Marketplace.

ArcGIS Server Cloud Builder on Microsoft Azure is a free, lightweight desktop application that lets you configure and deploy an ArcGIS for Server or Portal for ArcGIS site from your desktop. The Cloud Builder application abstracts some of the more technical aspects of working with the Azure platform.

It provides a set of tools for monitoring and administering sites on Azure. It helps you register an enterprise geodatabase in Azure SQL Data or SQL Server as an ArcGIS Server managed database. Cloud Builder provides two deployment options: a full web GIS implementation or a stand-alone GIS server deployment.

With the web GIS deployment option, the GIS server, Portal for ArcGIS, ArcGIS Web Adaptor, and ArcGIS Data Store (used to optimize publishing workflows to Portal) are tightly integrated, providing you with a complete ArcGIS platform running on your infrastructure. This option allows you to configure a federated and hosted ArcGIS Server site. You can use ArcGIS clients, such as ArcMap and ArcGIS Pro, to create and share maps with your organization via Portal for ArcGIS. It also creates a branded portal website for organizing and controlling access to all your GIS assets.

The web GIS deployment also gives you access to all the applications for Portal for ArcGIS, including productivity applications,

such as Collector for ArcGIS, Operations Dashboard for ArcGIS, Explorer for ArcGIS, and Web AppBuilder for ArcGIS (an easy-to-use tool for creating and configuring your own web apps without coding), and focused, configurable web app templates. Web GIS deployment also provides configurable security options including a built-in identity store for managing users and roles and SAML 2.0 Web Single Sign-On.

Alternatively, you can use Cloud Builder to simply deploy a stand-alone GIS server on Microsoft Azure. With this option, you can publish maps directly to your ArcGIS Server site using ArcMap. You can set up multiple ArcGIS Server instances and configure them as a highly available cluster of GIS servers on Microsoft Azure. This option creates a resilient system. If one ArcGIS Server instance fails, another instance is immediately available to provide your organization with continuous operations with minimum downtime. For more information, contact your local Esri representative.

Find Out Where the Water Goes

The Nighttime Flow Analysis solution, a COTS configuration of the ArcGIS platform, helps water utilities identify areas with underground leaks and other sources of nonrevenue water loss.

Nighttime Flow Analysis measures gallons per minute (GPM) of water consumption for an area at night, when households typically use significantly less water. It compares that rate to the expected flow estimated using industry standards for minimum nighttime uses—such as the use of toilets, washing machines, and outdoor irrigators—to determine potential nonrevenue water loss, or water flows that are not reaching a meter.

This solution is a collection of services, maps, and apps supported on ArcGIS 10.3 that helps utilities find and fix underground leaks and other sources of water loss that might go undetected for months. Rapidly identifying and eliminating unnecessary water loss provide better service, more efficient distribution to customers, less wear on treatment equipment, and longer-term value from capital-improvements spending.

Over the long term, Nighttime Flow Analysis can improve utility operations and capital planning by reducing high water loss, preventing service disasters, and reducing the time needed to make repairs from months to weeks or days.

Read the accompanying article in this issue "Tennessee Utility Proactively Stops Water Leaks" and learn how Tennessee's largest water and wastewater utility, White House Utility District (WHUD), uses other ArcGIS for Utilities solutions to manage its 600-square-mile service area. For more information on Nighttime Flow Analysis, visit solutions.arcgis.com/utilities/water/help/nighttime-flow-analysis/.

ArcGIS Pro on the
Virtual Desktop

Technology and IT trends are propelling companies and organizations to virtualize their physical desktops, making it easier for employees to work from anywhere and still be able to access all of their organizations' internal websites and applications.

ArcGIS Pro, the newest addition to the ArcGIS for Desktop suite, is a modern, 64-bit, multithreaded application that provides integrated 2D and 3D spatial analysis and visualization in one package. As with ArcMap, ArcGIS Pro is expected to be successfully virtualized by countless companies and organizations.

At Esri, ArcGIS Pro has been heavily tested in all major virtual desktop infrastructure (VDI) platforms. This includes VMware Horizon with View, Citrix XenDesktop, and Microsoft's Hyper-V VDIs. Testing has found that in some cases when ArcGIS Pro is used with 2D data, the user experience is fine without a graphics processing unit (GPU). When ArcGIS Pro is used with complex 2D data and any 3D data, a GPU is needed.

Delivering that user experience on a physical workstation is relatively easy with common hardware such as a GPU integrated with a computer's central processing unit. Getting that same level of user experience—or perhaps even better—is also possible in a virtualized environment. The major virtualized environments employ shareable GPU technology such as the NVIDIA GRID cards to deliver that user experience.

The Next Phase in Cloud-Based VDI—DaaS

Many companies are now considering the next phase of virtualization: cloud-based VDI, where a centralized server hosts desktop operating systems within a number of virtual machines. Desktop-as-a-Service, or DaaS, is a VDI delivered by a cloud computing provider. The provider supplies the hardware, operating system, and management capabilities needed to run the virtual desktops—though operating system licensing does vary across all providers.

Companies can then customize the virtual desktop supplied by the DaaS provider. They can add the business, application, and utility software their end users need, including Microsoft Office, ArcGIS for Desktop, and any necessary data.

A DaaS can be used when a small business or consulting firm needs a number of temporary employees for a short-term project or when an organization needs to give some permanent employees short-term access to certain programs such as ArcGIS software. For example, if a project requires 10 additional GIS analysts for six months, instead of purchasing desktop workstations and software licenses for the employees and then installing and configuring the software and maintaining the workstations for such a short period, the company can give its temporary users a DaaS workstation that is ready to go on day one. The virtual desktop is centrally maintained for the duration of the project and then simply removed from the centralizeed server when the assignment is over.

ArcGIS Pro in DaaS Now

ArcGIS Pro delivers a great interactive experience when working with 2D and 3D data. When users pan and zoom, the smooth animation feels remarkably gamelike. These visualization capabilities are also a way users can measure how well the program works in DaaS.

← Esri has tested ArcGIS Pro in all major VDI platforms. Performance is fine without a GPU when using basic 2D data, but a GPU is needed when using complex 2D data or 3D data.
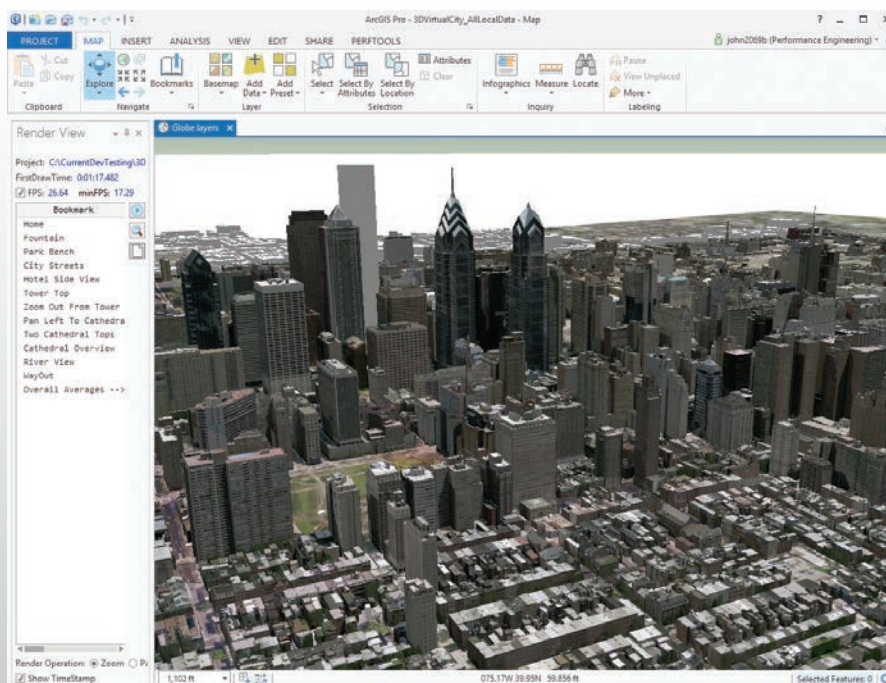
ArcGIS Pro has been preinstalled in several leading DaaS deployments, including NVIDIA Test Drive (www.nvidia.com/object/vmware-trygrid.html). Served from multiple data centers around the world, NVIDIA GRID Test Drive furnishes an entire Windows desktop with multiple graphics-intensive applications already installed to demonstrate how graphics-intensive applications can be successfully delivered and provide an impressive user experience.

ArcGIS Pro is one of the installed graphics-intensive applications. The rendering engine that drives the fluid, highly animated visualization uses DirectX or OpenGL libraries. These are the same libraries used for gaming software and their capabilities are maximized when used with GPUs.

ArcGIS Pro's user experience in the NVIDIA GRID Test Drive DaaS is enhanced because the virtual desktop provided by the DaaS is supported by a shareable GPU. The NVIDIA Test Drive environment uses NVIDIA GRID cards that are specifically designed for virtualization environments.

Putting ArcGIS Pro in DaaS

To successfully deploy ArcGIS Pro in a DaaS, there are a few important considerations.

Using 2D data that is relatively simple and doesn't have symbology does not typically require a DaaS supported by a GPU. For more complex 2D and 3D data, however, it is necessary to use a shareable GPU-supported DaaS.

When a shareable GPU is required, the DaaS provider must be able to support the use of a GPU such as a NVIDIA GRID K2 card in its hypervisor. This can have a dramatic impact on the end users' experience. Although many larger DaaS providers do not yet provide shareable GPU support, the ones that do include Europe's Cloudalize and Exponential-E and the United States' NaviSite. Moreover, existing providers are extending their service areas into more geographic regions and new providers are scheduled to come online.

Where to Go from Here

DaaS is a trend that will only continue to grow as more companies migrate from physical desktops to on-premises VDI environments and cloud-based DaaS. Keeping up with this progression will require confronting a myriad of challenges, but the evolution will not stop or be redirected.

ArcGIS Pro can be deployed into a DaaS environment and deliver a great user experience. There are many providers and options available to make that happen now. Esri is working with several DaaS providers to determine the level of user experience they offer through their services so that Esri and these providers can work together to provide best practices, configuration, and guidance to users.

Look for additional information on ArcGIS Pro in DaaS and virtualization environments at blogs.esri.com and pro.arcgis.com.

Executives Discuss
Smart Communities Solutions

In May 2015, the International City/County Management Association (ICMA) and Esri invited a small group of local government executives to Esri's Redlands campus to participate in a white boarding exercise that would capture their ideas on how best to develop strategies for delivering services to citizens, fostering collaboration with other organizations, and measuring performance. This carefully selected group of professionals represented communities large and small from across the United States. White boarding exercises are informal events in a think tank-like setting where executives can learn about technology trends and discuss the needs of their organizations.

In recent years, executives have dealt with reduced budgets and staffing that is the legacy of the recent recession. In many cases, the sources and funds allocated to governments have shifted. Policy changes, new legislation, and changes in the tax base mean that resources are no longer sufficient to pursue large projects. In practical terms, this means many jurisdictions continue using legacy business systems with less than optimal workflows.

At the same time, they must deal with a growing list of issues, many related to an aging population and deteriorating infrastructure coupled with a citizenery that now expects additional social services for groups such as veterans and those with mental health needs. Citizens also expect those services to be conveniently accessible via the web and smartphones.

This had led many local governments to embrace a smart communities approach: using digital technologies to manage resources more effectively and engage citizens. GIS plays a pivotal role in enabling the transformation of a community of any size into a smart community.

Partnering with Communities

Over the last several years, ICMA and Esri have cohosted Executive White Boarding exercises as a way to better understand the challenges executives face and help Esri develop smart community solutions that address these needs. These exercises nominally focus on a specific topic. The most recent session zeroed in on health and human services, an area of growing concern for governments as the population ages.

However, government's role in health and human services delivery can't be neatly parsed from the other types of services governments furnish. Consequently, the initial discussion revolved around the much broader topic of how to communicate with citizens in a simple way and collaborate with other organizations. That sparked wide-ranging conversations that occupied the morning session.

The consensus was that phones, specifically smartphones, are the single best method to reach the people who need services but may not have traditional computer access or even a mailing address. According to the Pew Research Internet and American Life Project undertaken in 2014, 90 percent of all American adults own a cell phone, and of those, 58 percent have smartphones. These statistics span virtually all income levels. This reality has been acknowledged by some jurisdictions that give out basic phones to homeless people because it was found to be the only effective way to communicate with this population.

Beyond agreeing that apps are an effective mechanism for delivering information, several participants identified a fundamental problem governments have when communicating with citizens. Most local governments require citizens to understand government organizational structure to determine which department or agency can supply what they need. Michael Penny, the city manager of Littleton, Colorado, and a veteran of Esri White Boarding exercises summed the situation up by saying, "We did not design ourselves around apps."

To be effective, public-facing apps should be user-centric in the manner of Yelp, Pinterest, and other

↗ More than 150 templates, such as this Citizen Service Request template, are available at no charge and can be quickly configured to provide apps that meet the specific needs of local governments.

→ In a brainstorming session, the group listed apps they would like to have developed.

↘ This app, built using Web AppBuilder for ArcGIS provides current information on the status of water and sewer projects for Washington Suburban Sanitary Commission (WSSC).
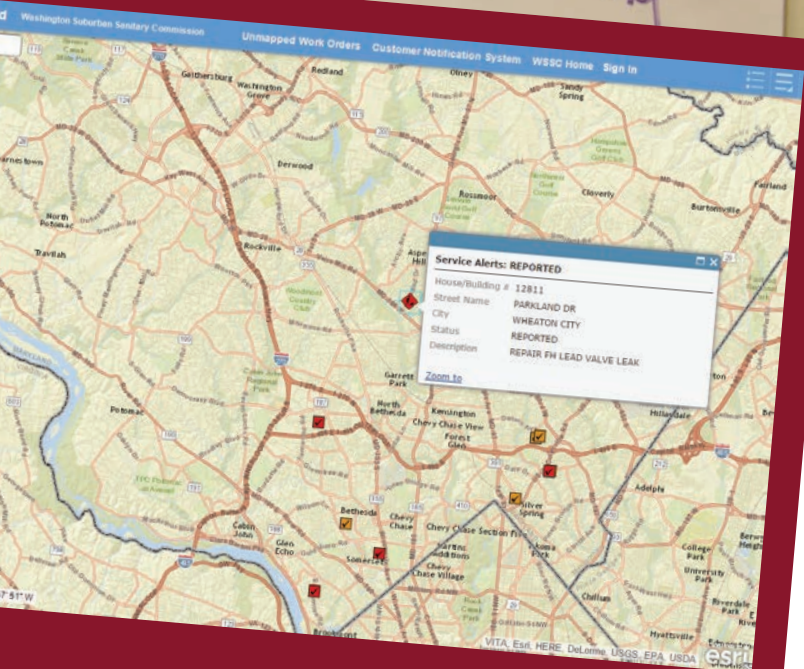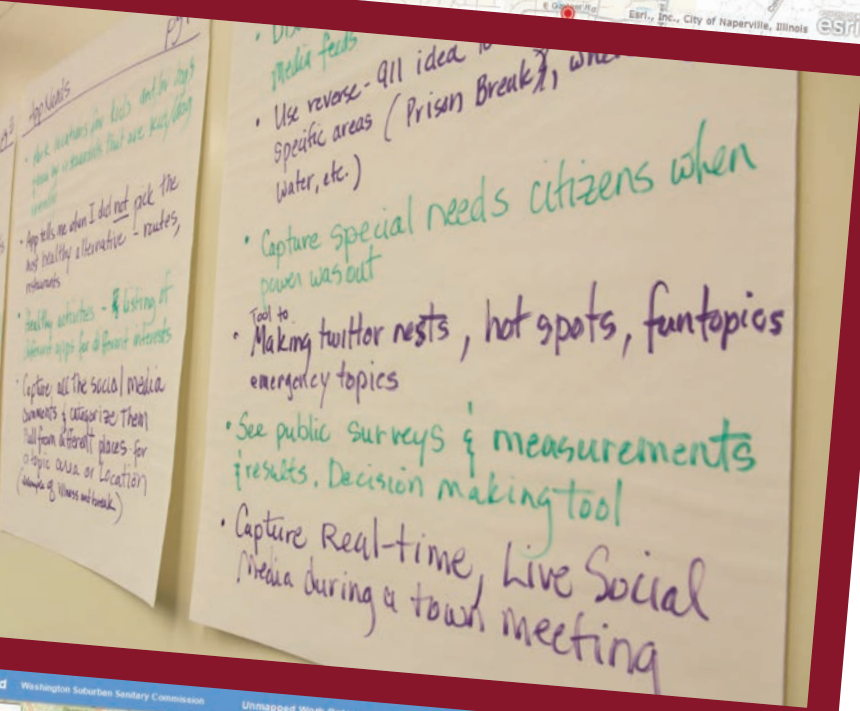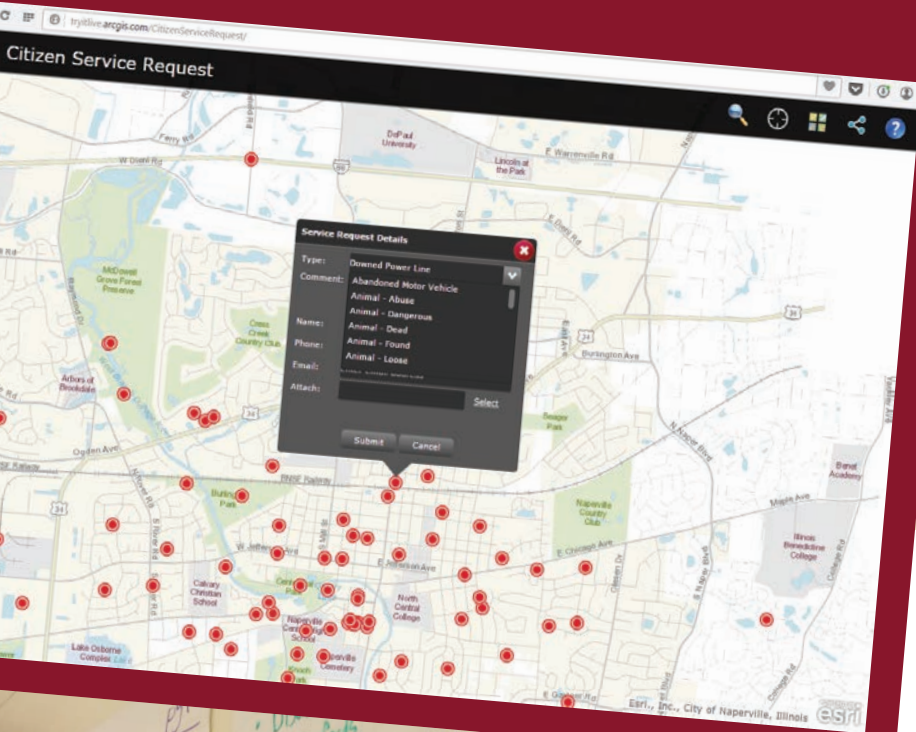
popular consumer apps. Apps should be about what the citizen wants and not what is most expedient for government. "We don't need to regurgitate the same information in yet another format," said Penny.

John Salomone, the town manager for the Town of Newington, Connecticut, and Veronica Ferguson, an administrator for Sonoma County, California, also noted that—increasingly—the character of communication with the public is changing. Citizens, particularly younger ones, want a dialog with government, not just an answer. Technology is helping to change the nature of public meetings from the comments of a handful of citizens who showed up at city hall to an ongoing discussion online that can include input from many citizens. GIS applications such as GeoPlanner for ArcGIS can facilitate these kinds of interactions.

In fact, GIS is almost always an aspect of citizen-centric apps because information about the location of services is most useful when placed in a geographic context. People don't always go to places in their own counties for services. They go to the nearest location for those services. Frequently, they don't know or care about jurisdictional boundaries. They just want their needs met as quickly and simply as possible.

This jurisdictional indifference drives both collaboration and, by extension, interoperability. By working together, local governments, agencies, and nonprofits can provide better, cost-effective service by more intelligently locating service centers. Conversely, sharing data on community resources with nonprofits and other entities not only helps get information out to citizens but can also enhance other programs, efforts, and research and lead to collaboration.

However, unlocking data and forming partnerships can be challenging. As several participants noted, some open data solutions are far from user-friendly and "are basically for geeks." Pushing data to the cloud primarily to eliminate local infrastructure requirements and reduce costs without any real plan for making it usable does not enable data sharing or app development with that data. From a developer standpoint, disparate cloud sources of data that have not been organized with openness in mind can be at best difficult to use and at worst nearly useless.

However, ArcGIS Online, with its online hosting, mapping capabilities, and apps and templates, facilitates data sharing without requiring a high level of technical expertise. ArcGIS Open Data, functionality built into ArcGIS Online, easily generates a website dedicated to sharing datasets selected from an existing ArcGIS Online or ArcGIS Server site and automatically updates those datasets, ensuring the most current data is used.

Esri director of government marketing Christopher Thomas, one of the event moderators, used the success of the New Mexico Community Data Collaborative (NMCDC) as an example of the value of data sharing using ArcGIS Online. This statewide data repository makes its health and human services data available through an ArcGIS Online site that was built entirely using free Esri apps. The site lives up to its motto, "Building community capacity to move data into action," by making more than 200 neighborhood-level datasets with more than 1,200 variables available to other agencies, nonprofits, and researchers.

During its first few months of operation, there were 56,000 data downloads from the site. Instead of concentrating on developing health apps, NMCDC develops and shares the neighborhood-level data that makes it possible for other government agencies and universities to do research that promotes community assessment, child health, and participatory decision making.

In addition to supplying data, NMCDC will collaborate with and train users of its data warehouse, offering workshops, consultation services, and assistance to users without requiring payment. Collaborating analysts, who are subscribers to the site, can upload and store data, make maps and apps, use files shared by others, and copy and modify maps.

This example also encouraged continuation of a discussion of the characteristics of successful apps. Good apps should be self-service, relevant to the citizen, unconstrained by jurisdictional boundaries, and provide context so the information can be understood. Great apps should incorporate demographics and/or the user's profile to provide information tailored to the individual that might even anticipate the user's needs and support a virtual experience.

An Esri Story Map is a great tool for sharing information with citizens and other agencies, whether that information is the amenities available at local parks or the status of disaster response efforts.

Thomas said local governments often run into problems when they hire an outside app developer. These developers do not thoroughly understand the problem they are trying to address. They are not part of government and typically don't understand the existing business processes or consider the needs of citizens.

Esri has been extending the ArcGIS platform to bring app development within the grasp of local government without requiring hiring developers, either in-house or on contract. For several years, Esri has been developing solution templates that supply functionality needed for land records, water utilities, public works, fire services, emergency management, law enforcement, planning and development, and elections departments. More than 150 of these configurable apps—some the direct result of feedback obtained from white boarding sessions—are available at no charge from ArcGIS Online.

To provide greater customization, ArcGIS Online and Portal for ArcGIS now includes Web AppBuilder for ArcGIS. Using this what-you-see-is-what-you-get wizard environment, nonprogrammers can create custom web mapping applications that run on any device.

AppStudio for ArcGIS, currently in beta, is another tool that lets nonprogrammers create apps. It can convert maps into mobile apps for Android, iOS, Windows, Mac OS X, and Linux that run natively on smartphones, tablets, and desktops.

↗ Michael Penny, city manager of Littleton, Colorado; Bonnie Svrcek, deputy city manager for the City of Lynchburg, Virginia; and Cory Fleming, program director for ICMA, participating in a white boarding exercise discussion.

→ This map, created by Sarah Haynes, the community outreach and development coordinator for NMCDC, provides information on more than 65,000 women and babies covered by the Supplemental Nutrition Assistance Program for Women, Infants, and Children program in New Mexico.

