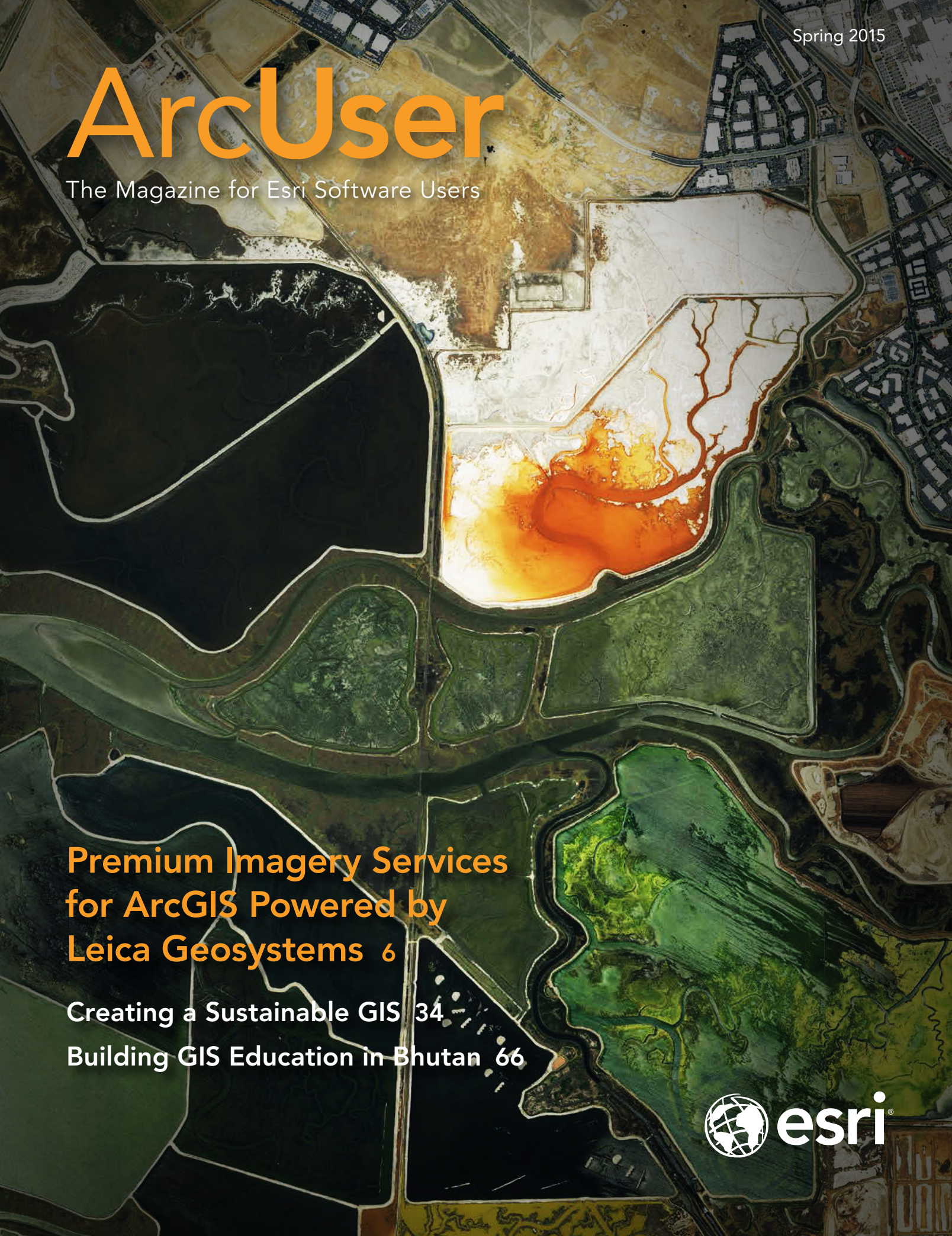
Spring 2015

ArcUser

The Magazine for Esri Software Users



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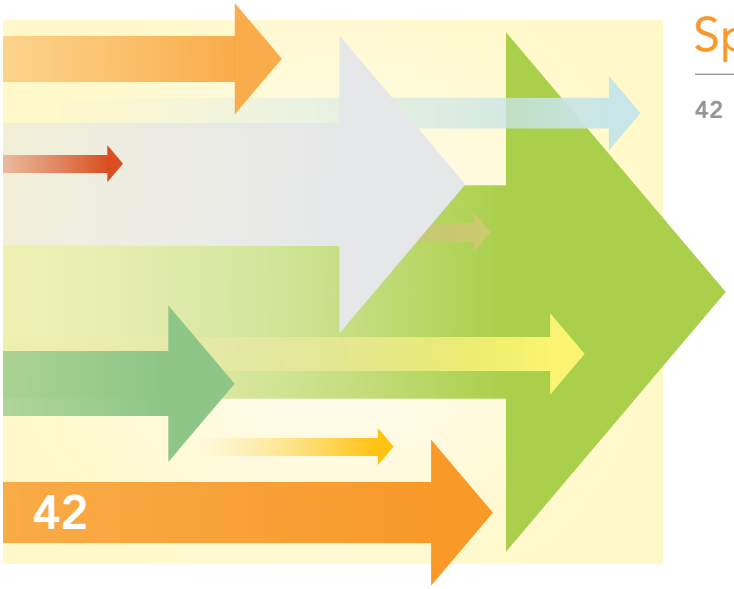

Special Section

Getting More Done

GIS is constantly evolving. Over the past 20 years, it has moved from workstations to PCs to web browsers and now to phones, tablets, and other mobile devices. The ArcGIS platform encompasses all these incarnations of GIS, which are now linked through the cloud. This cloud computing architecture makes the benefits of GIS more accessible throughout organizations so that people in those organizations can get work done more accurately and efficiently.

Articles in the Focus section of this issue illustrate how Collector for ArcGIS, Operations Dashboard for ArcGIS, and other apps that come with ArcGIS Online have helped governments and companies greatly increase the productivity of field-workers. In the case of Coweta County, Georgia, the demands of a rapidly growing population and stricter regulations coupled with staff reductions meant that infrastructure inspections doubled while the staff was reduced to just one employee.

However, the county's GIS analyst Clint Richmond had a solution. He downloaded Collector for ArcGIS, which came with the county's ArcGIS Online organizational subscription. He quickly configured it on an iPad and gave that iPad to the county's remaining field-worker, Scott Truitt. Using Collector, Truitt has not only caught up with required inspections, but he is also getting a jump start on additional inspections that will be required in the coming year.

Coweta County demonstrates that GIS no longer requires custom solutions. By taking advantage of the dozens of focused, configurable, and fully supported commercial off-the-shelf (COTS) solutions that Esri has developed and made available with ArcGIS Online, organizations can build a sustainable GIS that helps them not just survive but thrive in spite of increasing workloads and decreasing staffing levels.

Monica Pratt
ArcUser Editor

editor's page

ArcUser

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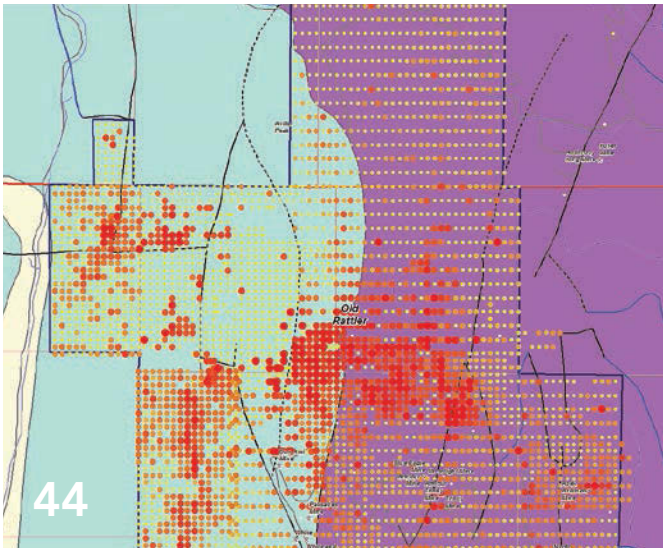
Departments



Premium Imagery Services for Arc

At the 2015 Federal GIS conference in February, Esri introduced a collection of new Premium Imagery services. Now available through the cloud, the Hexagon Imagery Program provides high accuracy imagery captured with Leica Geosystems airborne sensors. These services deliver high-resolution aerial imagery as ready-to-use basemaps and analytical subscription services.

Hexagon is a world leader in sensor manufacturing with its Leica Geosystems family of cameras and imaging sensors. These sensors have been deployed on a fleet of aircraft that continuously image the earth, providing a regularly refreshed stream of imagery delivered to your applications of choice. Powering these image services is the ArcGIS platform, deployed into the Amazon Web Services (AWS) cloud.

Utilizing the expansive reach of AWS, these services are pushed to regions closest to you, providing the fastest and most responsive cloud-based imagery service experience possible. Because these services are powered by the ArcGIS platform, you have the support of a dynamic web GIS. The Hexagon Imagery Program includes two imagery services that are live and available from the ArcGIS Marketplace as basemap and dynamic image services.

The Basemap Service is a cached basemap imagery service consisting of 30-centimeter true color imagery that is updated on an ongoing basis. This service provides a fresh backdrop to your GIS and has been optimized to perform quickly over mobile devices and web clients.

GIS Powered by Leica Geosystems

These cached tiles follow the same design as the existing basemaps in ArcGIS Online. This premium basemap is ideal for use in the field for infrastructure inspections and in organizational basemaps used in focused web applications as well as a foundation to derive context for other GIS layers.

The Multispectral Imagery Service provides access to the original pixel values for all four bands (R, G, B, NIR) of the 30-centimeter imagery. This dynamic image service is ready to use for rich image analysis and exploitation activities in ArcGIS for Desktop, ArcGIS Pro, web and mobile apps, and supported Esri partner applications. Native to this service are several views to aid in analysis. Users can view this service as color infrared, color normalized difference vegetation index (NDVI), and scientific NDVI.

While there are many imagery sources available on the market today, high-resolution aerial imagery provides an unprecedented geometric accuracy and radiometric consistency that is not available from space-borne sensors. These services are designed to support a wide range of industry needs.