↘ The New Mexico Community Data Collaborative (NMCDC) uses its ArcGIS Online site to share more than 200 neighborhood-level datasets.
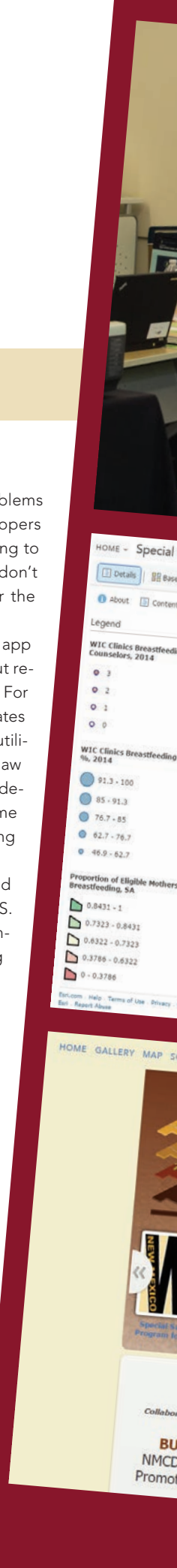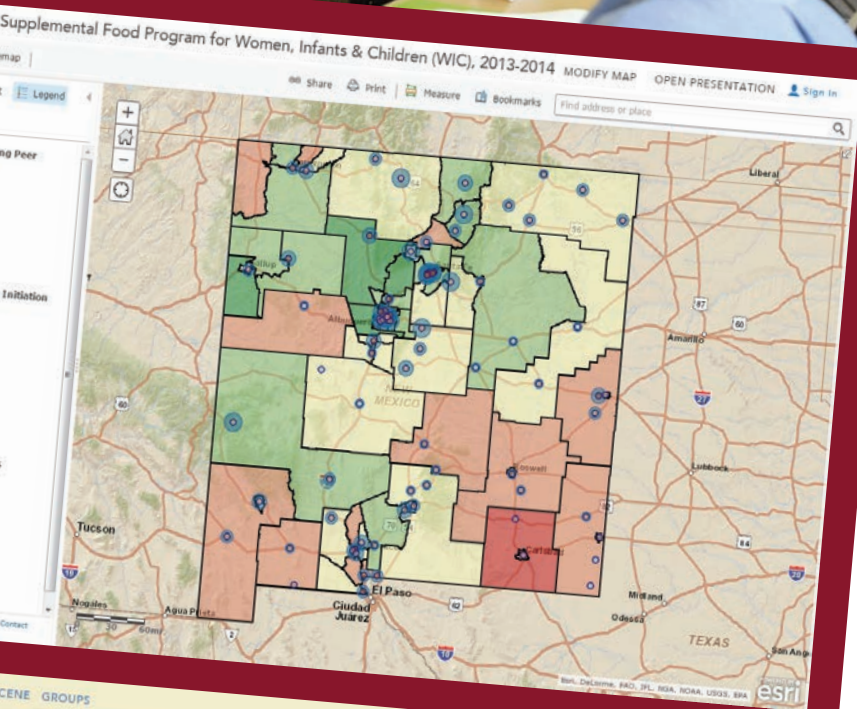
An App Wish List

After lunch, the group engaged in a brainstorming session to identify apps that would improve the delivery of government services and internal government processes. A sampling of the long wish list of public-facing apps compiled during the session included apps that

- Provide captions for hearing disabled persons attending a city event.
- Locate nearby businesses that accept Supplemental Nutrition Assistance Program (SNAP) cards.
- Apply the Uber model for sharing cars to provide transporation for seniors and disabled persons.
- Provide information on where to get clothes, transitional housing, and other necessities for people leaving jail.
- Locate all nonprofits in a community.
- Locate and describe nearby social services.
- Coordinate donations of clothing and food in response to a disaster.
- Show the real-time status of snowplows.

Internal apps were also listed. Most of these apps related to dealing with social media through aggregating feeds and mapping interest in specific topics to support officials when dealing with the public.

After creating the wish list, apps were prioritized and three high-priority apps were chosen: an app for capturing and aggregating social media comments, a 211 app for social services, and an app to measure the success of a job placement program. In the last exercise of the day, the group was divided into three teams and each was assigned a priority app. Each group identified the typical user for the app, the information it would provide, the information it would collect, how it would be used, and what would constitute a successful outcome.

Participants felt that walking through this robust app design process—which included not only who would use the app and how it would be used but also what information it would provide and how to determine if it was successful—was very valuable. They planned to share the insights they gained with others in their organizations and fellow ICMA members.

Intelligently built apps that promote smart community goals help executives make better informed decisions, departments accomplish more, and citizens remain engaged with local government.

A Platform for Coordinating
Disaster Response

By Monica Pratt, *ArcUser* Editor

↑ The 6.0 magnitude South Napa Earthquake caused severe damage to historic buildings and homes in the City of Napa, California.

In August 2014, the 6.0 magnitude South Napa Earthquake rocked the City of Napa, California, crumbling historic brick buildings, damaging houses, and causing widespread water leaks. The most powerful earthquake in California since the Loma Prieta earthquake in 1989, it hit this city of 77,000 in the early morning hours of Sunday, August 24, 2014, and caused significant damage in the neighboring communities of Sonoma and Vallejo.

City staff had to quickly assess the damage so response efforts by the city and other agencies could be coordinated. In addition, the public and media were clamoring for information about the extent of the damage and the status of response activities.

The City of Napa had used GIS for a number of years in several city departments. Staff expertise was primarily in desktop GIS use. Although the city had

entered into an enterprise license agreement (ELA) several years earlier that came with an ArcGIS Online subscription, the city had not used it.

The city's GIS coordinator, Katy Wallis, had been in this position less than a year. Previously, she held a GIS analyst position with the County of Napa. Since her arrival, she had been working to move the city's workflow from one that was CAD- and shapefile-based to a more modern, robust enterprise system based on the ArcGIS platform. Although the city had recently signed a contract with Esri partner Cartegraph systems to implement its Work Order and Asset Management system, the company's inventorying of the city's infrastructure would not begin until 2015.

The Tools to Respond

Wallis needed to make information in the city's GIS available to city staff and other agencies to help coordinate response and recovery efforts as well as keep the public and media informed. To make that happen

as rapidly as possible, she reached out to the Esri Disaster Response Program (DRP) for assistance.

DRP is available whenever and wherever disasters occur to provide expert assistance, remote support, software, data, and information products as part of Esri's corporate citizenship. When a major disaster occurs, DRP immediately begins generating data layers and information products that can support agencies responding to that event.

Wallis soon learned from Esri that the city already had the tools and infrastructure it needed to respond effectively and work collaboratively with other agencies, thanks to the ArcGIS Online subscription that was part of its ELA. By August 26, Wallis set up a private ArcGIS Online Group so the city could share geospatial data and information on emergency operations with other agencies.

Working with DRP, Wallis stood up a web map app in a very short time that answered the immediate needs of the public

and media for information on the earth-quake. The Napa Earthquake Information map, created using the Public Information map template, was live on August 26 and provided the most urgently requested information—the locations of severely damaged, red-tagged buildings.

Over the next day, information on additional red-tagged buildings and moderately damaged, yellow-tagged buildings was added. To prevent residents who were cleaning up their properties from hauling rubble to nearby school yards and other nondesignated locations, debris dumping site locations were also added to the map.

The earthquake caused numerous ruptures to the city's water distribution system. Residents needed current information on the status of the water leaks. Color-coded symbols indicating where leaks had been identified and if they had been repaired were also added to the map.

The Napa Earthquake Information map became the go-to resource for current information about the earthquake. It was shown live on KRON Channel 4 and was

embedded in numerous newspapers and television station websites. By the end of the first day and a half it was available, the web app received 150,000 hits while using only 0.2 ArcGIS Online account credits.

"This map was the one-click stop for the public to find up-to-date information on damaged buildings, water main leaks, debris drop-off points, and damage to public infrastructure," said Wallis.

Coordination across Agencies

Other agencies responding to the South Napa Earthquake included the County of Napa, the California Governor's Office of Emergency Services (Cal OES), the Federal Emergency Management Agency (FEMA), and the American Red Cross. These agencies needed to coordinate their efforts with those of the City of Napa.

Cal OES made extensive and effective use of ArcGIS Online to provide situational awareness to agency executives and the response team in the State Operation Center (SOC) during its five-day activation. The state agency worked with local, state, and

federal entities, determining the needs of affected communities and ensuring relief resources were available.

Immediately after the earthquake, Cal OES created situational awareness maps using its traditional workflows to produce paper maps for daily SOC and executive briefings using ArcMap. These maps incorporated data gleaned from the agency's Situation Status Report.

Chi Smith was a new GIS analyst who had been working at Cal OES for nine months when the South Napa Earthquake hit. She reported to the activation on the second day to meet Esri DRP team member Jon Pedder. Smith and Pedder immediately collaborated on a Story Map Journal. He had previously introduced the app to the agency's GIS unit, and Smith had immediately introduced it to the Cal OES planning and intelligence chief of SOC, the chief information officer, and Dan Bout, currently the assistant director of response.

Subsequently, Smith and Pedder collaborated with Wallis at the City of Napa and Pedder's Esri DRP counterpart, Justin

↓ This map, showing population and the number of households and businesses in the affected area, used the Impact Summary map template and the ArcGIS Online GeoEnrichment service.
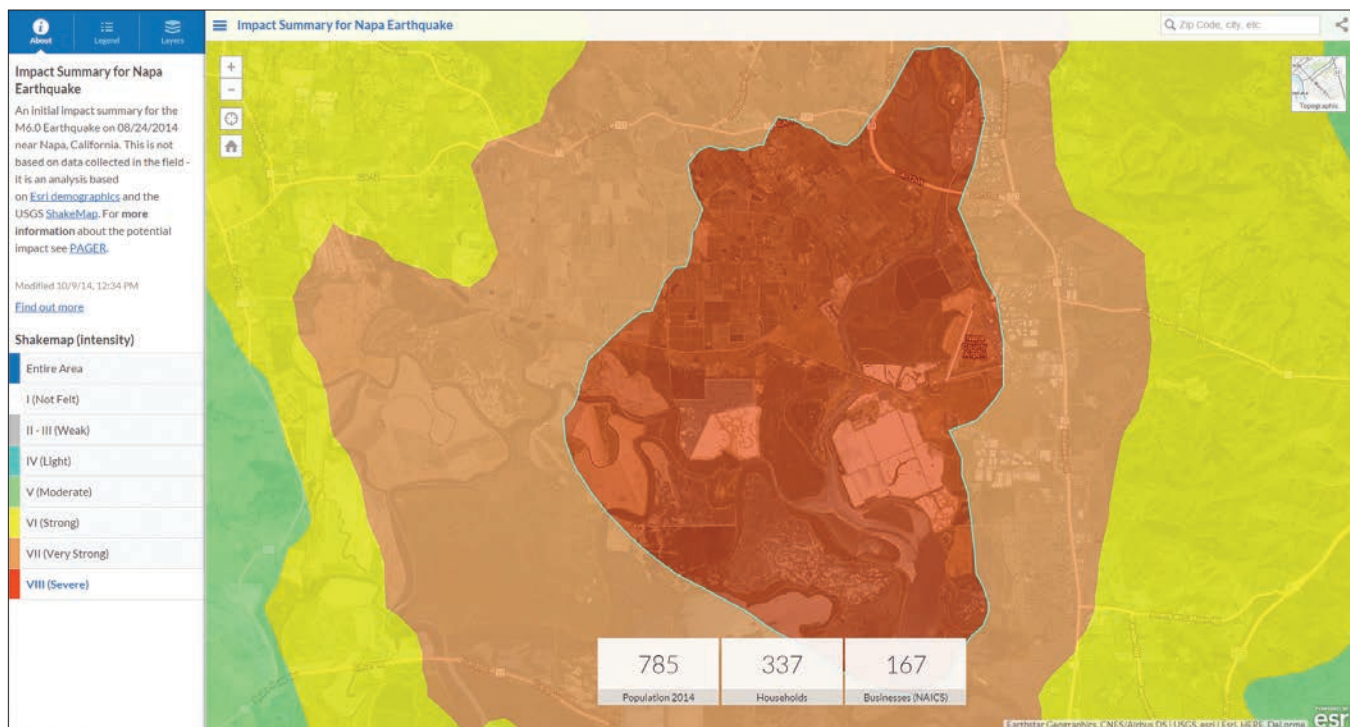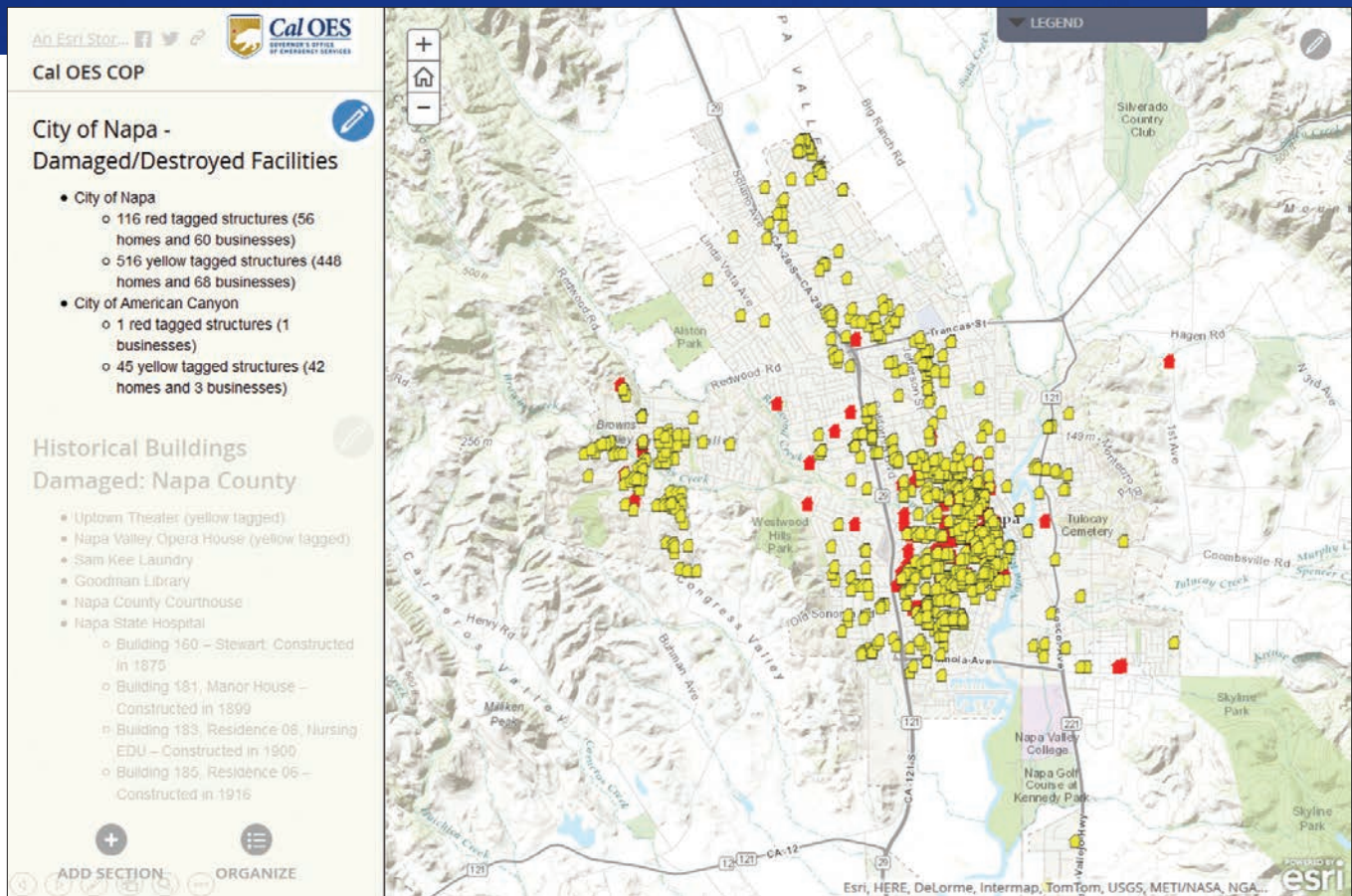
↑ The Map Journal Story Map created by Cal OES to communicate with executives was adopted as its common operating picture. This portion shows the locations of damaged and destroyed facilities.

Fan, on incident data sharing and product development.

DRP staff used ArcGIS Online GeoEnrichment service with the Impact Summary map template to create a map that showed the population and number of households and businesses in the affected area to the team at the SOC.

Using data that Cal OES published, DRP produced an Esri Map Journal Story Map about the agency's response that Cal OES executives adopted as its common operating picture (COP). The locations of damaged and destroyed facilities, geolocated and mapped by Cal OES, were added to this story map as well as damaged historical buildings. The Story Map Journal app provided a geospatial context to information that was disseminated during the twice-daily executive briefings.

An ArcGIS map presentation is a collection of slides that show different views of a map along with pop-ups and titles. Cal OES used a map presentation to coordinate

tactical, operational, and strategic planning activities with emergency management agencies and nonprofits involved in the South Napa Earthquake response.

The City of Napa shared its constantly updated authoritative data on water leak locations and the status of repairs via the ArcGIS Online Group. This data was incorporated into the Story Map Journal so Cal OES executives and SOC staff could quickly access it for planning purposes. The locations of damaged facilities in the City of Vallejo, available shelters, the damage sustained by mobile home parks in the surrounding area, the status of nearby medical and health care facilities, and water stations opened in response to concerns over bacterial levels in drinking water were also incorporated.

As efforts moved from response to recovery, the Napa Earthquake Information Sharing Group was formed so the City of Napa could disseminate its information on debris drop-off sites, water leaks, and

more detailed damage assessments with Cal OES and Red Cross GIS users.

Valuable Lessons

The City of Napa and Cal OES demonstrated that ArcGIS Online can be a powerful tool for emergency response. Wallis now recommends that cities have the ArcGIS Online emergency response web app preconfigured in advance of that looming and inevitable disaster.

The city rapidly created and released the Napa Earthquake Information map. It went viral because it satisfied the demand for current information on the effects of the earthquake and response efforts being mounted in a geographically referenced context.

Even after immediate response efforts, Wallis found the Napa Earthquake Information map invaluable in communicating the extent of the damage and its impact on the city to state and federal relief agencies. At FEMA's request, she supplied the map to help FEMA better evaluate the
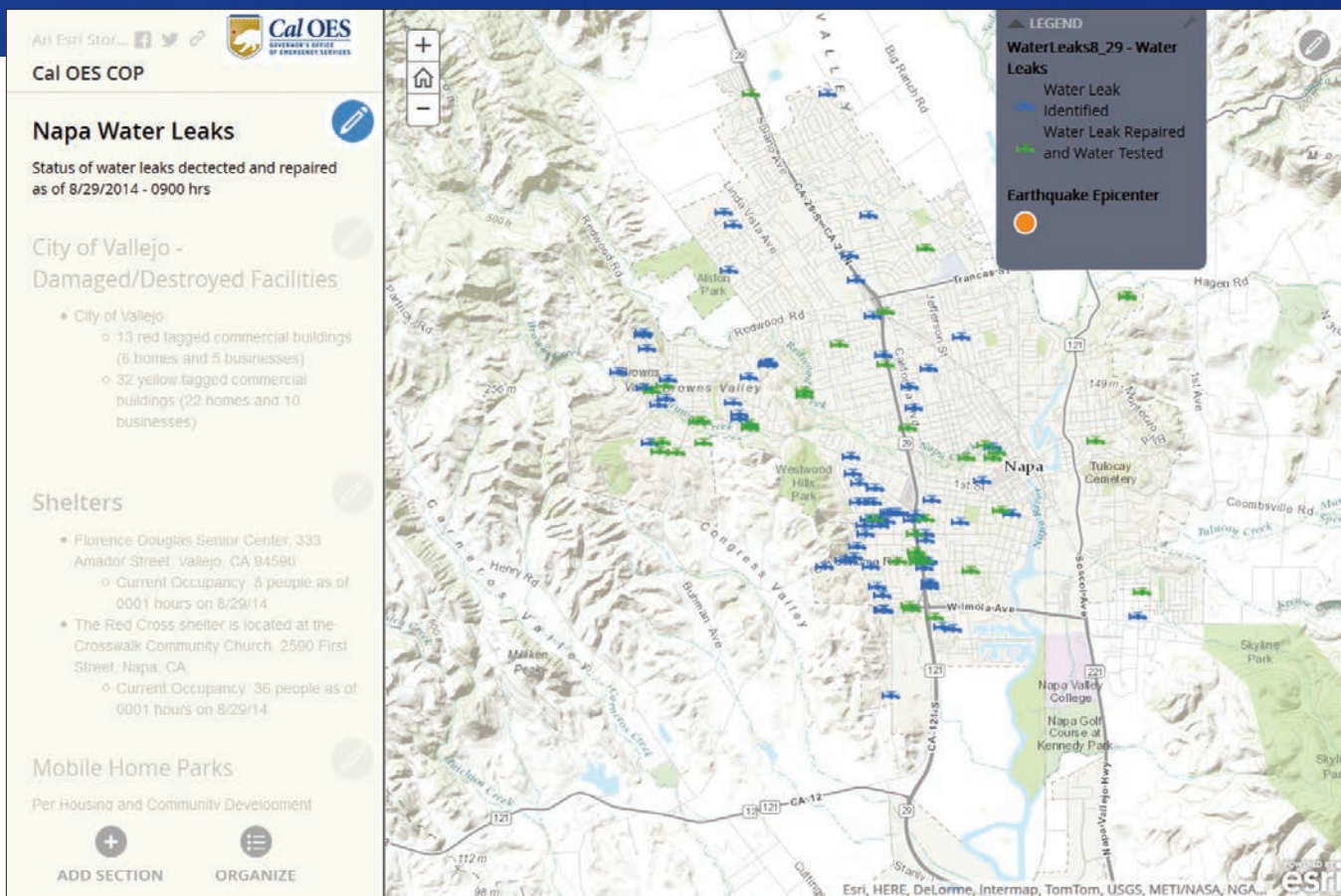
↑ Current data on the status of water leaks, included in the Story Map Journal app, was shared by the City of Napa with Cal OES through an ArcGIS Online Group.

situation. A week after providing the map, both state and federal agencies' assistance was granted to city residents.

Organizations that are responsible for emergency response should plan ahead to take advantage of the ArcGIS platform to aid their own response and coordinate with other agencies. Familiarizing staff members with tools, such as Collector for ArcGIS, can mean significant time savings and greater accuracy when performing damage assessments immediately after a disaster.

Smith observed that using ArcGIS Online templates enabled quick, safe, and secure data sharing using ArcGIS Online Groups so that state agencies, nonprofits, and businesses could collaborate and share disaster response or recovery information in a timely manner as data is collected or as part of a regular update process. Web apps available from ArcGIS Online helped communicate situational awareness effectively and promptly to both executives and response staff.

"Upon reviewing the workflow and applications used during this activation, Cal OES concluded that the Story Map Journal, map presentation, and the collaboration of online community groups have satisfied the reporting of disaster response activities in a timely and unprecedented manner to the SOC response team and executives," said Smith. "Consequently, this workflow has been adopted as our standard operating procedure and COP for future earthquakes. Furthermore, it is being implemented as a model for all subsequent disasters."

Smith noted that having to geocode incident data during the response effort was inefficient as compared with consuming geospatial data made available through an ArcGIS Online Group. She highlighted the importance of establishing an ArcGIS Online community for sharing incident data between government agencies before disasters occur. Smith invites members of the GIS community to join the Cal OES ArcGIS Online Group by sending an email to chi. smith@caloes.ca.gov.

Tennessee Utility Proactively
Stops Water Leaks

By Sarah Alban, Esri Writer

In 2013, the largest water and wastewater utility in Tennessee began transforming itself into a true GIS-centric organization.

White House Utility District (WHUD) is geographically Tennessee's largest water and wastewater utility. WHUD's service area extends 600 square miles and serves a population of just over 94,000.

"We had reached a point where continuing to develop custom software interfaces between software applications became too restrictive," said Bill Thompson, WHUD general manager.

Historically, WHUD has used GIS for managing asset information, workflows, subdivision records, and customer service and activities such as performing trend detection analysis, rate modeling, and gross revenue projection; and tracking growth areas, water use, and lots that have sold and those that are available.

In 2005, WHUD implemented an extensive leak detection program that focused on the reduction of nonrevenue water *[i.e., water lost in the distribution process that was not billable]*. WHUD's large coverage area posed a number of unique challenges for the district. The number one challenge was getting accurate information that could be analyzed quickly. In the initial stages of the program, the district was very successful. It reduced water loss from leaks by 50 percent, but WHUD reached a point at which results plateaued.

Primarily, this occurred because the technology in use was unable to receive real-time information that could be integrated with other field asset information. The only way WHUD could move forward with the program was to overcome this problem, so it reached out to Esri.

By working closely with Esri, WHUD was able to configure a connection that feeds real-time information from the district's smart meters into ArcGIS. Esri also helped to configure the district's supervisory control and data acquisition (SCADA) system so that flow meters, tanks, and pump stations all display real-time data. This information is accessible via ArcGIS for Server and ArcGIS Online as a web app and dashboard.

The web app uses color coding to show how the actual flow for a district metered area (DMA) compares to what has been determined by the staff as an acceptable flow rate for a particular zone. Using a set of geoprocessing tools and models, WHUD office staff can find where water loss appears excessive and then isolate potential leaks down to subzones, individual valves, and specific pipe segments.

Water Leak Investigator, a solution that is a configuration of the Collector for ArcGIS app, lets field crews pull up detailed information on a specific leak that includes a projection of the number of gallons that is excessive for an area. Once a leaking area is identified, office staff create point features to let field staff know where to place the leak loggers and share that information using ArcGIS Online.

Field staff place loggers and leave them in place overnight. The next day, more staff go out and read the data from the loggers. The data is then input on the logger point feature so office staff can see if a leak has been identified.

"If we have found the leak, a work order is created to fix it," Thompson said. "If not, we continue the process in that area until the leak is found. Once the leak is found and fixed, the new flow data for this DMA zone is updated and the zone will change colors to reflect the repair."

All of the district's flow meters are set up with high- and low-flow alarms. Anytime a meter's readings go above or below the gallons-per-minute (GPM) thresholds, an alarm is sent. ArcGIS GeoEvent Extension for ArcGIS for Server receives that alarm and creates a GIS feature that notifies WHUD's personnel. Staff can access the alarm's location on any device through the point feature GeoEvent Extension creates.

Staff members can assess the situation in

↓ On this dashboard, red indicates excessive leakage requiring field response.

↑ Water Leak Investigator, a solution that is a configuration of the Collector for ArcGIS app, lets field crews pull up detailed information on a specific leak.

issues and are able to confidently explain the situation. They are even using ArcGIS Pro to see 3D data visualizations that illustrate the effect of elevation in tank and pump station pressure to provide more accurate interpretations. With just a few minutes of analysis, staff can determine if low- to no-pressure conditions or other issues exist and use their findings to troubleshoot customer questions or work with developers on pressure issues.

After WHUD completes the smart meter installation, it will continue developing additional real-time data integration with its GIS. The information will display on simple, accessible viewers that tap into critical big data feeds.

"When we decided to move to a true GIS-centric environment, we felt like it was critical to examine every aspect of our organization from top to bottom," Thompson said. "In so doing, one of the things that I personally felt strongly about was the role GIS should play in the organization. I felt GIS should not report to the engineering department but should work collaboratively with them. I also felt equally as strong that IT should report to GIS instead of GIS reporting to IT. If we are to achieve our goal of having a true GIS-centric environment, GIS must be moved from an afterthought in the organization to a leadership role where our actions support our commitment."

real time and compare it with historic data to determine if they need to dispatch a crew. For instance, after receiving a GeoEvent alert about a low-pressure tank, they can then compare that reading with historic pressure readings recorded for the tank and consult service data, such as customer call-ins related to low pressure, before making a decision.

Three Days or Less to Repair All Leaks

Previously, it could take months to narrow down an underground leak to a specific location. Now leaks are detected and repaired within two to three weeks. The district will be able to cut repair times to 72 hours by July 1, 2015, and all field staff will have access to mobile GIS.

"The key benefit to ArcGIS in the field is the fact that it can be viewed in real time," Thompson said. "This information allows us to be proactive rather than reactive."

The monetary savings that can be realistically achieved will likely exceed $1 million annually according to Pat Harrell, WHUD district engineer.

Beyond these direct monetary savings, there are less easily identified indirect savings. These indirect savings include recovered capacity for treatment plants and recovered distribution capacity in transmission lines. Rapid detection and repair of leaks also generate cost savings because less

electricity is used, and there is less wear and tear on equipment. In addition, because the system is more efficient and proactive, there is less need for employees to work overtime.

Those benefits have a direct effect on WHUD's customers because they affect both short- and long-term water rates. WHUD expects initial savings to offset the cost of installing smart meters and the information technology infrastructure.

Other utilities in the region have made site visits to learn how WHUD is using technology to effectively detect leakage that is not coming to the surface.

"With ArcGIS Online, it's not as daunting as half the people think it is," Alexander said. "Using out-of-the-box COTS solutions like Collector has made it simple to get the tools deployed into the hands of our team quickly."

According to Harrell, "So much data is coming in the system at this point that the district has been caught a little off guard by the speed and quality of the information collected."

GIS Moves to a Leadership Role

So far, WHUD has improved planning, decision making, and customer service with the leak detection system. "The best part is that you don't have to be an engineer to make use of the GIS," Harrell said.

Customer service representatives now access the web map when customers call in. They can see right away if there are pressure

Gateway Supports
Sustainable Growth and Resilience

By Jeffrey Herter and Liz Podowski, New York State Department of State

In the spring of 2015, New York State's Office of Planning and Development (OPD) released a user-friendly gateway to its geographic information that uses Esri technology to help fulfill OPD's mission of promoting sustainable growth and increasing resilience for New York communities.

The initial goal of the Geographic Information Gateway was to update and improve the New York Oceans and Great Lakes Atlas (Atlas), which had been developed using MapInfo's MapXtreme. OPD officials realized the Atlas site was not easy for the public to use. Rather than provide a website for just downloading information, OPD wanted New York residents, decision makers, state agencies, academics, and internal staff to have access to information that was organized and presented in a manner that was easily understood and visually compelling. In addition, OPD wanted to explain why geographic information is important to New Yorkers, what it represents, and how it is used to inform decisions.

Better Access, Data, and Tools

Stone Environmental in Montpelier, Vermont, an Esri partner with extensive expertise and experience in building spatially aware data management systems and applications, was chosen by OPD to create a new gateway to geographic information that would provide public access to data, real-time information, and interactive tools.

To meet the initial goals of the new gateway, Esri's open source Geoportal Server was implemented as the basis for storing, serving, and managing geographic information. Geoportal Server relies on metadata content for data discovery. All geographic information that is findable, viewable, and downloadable within the gateway is stored as Federal Geographic Data Committee (FGDC)-compliant metadata records.

All metadata is stored in an instance of the open source relational database system PostgreSQL. The PostgreSQL database was used with ArcSDE and SDE binary spatial data types, which allowed Stone to store not only the metadata records in the system but also full geospatial datasets. The Atlas did not use live map service content. All datasets in the new gateway are ArcGIS for Server map services, whether served internally by OPD or externally through partner organizations.

While the Geoportal Server technology allows for robust management of metadata and discoverability, OPD wanted a custom interface and tighter integration with an interactive web mapping interface. A new user interface for Geoportal, with a user-friendly design and oriented specifically toward the goals identified by OPD, was constructed using AngularJS, a JavaScript framework.

The new interface, combined with Geoportal Server and ArcGIS for Server, provides a web mapping interface, allows easy searching and browsing of geographic information, and makes it easy to add discovered datasets directly with the web mapping tool for further visual exploration. The attractive layout, designed by OPD staff, provides easy-to-access links that reveal more than 400 datasets organized into eight categories that lead to extensive subcategories

related to OPD activities. Web map interface tools allow sharing, printing, and animation of time series datasets.

In addition, the home page provides an overview of the gateway content and links to search and browse interfaces that allow alternative access to the more than 400 datasets. These independent search and browse pages also interact with the web map viewer. Alternatively—for users interested in the most up-to-date coastal information—a Latest Conditions page provides access to real-time information such as water quality, tide levels, and beach conditions across the state.

Content for the site is managed through tables in PostgreSQL and ArcSDE. ArcGIS for Server provides functionality for querying and editing table content through secure REST endpoints.

The original portal and atlas sites were hosted on servers physically located at a hosting facility in Troy, New York. To reduce friction during development and make the site's capacity more elastic, the new gateway system was moved to the Amazon cloud. Now, as new data is added by OPD and its data storage needs grow, additional storage can be added painlessly to the cloud-based server. As the site's popularity expands, the cloud-based server's computing capacity can be increased and the instance cloned to provide load balancing or failover functionality.

Telling the OPD Story

OPD felt that the major component missing from the Atlas site was an explanation of how geographic information relates to OPD activities. The site needed stories that highlighted real-life examples of the state's use of geographic information and data to grow New York's economy, ensure resilient communities, and plan for responsible use and revitalization of state's land and water resources.

A custom-built, interactive story map template was developed as an important public communications tool. The map stories use a combination of illustrations, videos, and interactive maps to engage users and explain why geographic data made available by the site is important and how it informs planning and decision making. Stories cover many topics including New York's offshore wind planning efforts, coastal resilience planning, underwater canyons offshore New York, and the application of living shorelines as a shoreline management option. *[Living shorelines is an approach to shoreline stabilization that uses plants, sand, and limited amounts of rock to protect and maintain habitat.]*

The story template uses geodatabase tables to manage story content such as text, map layers, and links to internal and external content. A content management system was developed that enables OPD staff to develop, manage, review, and publish story content with ease through a user interface.

← New York State's Office of Planning and Development Geographic Information Gateway home page provides several opportunities for discovering data and related content.

↓ The web viewer interface is closely integrated with the search and browse functionality so datasets can be easily discovered and explored.
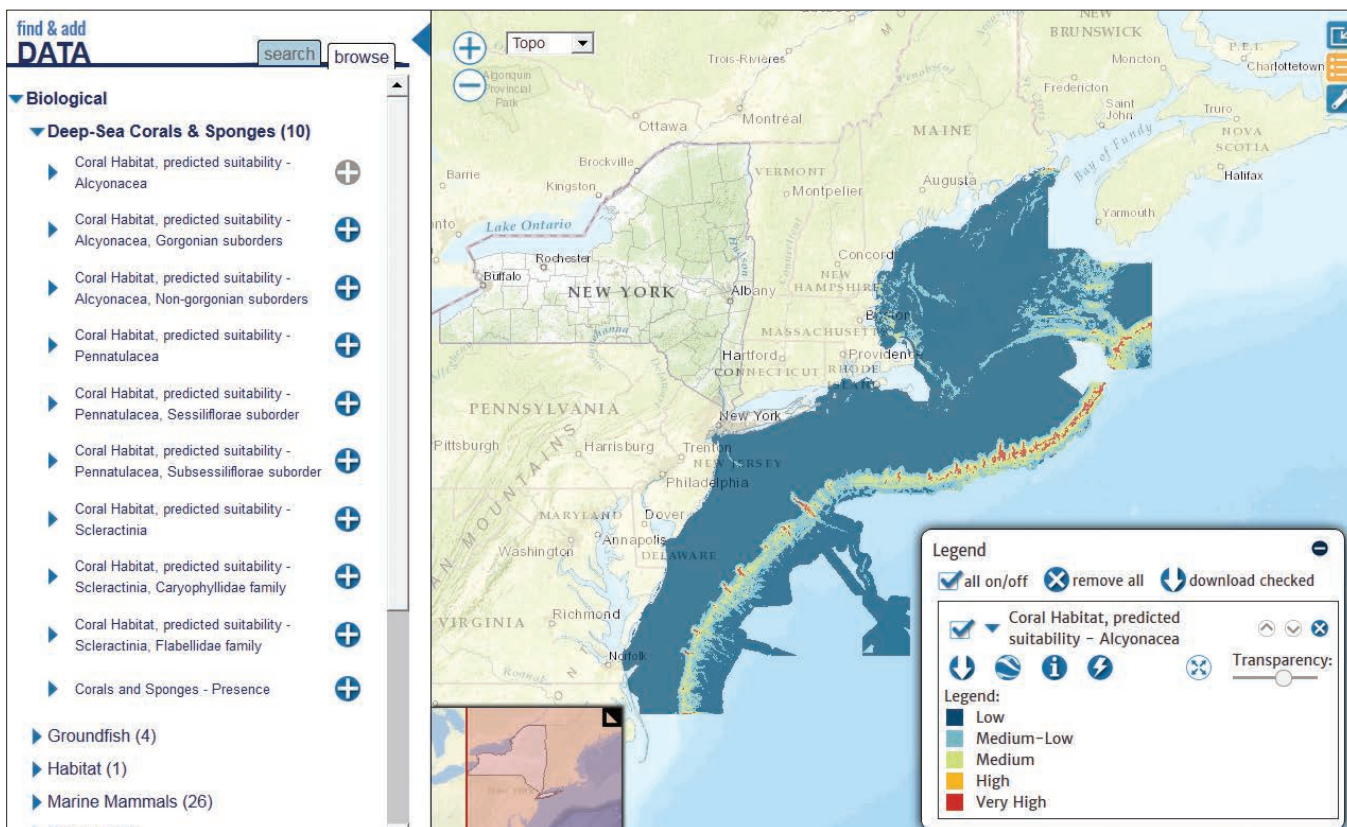
OFFSHORE CANYONS provide important habitat for New York's ocean resources

1 activity concentrates near canyons **2** unique canyon habitats **3** recent canyon discoveries **4** improving canyon management
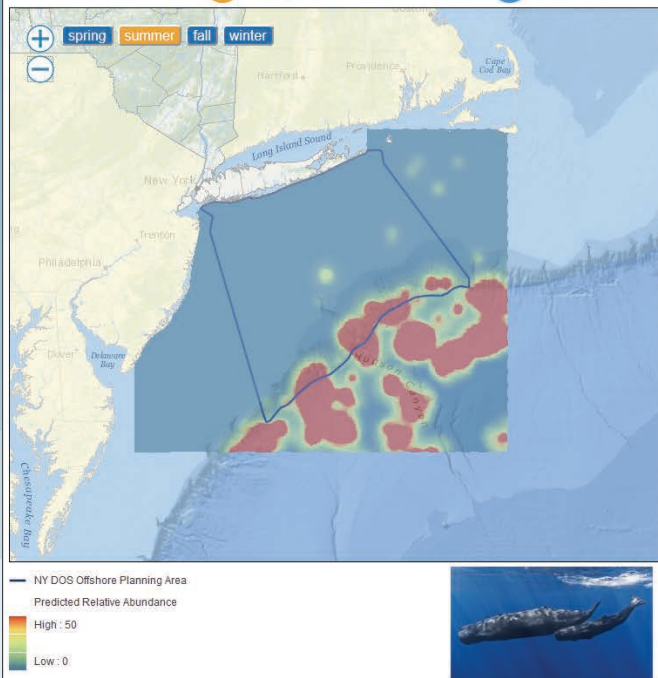
UNDERWATER CANYONS are hot-spots of ocean activity

Underwater canyons are unique features in the ocean, interrupting the seafloor terrain with deep, wide crevices. Offshore New York, underwater canyons provide important habitat for diverse marine species and support a number of recreational activities and ocean-industries important to the State. The Hudson Canyon is the largest submerged canyon off the U.S. East Coast and is one of the largest underwater canyons in the world. Read the sections below to learn more about examples of the various resources and uses that depend on canyon habitats, both seasonally and year-round.

explore the geography, resources, & uses of underwater canyons

1: new york's seafloor regions ▸

2: summer flounder (groundfish) ▸

3: sperm whale (marine mammal) ▾

In the waters offshore New York, sperm whales (*Physeter macrocephalus*) tend to concentrate along the continental shelf edge and slope where food is abundant. Block Canyon is an important corridor for sperm whales pursuing migrating squid in the spring.[3] When hunting for prey such as squid, octopus, rays and sharks, these whales dive deep – they can spend up to an hour underwater and sometimes dive to depths greater than 3,000 feet![4]

The map to the left displays the predicted relative abundance of sperm whales offshore New York. These data were modeled by the New England Aquarium (NEA) and University of Rhode Island (URI). To read more about NEA and URI's work, click here.

[3]Scott and Sadove. 1997. Sperm whale, Physeter macrocephalus, sightings in the shallow shelf waters off Long Island, New York. Marine Mammal Science 13(2): 317-321
[4]NOAA NMFS, Office of Protected Resources

4: wilson's storm petrel (seabird) ▸

5: commercial long line fishing ▸

6: recreational boating activities ▸

↑ A custom-built story map template provides a platform for communicating OPD activities through map content, text, videos, and images.

OPD Partners

To meet its goal to "support the resilient, sustainable growth of New York communities by advancing progressive land-use solutions, community development, and building standards and codes," OPD partners with community-based organizations, academia, government agencies involved in development, natural resources, and social services as well as other stakeholders.

At the outset of the project, OPD staff participated in developing the project's vision, mission, and success criteria. During the initial visioning meeting, the staff's ideas about the project outcome were distilled into a project charter. Various stakeholders were involved in numerous interactive and creative meetings that determined in detail the requirements for the gateway.

OPD and Stone participated in biweekly meetings to review the project's progress, desired functionality, and design requirements. The entire application was built using Agile software development techniques. Various functionalities were built in sprints over an 18-month time frame. Agile methods allow requirements and goals for the project to shift and change as the application was built.

Weekly and biweekly meetings with all team members at Stone and OPD provided a constant feedback loop. The OPD team could see what Stone was producing and adjust the course of Stone's work. In addition, various OPD programs worked together internally assembling stories to include in the gateway as Focus Area pages.

In its first release, the gateway primarily supports and showcases Atlantic Ocean and Climate Change and Resilience planning activities. Future releases will expand it into an officewide resource that will provide information relevant to all programs and support the office in its mission to increase the resiliency and sustainability of New York communities through progressive land-use solutions, community-based development, and building standards and codes.

The project has enabled OPD to more holistically view its activities. It provides one place that highlights what the office is doing using interactive story maps. Each division has developed user stories for its constituencies. At the same time, OPD staff can now manage application content and publish and update data on an ongoing basis, which is a key goal for the new website.

The Gateway's Future

The gateway's suite of information and tools is intended to serve as a valuable resource for New York communities, an educational resource for schools and universities, and a guide for the responsible development of the state's resources. The OPD and Stone will continue to expand the application over the next two years to include more databases and program area stories with interactive content. Planned future functionality may include crowdsourced content and social media integration.

About the Authors

Jeffrey Herter is the assistant director at the Division of Community Resilience & Regional Programs, New York State Department of State.

Liz Podowski is a National Oceanic and Atmospheric Administration (NOAA) Coastal Management fellow at the Division of Coastal Resources, New York State Department of State.

Seeing and Seizing
OPPORTUNITIES

At the 2014 Esri User Conference, the City of Rancho Cucamonga, California, received the Esri President's Award for its outstanding GIS work in planning a sustainable community and its innovative uses of GIS throughout the city.

Incorporated in 1977, the city began using GIS in 1985 to better deliver services to its residents and preserve the area's rural, historic character. The exemplary work for which the city was honored was made possible because it adopted an enterprise implementation of GIS. The move to this more systematic use of GIS for the city of 171,000 was primarily due to the GIS division's position within the Rancho Cucamonga city government and its staff's dedication over those years. The GIS division is under the Administrative Service Department. This places the division in a central position to support every department in the city.

The city's senior GIS analyst, Solomon Nimako, leads the GIS division in its deployment of solutions to city departments. Nimako has been using GIS for more than 19 years. He carried out his first

GIS project while still in high school in Ghana. He used ArcView GIS to plot all government schools in Ghana. It was a summer project and he loved it. Nimako went on to get a BSc in geodetic engineering from Kwame Nkrumah University of Science and Technology in Ghana and a master's degree in GIS from the University of Redlands, California, in 2005. The next year, he began working at Rancho Cucamonga and, in 2008, he became a supervisor.

In his current role as a project lead, he identifies new projects across the city's departments and ensures that existing applications are maintained to meet the expectations of internal clients. The GIS division has 11 full-time staff members. "We do have terrific staff working in our division, and with their support we are able to build new products for our internal clients," said Nimako. Our philosophy is "a free mind is a creative mind," and this concept has the full support of Lori Sassoon, deputy city manager in charge of administrative services.

Transforming GIS

Although the city was an early adopter of enterprise GIS, the addition of Nimako to the GIS team helped push the division forward in deploying newer and improving existing solutions. The GIS division

↓ Members of the City of Rancho Cucamonga, California, city government accepting the Esri President's Award for the city's outstanding GIS work. From left to right, Esri president Jack Dangermond; Ingrid Bruce, GIS/special districts manager; Solomon Nimako, senior GIS analyst; John Gillison, city manager; Chris Bopko, management analyst; and Mike Bell, former fire chief.
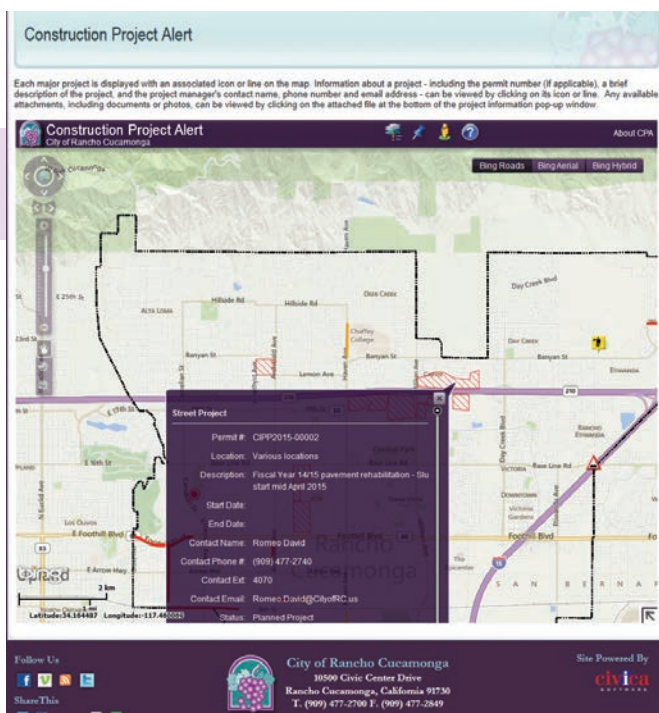
↑ The GIS team works closely with other city departments to improve communication with city residents. This web map app provides the details of construction projects under way in the city.

was initially placed under the city's manager's office. This has been beneficial from a strategic standpoint because it has never been affiliated with a specific department and has been expected to support all departments. This aided the GIS division in evolving the use of GIS at the city.

ArcIMS helped with initial efforts to provide GIS services throughout the organization because it required only a browser. Since those early days, ArcGIS for Server, ArcGIS Online, and the apps that come with ArcGIS Online, such as Collector for ArcGIS, have moved services to city departments to the next level.

Improvements in GIS technology have expanded the types of things the GIS division can do for departments, but the real challenge in achieving a citywide implementation involved thoroughly understanding the business needs of each department and building rapport with individuals in those departments.

"To be able to provide solutions for other departments, we first had to understand their workflow, but in addition, we knew that the key to a successful GIS enterprise deployment is relationship," said Nimako. "Good internal relationships serve as an assurance to other departments that you care about their work and are also willing to learn what they do."

His team had to make sure that their internal clients knew that the ultimate goal was to use GIS to streamline processes and make their jobs easier. They also stressed the importance of data collection not only to the overall organization but also for individual departments.

Gaining a good working relationship with the city's IT department was also very important to Nimako's success in implementing ArcIMS and ArcGIS for Server. The GIS team needed to convince IT

that the GIS team required administrative rights so it could manage GIS services and build web applications. As Nimako recalled, "This was not comfortable for most IT departments and certainly we had to explain the big picture benefit to the organization for the deployment."

Maintaining an open relationship with the IT team enabled the GIS division to effectively communicate its needs. Although the GIS division did not face any major resistance, the IT team did have concerns about security. By taking the time to explain how Esri security works, the IT team gained a better understanding of GIS architecture, and that brought the team into the GIS world a bit. "This really helped in paving the way for us to have access to our servers and the various applications development," said Nimako. Rafael Balneg, senior GIS analyst, is a lead in the GIS/IS collaboration and manages the division servers, and his role is a key one because he understands and knows the installations and configuration of the Esri applications.

In addition to gaining the cooperation needed to manage hardware, Nimako and the GIS team needed executive endorsement. It needed decision makers to use the information products that the division created. "We have been very fortunate that our executive team has always loved technology and knows the importance of location," observed Nimako. "Because we were under the city manager's office, it opened the door for us to show executives the various products and benefits of the platform."

ArcGIS Online and the mobile apps made it easy for executive staff to interact with information products. The GIS division was able to transition executives from hard-copy parcel and zoning maps to ArcGIS mobile apps on iPads. It was an easy sell because the products are so accessible and easy to use.

Another component of Nimako's and the GIS team's success is a concept called the Team of Two. "For any successful enterprise deployment, there needs to be a lead figure and a technical figure working hand in hand," he explained. Ingrid Bruce, the GIS/special districts manager, helped the team come up with new ideas and solutions that she was able to bring to the forefront on the city's agenda.

Seeing Challenges as Opportunities

According to Nimako, understanding the deliverables that are important to stakeholders and decision makers was critical to their success. He believes GIS analysts have to look at things a little differently these days and identify the sensitive and important projects in an organization.

"We should look at challenges as opportunities to spread the extensive benefits of GIS," said Nimako. He uses sidewalk issues as a good example. For local governments, sidewalk issues are a huge financial burden but—for the GIS division—it was an opportunity to build a solution that allows public works staff to quickly identify issues and repair crews to fix them. For three years, the city's public works team has been doing inspections with the Esri mobile app and this has made the staff very efficient in identifying and repairing sidewalk issues.

Residents often call the city manager's office to find out when their street is going to be repaved. This was another opportunity to

↑ GIS maps, such as this one showing trash collection zones, make it easy for residents to get information about city services at any time without calling the city.

address an issue with GIS. By working with the engineering department, the GIS department built an easy-to-use GIS application that lets residents look up this information for themselves.