With the increasing population throughout the world, effective agricultural and natural resource monitoring is critical. Through the use of these multispectral services, natural resource professionals can quickly and efficiently create information products such as species identification and forest stand maps as well as answer questions such as why crop yields aren't meeting current forecasts.

Local governments rely on aerial imagery for many critical tasks including tax assessment, emergency services, planning, and resource management. The time to contract for imagery collection, processing, and delivery has proven to be longer than most local governments would like. Additionally the cost to store, manage, and serve this imagery to users has not been trivial. Through the Hexagon Imagery Program, the collection, storage, and serving of imagery has been streamlined through a set of cloud-based subscription services, freeing up staff to perform the critical tasks that keep our communities running smoothly.

Utilities manage assets that power our world. Many of these assets exists in locations that present extreme accessibility challenges. Instead of risking personnel, utilities rely on high-quality imagery to monitor and assess the condition of assets. Utilizing Hexagon Imagery Program subscription services, utilities can remotely assess the state of vegetation and man-made encroachments to corridors, identify gas and oil leaks, and perform regular maintenance planning before stepping into the field.

Access to these services is available through the ArcGIS Marketplace. These services are sold on a subscription basis for your areas of interest. A single subscription includes access to both the Basemap and Multispectral Imagery Services. This unique bundling of capabilities lets organizations deliver both fast performing basemaps and analytically capable multispectral services using just one subscription.

To see a sample of these two imagery services, go to the ArcGIS Marketplace and search Hexagon Imagery Program. Free 30-day trials are available to test drive the Hexagon Imagery Program. When a free trial is requested, it is provisioned within 5 to 15 minutes. Once ordered, the imagery service becomes available in 24 to 48 hours.

For more information, go to the ArcGIS Marketplace at marketplace.arcgis.com, find the Hexagon Imagery Program offerings, and select Free Trial. If you don't already have an ArcGIS Online account, you can create a free ArcGIS Online trial account at esri.com/software/arcgis/arcgisonline/evaluate.

Smart Mapping Eliminates Guesswork

The February update to ArcGIS Online introduced an exciting new capability: Smart Mapping. This is a new approach to making maps that are both useful and visually stunning. To do this, this update adds new ways to symbolize data, smart defaults, and data-driven workflows to the ArcGIS Online map viewer.

Esri wanted to simplify mapmaking by taking the guesswork out of choosing from among hundreds of potential settings and providing defaults predicated on the map context, resulting in maps that are both cartographically appropriate and beautiful. This also means you can make maps more quickly because fewer iterations will be required.

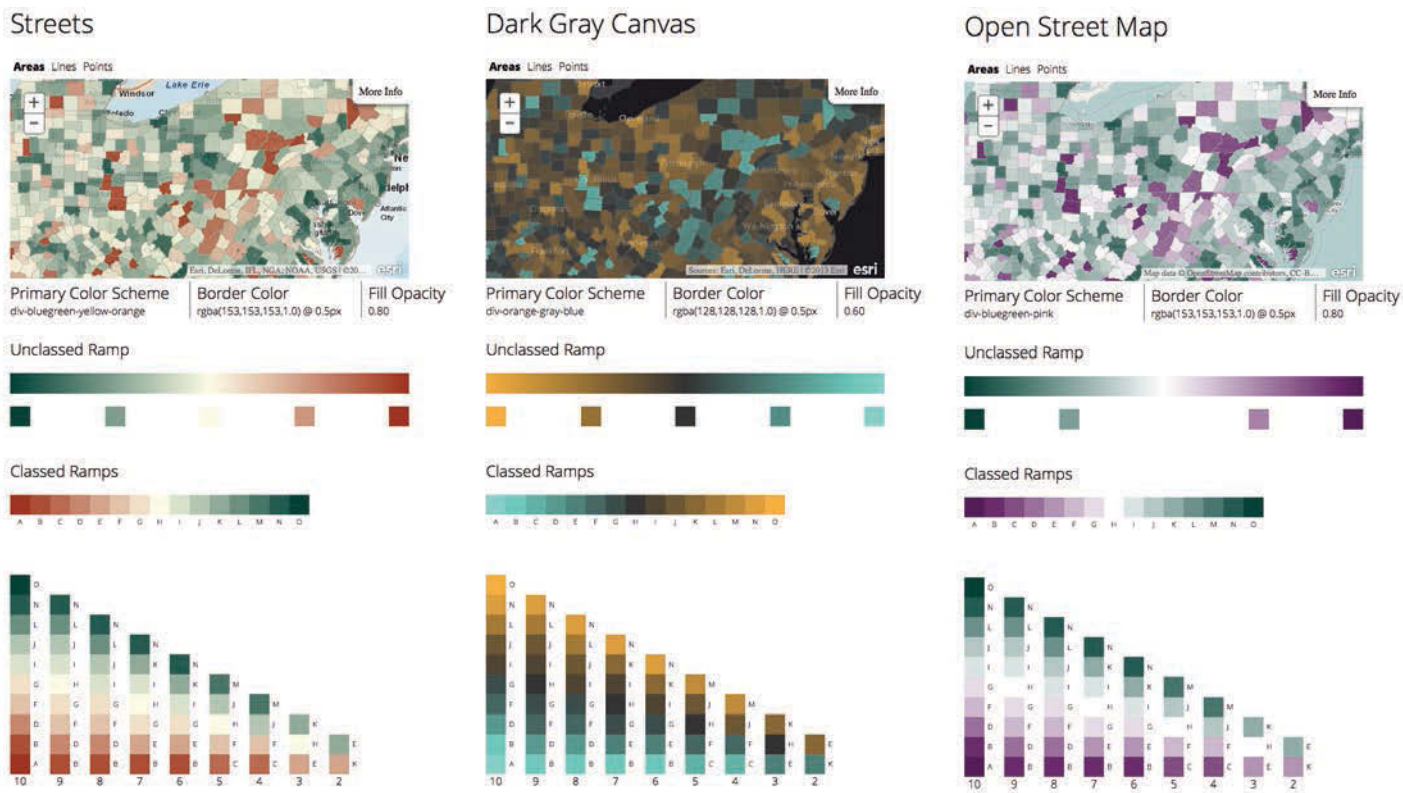
This does not take control away from map authors or dumb down the map authoring experience. Mapping pros still have full control over the process. Smart Mapping just provides better initial parameters, such as colors, scale, and styling, that fit the data and map's story. That's why it benefits novices and experts, making both more productive.

Continuous color ramps and proportional symbols, improved categorical mapping, heat maps, and new kinds of bivariate maps that use transparency are delivered through a streamlined and updated user interface.

Smart Mapping capabilities in the February update include

- A new gallery browser in the map viewer for identifying the best ways for representing the data in the map.
- Automatic determination of appropriate maximum and minimum zoom levels for the map. Setting scale limits properly is essential but can be tricky. ArcGIS Online handles this for you.
- ArcGIS Online automatically picks the right colors, line weights, opacity, and other styling to harmonize with the Esri basemap being used. Esri embraced a live styling philosophy so any changes are immediately visible on-screen.

The February update will also include enhancements such as metadata support, a new custom role privilege, and support for the Greek language. For the complete list of features in this release, see links.esri.com/arcgisnew.



↑ The color ramps provided by Smart Mapping defaults are keyed to the basemap you are using so everything will harmonize.

The TOP 10 Things You Might Not Know about ArcGIS Online

1 It's Included with ArcGIS for Desktop

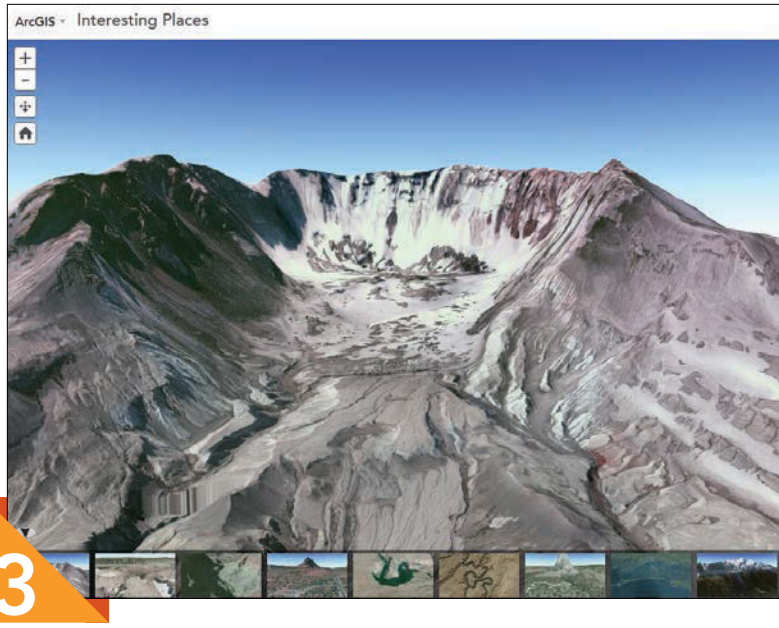
An ArcGIS Online subscription comes with every ArcGIS for Desktop license that is current on maintenance. Activate your ArcGIS Online account to access rich, ready-to-use content.

2 You Activate ArcGIS Pro through Your ArcGIS Online Account

To access ArcGIS Pro, you'll need an ArcGIS Online named user account. ArcGIS Pro licenses are assigned and managed through ArcGIS Online. With ArcGIS Pro, you can design in 3D as well as 2D and work with multiple displays and layouts. You can publish your maps directly to ArcGIS Online and view them in the Scene viewer. Because ArcGIS Pro is a 64-bit app, it processes data faster than ever.

3 ArcGIS Online Provides All Kinds of Content

Looking for basemaps, imagery, elevation, or other data? ArcGIS Online includes a vast collection of maps and data from Esri and thousands of organizations from around the world. With the award-winning Living Atlas of the World, you can explore demographic, business, landscape, climate, and other types of maps. Esri Demographics adds contextual information about a location, such as population, household, and spending data. You can access Esri Demographics in ArcGIS Online using the Enrich Layer tool.