The Executive Dashboard, an internal customized mobile app that runs on both iOS and Android devices, was the brainchild of John Gillison, the city manager, and Mike Costello, the city's fire chief. It was largely developed and deployed by Ryan Wilson and Isaiah Aguilera, two lead GIS developers for the city. The dashboard provides situational awareness for executives, location and incident analytics for the fire and police departments, an operational view of projects currently being undertaken by the public works department, and the current location of all city vehicles via automatic vehicle location (AVL).

To provide a better understanding of the needs of internal customers, GIS team members have ongoing assignments with specific city departments. The GIS team's close working relationship with the public works department is led by two GIS team technicians, Sopheak Kong and Art Yero. The assignment of GIS technician Vincent Grant to the fire department has enhanced the team's relationship with the department. Chearice Johnson, another GIS technician, is assigned to maintenance and upkeep of the city's parcel database. The special districts side of the division manages all special assessment districts

in the city and adds annual special taxes and assessments information to the tax roll. GIS is used extensively for the management of the 35 districts. Chris Bopko, management analyst, and Kelly Guerra, special districts technician, are the key staff in this division.

Strategies for Expanding GIS

When asked what he would say to GIS analysts who think they don't have the time or resources to achieve similar results, Nimako urges them to start with a small-scale implementation. "Build a useful solution for a department or group that makes them more efficient and that will be your story, and that will bring others on board. With ArcGIS Online and the various Esri templates, it is much easier to implement most of these solutions," he said. "Another good strategy is to reach out to other organizations that are doing similar projects and learn from them. A sidewalk issue in one city is no different than a sidewalk issue in another city."

Instead of jeopardizing GIS jobs, getting more people using GIS in an organization is a bonus for GIS professionals. According to Nimako, "There is a lot of intelligence behind these apps, which are supported by us, the core GIS staff, and, therefore, our jobs are not in danger. Rather, these new tools open the door for us to reach more users and promote GIS even further."

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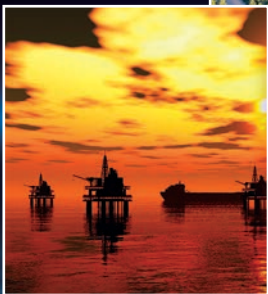
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Top Takeaways from the
2015 Esri DevSummit

Esri ArcGIS program manager Jim McKinney opened the 2015 Esri Developer Summit (DevSummit) by saying, "Whether you are developing for the web or native apps or desktop or enterprise GIS, we've got something for all of you."

During the Plenary Session at the Palm Springs, California, event, Esri's developers unveiled and demonstrated new technology and tools to more than 2,500 attendees. This article summarizes the 11 top takeaways from this year's summit.

1   ArcGIS Pro SDK for .NET

You can now extend ArcGIS Pro with the ArcGIS Pro SDK for Microsoft .NET. ArcGIS Pro is a 64-bit application that comes with ArcGIS 10.3 for Desktop and can be installed and run on the same machine. It has tools to visualize, analyze, compile, and share your data in both 2D and 3D environments and works with ArcGIS for Desktop.

This SDK is based on the add-in extensibility pattern that does not require elevated user permissions or COM-style category registration. With the SDK, you can leverage modern .NET features and patterns such as Task-based Asynchronous Pattern (TAP), Language-Integrated Query (LINQ), Windows Presentation Foundation (WPF) data binding, and Model-View ViewModel (MVVM) to write integrated 2D/3D add-ins using editing, mapping, geoprocessing, layout, geodatabase, and geometry APIs for ArcGIS Pro.

ArcGIS Pro SDK for Microsoft .NET resources, including concepts, guides, tutorials, samples, and snippets, will be available on GitHub when ArcGIS Pro 1.1 is released.

2   3D Mapping

Esri is continually adding 3D to the platform. The Plenary Session included demonstrations of ArcGIS Online Web Scene Viewer and ArcGIS Pro 1.0 as well as the 3D analytical capabilities available on the desktop and the use of 3D on mobile devices.

3   ArcGIS Runtime SDKs

You can use ArcGIS Runtime SDKs to add full GIS capabilities to your native apps on any platform using your development language of choice. In 2015, new and improved APIs are being added to ArcGIS Runtime that let you work with the ArcGIS platform's geoinformation model—specifically portals, maps, and layers.

The next major release of ArcGIS Runtime is a project named Quartz. It will be available in beta this summer and is expected to be released by the end of the year. Quartz will let you author and edit maps in apps and share these with your organization. You will also be able to more easily authenticate with portals and easily retrieve content. ArcGIS Runtime also provides several options for cross-platform development using Xamarin, Java, and Qt/QML so you can get your apps to market faster.

↓ Esri smart mapping reenvisions mapmaking through the use of data-driven workflows, intelligent defaults, coordinated styling, automated scale ranges, and improved color ramps.
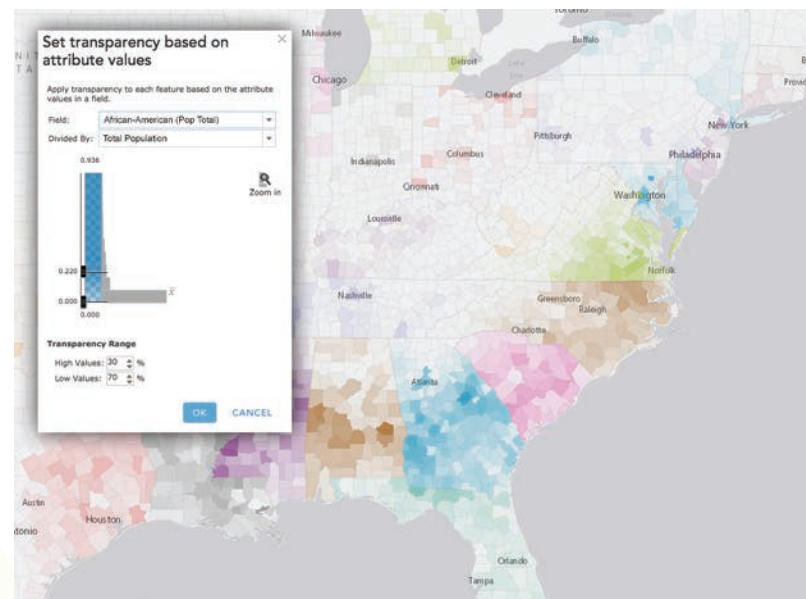
4 Vector Tile Maps

The announcement at DevSummit that Esri would be supporting the creation and display of maps using the vector tile format elicited cheers from the audience. Vector tile mapping offers fast, high-quality content display and reduced cache sizes. Vector graphics provide excellent quality display on high-resolution devices. Because drawing is done on the client side, vector tile maps can be restyled to suit different mapping applications.

5 Mobile Map Packages

Mobile map packages are an easy way to gather maps, layers, and associated data together for use in applications developed with ArcGIS Runtime SDK. Created in ArcGIS Pro, mobile map packages store compressed data for operational layers, basemap layers, network datasets, and locators. Packages can be shared on ArcGIS Online or side loaded onto devices. Once loaded, packages can be used offline to identify, query, perform analysis, route, and geocode.

6 Smart Mapping

Esri's smart mapping helps you tell better stories with your data. It reenvisions mapmaking through the use of data-driven workflows, intelligent defaults, coordinated styling, automated scale ranges, and improved color ramps. Esri has added new kinds of maps to ArcGIS Online, such as heat maps, and improved symbology with continuous color ramps, proportional symbols, improved categorical mapping, and new ways to use transparency effects to show additional details about your data. Smart mapping, delivered via a streamlined and updated user interface, helps experts and novices alike to work faster, with more confidence and less effort.

Are You a Start-Up?
Esri has a program for you.

Was your business founded less than three years ago?

Is it currently generating less than US$1 million annually?

Does it build software or platform-as-a-service products?

If you answered yes to the preceding three questions, you may be eligible to participate in the Esri Emerging Business Program (EBP), a three-year program that provides eligible up-and-coming businesses with free ArcGIS platform technology to integrate spatial functionality within their products. As a member, you will receive software, tools, support, and opportunities that will help your business succeed. More than 150 businesses are currently in the program.

The program's key benefits are access to an ArcGIS Online organizational subscription, an ArcGIS for Server license, and the Esri Developer Network package, training, support, and maintenance.

EBP members also have opportunities to attend and exhibit at Esri conferences and comarket with Esri business teams. More than 60 EBP members attended the 2015 Esri Partner Conference and Developer Summit in Palms Springs, California, in March.

At the 2015 Esri User Conference, businesses enrolled in the program will be exhibiting products and networking with others in the EBP at the Startup Zone, located on the EXPO floor.

To learn more about EBP and sign up, visit developers.arcgis.com/startups.

7 Build Native Apps with AppStudio for ArcGIS

Build fully functional, cross-platform native apps with AppStudio for ArcGIS. Currently in beta, AppStudio lets you convert your maps into beautiful, consumer-friendly mobile apps that are ready for Mac, iOS, Android, Windows, and Linux, and publish them to Google Play and the Apple App Store using your own brand. No developer skills are required. Get involved with this new technology by entering the AppStudio for ArcGIS App Challenge! Download, build, and win (esri.com/landing-pages/appstudio).

8 Python in ArcGIS

Esri continues its commitment to Python and the scientific community with the addition of Python libraries including NetCDF4 for using multidimensional data, SciPy to perform scientific computation, and Pandas for easier data analysis. Esri plans to make it easier for Python users to find and use compatible Python libraries from within ArcGIS using Conda, an industry-standard build and distribution framework. This will ensure that Esri libraries and standard scientific libraries will always be compatible.

9 Python in ArcGIS Pro

ArcPy in ArcGIS Pro is a Python site package that provides a useful and productive way to perform geographic data analysis, data conversion, data management, and map automation with Python. ArcPy provides access to geoprocessing tools as well as additional functions, classes, and modules that allow you to create simple or complex workflows quickly and easily. ArcGIS applications and scripts written using ArcPy can access and work with numerous Python modules developed by GIS professionals and programmers from different disciplines.

→ The 2015 DevSummit has something for every GIS developer, whether web, native app, desktop, or enterprise.

10 R in ArcGIS

When ArcMap 10.3.1 and ArcGIS Pro 1.1 are released, you will be able to run your native R scripts directly as script tools and allow R to access ArcGIS data. Using the geoprocessing framework, your R script will work directly with Esri-supported feature data, honoring its selection and projection. With R and its thousands of contributed libraries added to an already awesome platform for scientific computing and visualization, ArcGIS continues to deliver on its promise to become *the* platform for the scientific community.

11 Server Object Interceptors

Introduced with ArcGIS 10.3.1 for Server, Server Object Interceptors let you intercept and modify requests going into the GIS server and responses coming out of the GIS server. This developer level functionality gives you the ability to integrate spatial data with other external custom data sources at the ArcGIS for Server tier or implement fine-grained security such as layer or operation-level security without having to modify any client applications. You can customize server behavior without making existing apps incompatible. You can still take advantage of platform apps such as Collector for ArcGIS or other existing custom applications built with ArcGIS API for JavaScript or ArcGIS Runtime SDKs.

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↓ Audubon volunteers collect data for a project in the Bahamas. (Photo by Walker Golder/courtesy of the National Audubon Society)

National Audubon Society
Reshapes Its Approach to Data

By A. J. Mangum

Five years ago, the National Audubon Society, the century-old conservation group devoted to protecting bird populations and habitats, embarked on an ambitious plan to reinvent itself by using ArcGIS to change the way it collects and manages data.

With its roots in an 1890s movement to fight the slaughter of waterbirds for the hatmaking trade, Audubon started as a loose-knit network of state-level groups. It has long relied on that decentralized framework to enable a wide reach and empower local efforts. Unfortunately, Audubon's federated structure—with 467 local chapters and a long roster of independent, grassroots conservation projects across the northern hemisphere—created significant data management challenges.

Reporting methods varied wildly, creating a haphazard assortment of data. Redundancies and flawed, even conflicting, datasets were commonplace. Despite the volume of information potentially available to decision makers at the regional and national levels, vital intelligence was still far out of reach.

"In that scenario, our [incoming information] wasn't quality controlled," said Doreen Whitley, Audubon's geospatial information officer. "It was simply up to users, those generating spatial data, to do the best they could with the information they had. I could make maps, but I'd have to pull from back-of-napkin resources with no assurance of accuracy."

Acquiring Situational Awareness

In 2010, Audubon's leadership committed to pursuing large-scale conservation projects that would require situational awareness across multistate regions. The group restructured itself, creating a new organizational alignment based on four North American flyways, the north–south paths traveled by migratory birds each spring and fall.

State and local chapters typically pursued independent conservation initiatives that were based on strategies that seldom reached across state lines. Audubon hoped that under this new configuration, these chapters could begin to see their efforts in the context of wider regional pictures. This new approach would reduce redundancies and promote interchapter partnerships. The database required for such an overhaul, though, simply didn't exist.

As the first step in its flyway-oriented retrofit, Audubon created an experimental protocol. Chapters in each north-south flyway systematically reported every four months on their progress with ongoing projects.

Whitley led the effort to compile and organize the incoming data using ArcGIS to build—piece by piece—a comprehensive new picture of Audubon's efforts.

"It was the first time *[chapters]* could see across state boundaries," said David Yarnold, Audubon's president and CEO. "What none of us expected was that this experience would trigger a series of management changes where a new generation of collaborative leaders took over and brought with them a 'one Audubon' approach to conservation that's fired up our entire network of four million."

The experiment set the stage for the development of enterprise GIS. This transition saw Audubon evolve from an organization with some 90 users of ArcGIS—each creating and managing spatial information on a local level—to an intelligence-centric culture with more than 1,000 network members using the Esri platform on a widespread basis to gain ownership of authoritative data.

That reinvention began with a cultural shift.

Molding GIS to the Culture

Audubon's leadership faced a unique challenge: broadening the group's use of GIS while staying true to the decentralized organizational structure that has allowed for efficacy at national, state, and local levels.

Tearing down that structure was not an option. An enterprise GIS strategy had to be molded to fit Audubon's existing culture. In that culture, data management skills, data needs, and technology access varied chapter by chapter. Whitley knew that, for Audubon, GIS implementation would need to be both creative and agile.

"Our goal wasn't to create more spatial data experts but to make it easier to access and use data," she said. "For us, the starting point was the idea of the value of authoritative data. In any organization, whether it's decentralized or centrally focused, the key is understanding that value and recognizing the datasets that drive your mission. Focus on those and flexible ways to distribute them. Everything grows from there."

Whitley led an organization-wide

↓ When Audubon committed to large-scale conservation projects in 2010, it adopted a new organizational structure based on four flyways traveled by migrating birds. (Screen shot courtesy of the National Audubon Society)

exercise in identifying core spatial datasets such as species populations, habitat locations, migration patterns, and climate measurements. Unraveling the origins of these datasets illustrated the value of quality control in data management. The effort helped clarify for all players the importance of consistency and accuracy in gathering and sharing geospatial information. It brought the organization together, bonding personnel through a shared newfound trust in a single authoritative dataset.

"Soon everyone in the organization appreciated that there weren't five answers to the same question," Whitley said. "At that point, no one's resistant, and people are looking to use geospatial data to create solutions. That's how GIS builds connective tissue."

Using this more accurate spatials data, Audubon's GIS team created maps in ArcMap and published them to ArcGIS Server as map services so they would be available online for users throughout the organization. End users in local chapters could then incorporate the material into their own initiatives and campaigns. The value of Audubon's data increased as its directional flow changed.

Area program—developed by the conservation group BirdLife International but administered in the United States by Audubon—identifies vital bird habitats. Historically, Audubon had relied on "stitched together" data arriving in the form of thousands of e-mails from sources working at various levels within the organization and using differing criteria in evaluating bird populations and threats.

With enterprise GIS, users at Audubon's state and local levels can now access the most recent national data via a shared server. They can check out data, edit it, and check it back in, thus contributing to the ongoing refinement of a single, reliable dataset.

Lights Out Program

Audubon's Lights Out program works to mitigate the risk that migrating birds will be killed at night by flying into tall buildings. Many bird species migrate at night and rely on the moon and stars for navigation. Brightly lit windows in tall buildings can disorient birds, causing them to be killed when they strike urban structures. According to Audubon, more than 100 million birds die annually from such strikes.

"We bring in collected data, reprocess it as a feature class, then bring it into CityEngine," Whitley explained. "The end product is a 3D model of a strike location, which allows us to make better recommendations in lighting changes."

The technology has changed the tone of Audubon's conversations with building owners. Rather than issuing a blanket request that all lights in a building be turned

"GIS helps us better organize the work of thousands of compilers and volunteers and makes *[data]* available much more quickly."

"Less content—what had been considered authoritative content—is created locally," Whitley said. "Most core data is now accessed centrally. Authoritative spatial data is tied to the institution, not the individual."

With an improved data structure in place, Audubon introduced specific GIS-empowered initiatives and retooled existing efforts to better use spatial information. The Important Bird and Biodiversity

Prior to Audubon's widespread adoption of GIS, volunteers monitoring buildings for signs of overnight bird strikes might have compiled data consisting of little more than the building's address. Now, volunteers can use Collector for ArcGIS to record specific strike locations on a building's exterior. Audubon has begun using Esri's CityEngine to model the environments in which these strikes occur.

off overnight, Audubon can present what Whitley calls "a more reasonable ask" to limit lighting in specific locations on specific floors. That change in tone has actually brought many building owners on board as voices for the Lights Out cause.

Largest, Longest-Running Animal Census

Audubon's Christmas Bird Count (CBC), a century-old citizen science program, still relies on bird population numbers generated by volunteers and submitted as tabular data. Nonetheless, CBC has been reformed through GIS. Data is vetted at the national level, added to a single database, and can be mapped on demand. The effort illustrates how Audubon has balanced technological progress with the preservation of its culture.

"One reason a lot of NGOs are decentralized is that you have people who care about the same things, and they start grassroots efforts locally," Whitley said. "As the organization scales up, you get a bit of disconnect in things like spatial data skills. With the CBC, volunteers manage everything that goes on in their circles. GIS plays an important role for the national-level staff and biologists who vet incoming CBC data and provide volunteers with the maps they

↑ The ArcGIS platform has helped Audubon develop strategies for vetting and editing data—including bird census figures—collected by local volunteers. (Photo by Walker Golder/courtesy of the National Audubon Society)
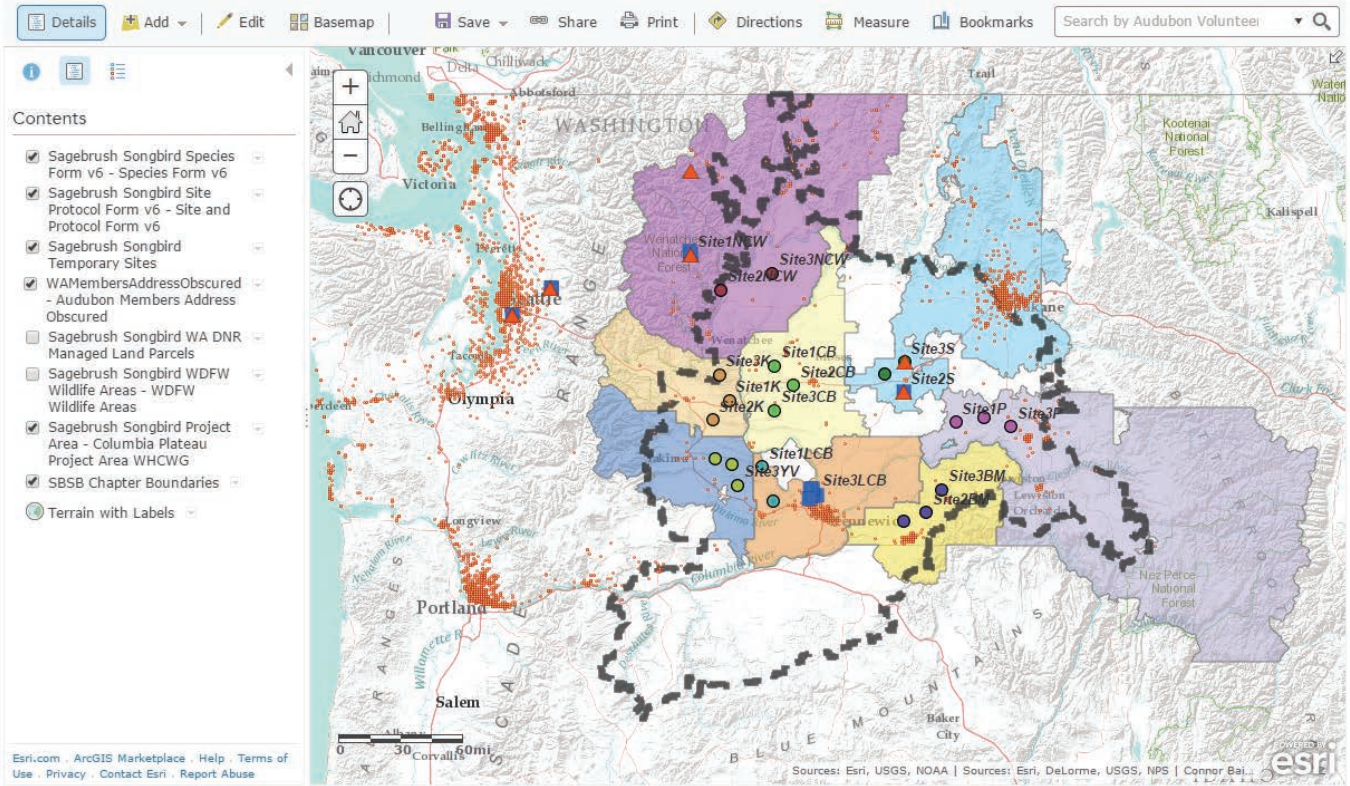
↑ By compiling geospatial data on a shared single server, and then providing editing capabilities to users throughout the organization, Audubon's GIS team enabled the creation of a single authoritative dataset. (Map courtesy of the National Audubon Society)

need to coordinate work in their circles."

"People don't realize the CBC is the largest, longest-running animal census on the planet," Yarnold said. "GIS helps us better organize the work of thousands of compilers and volunteers and makes *[data]* available much more quickly."

GIS has enabled Audubon's science teams to conduct sophisticated spatial analyses of bird ranges and determine how habitats and migratory patterns could change under a variety of future climate scenarios. Enterprise GIS has allowed climate/habitat data to be distributed within Audubon's network with greater efficiency and effect. Chapters can now internalize data produced by scientists working at the national level, and repurpose it for use locally.

Even Audubon's fund-raising and recruitment efforts have been reformed by GIS. Spatial data analysis offers new perspectives on donor histories, demographics, and projected outcomes for future campaigns.

Going forward, Whitley said, Audubon expects to make greater use of 3D mapping. CityEngine's 3D capabilities are effective in illustrating birds' airborne environments, but Whitley expects that 3D's strength as a storytelling tool—equipping viewers to see habitats and threats through the eyes of a bird—will further aid Audubon in its advocacy efforts. Boosting local volunteers' skill levels in using Collector for ArcGIS and in creating compelling Esri Story Maps, she added, will likewise lead to more effective communications with the public and with policy makers.

A More Collaborative Approach

"We see opportunities in these 467 chapters, with the volunteers that have committed to the organization," Whitley said. "The more we can arm them with technology, the stronger their voices will be and the more successful they'll be."

Yarnold sees GIS as a vital component for nonprofits of the future. He said that organizations like Audubon will always reflect the visions of their leaders, but he adds that, in groups that embrace GIS, those visions can be shaped, refined, and strengthened by meaningful data. He expects GIS to enable nonprofits to move away from what he calls traditional models—those in which advocacy heroes make decisions while other participants are relegated to supporting roles—and shift toward more collaborative approaches in which all players have the tools and data to participate in strategy making.

Rising to a leadership role within Audubon, Yarnold asserts, now requires a belief in collaborative goal setting and clear metrics. He expects GIS itself to become a basic part of the skillset required for the group's decision makers.

"Our culture change *[was achieved]* using data to level the playing field and let science lead the way," Yarnold said. "GIS is a creator of baselines and a truth teller, an objective view of opportunities and challenges. The bottom-line payoff is trust and confidence that we're using the best available science to inform our conservation decisions."

About the Author

A. J. Mangum is a Colorado-based writer, photographer, and editor.

Jack and Laura Dangermond
Awarded the Audubon Medal

Esri founders Jack and Laura Dangermond received one of the nation's most prestigious environmental awards, the Audubon Medal, during the 2015 National Audubon Society Gala Dinner held in New York City in March 2015.

The Audubon Medal is one of the highest honors awarded for conservation. It has been given only 53 times. Past recipients include Rachel Carson, Robert Redford, Ted Turner, and the Rockefeller family. The award was presented to the Dangermonds in recognition of their outstanding achievements in the field of technology and conservation innovation and their support for research institutions, schools, and nonprofit organizations.

David Yarnold, president and CEO, and David Ford, chairman of the National Audubon Society, presented the award and noted that Esri's development of innovative technology has allowed the National Audubon Society to advocate for conservation solutions and share data. This has also empowered citizen scientists who are members of its chapters across the country. With the help of Esri technology and the support of the Dangermonds, Audubon has been able to improve the world and drive change using the power of GIS.

Jack Dangermond accepted the award on behalf of colleagues at Esri, partners in the NGO space, and Esri users all over the world. He observed that, "Their work is the real science." Dangermond believes that "GIS will fill in all of the blanks and will become a nervous system for the planet."

While noting his respect for everything about nature, Dangermond also emphasized the importance of what is happening in the technology world. "If we can bring these two worlds together, like what the Audubon Society is doing, I will have a lot more hope for the future." Jack concluded his remarks saying, "I am very deeply moved by this honor, and I am going to respect it for the rest of my life."

Editing with Feature Templates

By Mike Price, Entrada/San Juan, Inc.

This tutorial is one of a series that demonstrates best practices for editing in ArcGIS for Desktop. It introduces feature templates and shows how they are created, updated, and applied.

ArcGIS 10.x for Desktop uses feature templates to create and update spatial data. These templates help manage symbology and populate selected attributes efficiently. Feature templates are usually created in or just before an editing session and often apply predefined layer symbology displayed in the map's table of contents (TOC).

Feature templates define information used to create a feature, including the default construction tool, selected attributes, and storage rules. Templates contain a user-defined name, description, and useful tags. Once created, templates are stored in the ArcMap document and in an item's layer file.

Well-Behaved Feature Templates

Users often ask me to explain why feature templates tend to behave badly for them. Carefully constructed and managed feature templates behave quite well, but you need to understand the rules for using them.

The first step when creating a feature template usually involves starting an edit session and loading the Create Features window. Often, the editing layer does not appear in the Create Features window, which creates confusion. A template might not appear because

- The layer or its group is not visible.
- The layer's visible scale range is beyond the map's current scale.

- The layer is a parcel fabric dataset.
- The layer has a definition query applied, and the default feature template does not match that query. This is the most common reason.

The best way to avoid problems with templates is to create the definition query first, clear any old templates, and create a new template for the queried data.

Getting Started

This exercise uses data shown on the US Geological Survey Antler Peak 7.5-minute quadrangle. This is a portion of the Battle Mountain, Nevada, training set that has been used in seven previous exercises. This installment in the series will explain how to create, update, manage, and use feature templates for geological and topographic data including faults, hydrology, mineral occurrences, and bedrock.

To get started, download the sample dataset from the *ArcUser* website (esri.com/arcuser) and unzip it to a local machine.

1. Start ArcMap, navigate to the \Battle_Mountain08 folder, and open Antler_Peak_01.mxd.
2. Explore the data layers and look at their attribute tables. Expand all layers and turn them on and off. Check out labeling schemes. Verify that the Maplex label engine is being used by right-clicking the data frame, choosing Properties, and clicking the General tab. Under Label Engine, make sure Maplex is selected. Maplex comes with ArcGIS 10.3 for Desktop.
3. From the ArcMap standard menu, choose File > Map Document Properties. Complete the descriptive fields, providing a title, summary, and simple description. Include your name as Author and include Antler Peak, Geology as tags. Set paths to relative and set Battle_Mountain08\GDBFiles\Antler Peak.gdb as the default database.

This file geodatabase contains all the data for this exercise except for one georeferenced image, which is stored in Battle_Mountain08\JPGFiles. Since this is a rather simple editing exercise, it uses only one geodatabase to store all vector data. In an ArcMap editing session, only shapefiles stored in a common folder or feature classes inside a selected geodatabase may be edited.

Sometimes, when I edit in large, complex projects or share editing duties with others, I store edited data in one or more separate geodatabases to minimize the chances that a data management disaster might occur. Once editing is finished, I may copy edited feature classes back to master project geodatabases. However, for this exercise, remember to make only the editing layer selectable.

↓ This exercise uses data shown on the US Geological Survey Antler Peak 7.5-minute quadrangle.
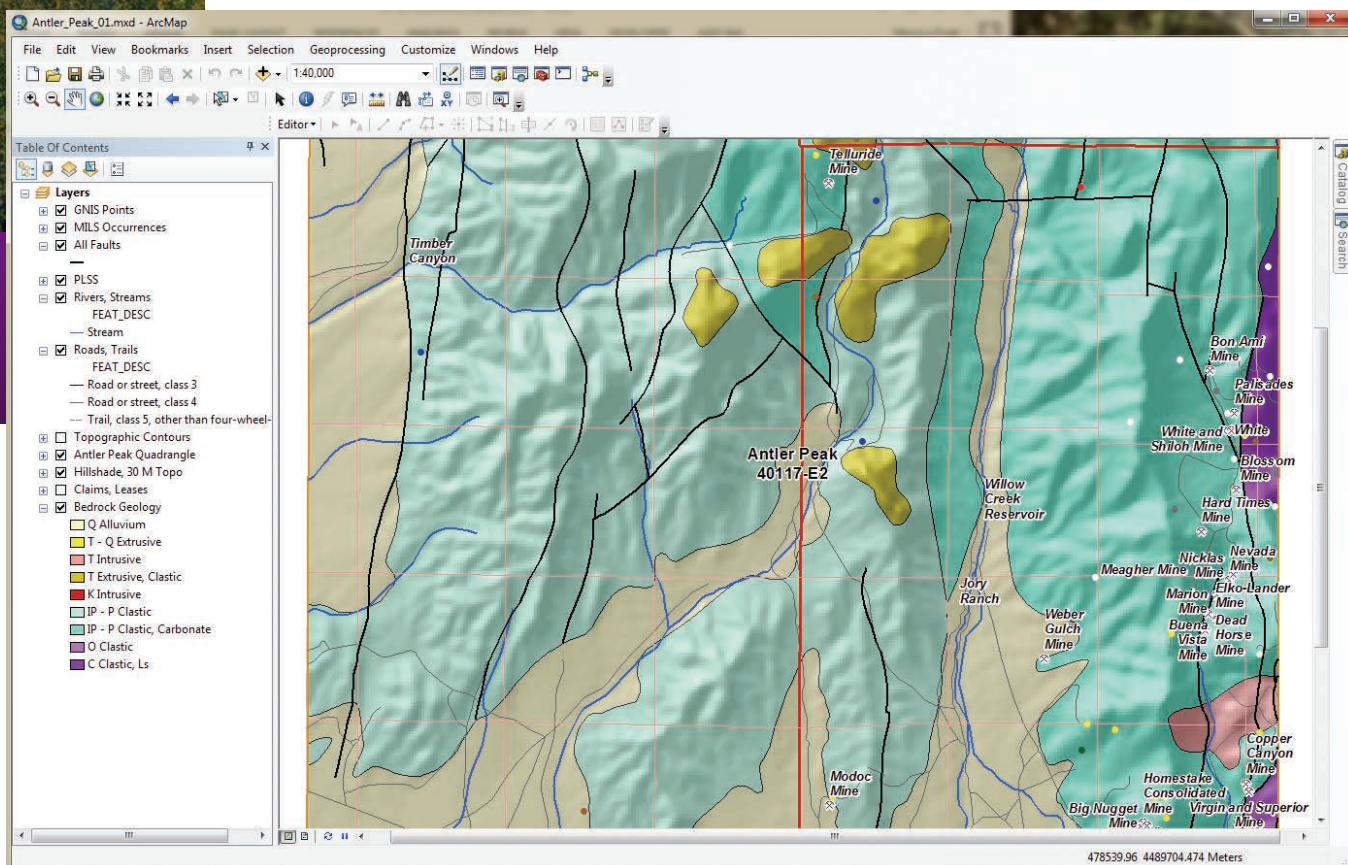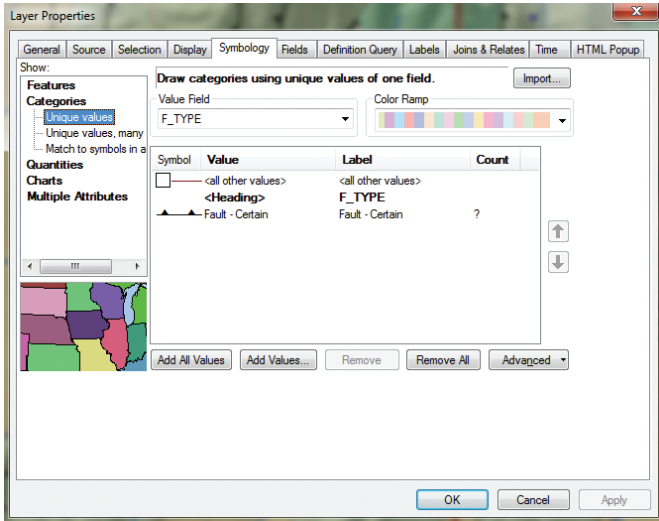
↑ After applying a definition query to select the thrust faults, symbolize this data using the USGS symbol set.

Preparing Data Layers

Begin by studying all the layers in the map.

1. Right-click the Bedrock Geology layer and choose Data > View Item Description to view the attribution. It is limited but is a complete attribution.

2. Open the attribute table for All Faults and sort on the [F_TYPE] field in ascending order. Notice that attributes include Faults

- Certain, Faults - Concealed, Faults - Inferred, and Thrust Fault - Certain. Close the All Faults attribute table.

3. In the TOC, right-click All Faults and select Copy. Right-click the data frame name, Layers, and choose Paste Layers twice. Select all three instances of All Faults and group them, naming the group Faults Group. Rename the first copy "All Faults to Thrust Faults" and the second copy "Normal Faults." Leave the All Faults layer unchanged and turn it off.

4. Double-click Thrusts, select Properties and click the Definition Query tab. Use the Query Builder to create the expression F_TYPE = 'Thrust Fault-Certain'. Select and copy this query to your clipboard. Then click OK and Apply.

5. To symbolize the Thrust Faults layer, double-click the layer, choose Properties, and click the Symbology tab. Set Categories to Unique Values and the Value Field to F_TYPE. Click the Get All Values button, uncheck <All other values>, and double-click the default symbol.

6. In the search window, type "thrust fault certain," select All Styles, and click Search. Six symbols should appear. Select Thrust Fault, 1st generation-Certain. Click OK twice to apply this symbology. Carefully inspect the symbology.

7. Save the project.

These symbols are included in the Geology 24K Style. They are carefully created to conform with the geology symbol sets used by the US Geological Survey and other agencies. The full symbol definition can

↓ Fault lines showing the direction of faults can be corrected easily in ArcMap using templates.
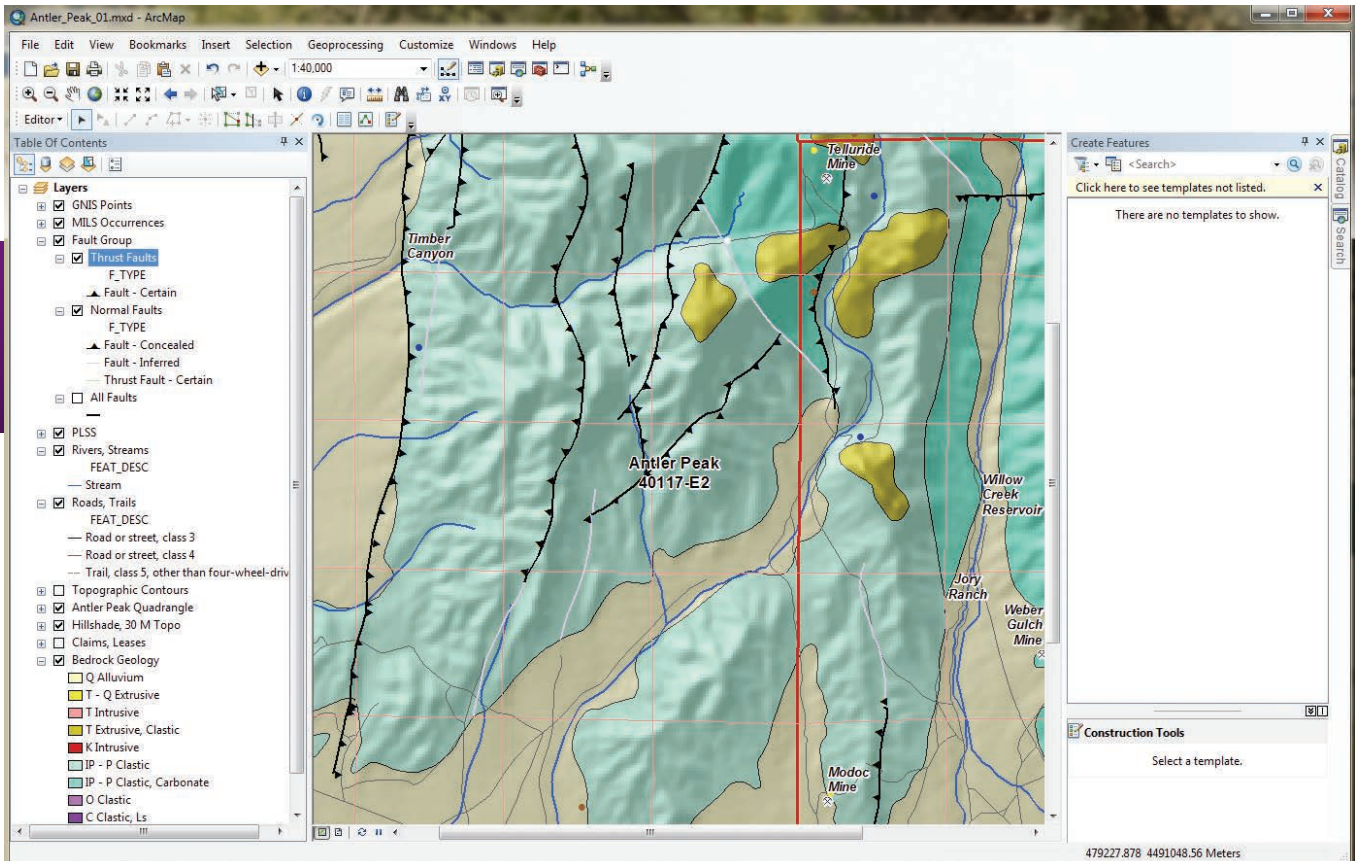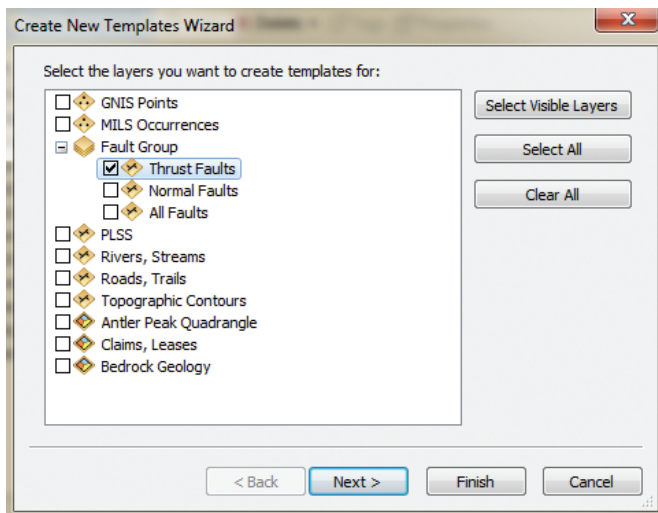
↑ Use the Create New Templates Wizard to create a feature template to edit fault lines.

be downloaded from the US Geological Survey as FGDC Document Number FGDC-STD-013-2006.

Check Symbol Direction

Consider what happens when faulted blocks frequently override other blocks at a low angle. Symbolized as triangles (or barbs), these symbols should point in the direction that the overlying rocks came from. The next step is to load a map to see if they are correct.

Navigate to \Battle_Mountain08\JPGFiles and load Thrust_Fault.jpg. Zoom in to the northeast corner of the project at a scale of approximately 1:15,000 and inspect the image and the symbolized lines. Notice that the red triangles in the image point west, toward the source of possible compressive forces.

In this case, the Pumpernickel Formation occurs above the Antler sequence, and the thrust barbs must be switched. To do this will require opening an editing session, creating a feature template, selecting the offending fault lines, and flipping them.

Creating Thrust Fault Template

1. Before opening an edit session, change the TOC display to List By Selection. Make Thrust Faults the only selectable layer. Change the TOC to List By Drawing Order and make sure Thrust Faults is displayed.
2. In the TOC, right-click the Thrust Faults layer and select Edit Features. The context menu provides three choices: Start Editing, Define New Types of Features, and Organize Feature Templates. The Define New Types of Features option allows symbology editing to be expanded later. Choose Start Editing from the context menu. The Editor toolbar should appear and can be docked above the TOC.
3. In the Editor toolbar drop-down, choose Editing Windows > Create Features. The Create Features window appears and can be docked on the right side of the workspace.
4. In the Create Features window, click the Organize Templates button. Inspect the layers listed in the Organize Features Template window. Select Thrust Faults Layer and click the New Template button.

Building Antler Peak

In the middle Paleozoic, over 300 million years ago, a large mountain-building event occurred in the present-day Great Basin, a large geologic and physiographic area centered in Nevada.

Although the exact mechanism is controversial, geologists generally believe that material from the western edge of the Paleozoic continent was pushed eastward by massive compressive forces, thrusting over eastern, often younger, rocks. Continued faulting and igneous intrusions, coupled with extensive erosion, modified the region's geology and geomorphology until the present time.

Mineralizing events emplaced a wealth of mineral occurrences. High angle normal faults and thrust or reverse faults controlled placement of mineral deposits. Over the last two centuries, gold, silver, copper, lead, tungsten, and many other metals, as well as minerals that are important industrial commodities, have been mined in this area.

For current information on the geology of north central Nevada, read Keith B. Ketner's 2012 paper, "An Alternative Hypothesis for the Mid-Paleozoic Antler Orogeny in Nevada, US Geological Survey Professional Paper 1790." To review concepts and background information on this topic, see Ralph J. Roberts' 1964 paper, "Stratigraphy and Structure of the Antler Peak Quadrangle, Humboldt and Lander Counties, Nevada, USGS Professional Paper 459-A." Work by Roberts is credited with opening modern mineral exploration in the Battle Mountain, Carlin, and Eureka areas. Both papers are available from the USGS website.

↓ This USGS quad map from 1940 shows the area covered by this tutorial. This and other historical maps can be downloaded from the USGS Historical Toopographic Map Explorer at historicalmaps.arcgis.com/usgs.
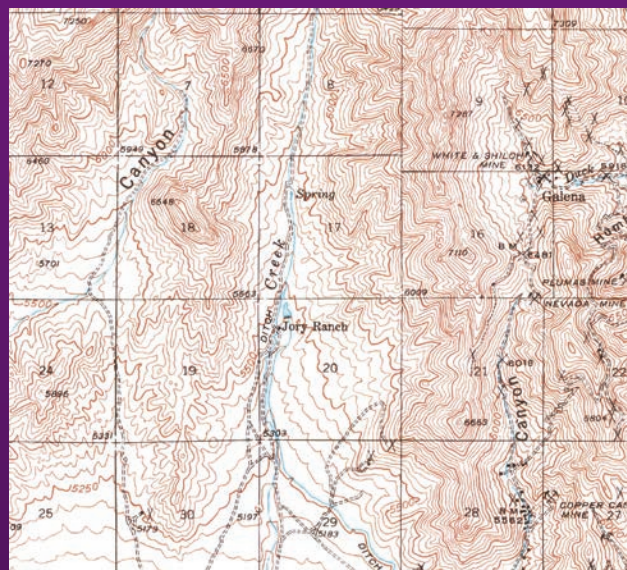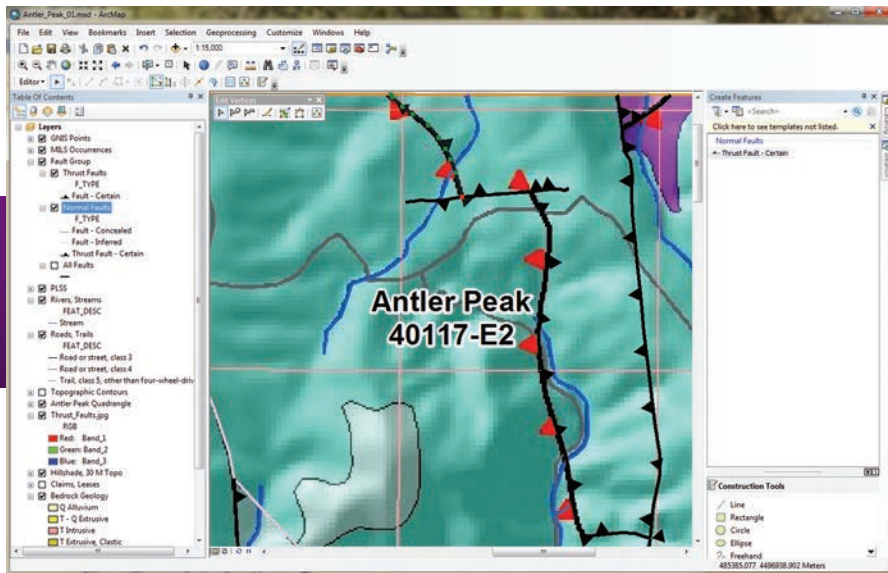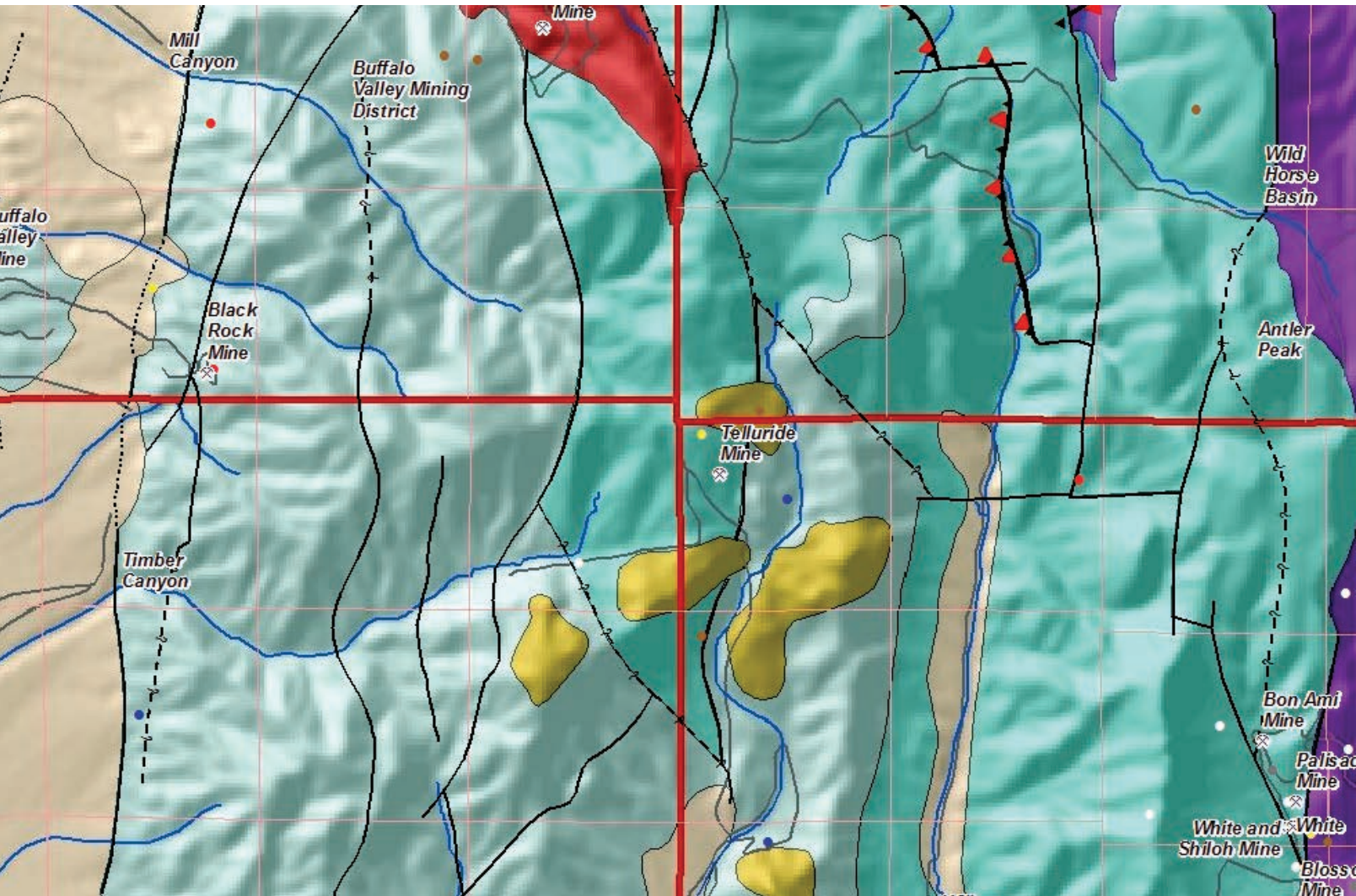
↑ The Thrust_Faults.jpg lets you see which fault lines need to be flipped.

at its properties. Inspect the Template Properties. In this dialog box, you can rename the template, specify an alternate Default Tool, and set field defaults.