4 One Subscription Provides Access to Productivity Apps on Multiple Devices

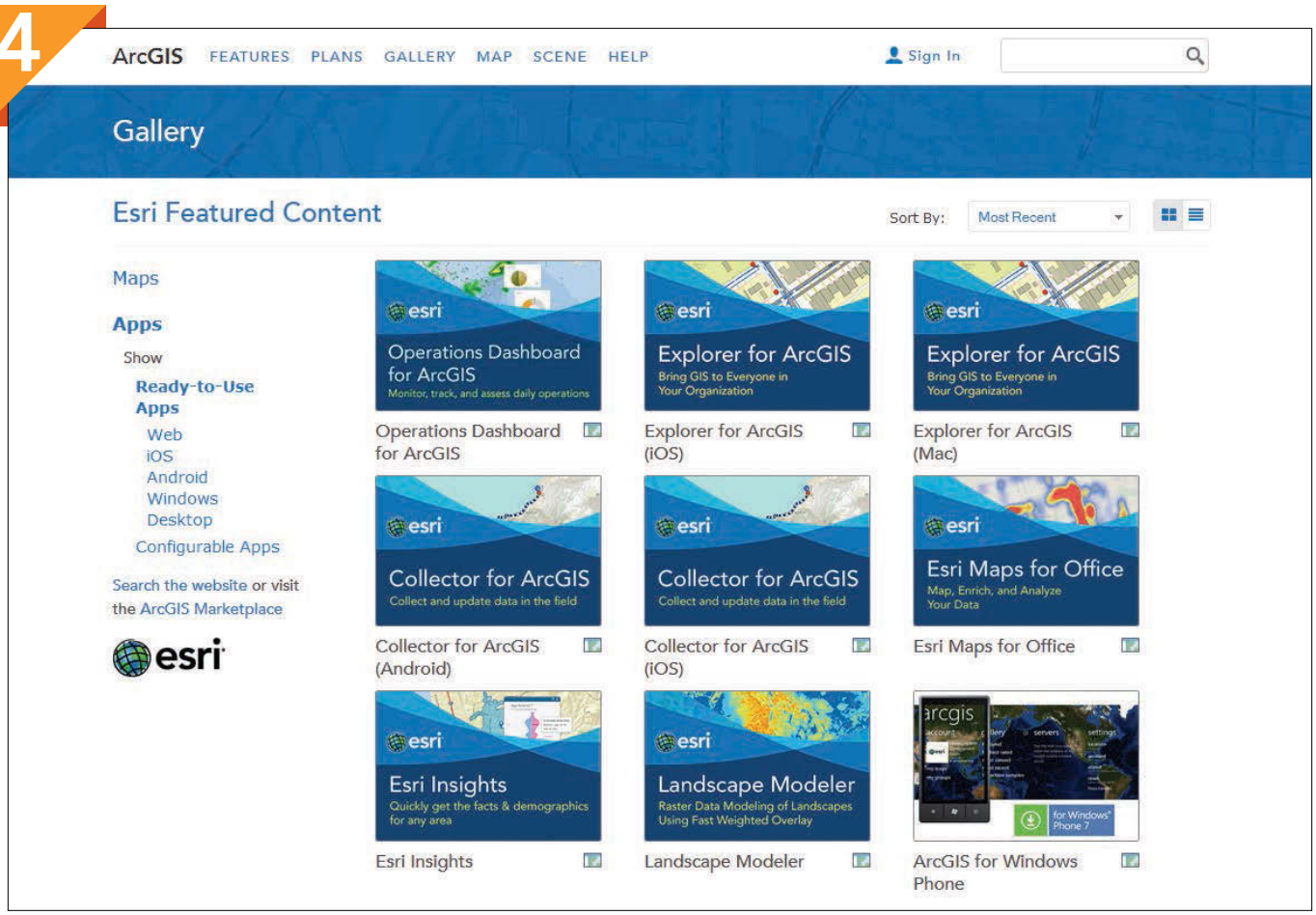
Access the ArcGIS apps that help you work more efficiently from a browser, smartphone, or tablet. Field-workers using Collector for ArcGIS can inventory assets or monitor events. Map spreadsheet data directly in Microsoft Excel using Esri Maps for Office. All ArcGIS Online productivity apps are available to ArcGIS Online subscribers and users of ArcGIS for Desktop and ArcGIS for Server.

5 It's Easy to Tell Your Story with Maps

Web application templates and Esri Story Map apps are easy to configure. Combine your maps with other content using these resources to deliver a focused and elegant user experience.

6 Create Custom Apps without Coding

Create HTML/JavaScript apps that run on any device and let Web AppBuilder for ArcGIS do the heavy lifting. Choose from ready-to-use widgets and themes to build an app with a custom look and feel within minutes.



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9 Get Solutions for Your Industry

ArcGIS Online provides access to ArcGIS Solutions, template maps, and apps tailored to specific industries and aspects of local government. You have everything in one place. These solutions can be configured with the ArcGIS platform and used to improve operations and service delivery.

10 Resources for Developers

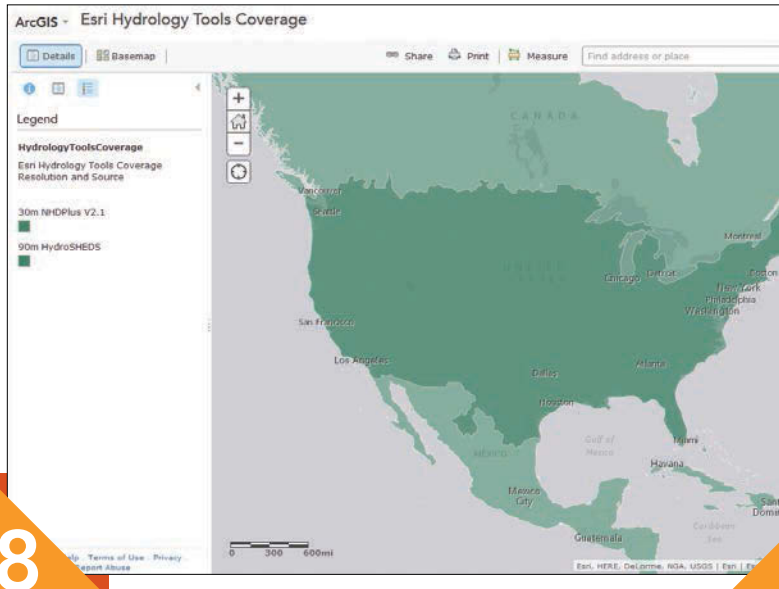
Whether you are a developer in a start-up company or part of a large enterprise, ArcGIS for Developers has the tools for building geoenabled web, mobile, or desktop apps. Sign in using an ArcGIS Online organizational account to use all the developer tools. Access web APIs and ArcGIS Runtime SDKs; ready-to-use content, such as basemaps and imagery; and Esri cloud services, such as geocoding and spatial analytics. It's easy to get started with the free development and testing account. Esri has flexible monthly plans once you are ready to deploy your app.

7 Useful Tools at Your Fingertips

ArcGIS Online provides geocoding, routing, and directions tools. World Geocoding supports gecoding for more than 100 countries so you can use it to find an address, a place of interest, or perform reverse or batch geocoding. The ArcGIS Online Plan Routes tool generates efficient routes that can save time, manage fuel usage, and limit air pollution. Add turn-by-turn directions to a map and optimize the route. Schedule deliveries for multiple vehicles, assign route stops by driver, and include time windows for deliveries.

8 Go Deeper with ArcGIS Online

Use the analytical tools available from ArcGIS Online to find patterns and relationships in your data related to proximity and connection. Display analysis results in a map. Discover insights that will lead to better decisions.



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Esri Managed Cloud Services Achieves FedRAMP Moderate Compliance

By Matt Lorrain, Esri Security Architect

On January 29, 2015, Esri Managed Cloud Services (EMCS) achieved Federal Risk and Authorization Management Program (FedRAMP) Moderate compliance. This milestone provides assurance to customers that EMCS aligns with the latest rigorous security controls required for cloud systems at the moderate impact level (specifically, FedRAMP Rev. 4 Baseline).

EMCS enables customers to quickly leverage the full ArcGIS platform in a secure/compliant cloud environment. GIS services within EMCS are provisioned through ArcGIS for Server and Portal for ArcGIS.

The EMCS offering can be utilized in a stand-alone deployment or as a hybrid deployment that incorporates ArcGIS Online. If ArcGIS Online Federal Information Security Management Act (FISMA) Low Security is not considered adequate for your organization's needs, or if your organization wants to utilize specific geospatial capabilities only available in ArcGIS for Server, supplementing an ArcGIS Online implementation with EMCS is a viable option. *[ArcGIS Online was granted FISMA Low Authority to Operate (ATO) by the United States Department of Agriculture in June 2014.]*

Beyond this, EMCS provides these key security benefits:

- 24/7 Security Operations Center for monitoring and threat detection
- An Intrusion Detection System (IDS) to detect malicious activity
- Continuous security monitoring of log data through a Security Information and Event Management (SIEM) platform that is reviewed by security experts
- A Web Application Firewall (WAF) to mitigate against common web application attacks such as cross-site scripting (XSS)
- FIPS 140-2 compliant encryption for data in transit and data at rest
- A hardened network and virtual machine environment utilizing advanced inbound/outbound firewall traffic rules
- Mandatory continuous application, system, and database vulnerability scans
- Yearly vulnerability assessment, penetration testing, and security control reviews by an accredited Third Party Assessment Organization (3PAO)

For more information about FedRAMP Moderate, visit the official FedRAMP site (cloud.cio.gov). Additionally, you may want to view the official listing of the EMCS package at cloud.cio.gov/fedramp/esri.