7. Change F_CODE to 5, F_MOVE to D, and EditCode to 0. Now, when a new thrust fault is created using this template, the attributes will be populated using these values. Click OK.

Flipping Faults

1. Open the Thrust Faults attribute table. Select F_Index = 88, close the table, and look for the highlighted selection in the northeast portion of the map.

2. Select the Edit Tool in the Edit toolbar. Double left-click the highlighted segment to display its vertices. Notice the single red node that marks the terminus of the fault line. Right-click the northernmost vertex and choose Flip. The barbs on the fault line change direction from east to west. Select the next line (F_Index = 89), and use the same process to flip it. Repeat the edits for F_Index = 96.

5. The Create New Templates Wizard opens. Look at the layers in the Faults Group. Check Thrust Faults and make sure all others are unchecked. Click Next. Click Finish and Close.

6. Double-click the new Thrust Fault - Certain template to look

↓ After flipping the direction of two Thrust Fault lines, symbolize the three types of Normal Faults after applying a definition query and USGS symbology.

3. Inspect your edits, and if they are correct, open the attribute table and use the Field Calculator to change all EditCodes to 3.

4. Turn on Bedrock Geology labels and use the Identify tool to check the relationships between upper and lower rocks separated by each Fault. Are there older rocks on top of younger rocks?

5. Open the Edit toolbar drop-down and choose Save Edits. Close the Thrust Faults attribute table, turn off Thrust_Faults.jpg, zoom to the project extent, and save the project.

Symbolizing Normal Faults

The same steps used with Thrust Faults will be used to symbolize the Normal Faults layer. The fault lines in Normal Faults will not be edited.

1. In the TOC, right-click Normal Faults and open Properties. Click the Definition Query tab. Use the Query Builder to form the expression F_TYPE <> 'Thrust Fault - Certain' and apply it.

2. Click the Symbology tab. Choose Categories > Unique values, choose F_TYPE as the Value Field, and click the Add All Values button.

3. Use the search function in the Symbol Selector using the layer name to locate the appropriate symbology from the Geology 24K Style Reference. For example, search on fault inferred to find the symbol for the Fault - Inferred layer.

4. Now create a feature template for Normal Faults. In the Create Features window, click Organize Templates and select Normal Faults. Click New Template, making sure only Normal Faults is checked, click Next then click Finish. Close the Template Organizer.

5. Save the Thrust Faults and Normal Faults as layer files to capture the associated feature templates. Save the map.

When finished, inspect the fault symbology on the map. Can you determine the difference between a concealed fault and an inferred fault? A concealed fault is hidden by an overlying geologic map unit, water, or ice, even though it may be observed nearby. An inferred fault's location must be inferred by indirect means such as geophysics and remote sensing.

Summary

This exercise showed how to access meaningful geologic symbology and use definition queries when applying symbology. This updated symbology was used when creating several feature templates.

Acknowledgments

Once again, thanks to my Battle Mountain data providers and to my earth sciences followers. Special thanks to my editor, who keeps me always heading in the right direction.

Contributing to
Community Maps Made Easy

By Tamara Yoder, Esri

← The empty feature classes in the CommunityGDB_ TemplateBeforeProject geodatabase serve as templates for the output feature classes that are created using the Community Maps Data Prep Tools.
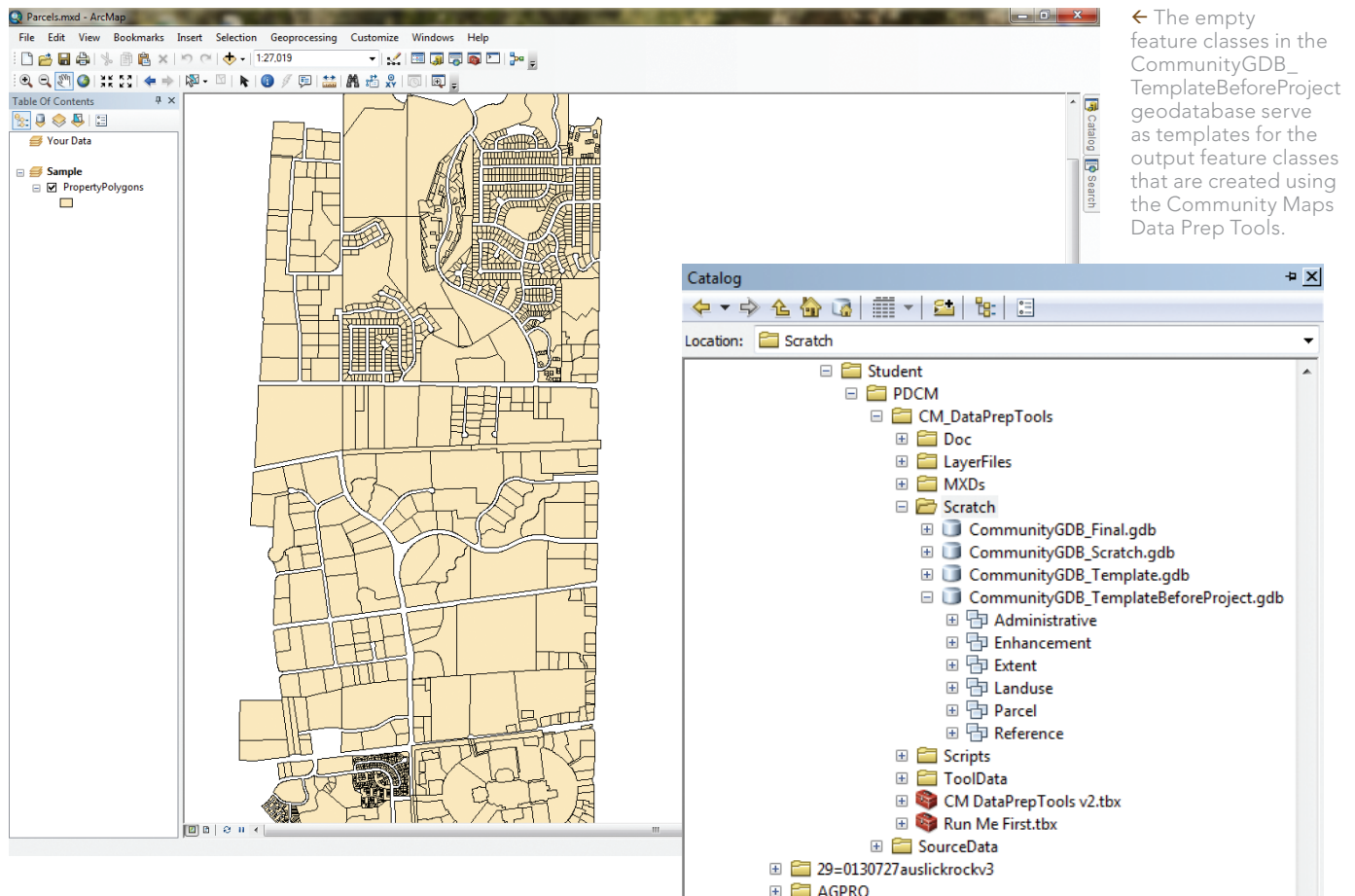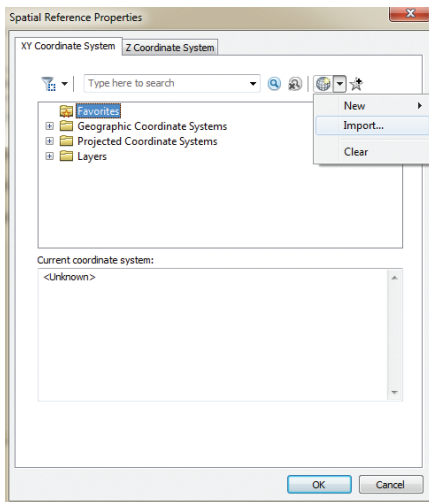
← Use PropertyPolys.shp to reassign the coordinate system for the Parcels layer.

The Community Maps Program is an Esri-led cooperative effort to build multiscale basemaps of the world using the best available data sources from the ArcGIS user community. Participating in this program can make your organization's GIS content more accessible and provide access to more authoritative basemaps for GIS projects.

There have been many enhancements to Esri's Community Maps over the last couple of years, most notably the Community Maps Data Prep Tools that let contributors quickly and easily prepare data for contribution. These tools were built using the geoprocessing tools in ModelBuilder.

Two toolboxes provided in the sample dataset available from the *ArcUser* website—Run Me First and CM DataPrepTools v2—contain all the tools. The Run Me First toolbox only contains the Run Me First tool, which must be run first because it sets the stage for the other tools. The CM DataPrepTools v2 toolbox contains tools for every type of layer that can be contributed to Esri Community Maps and the Living Atlas of the World.

Getting Started

Download the sample dataset archive containing the Community Maps Data Prep Tools and sample data download from the *ArcUser* website and unzip it to a local machine. To complete this exercise, you will need ArcGIS for Desktop (any license level) at version 10.x or higher.
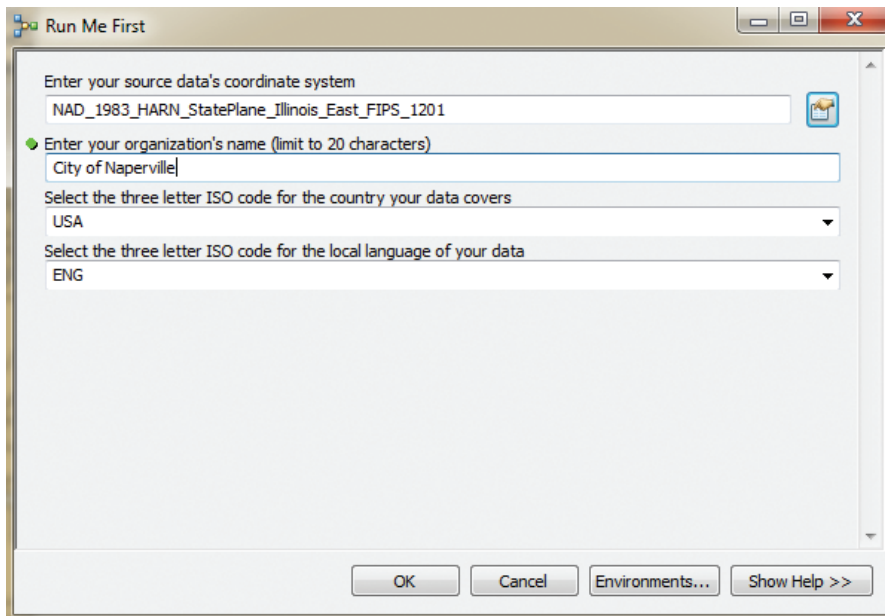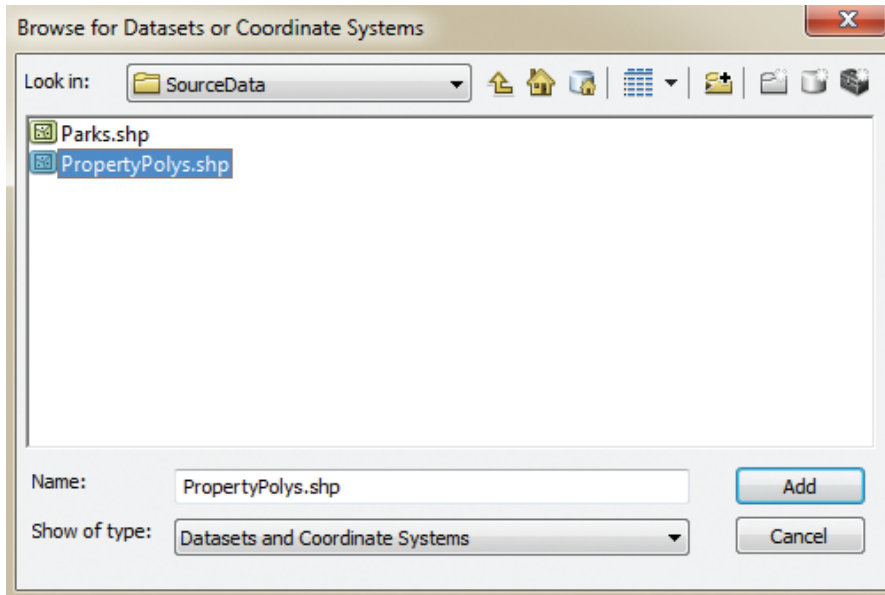
In this tutorial, you will run the Run Me First tool then the Parcels and LocalParks tools. The Run Me First tool sets the output geodatabase schema and defines the spatial reference for the output data. It also asks for some additional information that will be used for quality assurance purposes.

Although ArcGIS Online basemaps use the Web Mercator Auxiliary Sphere map projection, it is not necessary to reproject data to conform to this projection to use the Community Maps Data Prep Tools. In fact, using your established map projection and coordinate system is preferred. The ArcGIS Online Content team will reproject your data when it is received.

The Parcels tool is the quickest and easiest tool to run and provides a good introduction to the other tools. The LocalParks tool, while a bit more difficult, demonstrates the workflow of many of the tools used to prepare source data for contribution.

Explore the Scratch Folder

1. To use the Run Me First Tool, navigate to the location where you unzipped the sample dataset and open the Student folder. In the Student folder, navigate to the ...\PDCM\CM_DataPrepTools\MXDs folder and double-click the Parcels.mxd map document to open it.
2. Notice that this map document has two data frames: Your Data, for data that will be contributed, and Sample, for the sample data that has been provided. The

↑↑ Browse to the ...\PDCM\SoureData folder and double-click the PropertyPolys shapefile to select it.

↑ Completed fields in the Run Me First tool

classes. After the Run Me First tool is run, it will be populated with empty feature classes that are copies of those in the CommunityGDB_TemplateBeforeProject geodatabase that use the spatial reference that has been defined.

6. Expand the CommunityGDB_Scratch geodatabase. The CommunityGDB_Scratch geodatabase doesn't contain any features, just a table. This geodatabase will be used for intermediate layers that will be created while the tools are running. The table will be populated when the Run Me First tool is run. You can ignore this geodatabase.

7. Click the CommunityGDB_Final geodatabase. Notice that it is currently empty because no tools have been executed. This geodatabase will receive the output from the Community Maps Data Prep Tools.

Run the Run Me First Tool

1. In the Catalog window, Av navigate to the Run Me First toolbox in the ...\PDCM\CM_DataPrepTools folder. Expand the Run Me First toolbox and double-click the Run Me First tool to open it.

2. Click the button next to the text box for Enter your source data coordinate system to invoke the Spatial Reference Properties dialog box. In the Spatial Reference Properties dialog box, click the Add Coordinate System button and then click Import.

3. Browse to the ...\PDCM\SourceData folder and double-click the PropertyPolys shapefile to select it. Notice that the current coordinate system is now set to NAD_1983_HARN_StatePlane_Illinois_East_FIPS_1201 (the spatial reference for the PropertyPolys shapefile). Click OK on the Spatial Reference Properties dialog box.

4. Now, back in the Run Me First dialog box, type "City of Naperville" for the name of the organization. For the three-letter ISO code for the country covered by the sample data, accept the default of USA. For the three-letter ISO code for the local language of the sample data, accept the default of ENG. (These fields

sample data lets you to run the tool to see how it works before trying it on your own data.

3. In the Catalog window, navigate to ...\PDCM\CM_DataPrepTools\Scratch and expand the CommunityGDB_TemplateBeforeProject geodatabase. The empty feature classes in this geodatabase serve as templates for the output feature classes that are created using the Community Maps Data Prep Tools.

4. Expand the Parcel feature dataset and

double-click the OwnerParcel feature class. Click the XY Coordinate System tab. Notice that the spatial reference of this feature class is Web Mercator Auxiliary Sphere. Although this is the map projection used by ArcGIS Online basemaps, it is probably not the projection typically used. Click OK to close the Parcels Feature Class Properties dialog.

5. Click the CommunityGDB_Template geodatabase. Notice that this geodatabase does not contain any feature
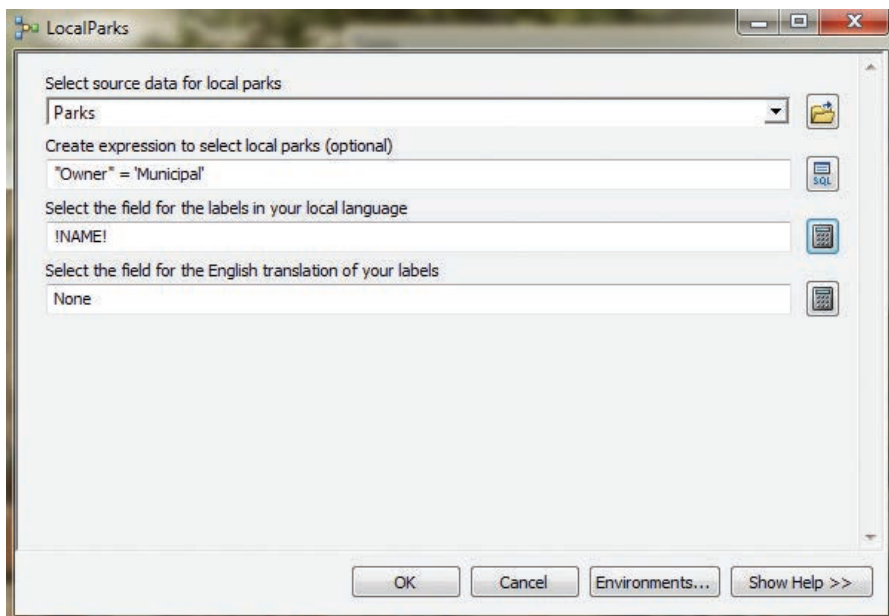
↑ Use Query Builder to migrate only the municipal parks.

are important for quality assurance and quality control.) Click OK to run the Run Me First tool.

5. When the tool has executed, click Close. Right-click the CommunityGDB_ Template geodatabase in the Catalog window and click Refresh. Expand the CommunityGDB_Template geodatabase. Notice that the geodatabase now contains the same feature datasets and feature classes as the CommunityGDB_ TemplateBeforeProject geodatabase.

6. Expand the CommunityGDB_Scratch geodatabase. Drag the DataPrepTable into the Table of Contents. Right-click the DataPrepTable and choose Open. Notice that the DataPrepTable recorded the information that you placed in the Run Me First tool. You can close the DataPrepTable and remove it from the Table of Contents by right-clicking and choosing Remove.

7. In the CommunityGDB_Template geo-database, expand the Parcel feature data-set and double-click the OwnerParcel feature class. Click the XY Coordinate System tab. Notice that the current co-ordinate system is NAD_1983_HARN_ StatePlane_Illinois_East_FIPS_1201, just as you defined in the Project tool. Click OK to close the Parcels Feature Class Properties dialog box.

Run the Parcels Tool

1. In the Parcels map document, right-click the Your Data data frame in the Table of Contents and click Activate.

2. Add the source data to the map. In the Catalog window, navigate to ...\PDCM\ SourceData. Drag the PropertyPolys shapefile from the Catalog window and drop it on the map.

↓ After using the Field Calculator to choose NAME as the label field, the LocalParks tool is ready to be run.

↑ Use AllLayers.mxd to check how your layers will display.

3. Right-click the PropertyPolys layer and click Open Attribute Table. Notice how many parcel polygons are in this shape-file. Note the number of input features. This will be helpful when reviewing the output data after a tool is run. Close the attribute table.

4. In the Catalog window, navigate to and expand the ...\PDCM\CM_DataPrepTools\CMDataPrepTools v2.tbx toolbox. Double-click the Parcels tool. This tool requires only a data source and an optional selection query. All parcels are displayed in the World Topographic Map with a uniform symbology, so no

other classification queries are necessary.

5. For the data source, click the down arrow and choose PropertyPolys. Since all the polygons in this shapefile are parcel features, there is no need to enter a selection query, so that field can be left blank. Click OK to run the tool.

6. When the tool finishes, click Close. The Parcels tool created a new layer, OwnerParcel, and added it to the Table of Contents. It is symbolized with 40 percent transparency and is displayed with the World Topographic Map sym-bology. Close the map document with-out saving changes.

Run the LocalParks Tool

1. Navigate to the ...\PDCM\CM_DataPrepTools\MXDs folder and dou-ble-click the LocalParks.mxd file to open it. Activate the Your Data data frame.

2. In the Catalog window, navigate to the ...\PDCM\SourceData folder. Drag the Parks shapefile into the map. Open its attribute table. Note how many records (features) are in this table, then close it.

3. In the Catalog window, navigate to and expand the ...\PDCM\CM_DataPrepTools\CM DataPrepTools v2.tbx. Expand the Landuse toolset to expose all its tools. Unlike the Parcels tool, you can designate label fields with the LocalParks tool. Double-click the LocalParks tool to open it.

4. For the LocalParks source data, click the down arrow and choose the Parks layer. The Parks shapefile contains two types of parks—municipal and private. You only want to include the municipal parks in your Community Maps contribution, so you will need to create a selection query. Click the SQL button to access the Query Builder. Use it to construct the following expression: "Owner" = 'Municipal'. Click OK to close the Query Builder.

5. Next click the Field Calculator button next to the Select the field for the labels in your local language text box. In the Field Calculator, choose NAME. Click OK to close the Field Calculator dialog box. For Select the field for the English translation of your labels, accept the de-fault of None.

6. Click OK to run the LocalParks tool. When the tool has finished running, click Close. Notice that a new LocalPark layer has been added to the Table of Contents.

7. Open the LocalPark attribute table. This feature count is less than the feature count from the Parks shapefile because only municipal parks were migrated. Close the map without saving the changes.

Review Migrated Layers

Reviewing your output from the Community Maps Data Prep Tools is a necessary step in

the data preparation process. If you used the tools to produce several layers, the easiest way to review them together is with the AllLayers map document included with the Community Maps Data Prep Tools download.

1. Navigate to ...\PDCM\CM_DataPrepTools\MXDs and double-click the AllLayers.mxd file to open it.
2. Notice that the Table of Contents contains more than 50 layers. Most of them will have red exclamation points next to them indicating that they are not currently linked to a valid data source. Layers that do not have red exclamation points and have check boxes that are not grayed out are visible. These layers are pointing to the feature classes that were created by running the tools you ran in the previous steps.
3. In the Catalog window, navigate to ...\PDCM\CM_DataPrepTools\Scratch and expand the CommunityGDB_Final.gdb. Notice how the feature classes in the geodatabase are linked to the valid layers in the map document.
4. If your map document is zoomed out too far to easily see all the layers, right-click on the LocalPark layer and choose Zoom To Layer. Now all migrated layers should be visible.
5. Turn each layer on and off to get a good idea how they are displayed in the map. Though not an exact template of the World Topographic Map, the AllLayers.mxd file will give you an idea of how your layers will look together when they are published.
6. When you are finished reviewing your layers, close the AllLayers.mxd file without saving your changes.

Conclusion

This exercise demonstrated how to use the Community Maps Data Prep Tools to prepare basemap source data for contribution to the Esri Community Maps Program. For more information about this program or to learn about contributing your content, contact the ArcGIS Online Content team at communitymaps@esri.com.

About the Author

Tamara Yoder, a geospatial analyst on the ArcGIS Online Content team, facilitates and teaches workshops, conducts webinars, and writes documentation. She also manages the social media aspect of the Community Maps Program and the Living Atlas of the World. She has been with Esri for four years. Before coming to Esri, Yoder earned a bachelor of science degree from Pennsylvania State University.

No Programming Required

Create web apps rapidly with Web AppBuilder for ArcGIS

By Derek Law, Esri Product Manager, ArcGIS for Server

Do you want to build web mapping applications you can run on desktop, web, or mobile platforms without doing any programming? If so, this article is for you. All you need is an ArcGIS Online or Portal for ArcGIS account.

ArcGIS Online and Portal for ArcGIS now include Web AppBuilder for ArcGIS, which lets you create custom web mapping applications in a what you see is what you get (WYSIWYG) wizard environment that is intuitive and easy to use. Web AppBuilder for ArcGIS is built on ArcGIS API for JavaScript and HTML5, enabling you to create apps that can run on any device.

This article shows how to create a web mapping application based on a web map in ArcGIS Online or Portal for ArcGIS in just six steps without having to write a single line of code.

↓ Provide metadata for your new web app.

Step One: Select a web map and activate Web AppBuilder for ArcGIS

Log in to your ArcGIS Online (or Portal for ArcGIS) account. Navigate to your My Content page and select a web map that you want to use in your web app. Open it in the map viewer. Click Share. In the Share dialog, select the group or groups you want to share the web map with, and then click Make a Web Application.

In the Make a Web Application dialog, you will see that you could create a web app using the Web Application templates. But in this case, click the Web AppBuilder tab to create a new web app in Web AppBuilder for ArcGIS.