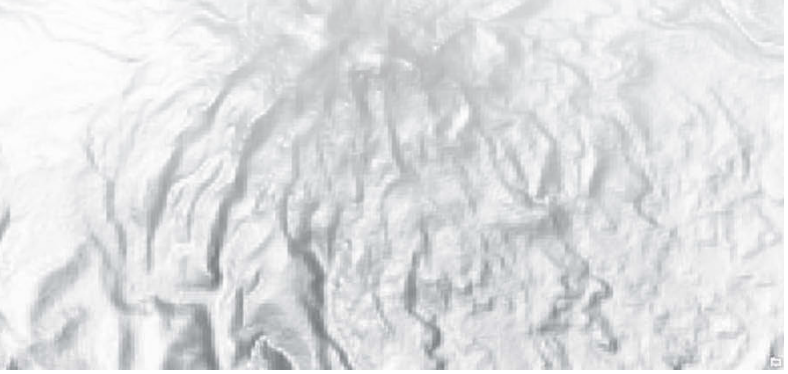
SRTM Data for South America and Western Europe Added to Esri World Elevation Services

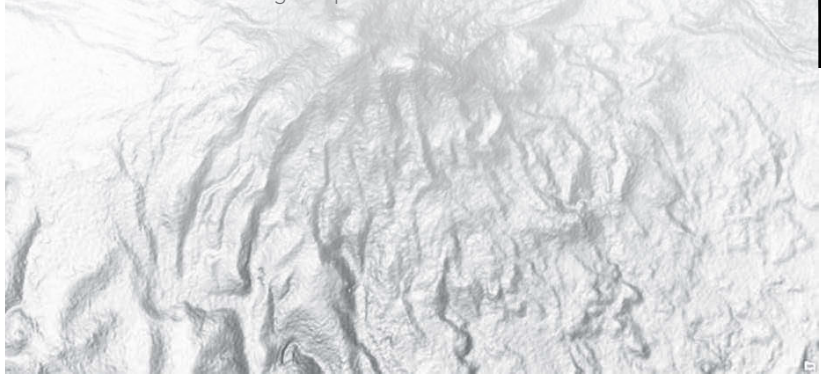
Esri World Elevation Layers for South America, Western Europe, Central America, and the Caribbean Islands have been enhanced with detailed, void-free, 1 arc-second (~30 meters) Shuttle Radar Topography Mission (SRTM) data (version 3.0) from the National Aeronautics and Space Administration (NASA). This update provides three times the level of detail in these areas than was previously available.

Esri's dynamic World Elevation image services—Terrain and TopoBathy—can not only be used for visualizations, such as multidirectional hillshade and tinted hillshade, but also provide access to raw elevation values and derivatives, such as slope and aspect, that can be used for analysis. Access to these global layers is free. An ArcGIS Online organizational account is required but using these layers does not consume any ArcGIS Online credits.

Previously released SRTM data for Africa has also been refreshed with void-free SRTM 30 m (version 3.0) data in this update. Updates for Asia and Australia are pending. For more information about the coverage of the World Elevation services, see the Elevation Coverage Map on ArcGIS Online.

↓ Compare the SRTM 90 m image (left) with the more detailed SRTM 30 m image (right) showing Chimborazo, an inactive stratovolcano that is the highest peak in Ecuador.





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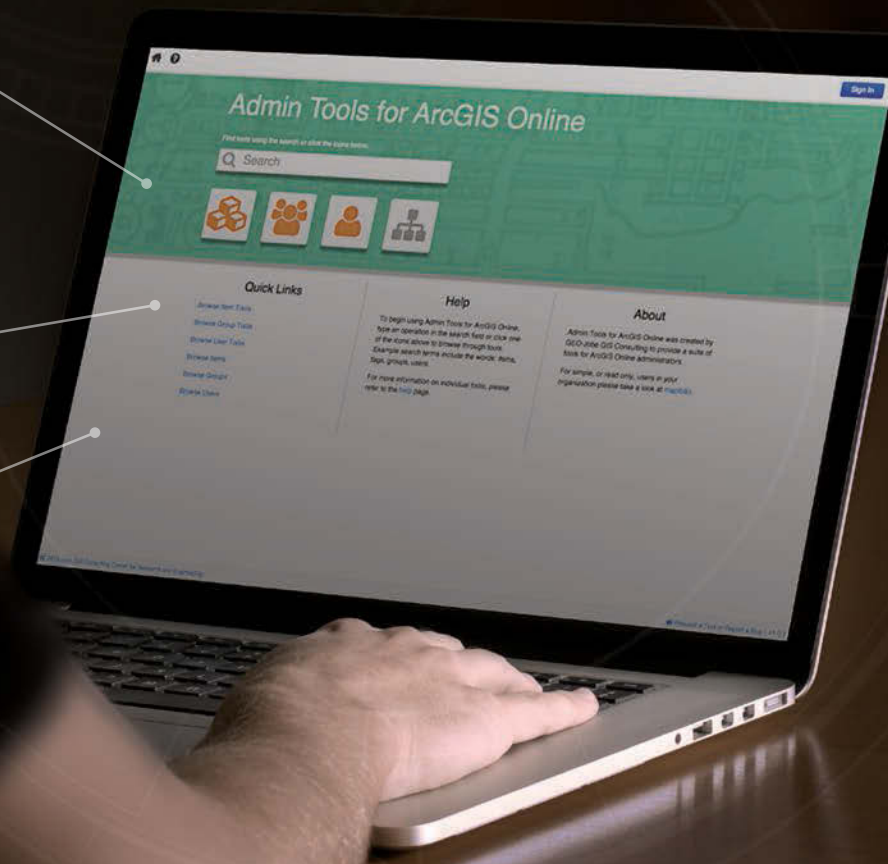

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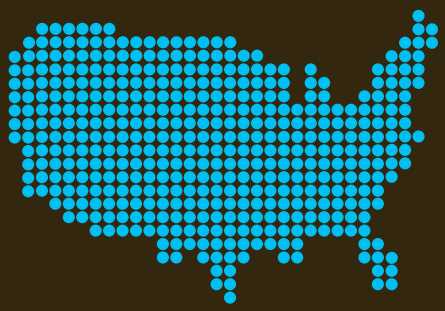
ArcGIS Online Specialty

USING TAPESTRY TO FIND SELFIES

BY BRENT RODERICK, ESRI PRODUCT MARKETING



Most people define a selfie as a photograph taken of oneself, typically with a smartphone or webcam and shared via social media, but another definition is emerging.

Economist Edward Yardeni uses the word *selfie* to describe single people who can spend money on themselves or save for later because they're not supporting a family, saving for college, or paying off a mortgage. Bloomberg.com recently quoted Yardeni in a story about selfies and reported that this segment of the population is 125 million strong and has $2 trillion in buying power, making it a coveted market.

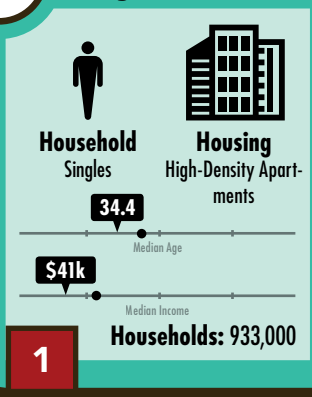
Esri Tapestry Segmentation can help businesses and other organizations identify pockets of these desirable singles, whether they are young, middle-aged, or elderly. Tapestry does this by classifying residential neighborhoods in the United States into 67 unique segments based on demographics and socioeconomics.

Food companies that want to attract selfies offer smaller portions, prepared meals, and other convenience foods. Because many Millennials snack during the day or eat out rather than sit down to meals, companies have developed packaged on-the-go foods. More affluent selfies eat out frequently and shop at grocery stores only for essentials. Senior citizen selfies also appreciate the smaller portions and ease of preparation.

Because many selfies rent, major appliances and home improvement items don't appeal to them. They will spring for fancy coffee makers and floor cleaning appliances. Electronics are always a necessity for younger selfies who don't mind spending for the latest upgrades. Adventurous selfies who travel can find a wide variety of options. Travel, resort, and hotel companies are targeting selfies by offering themed cruises, destinations, and travel packages designed for selfies of all ages.

Where can you find selfies in the United States? Pockets of them live in densely populated urban areas such as Washington, DC; New York City; and Chicago—places where young people often move to find work. Selfies are also found in places such as Sumter County, Florida, where many senior citizens live in one-person households. Esri's Tapestry Segmentation data includes several segments of one-person households.

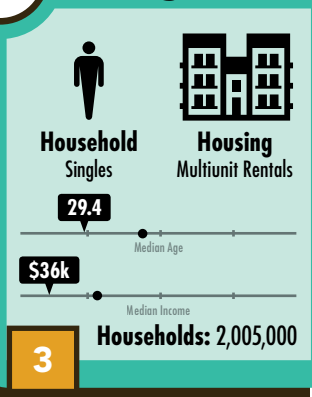
11A City Strivers



Svcs/Prof/Admin
HS Diploma Only
Black

- Buy branded clothing
- Own savings account
- Shop at discount retailers, warehouse clubs
- Watch movies on premium TV channels
- Take public transportation

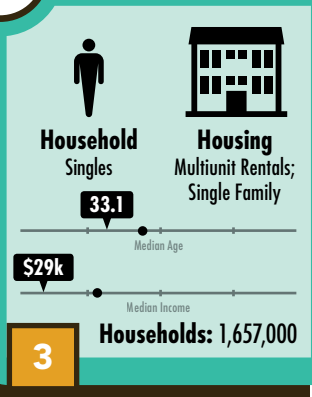
11B Young and Restless



Svcs/Prof
College Degree
White/Black

- Text, redeem coupons from cell phone
- Bank online
- Go dancing; play pool; buy organic food
- Listen to blues, jazz, rap, hip-hop, dance music
- Buy from eBay

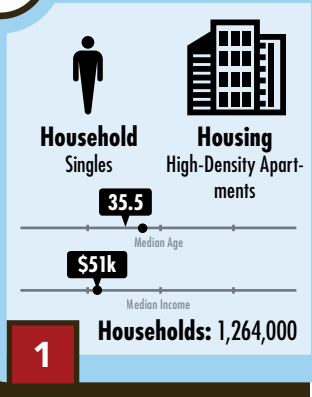
11D Set to Impress



Svcs/Prof/Admin
HS Diploma Only
White/Black

- Go to rock concerts, nightclubs, zoos
- Manage finances online
- Shop at Walgreens
- Download latest music online
- Own used, imported vehicles

3C Trendsetters



Prof/Svcs/Mgmt
College Degree
White

- Travel frequently
- Seek financial advice; build stock portfolios
- Shop at Whole Foods, Trader Joe's
- Stay connected; prefer texting
- Choose subcompacts, public transportation

CITY STRIVERS

Many City Strivers are foreign-born. They hold on to their native cultures while embracing American ways. They rent apartments in densely populated city neighborhoods. Most of their hard-earned wages go for rent. They work in retail or hold service jobs. Their commutes are long, often on public transportation. Style and image are important, so they follow the trends and look for deals on branded clothes. For an occasional treat, they might eat out or splurge on personal services. They also spend for a cable TV package.