On the Web AppBuilder tab, provide a title, appropriate tags, and a summary description of the web app you will create for your selected web map. Then click Get Started. This will activate the Web AppBuilder for ArcGIS "builder" application.

Note that while you are still in either ArcGIS Online or Portal for ArcGIS, you are now working in the Web AppBuilder for ArcGIS application within those sites. Alternatively, you could have also activated Web AppBuilder for ArcGIS directly from the My Content page by clicking Create > App > Use the Web AppBuilder. (This option is already available in ArcGIS Online and will be available in Portal 10.3.1 for ArcGIS.)

The Web AppBuilder for ArcGIS application layout is divided into two general sections. To the left are the different parameter settings you can enable and configure for your new web app. To the right is a live, WYSIWYG preview of how the web app will appear after you have configured parameters for the web app.

Notice that the left section of the layout contains four tabs: Themes, Map, Widgets, and Attributes. These are the main areas where you can configure and customize your new web app. Both the Themes and Attributes tabs are for defining the look and feel of the web app.

The Map tab defines the data content of the web app—in this case, it is the web map you selected. The Widgets tab allows you to set and configure the functionality in the new web app. When you make a change in the left section in one of the four tabs, it will be immediately visible (if applicable) and enabled in the right display preview section of Web AppBuilder for ArcGIS. This provides a very intuitive and user-friendly experience so you can see and try out the changes
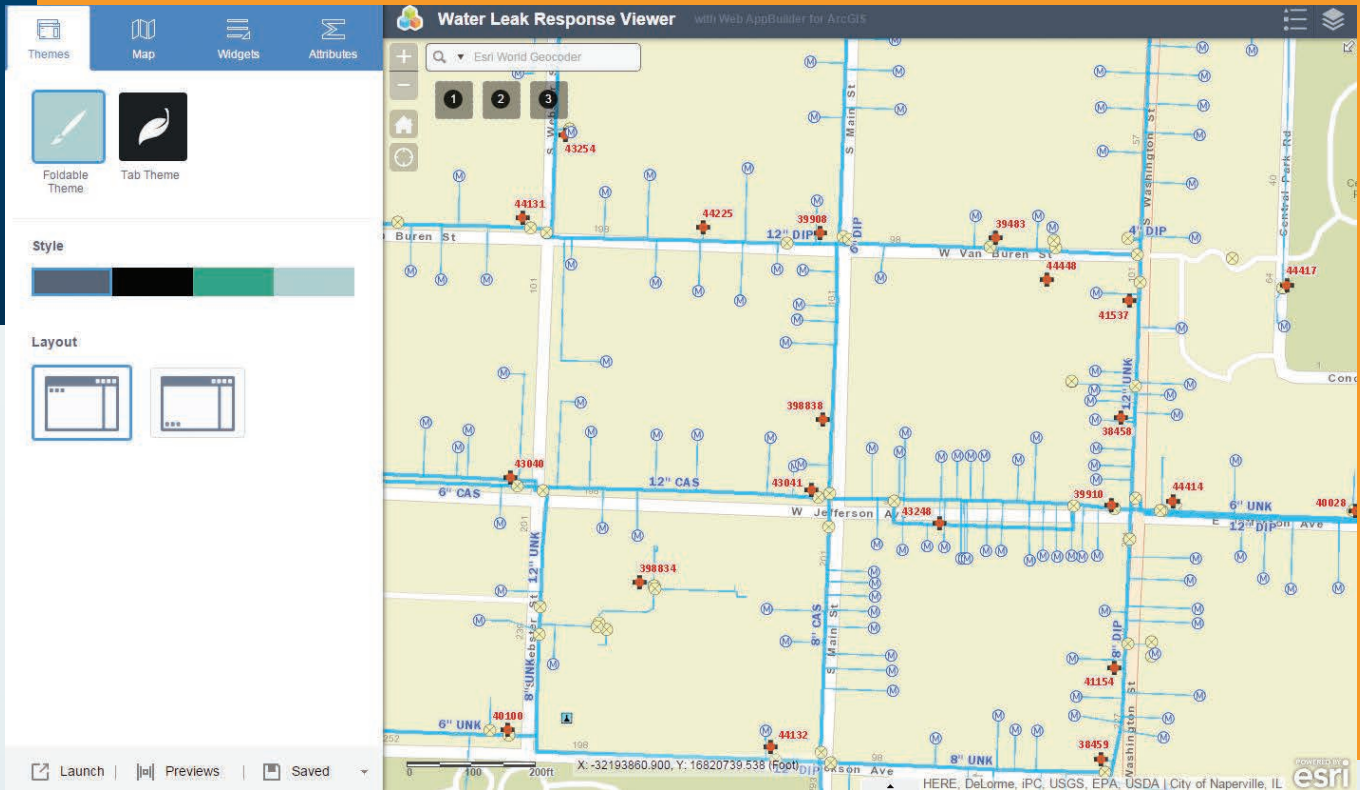
↑ Web AppBuilder for ArcGIS provides a dynamic interface. As changes are made on the left panel, they will appear in the right panel of the preview window.

you just set for the web app. For example, if you were to add a new widget button to the app interface, it would appear in the app layout.

Step Two: Configure the look and feel of your web app

Click the Themes tab. There are two default themes available: Foldable and Tab. First, click the Tab Theme button. You will notice that the app's layout changes in the preview window on the right. Then click the Foldable Theme button. You will see that the app layout returns to the way it was. Note that each option also has its own unique style and layout options. Select a theme for your new web app along with a style and layout and then click Save in the lower part of the left section.

Next, Click the Attributes tab. On this tab, you can further refine the appearance of your web app. You can add a custom logo, title, and optional subtitle and web links for your web app. Add an appropriate title for your web app; click the Logo button to add your own custom logo; and add a subtitle and web links, if desired. Click Save when you are finished with your custom settings.

Step Three: Customize the map display of your web app

Click the Map tab. On this tab, you can change the data content for your new web app by simply clicking the Choose Web Map button. In the Choose Web Map dialog, you will see all the web maps in My Content of your ArcGIS Online (or Portal for ArcGIS) account. You can also view the web maps that you can access in your organization, the groups you belong to, and public web maps. But you will use

the web map you originally selected for this new web app; therefore, click Cancel.

You can navigate and change the spatial extent of the current map display in the right-hand section of Web AppBuilder for ArcGIS. Zoom to the spatial extent that you want your new web app to show when the app starts up and click the Use Current Map View button. Click Save when you are finished.

Step Four: Configure your web app's functionality

Define the different capabilities available in your new web app. Click the Widgets tab. This tab lists the different functionalities that you can add to your new web app. A widget is a chunk of code that enables functionality in web apps. By selecting and adding widgets, you enable different functionalities in the app.

A best practice is to create web apps that meet a specific business workflow instead of generic apps that address multiple workflows. For example, you should create an app for editing parcels and a different one for collecting data from the field, instead of a single app that would do both.

The Widgets tab lists several widgets that form part of the user interface (UI) of your new web app. Hover your cursor over a widget such as Geocoder. Notice that the widget becomes highlighted in red in the app preview display. Some widgets in the list appear in light blue, indicating that they are not activated, and therefore, not part of your app. To disable a widget, hover over the upper-right corner of the widget icon and click when an eye icon appears to hide it. To configure a widget's specific properties, hover over the lower-right corner of the widget icon and click the pencil icon when it appears.
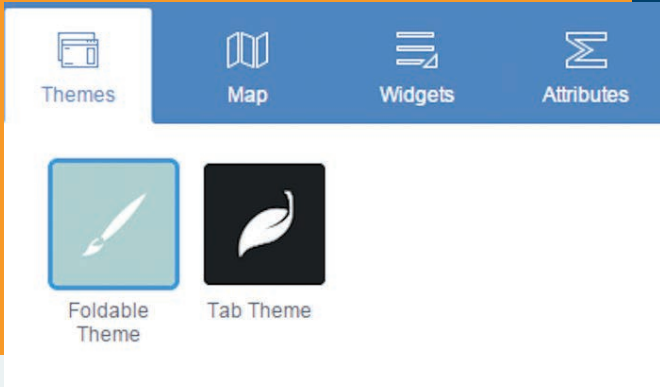
At the bottom are three generic widget icons denoted by the numbers *1*, *2*, and *3*. These are currently empty placeholders that enable you to add more widgets to the web app UI, if desired.

Click Widget 1 on the Widgets tab to make the Choose Widget dialog appear. In this dialog, you can select the widget you want to add. Select the Basemap Gallery widget and click OK. Next, the widget's configuration properties dialog appears—this is where you can further define the properties of the widget. Select the basemaps you want available and click OK to save your widget settings. The Basemap widget now appears in the app preview display. Click the Basemap widget in the preview window to see how it would work in the web app.

If you need to add more widgets to the app, you can click the Header Controller widget at the top of the Widgets tab. It contains widgets in the app title bar. Web AppBuilder for ArcGIS includes more than 20 widgets. More widgets are added with each new ArcGIS Online and Portal for ArcGIS update. The widgets initially offered provide core functionalities typically found in GIS applications and are listed in Table 1. The complete list of available widgets and information on configuring widgets is available from the ArcGIS Online help (doc.arcgis.com/en/web-appbuilder/).

Widget	Functionality
Display attribute table	Layer lists
Basemap gallery	Legend
Spatial bookmarks	Measurement tools
Display charts	Overview map
Display coordinates	High-quality printing
Directions	Queries
Draw tools	Scale bars
Editing tools	Splash screen
Geocoding	About dialog
Time slider	Header controller
Swipe tool	Geoprocessing
Analysis widget	(ArcGIS Online only)

↑ Table 1: Widget functionality

↓ You can change the data content in your web app by selecting a different web map.
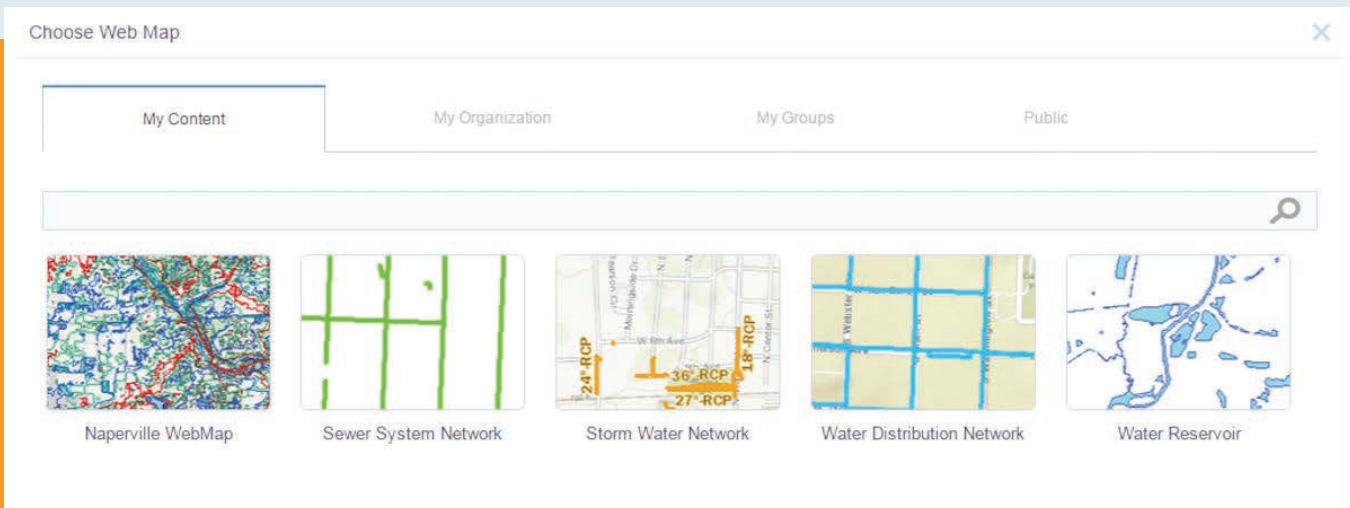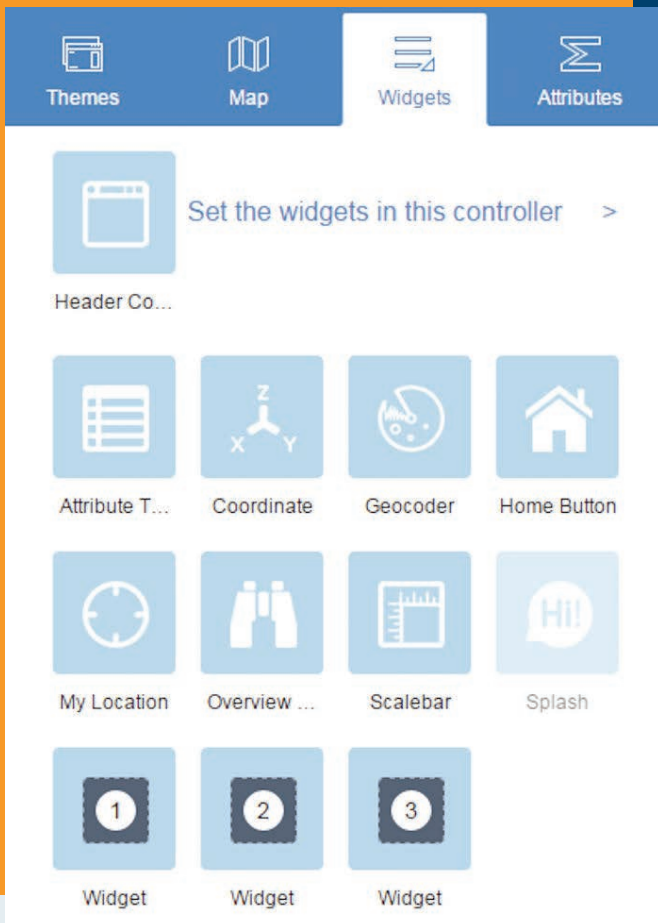
← Select a widget from the Widgets tab.

Select and add the widgets that would be appropriate for your new web app. Click Save when you are finished. You have now completed setting the appearance, data content, and functionality of your new web app. Your custom web app is complete and ready to use.

Step Five: Save and launch your web app

Your new web app is saved in My Content. The web app becomes a new item and can be edited within the Web AppBuilder for ArcGIS builder environment at any time. It is now live and can be accessed by anyone you have shared it with. Click Launch at the bottom of the left-hand section to run your newly created web app in the web browser.

↓ Preview the Basemap widget in Web AppBuilder for ArcGIS.
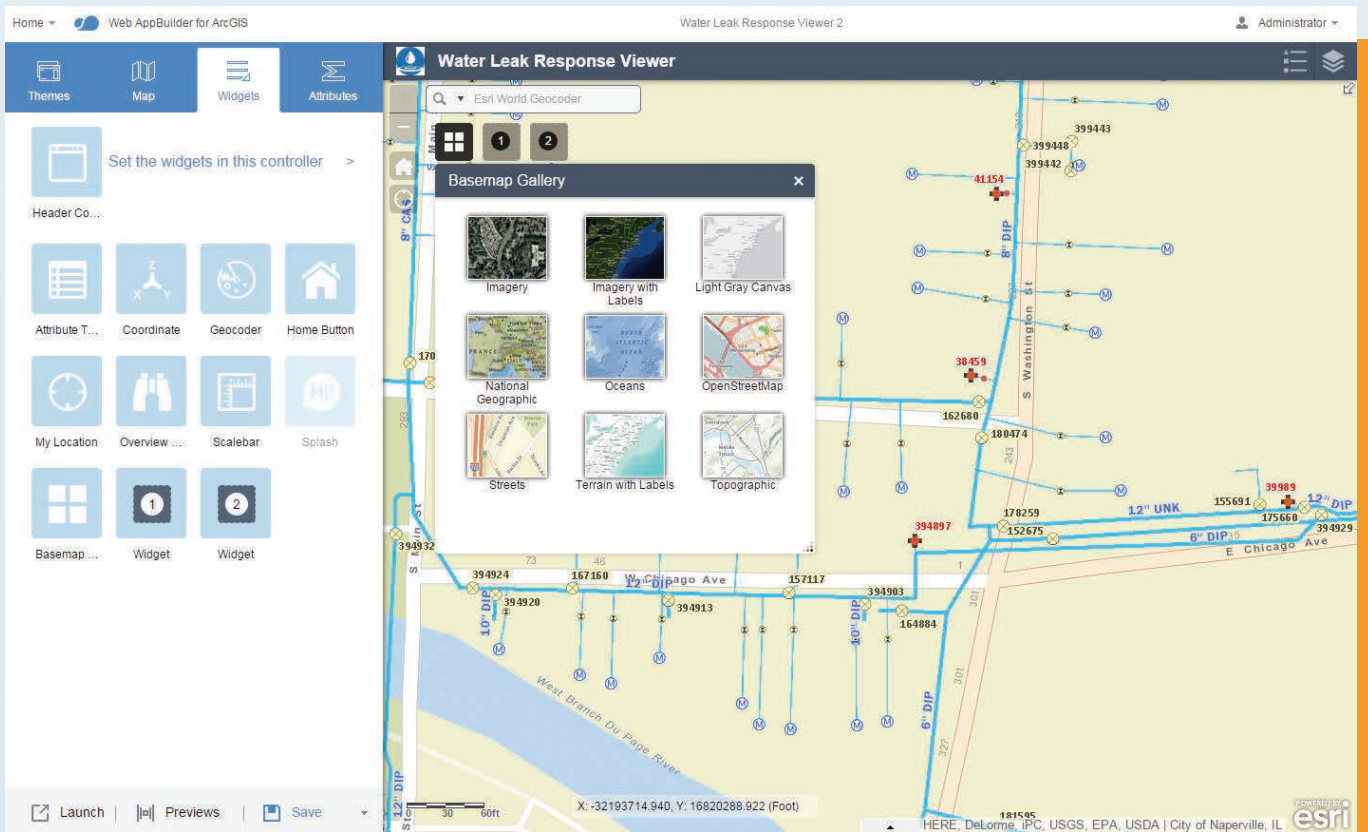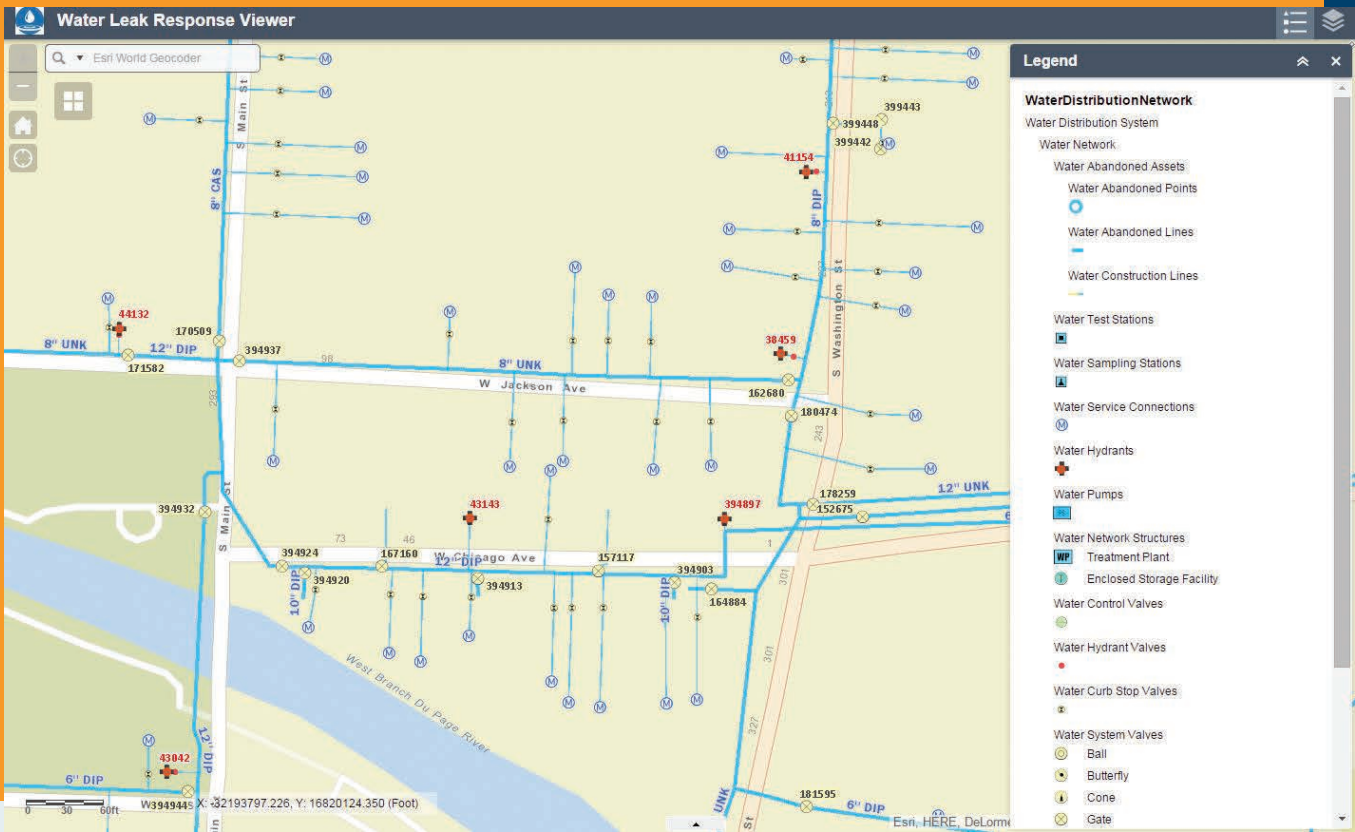
↑ Here is an example of a finished web app created using Web AppBuilder for ArcGIS.

Step Six: See how your web app will appear on different devices

Because Web AppBuilder for ArcGIS is built on ArcGIS API for JavaScript and HTML5, the new app can run on any web browser on any device. The Web AppBuilder for ArcGIS user interface provides an environment that enables you to preview how the web app will look on these different platforms.

At the bottom of the left-hand section, click the Previews button. This changes the entire Web AppBuilder for ArcGIS display interface. On the left, a list of mobile devices is shown, and on the right is a preview of how the new web app will look in the selected device. Click Configure to return to the previous Web AppBuilder for ArcGIS interface when you are done.

See how easy it was to create, configure, and launch a custom web mapping application in Web AppBuilder for ArcGIS? Web AppBuilder for ArcGIS is also extensible, meaning you can create your own widgets and themes using the Web AppBuilder for ArcGIS Developer Edition and with ArcGIS API for JavaScript.
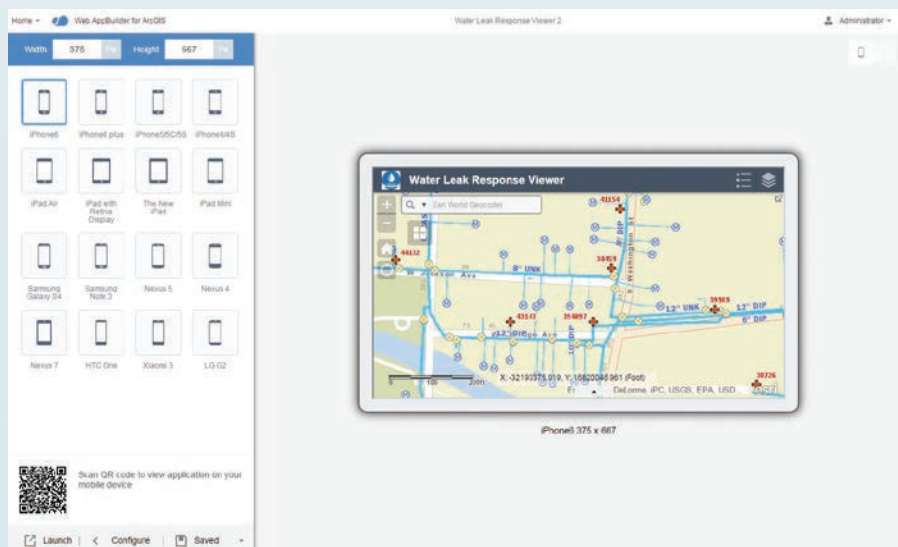
→ You can preview how the app will look on an iPhone 6 or other devices.