YOUNG AND RESTLESS

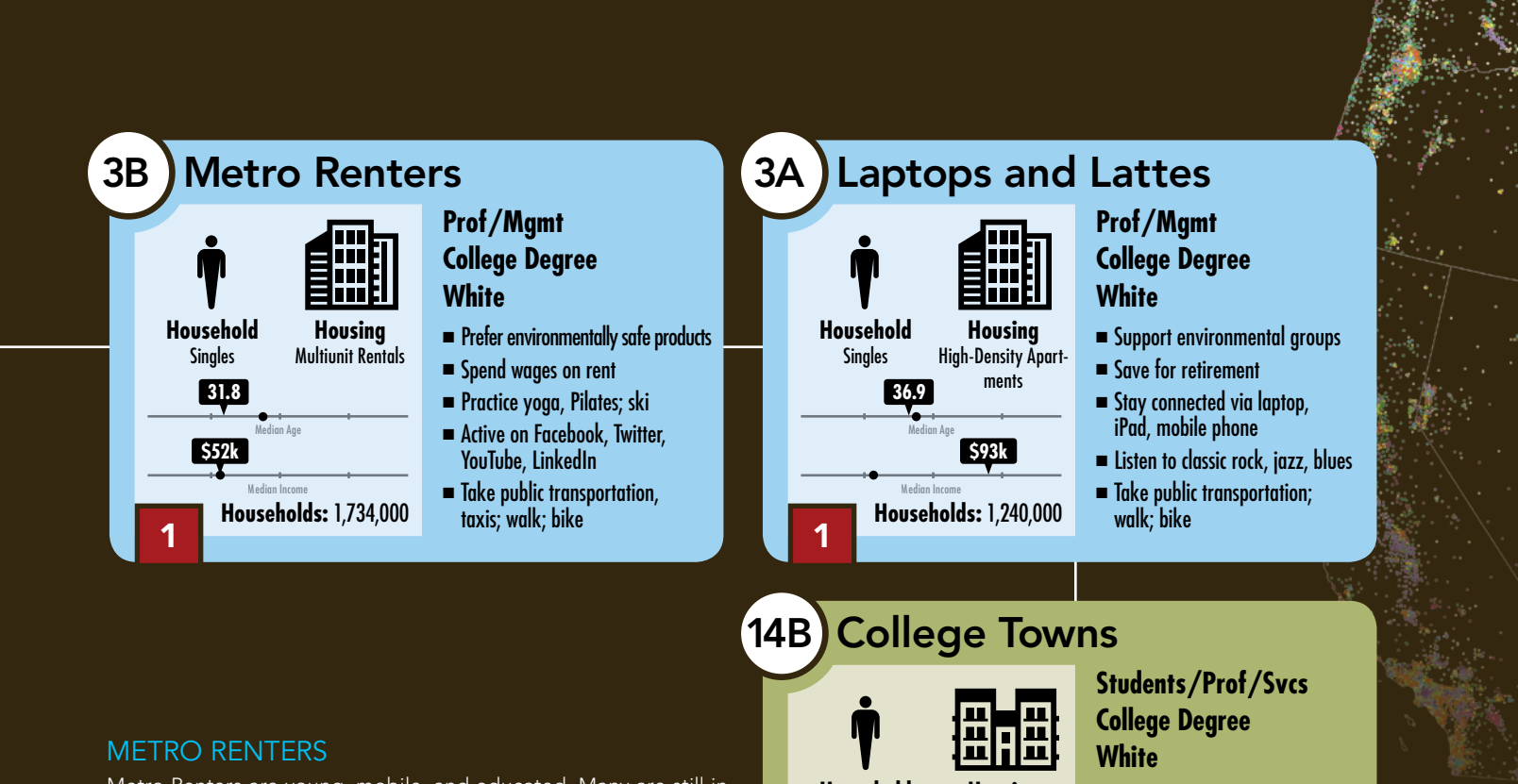
Many in these neighborhoods are Millennials—young, diverse, well educated, and either finishing their education or working. They rent and live alone or share a place in densely populated areas of large metros in the South, West, and Midwest. They can't do without their cell phones. They are not brand loyal and shop for the best price. They buy natural/organic food but will also buy fast food. They go online to bank, buy from eBay, access Twitter and Facebook, and watch TV and movies.

SET TO IMPRESS

Residents are young—either still in college or working—and rent apartments in large multiunit buildings in the city or suburbs. Many live alone but keep in close touch with family. Most have a cell phone. They're very image conscious and often buy clothes impulsively to look good. They're really into music—they listen to and download a variety of the latest music and know about their local music scene.

TRENDSETTERS

These young, educated singles live life to the fullest and are not ready to settle down. They have good jobs and spend their disposable income on upscale city living (mostly on rent) and entertainment. They're connected at all times. Texting and social media are essential for this group. They prefer e-readers and tablets for everything except women's fashion and epicurean magazines. They shop at Whole Foods and Trader Joe's.



3B Metro Renters

Household Singles
Housing Multiunit Rentals

31.8 Median Age

$52k Median Income

Households: 1,734,000

1

Prof/Mgmt
College Degree
White

- Prefer environmentally safe products
- Spend wages on rent
- Practice yoga, Pilates; ski
- Active on Facebook, Twitter, YouTube, LinkedIn
- Take public transportation, taxis; walk; bike

3A Laptops and Lattes

Household Singles
Housing High-Density Apartments

36.9 Median Age

$93k Median Income

Households: 1,240,000

1

Prof/Mgmt
College Degree
White

- Support environmental groups
- Save for retirement
- Stay connected via laptop, iPad, mobile phone
- Listen to classic rock, jazz, blues
- Take public transportation; walk; bike

14B College Towns

Household Singles
Housing Multiunit Rentals; Single Family

24.3 Median Age

$28k Median Income

Households: 1,104,000

3

Students/Prof/Svcs
College Degree
White

- Use computers, cell phones for everything
- Pay bills online
- Shop impulsively
- Customize cell phones
- Prefer vehicle with good gas mileage

12D Modest Income Homes

Household Singles
Housing Single Family

36.1 Median Age

$22k Median Income

Households: 1,632,000

2

Svcs/Admin
HS Diploma Only
Black

- Shop at low-cost retailers, warehouse clubs
- Pay bills in person
- Play basketball
- Watch BET; listen to gospel, R&B radio
- Take public transportation

METRO RENTERS

Metro Renters are young, mobile, and educated. Many are still in college. They live alone or with a roommate in rented apartments or condos in city centers. Most of their income is spent on rent, fashion, and the latest technology. They use their cell phones and computers every day. They buy groceries at Whole Foods and Trader Joe's and shop for clothes at stores such as Banana Republic, Nordstrom, and Gap.

LAPTOPS AND LATTES

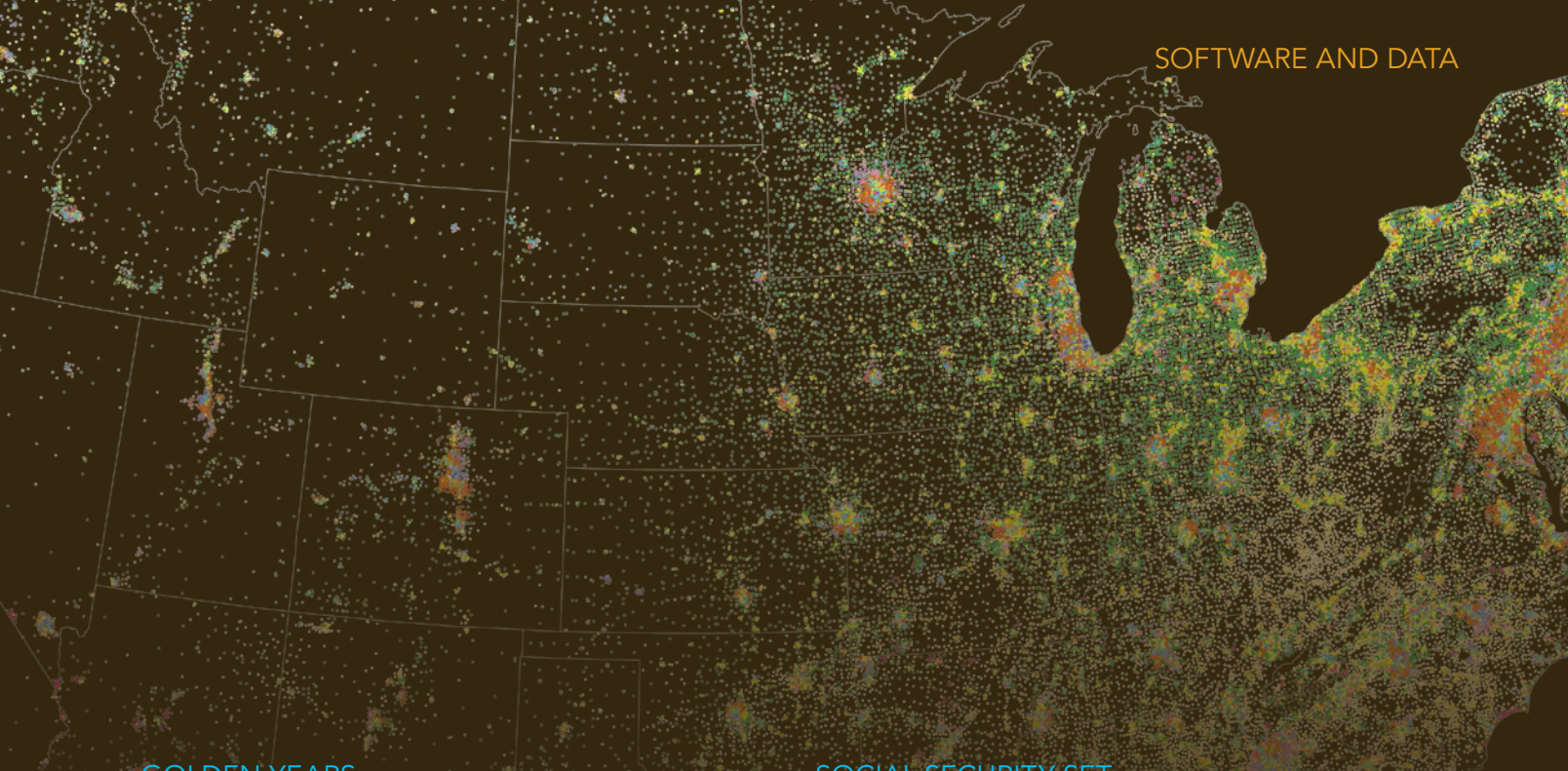
These affluent, well-educated singles love life in the big city and hold professional jobs. Most don't own a home or vehicle. They rent apartments close to amenities. They invest in mutual funds and contribute to retirement plans. Regular expenses include nice clothes, travel, lattes at Starbucks, organic food at high-end grocers, or treatments at spas. To stay connected, their laptops, cell phones, and iPads are always on.

COLLEGE TOWNS

Residents of these neighborhoods are either college students or work for a college or the services that support a college. Students are busy with studies but make time for part-time jobs, sports, and socializing. They might splurge on impulse purchases such as the latest fashions. Computers and cell phones are important to them. They go online for everything.

MODEST INCOME HOMES

Religious faith and family values guide the people who live in these neighborhoods. Many residents are primary caregivers for elderly relatives. Jobs are often hard to find, so Social Security, public assistance, and Medicaid help them to scrape by. They don't use credit cards and prefer to pay bills in person. They play basketball, watch a lot of TV, and buy products endorsed by celebrities.



GOLDEN YEARS

Residents in Golden Years neighborhoods are active, independent seniors who are either retired or nearing the end of their careers. Most are single or empty nesters. They enjoy life and stay busy with a lot of interests. They go online for everything and donate generously to charities. They read daily and Sunday newspapers, keep a landline, and use cell phones only as a convenience. TV is for news, sports, and on-demand movies.

SOCIAL SECURITY SET

These senior citizens live alone on low, fixed incomes. They reside in low-cost apartments in high-rise buildings near heavily traveled urban business districts. Wages and salaries provide income for those who are still working. Social Security, Supplemental Security Income, and public assistance provide support for others. Low incomes limit shopping, so they're very careful spenders. They're technology averse. Cable TV and bingo provide most of their entertainment.

9B Golden Years

Household
Singles

Housing
Single Fam; Multiunits

51.0
Median Age

$61k
Median Income

Households: 1,597,000

4

Prof/Svcs
College Degree
White

- Travel overseas frequently
- Manage portfolios of CDs, stocks
- Shop, pay bills, and track investments online
- Watch cable TV; read newspapers
- Support arts, charities

9F Social Security Set

Household
Singles

Housing
Multiunit Rentals

44.2
Median Age

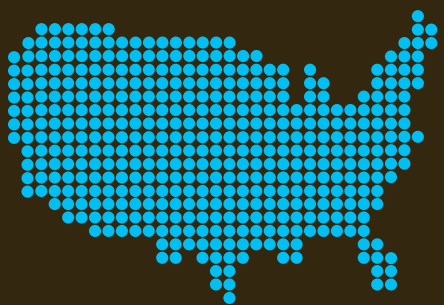
$16k
Median Income

Households: 962,000

3

Retired/Svcs/Prof
HS Diploma Only
White/Black

- Prefer to cook, eat at home
- Pay bills in person
- Play bingo
- Subscribe to basic cable TV
- Take public transportation



Want to learn more about all of Tapestry's segments? Esri's Tapestry Segmentation data (available at multiple levels of geography in maps, in reports, online, and in software) contains detailed lifestyle information about every US neighborhood.

It's a BIG Deal!

Collector for ArcGIS 10.3

By Jeff Shaner, Senior Program Manager, Esri Software Products

Collector for ArcGIS 10.3 for Android, available on Google Play, is a big update. Esri couldn't wait to share this update with the Android community.

Here are some of the hot features in 10.3:

Related Data in Your Forms

Now you can create/update information that is modeled using relationship classes inside your geodatabase. This unlocks new capabilities. For example, one or more inspection forms can be related to an asset or relationships can be used to provide a more advanced survey that includes optional subforms. Note that if you use archiving with ArcGIS for Server feature layers specifically, look for a patch for Server that will support relationship classes that will come out later.

Editing Versioned Feature Services

To leverage your investment in ArcGIS for Server, you can publish feature services that are managed using a versioned transaction model and edit features offline using Collector. What's great about this is that you can use the versioning model to manage the QA/QC of field edits before merging them into production systems. Note that this will require upgrading ArcGIS for Server to version 10.3.

Editing Permissions

When you capture or update data in Collector, you are using feature layers. Feature layers support advanced editing permissions defined through the service that they are hosted within (either ArcGIS Online hosted feature layers or ArcGIS for Server feature layers). Collector now fully honors those permissions so that you can model desired behaviors such as restricting field users to editing form content and preventing them from changing locations or deleting features.

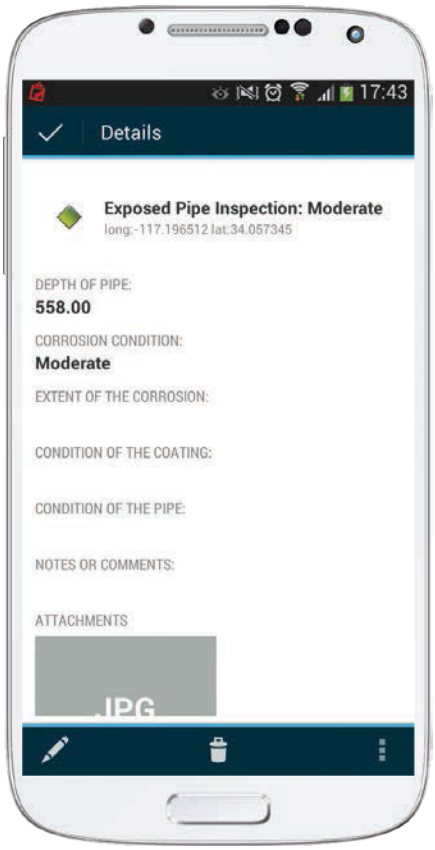
Hosted Tiled Web Layers

Until now you could either take Esri basemap layers offline, generate your own tile packages, and sideload them to your mobile device or publish ArcGIS for Server tiled map service layers and use them as your basemap. Now you can also use tiled web layers hosted within your ArcGIS Online subscription.

What's Coming

Without giving it all away, there are some big things in the works this year! Esri is working hard to bring Collector to Windows and Windows Phone devices right now so this release can include all the great 10.3 capabilities. Esri is also improving the capabilities in the map and how it is packaged for use in the field providing more advanced symbology, prepackaging maps for offline use, and making other improvements.

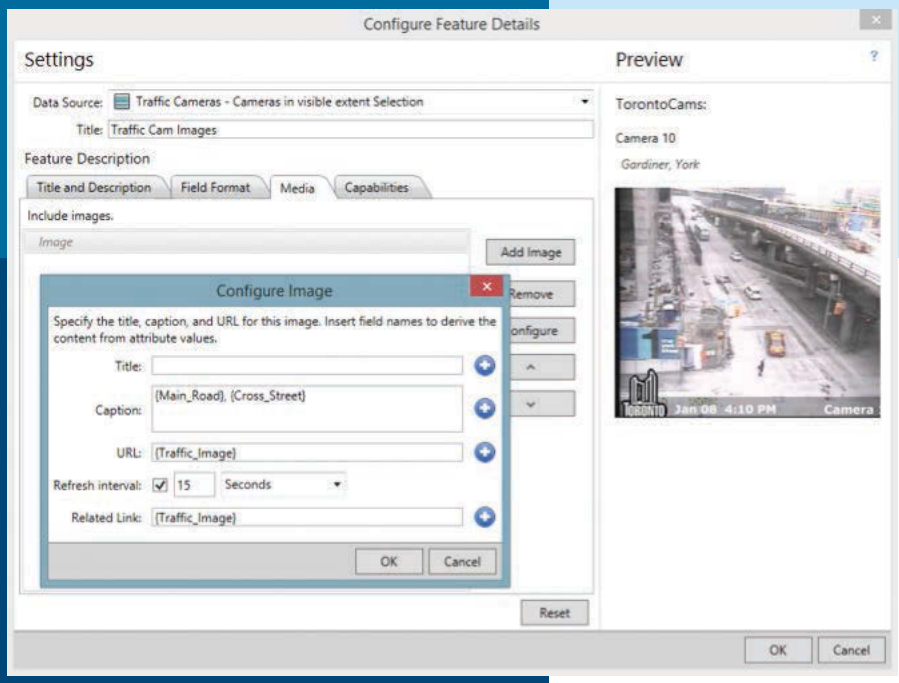
Collector is a great app for collecting and editing your data in the field right now, but here are some of the directions Esri would like to take this app:



- More tools for planning offline field operations
- Smarter data collection forms
- Data collection with offsets
- Ad hoc collection support
- Integration of peripherals such as laser range finders and bar code scanners

Share your ideas for new capabilities or your feedback in an e-mail to Collector4ArcGIS@esri.com.

Operations Dashboard for ArcGIS 10.3



The Operations Dashboard for ArcGIS 10.3 update provides a number of focused enhancements as well as stability improvements.

Filter Data Sources by Current Map Extent

This is a really powerful new feature. Your feature layer is a data source and you have always been able to apply an attribute query as a filter, but now you can combine that with a spatial filter (the current map extent). This lets you use widgets to compare data. For example, you could compare well production shown in the current map extent with all well production. Combined with an attribute filter, you can do some pretty amazing visual analytics.