Resources

Web AppBuilder for ArcGIS Help
doc.arcgis.com/en/web-appbuilder

Web AppBuilder for ArcGIS Developer Edition
developers.arcgis.com/web-appbuilder

Web AppBuilder for ArcGIS demo video
video.esri.com/watch/3993/web-appbuilder-for-arcgis

GIS Bookshelf

Developing Mobile Web ArcGIS Applications

By Matthew Sheehan

This book provides a streamlined method for learning how to build web-based mobile applications using the ArcGIS API for JavaScript. Its target audience is GIS professionals who want to build these types of applications and have beginning or intermediate development skills. A good understanding of HTML5, CCS, and JavaScript is assumed. Familiarity with the ArcGIS API for JavaScript is helpful but not required. The book begins by identifying the requirements and restraints inherent in mobile application design then covers mobile frameworks and APIs. Succeeding chapters walk the reader through the development of a responsive mobile web application and its integration with ArcGIS Online. The final chapter covers creating a hybrid application that combines web and native applications. The example code for all exercises in the book is available online. Packt Publishing Ltd., 2015, 138 pp., ISBN: 978-1-78439-579-7
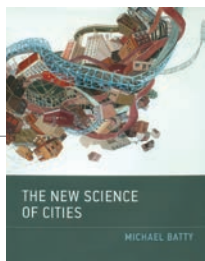
The New Science of Cities

By Michael Batty

Rather than as artifacts that occupy a "place in space," author Michael Batty argues that cities can be seen as a system of flows and networks that change over time. Understanding how cities function and how to make them better places to live becomes increasingly important as more of the world's population lives in urban areas and cities grow in size and complexity. While the attempt to fashion a science of cities is not a new concept, Batty recognizes complementary work in related research areas: urban economics, regional science, urban geography, and transportation as well as complexity theory. The book is organized into three sections. The first lays out the foundations for this new science of cities. The second focuses on understanding how cities function. The third addresses how cities could be designed. Batty is Bartlett Professor of Planning at University College London, where he is also chairman of the Centre for Advanced Spatial Analysis (CASA), and Visiting Distinguished Professor at Arizona State University. The MIT Press, 2013, 520 pp., ISBN: 978-0262019521

Incorporating Spatial Thinking into Scientific Research

←
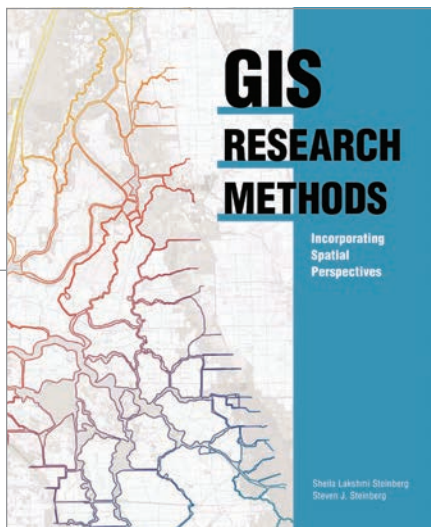
Scientific data that's spatially analyzed produces highly useful information for academics, scientists, and other researchers, helping them better answer questions and make well-informed decisions. *GIS Research Methods: Incorporating Spatial Perspectives*, published by Esri, shows how spatial analysis using GIS technology enhances research in the social and physical sciences.

The book, which was written for social and physical science professionals and academics, provides a solid introduction to research methods using GIS. Authors Sheila Lakshmi Steinberg and Steven J. Steinberg provide well-organized and easy-to-understand descriptions of how spatial thinking and GIS can be incorporated into research design and analysis. It introduces readers to the value of thinking spatially, GIS basics,

research design and ethics; data sampling and collection, volunteered geographic information, and spatial analysis using Esri ArcGIS technology. The authors are scientific researchers who have used GIS in their academic work.

In the book's foreward, the authors note that, "A unique aspect of this book is that we focus specifically on how to integrate GIS into both qualitative and quantitative research. Our objective in writing this book is to provide a foundation for GIS research methods and, more specifically, to integrate spatial thinking and spatial analysis into a research tool with clear methodological techniques."

The book not only provides a solid introduction to research methods using GIS, but it also addresses factors—such as geographic boundaries, data, and stakeholders—that should be considered when creating strong place-based policies. The authors maintain that policy makers who consider space and place will be more likely to generate policy that is effective in the long run because they have a better opportunity to consider the concerns, needs, and perspectives that tie data, people, and place together.

Sheila Lakshmi Steinberg is a professor of social sciences at Brandman University, based in Irvine, California. She earned her bachelor's degree from the University of California, Santa Barbara; her master of science degree from the University of California, Berkeley; and her doctorate from Pennsylvania State University. Her research interests include environmental sociology, culture, and GIS.

Steven J. Steinberg is a principal scientist at the Southern California Coastal Water Research Project, a public environmental research agency based in Costa Mesa, California. He received his bachelor of science degree from Kent State University, his master of science degree from the University of Michigan, and his doctorate from the University of Minnesota. Esri Press, 2015, 440 pp., print: ISBN: 9781589483781, e-book: ISBN: 9781589484047.

Drawn to Challenges

↑ Coach Matt Madigan and his crew of Sarah Trowbridge and Margot Shumway earned a spot to race at the Olympics in the women's double sculls by finishing first at the Olympic Qualification Regatta in Lucerne, Switzerland, in 2012.

Matt Madigan, like many Esri employees, says that one of the reasons he enjoys his job is that he gets to work in a variety of roles. However, Madigan's situation is a little unique. He works out of two offices. His main job is as an account manager in the Washington, DC, regional office. He also works with start-ups and a start-up incubator out of Esri R&D Center—DC. In this interview, he talked about enjoying the challenges he encounters in his professional and personal life.

Tell us about your work with Esri.

As an account manager, I'm responsible for a couple of accounts on the intel *[information and technology]* team. Previously, I was the operations director and director of federal business at GeoIQ *[a geolocation company that joined Esri in 2012]*. We were working with In-Q-Tel and deployed at many agencies within the intelligence community, so that carried over into my role on Esri's federal team because I was very familiar with the community.

My work at the R&D Center is also really exciting. Last fall, we started a relationship with 1776, which is a start-up incubator with 240 plus member companies. We want to empower them with the ArcGIS platform and then let them bring their innovation to that platform. So instead of having to build a new GIS out of open source, they're using our tools to actually build out their solutions.

I understand you're also involved with Esri's new Young Professionals Network. What's that about?

This is an initiative to get young professionals in the federal government, commercial, nonprofit, developer, and start-up communities to become more familiar with Esri tools. More importantly, it's a forum for them to see how these tools can help them move forward both in their careers and with their projects. The Young Professionals Network had its first meeting at the Esri Federal GIS Conference in February. Nearly 500 attended and took advantage of career and GIS employment workshops, a Q&A session with *[Esri president]* Jack Dangermond and other Esri leaders, and a networking happy hour.

I was told you were a rowing coach for the Olympics.

Yes, that's true. That was in 2008 in Beijing and 2012 in London. China was amazing—the excitement of being at my first Olympics was just incredible. In Beijing, I was fortunate to represent the rowing team and march in the opening ceremonies, which is beyond words.

And how did you get involved in that?

I had been a rower for a long time and was on a couple of world championship teams. After working with the sports scientists at the US Olympic Committee in Colorado Springs, I had a pretty good idea on program design. I had trained with prominent national team coaches as an athlete and coach. My second summer of coaching, I formed a boat that won trials, went on to the world championships, and won a bronze medal. In my third year of coaching, we had several boats win Pan American Games medals. When the following generation of athletes came in, we continued to do well winning medals at the national and international levels, and so it just kind of blossomed from that.

At GeoIQ, we started GeoCommons, which enabled a community of people to easily share GIS data in a variety of formats and do some basic map visualization and analytics. Many rowers in my program needed part-time jobs. We hired them at GeoIQ to recruit data, clean it up, and load it into GeoCommons as foundational data. I would coach them in the morning, they'd work for five or six hours at GeoIQ, and then we would go back to the boathouse and row in the afternoon. It became a very close-knit group of people who came here for one reason, but then they started their careers in GIS.

Are you still coaching?

I run coaching clinics now and then. There are a couple of people at Potomac Boat Club I'm helping this spring. One of them won a gold medal in 2012 in London and the other one is an up-and-comer who shows a lot of potential.

Are there things about Esri you feel are different compared to other software companies or other organizations in the GIS space?

I really like the atmosphere around Esri where Jack really cares about his customers and the communities he works with. He's interested in what his customers are doing and ensuring they are successful. The fact that he's donating $1 billion in software to schools through the ConnectED Initiative and trying to create a GIS mentoring system in schools is so important for STEM education. He really has his heart in the right spot, and when you can work for an organization where you get that from the owner, it empowers us as employees to make a difference.

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VIRTUAL WORKSTATIONS
PROVIDE A
LOW-COST OPTION

By Jim Baumann, Esri

Talbot Brooks was faced with a dilemma. As the longtime director of the GIS center at Delta State University, he had carefully constructed a program around the university's Esri site license. That program had become a lighthouse installation for other colleges developing their own GIS programs. However, he was becoming the victim of his own success.

Brooks' online GIS courses were increasingly popular among both off- and on-campus students. He found himself in an annual struggle with his administration for funds to maintain the servers for his teaching lab. Because his online students were located in many different parts of the world, they required access to ArcGIS when and where they needed it. In addition, his students were progressively moving away from desktop computers in favor of tablets that let them learn anywhere. Students who used desktop computers often had older models that couldn't properly run ArcGIS for Desktop.

"We were probably dropping $10,000 a year on server support and another $15,000 or so to maintain an up-to-date computer lab," said Brooks, director of the Center for Interdisciplinary Geospatial Information Technologies at Delta State University in Cleveland, Mississippi. "So, I began to look for other options that were more cost-effective for both the students and the university."

Brooks began exploring the Bring Your Own Device model for both his online and on-campus courses. He determined that he could set up virtual machines in the Amazon Cloud for about $35 per month per student.

"So, I'm looking at about $25,000 per year to run my 20-seat teaching lab as well as the cost of tech support and maintenance, as opposed to a $35 monthly per seat rate and there was just no argument," continued Brooks. "Using ArcGIS for Desktop on a virtual workstation is incredibly cost-effective and convenient all the way around. By setting up virtual machines in the cloud, I've unburdened myself of a huge headache of maintaining the computer infrastructure, and I'm saving my university a truckload of money."

Students can log in to their virtual workstations with their smart tablets and immediately

"Using ArcGIS for Desktop on a virtual workstation is incredibly cost-effective and convenient all the way around."

start learning and experimenting with GIS by following the ArcGIS tutorial lessons Brooks provides. Data from the lessons is loaded on the virtual machines, and, after the students complete their work, they can export the maps they create as PDFs and e-mail them to Brooks at the end of each class. If for any reason a virtual machine goes down, Brooks can copy the student's work onto another virtual machine, and the students are back to work in less than 20 minutes.

Brooks believes that virtual workstations have great potential to lower costs for the online educational community. For example, there are different price models that can be applied to virtual computing. An English major who doesn't have heavy computing needs could use a virtual machine only when needed, which would keep costs down. The old computers in a learning lab could be used as terminals to access virtual workstations, eliminating the need to refurbish the lab with new computers.

"For my GIS courses, my instructions to students are, 'bring your own device and here is your GIS-issued virtual PC for the semester,'" said Brooks. "The savings in time and money will be absolutely tremendous. Because it's not just the cost of the physical resources but also the service and support that goes with them. There is also a huge convenience factor. Students with their iPads or Android tablets can do their coursework wherever they are. They're not tied to the learning lab or a desktop computer. Also, because of the costs involved in setting up and maintaining GIS learning labs, this could be a real opportunity for those departments interested in expanding their GIS offerings. I think the convenience and cost reduction opportunities can be a distinct competitive edge for universities in the future."

Success in the First Year of ConnectED

By Charlie Fitzpatrick, Esri Schools Program Manager

> Education is a process of engagement, not of delivery. Technology has brought many opportunities for engagement, but not all students have had the chance to build the tech skills so important for today and tomorrow.

In 2013, President Obama launched the ConnectED Initiative (www.whitehouse.gov/connected) to boost access to digital resources. He asked private industry to provide more devices, connectivity, learning resources, and teacher support for schools. On May 27, 2014, Esri made a billion dollar offer: Any K–12 school in the United States could acquire an ArcGIS Online organizational account for instructional purposes for free.

During the first year, more than a thousand ArcGIS Online accounts have been provisioned for K–12 schools. Where accounts have been implemented, much has happened. Educators are using apps, external groups are sharing content, leaders are crafting maps and scenes, and students are constructing data, designing presentations and story maps, and building knowledge and skills on all types of devices.

Uses range from quick demos for a single student to hour-long activities for multiple class sections to projects that last weeks and generate national attention. Here are just a few examples of the kinds of learning opportunities that access to Esri software has enabled.

- Seventh grade students of science teacher Erika Klose, at Winfield Middle School in West Virginia, tackled lessons from LearnGIS, an online course designed for adults (learn.arcgis.com). "We did *[the volcano lessons]* all on our Chromebooks and were very successful. This provided a great background for our next activities. They had fun!"
- A 12th grade student in Marcel Duhaime's math modeling class at Bow High School in New Hampshire performed drive time analysis to demonstrate levels of coverage provided by current fire station locations.
- Students in Matthew Cowan's ninth grade English class at Yucaipa High School, in California, are working on story maps that locate events in John Steinbeck's novels.

Teachers find that students love working with maps. Some students are really quiet when they're engaged, while others generate a buzz of excitement as they share what they find or help each other. The magic is engagement, intensity, and duration.

↑ In the first year, more than a thousand ArcGIS Online organizational accounts have been provisioned for K–12.

"I have found teaching with ArcGIS Online helps me differentiate my lessons and helps all my students learn," said Dave Casey of Buffalo Central Middle School in Minnesota. "Students who have struggled in the regular classroom seem to grasp the lesson well using ArcGIS."

Because it's web based, students can use ArcGIS Online on computers, laptops, tablets, and smartphones of all shapes and sizes that run a variety of operating systems. Sometimes students all have the same type of device. Other times it's a medley of student- and school-provided devices. Either way, it's usually not a problem. A student can work on ArcGIS Online and move seamlessly from an Android phone to iPad to Chromebook to the teacher's Mac or Windows laptop within a single class period.

This flexibility delights some teachers but can be a little trying for others. Many are hesitant to try resources if they cannot define precise bounds, strategies, and content areas. Vigorous learning by students may happen when students dive in neck deep, but not all teachers are comfortable with this.

To help educators get comfortable with this inquiry-based approach, Esri is constructing GeoInquiries. These are short, targeted activities that let educators dip a toe into ArcGIS Online. GeoInquiries cover core content in certain curricular areas and help teachers discover the power of interactive maps. The topic for the first GeoInquiries is earth science. It is available at (edcommunity.esri.com/geoinquiries). The next topic will be US history, followed by advanced placement human geography.

Esri is also supporting the uptake of ArcGIS Online by sponsoring a set of workshops held by knowledgeable educators across the country. In June 2015, Esri hosted its seventh annual Teachers Teaching Teachers GIS (T3G) Institute to help another hundred education leaders expand their existing skills for sharing with their peers the power of ArcGIS Online as an educational tool.

GIS users can help teachers and students take advantage of the ConnectED program and access to ArcGIS Online by finding an interested teacher, librarian, or tech person at a local school and sharing the resources at connected.esri.com. They can also sign up to be a GeoMentor at edcommunity.esri.com/educational-roles/GeoMentors.
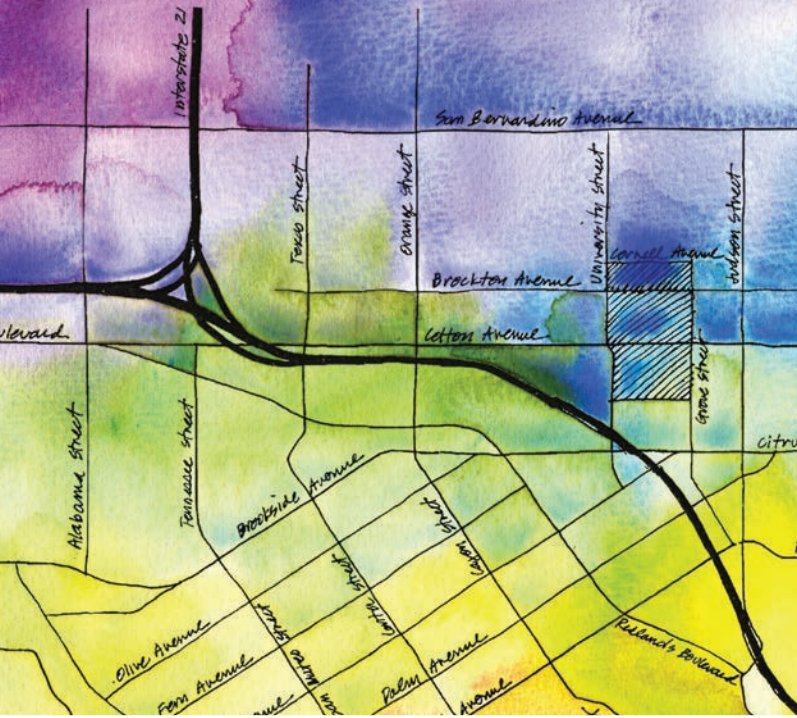
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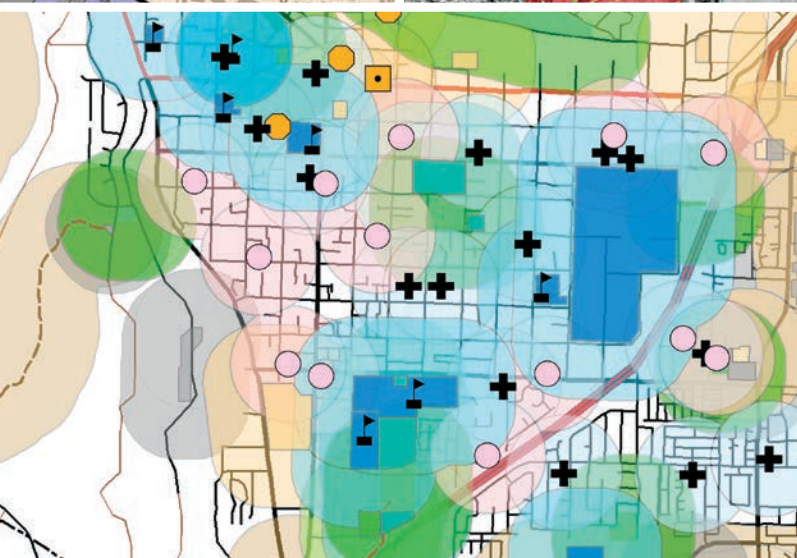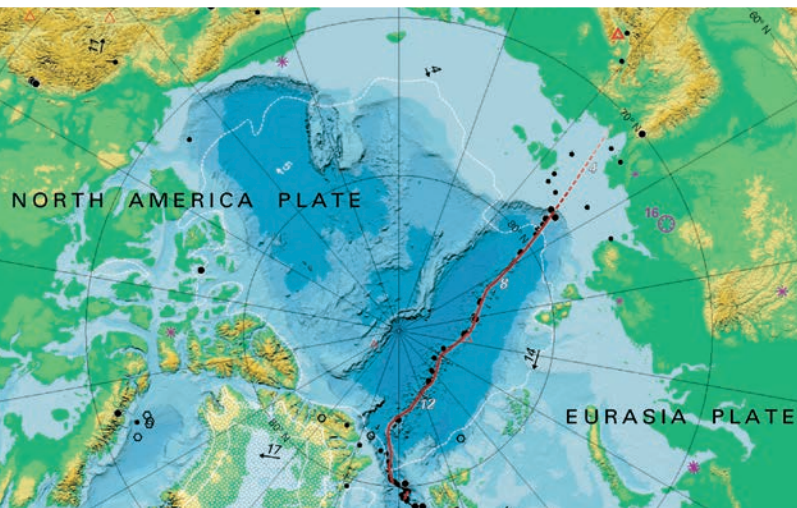
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Mapping the News in the Netherlands
Media Tell Data-Driven Stories with Maps

By Carla Wheeler, Esri Writer

Online media outlets in the Netherlands, including *BNR Nieuwsradio*, *Trouw*, and *Dagblad van het Noorden*, illustrate news stories using maps created with Esri technology, turning data into meaningful information that helps readers get a clearer and deeper perspective of events and issues.

Esri Nederland B.V., Esri's distributor in the Netherlands, works closely with *BNR Nieuwsradio*, a radio station and online publication that covers economic, political, sports, and technology news, to analyze and visualize data and then produce maps for *BNR Nieuwsradio's* website. For example, data was mapped for stories about the provincial elections in the Netherlands, European Parliament elections, the Ebola virus crisis in Africa, bird flu outbreaks in the Netherlands, and 2014 World Cup Soccer matches in Brazil. Staff from Esri Nederland occasionally provide commentary about what the maps show during radio broadcasts.

According to Harmen van Doorn, a communications specialist at Esri Nederland, the Dutch media is discovering that maps offer a great way to communicate information to readers and viewers. Though the company provides maps to the media for important news stories, journalists have the opportunity to tap into the power of geography themselves. They can learn to use the Esri ArcGIS platform and turn raw data into maps for the stories they are pursuing.

The audience is very interested in the maps said Thijs Baas, web editor at *BNR Nieuwsradio*. "The maps make the national news more meaningful to people, helping them to answer questions such as, What do the election results mean to me and my community?" Baas said. "A visualization creates an image. People think in images, and we see that reflected in the statistics on our website. When we have a map on our website where you can see the impact of the national news on your own community, the readership for the story increases."

During the provincial elections in the Netherlands on March 18, 2015, there were more than one million views of Esri election-related maps in the media. The election maps were published on the *BNR Nieuwsradio* website and in many media outlets, including the daily newspapers *Trouw* and *Algemeen Dagblad (AD)*. The maps, created using ArcGIS, were also published on the website of the Dutch television station RTL.

The media used the maps to provide election results and compare the percentage of voter turnout to that of the 2011 election. Esri Nederland teamed up with ANP, the Netherlands national news agency, to provide live election result updates, using maps that showed which parties were gaining votes and which were losing votes in each of the 12 provinces.

The map service was published on the *BNR Nieuwsradio* website on election night and the morning after, when van Doorn gave an interview about what the maps showed about the voting trends such as the losses by the Labour Party and the gains by the Christian Democrats and the Democrats 66 party.

Esri Nederland also used Operations Dashboard for ArcGIS to provide the media with a dashboard to monitor the election results from their offices. The dashboard included a map and widgets in the form of bar charts and gauges. One gauge kept a running tab on how many municipalities were reporting election results, while a bar chart showed which parties were winning the election. Another widget indicated the percentage of voter turnout.

Digging Deeper into the Political Data

After the elections, Esri Nederland conducted several geographic analyses to determine how a spate of recent earthquakes in Groningen province affected the election results.

The number of earthquakes in Groningen province has increased in the last few years due to gas extraction in that region, van Doorn said. The people there are angry with

↓ Esri Nederland B.V. provided *BNR Nieuwsradio* with live maps of the provincial election results that staff could use in the newsroom while on air.

↓ Media in the Netherlands used Esri's Operations Dashboard for ArcGIS to monitor the results of the country's recent provincial election. Widgets on the dashboard showed the number of municipalities reporting election results, the winning parties, and the percentage of voter turnout.

↑ Harmen van Doorn of Esri Nederland B.V. was interviewed by *BNR Nieuwsradio* about the election result trends that the maps showed.

the government, and the Labour Party, which is normally popular in that province, lost many votes in all Groningen counties, he said.

Another trend the maps revealed was that people in the Christian region (known as the Netherlands' Bible Belt), who live in a corridor that runs from the southwest to the north in the middle of the country, vote in higher percentages than the people living in other regions. This map showed that two parties—the ChristianUnion (CU) and the Reformed Political Party (SGP)—did particularly well in the Christian region during the 2015 election.

Beyond Election Results

Esri Nederland is also mapping data for the media that pertains to topics other than the elections, including the bird flu outbreaks in the Netherlands, the economy, and even where in the country Dutch drivers are most likely to get speeding tickets.

Drivers use the Flitsmeister app to report the location of *flitsers*—cameras that record the speed of cars and their license plate numbers if they go over the speed limit. Esri Nederland and *BNR Nieuwsradio* mapped the highway locations in the Netherlands where the chances are greatest that drivers will be ticketed for speeding. This Esri Story Map Journal shows which sections of highways have the

greatest density of cameras and routes where drivers are most likely to get caught for speeding.

Maps also have been used to tell sports stories. Esri Nederland used the Esri Story Map Journal template to make the On the Road to Success in Brazil story map, which last year documented the triumphs and defeats of Oranje, the national soccer team from the Netherlands.

Open Data and Privacy Concerns

Esri Nederland and *BNR Nieuwsradio* are also partnering on other data visualization projects related to weather and earthquake reporting.

"Society profits from having a geographic view," said Sjors Fröhlich, editor in chief of *BNR Nieuwsradio,* during the Esri GIS Conference in the Netherlands in 2014. "GIS users can be generous with sharing data. You are sitting on gold—so much useful information."

But Fröhlich knows that making data public can conflict with privacy policies that are important in the Netherlands. "But we can do beautiful and useful work with data by visualizing it and doing research on it," Fröhlich said. "The data can clear up things and sometimes prompt the government to take needed actions. Society will benefit by making data public, I am sure."

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