Separate Refresh Rates for Media

Operations Dashboard is designed to work with real-time data. You can tweak how frequently you want to see and receive updates (either synchronized in the app or independently by layer). If you had security or traffic webcams though, refreshing the layer itself didn't help you. Now you can have a separate refresh rate that you set specifically for media that you link to that updates on its own schedule.

Expanding Widgets in the Browser App

Back in March 2014, Esri introduced the Browser app to complement the Windows app. It was designed specifically for touch screen tablets (iPads, Android tablets). With 10.3, it is now available with your on-premises Portal for ArcGIS as well as embedded within ArcGIS Online. Esri recently added the ability to pop out widgets so you can see them better on smaller screens.

More Improvements and Plans

There are many more enhancements such as support for stand-alone tables as external data sources and an image refresh setting in the feature details widget. You can find details at doc.arcgis.com/en/operations-dashboard/. (Note: If you deploy Operations Dashboard with ArcGIS for Server, download the Deployment Utility from My Esri.)

Esri is doing a lot of exciting work in 2015, such as a new way to extend Operations Dashboard using JavaScript, a complete refresh of the Windows app, massive improvements to charting, and many new widgets. Esri really wants to hear about your use of the Operations Dashboard app and what enhancements you would like to see next. E-mail your ideas and feedback to Dashboard4ArcGIS@esri.com.

Mission Impossible Becomes Possible with ArcGIS and an iPad

A county in Georgia discovered a way to deal with a skyrocketing demand for infrastructure inspections even as its field staff was greatly reduced.

Coweta County, located just 30 minutes south of Atlanta, has a small-town feel, but over the past 20 years, industrial and commercial growth in the area has exploded and the population has more than doubled to 130,000.

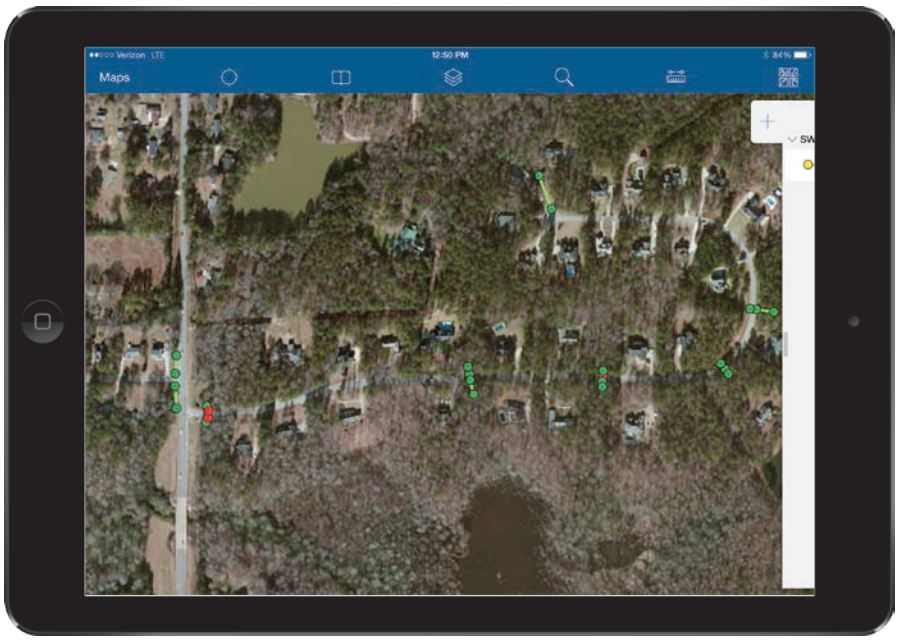
"The growth in all aspects of our community has resulted in us just trying to keep up with infrastructure," said Brian Martin, the county's storm water resources manager. "We don't want to get to the point where we have a lot of infrastructure going in and we are not able to keep up with it."

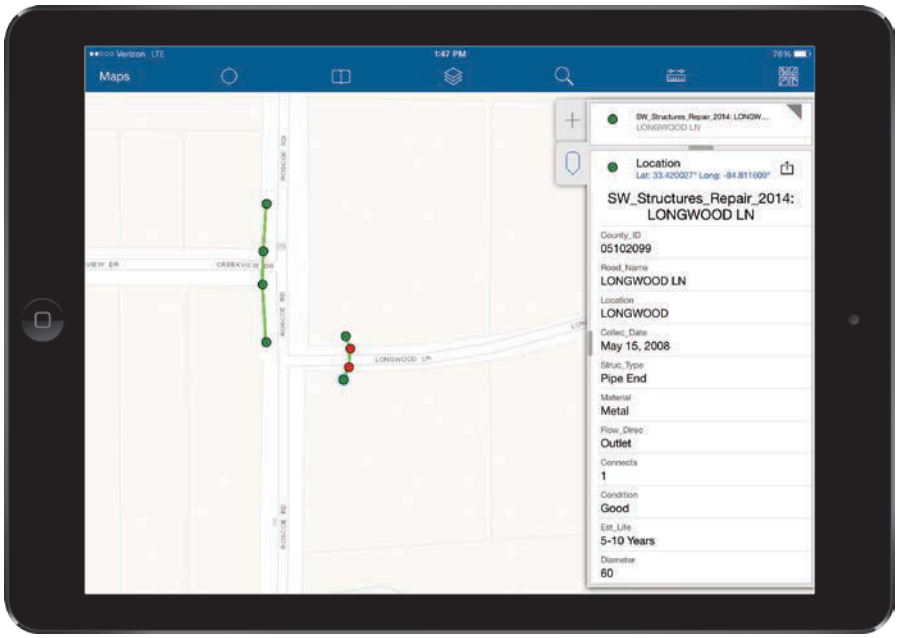
Something else doubled in the past two years: the number of required infrastructure inspections. Coweta County recently became part of the Metropolitan North Georgia Water Planning District. Now the county must adhere to stricter regional mandates that require new annual inspections of all urbanized infrastructure and at least 10 percent of the assets located in unincorporated areas.

Dealing with this situation required the county's GIS department to get creative. Clint Richmond, county GIS analyst, had read Esri articles that described how iPads could speed inspections and explored the use of iPads as an option for improving the inspection process.

At the same time, the number of staff deployed to make the newly mandated inspections was reduced to just one employee—Scotty Truitt—who was now responsible for inspecting more than 15,000 assets. To make these inspections, Truitt used a clunky mobile device with a small screen. Each morning, he checked out the device from the divisional office and drove across the county to Richmond's office so the GIS data

↑ Coweta County field inspector Scotty Truitt inspects a catch basin in a subdivision. Collector for ArcGIS lets him document his findings.





↑↑ Coweta County GIS analyst Clint Richmond configured Collector for ArcGIS with multiple basemaps for field inspection.

↑ Selecting an attribute on the iPad pops up information the field inspector can edit and update.

he would need that day could be exported onto Truitt's device. At the end of the day, Truitt returned to Richmond's office, where data was downloaded to the GIS, and drove the device back to his office. If Truitt could transfer data in real time from a mobile device, it would mean a huge time savings.

Coweta County started using ArcGIS for Desktop in 2007 to centralize the county's departmental GIS use for tax assessment, public safety, planning, and engineering applications. In 2013, the county got an ArcGIS Online organizational account, which Richmond thought would help with inspections and user web applications. After testing the iPad with ArcGIS software, Richmond asked the county to get Truitt an iPad. Richmond set up the organizational ArcGIS Online account with Esri, connected the iPad with Coweta County's centralized GIS, and configured the Collector for ArcGIS app.

Now Truitt could perform his daily inspections without driving back and forth to Richmond's office, and his field data was uploaded instantly to the county GIS via the Internet. Now Truitt is an infrequent rather than a daily visitor. "I don't even have to see him," Richmond said. "I haven't seen him in a month now."

The results have been remarkable. In 2012, Truitt completed slightly more than 50 inspections a day. The iPad has almost doubled his productivity. In 2014, he completed almost 100 inspections per day. The project has been so successful that Truitt finished all the mandated asset inspections halfway through 2014 and exceeded the mandated 10 percent for rural inspections by inspecting 40 percent of those structures.

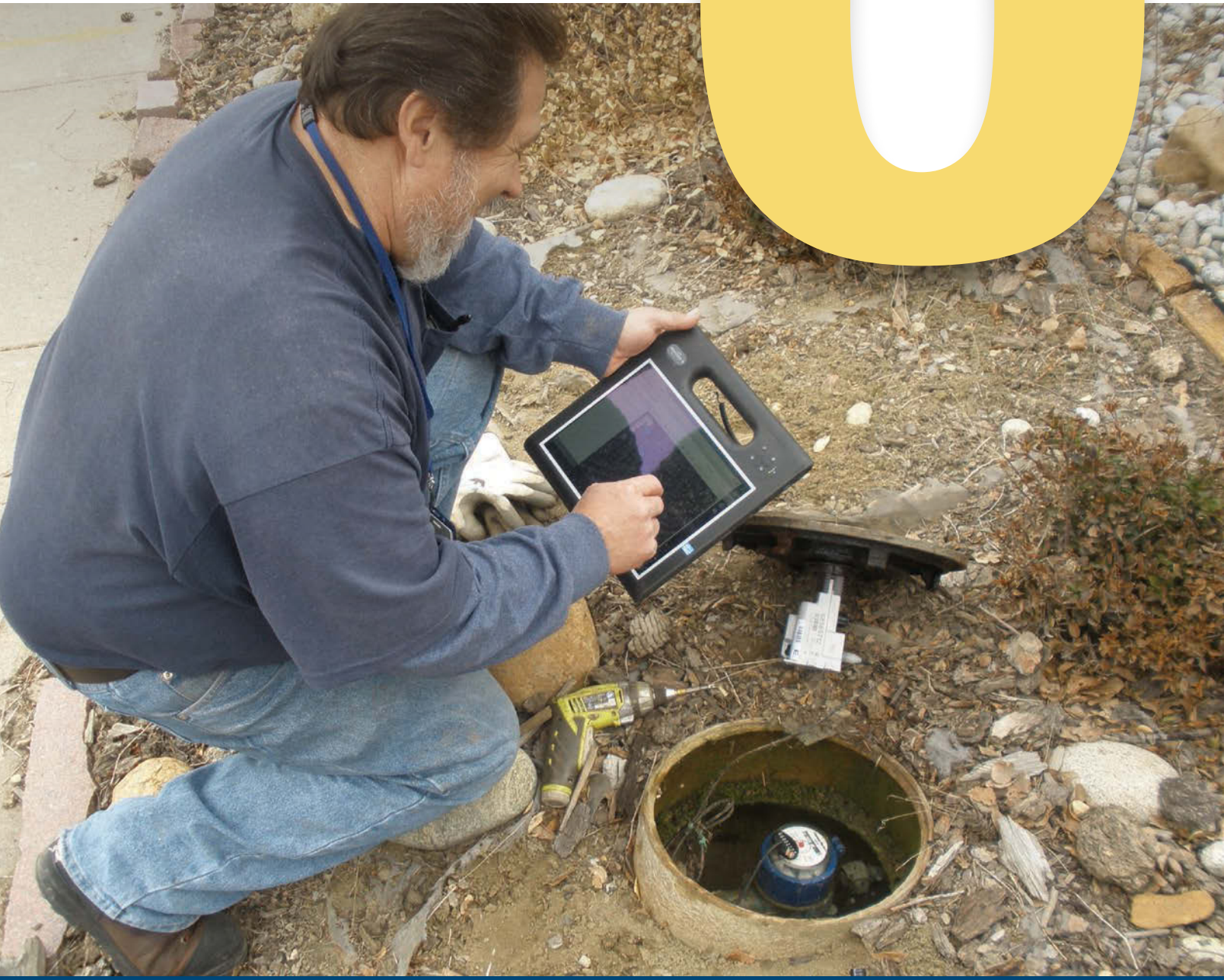
"The resulting increase in productivity is above and beyond our mandate," Martin said. "The asset information is invaluable to the county, especially if we have failure of infrastructure, allowing us to be proactive."

Truitt is now getting a jump start on a second set of regulatory initiatives that will require the county to map driveway pipelines. This is not yet a priority, but the county is making the most of Truitt's free time. "There's no big rush, just a year or so," Richmond said. "But we were like, 'Heck. Let's just start finding them.'" Truitt is now using the Collector for ArcGIS app on the iPad to locate driveway pipes. Richmond added aerial layers to Truitt's basemap. "He can zoom in right where he's at and draw the pipe in," Richmond said.

Not only is work getting done faster, but Coweta County can also proactively see where work needs to be done. "It's real nice for us not only for reporting to the state," Richmond said, "but also just knowing what's out there and what needs fixing."

Tablets and ArcGIS Online Solve Utility's Problem for $0

By Sarah Alban, Esri Writer



The city of Thornton, Colorado, discovered that if it didn't replace roughly 31,000 aging electronic radio transponders (ERTs) on its water meters, city staff would no longer be able to perform drive-by meter readings.

Ten miles north of Denver, Colorado, Thornton serves water to approximately 123,000 people through 36,000 residential and 2,000 commercial metered accounts. Recently, Thornton realized nearly 90 percent of its residential meters had ERTs reaching the end of their life cycles. Installed in 2004, ERTs enable drive-by meter readings, eliminating the need for staff to manually read each meter.

Thornton put out a request for proposal to assist with the interface in the change-out program. "We came across one we liked," said Jason Montoya, utility maintenance supervisor. "But the overall financial implications were too great." The solution they liked would have cost more than $100,000—far more than the city could spend. Consequently Thornton opted to utilize an existing technology for zero cost.

Web Maps and DIY

Thornton had been using Esri software for nearly two decades, and in the past two years, the city had been using ArcGIS Online and its cloud-hosted services. Montoya asked the GIS group if they knew of a solution that would enable field technicians to use existing technology to replace the ERTs. GIS analyst Mary Ann Nicaise suggested serving out water meter locations to field personnel via ArcGIS Online as a web service.

← Each technician scans the asset data using the bar code reader, eliminating the need for paper-based data entry and its associated issues.

"So I sat down with IT and Mary Ann and told them what I was looking for," Montoya said. "They started bouncing ideas, and Mary Ann thought we could do a web-based service." The focus turned to the existing GIS for the solution.

Nicaise configured a web map that crews could access on tablets that ran the Windows 7 operating system and had been outfitted with a bar code reader and Wi-Fi card. Meanwhile, the IT department wrote a Python script that performed a verification function. The script cross-referenced field data with a billing database and enabled supervisors to accept or reject information based on its accuracy.

Point and Shoot

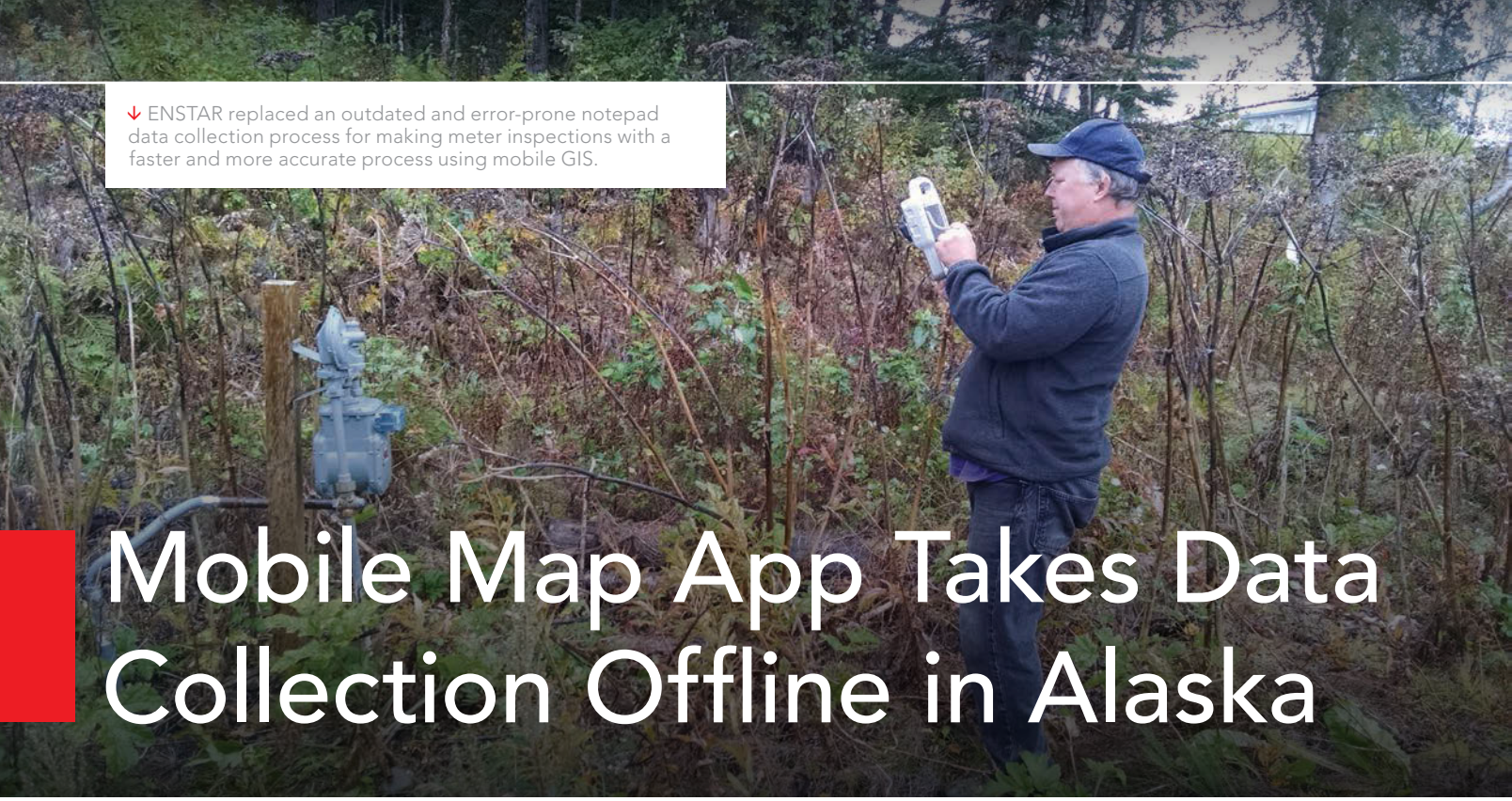
Each morning, each technician receives meter assignments. Meters shown on the web map are color coded to indicate the technician assigned. Each technician scans the asset data using the bar code reader, eliminating paper-based data entry and all issues associated with that process.

At the end of the day, the Python script verifies that the ERT number is imported into the correct customer account and ensures that the technician inspected the correct property. Once verified, the updated information propagates through the database and a joined billing system.

The web map took four months from idea to implementation. The only cost to the city was $12,000 for handheld tablets. "We would have had to purchase those regardless," Montoya said. "So there was no cost really."

This solution not only assists with the ERT change-out project but also collects geostamped asset information at the same time while reducing paper. In the future, it will help other maintenance and work order efforts.

For more information on ArcGIS Online, visit arcgis.com/features.



↓ ENSTAR replaced an outdated and error-prone notepad data collection process for making meter inspections with a faster and more accurate process using mobile GIS.

Mobile Map App Takes Data Collection Offline in Alaska

An Alaskan natural gas utility adopted a new approach to managing its tranmission network that developed an offline mobile GIS app that has improved the flow of information from the field to the office.

ENSTAR Natural Gas has powered Alaska homes since the 1960s. Today ENSTAR serves a population area of more than 420,000 across nearly 3,000 square miles. Working in Alaska offered challenges, but ENSTAR had a working system for managing more than 450 miles of transmission main and nearly 3,000 miles of distribution main.

The utility limited inspection work to Alaska's summer months, May to September, and it used temporary workers who recorded fieldwork on paper maps and printouts. When workers installed a main or service line, they filled out a paper completion report. From these reports, ENSTAR made its annual update to its as-builts.

So, true to the Alaskan spirit, ENSTAR was determined to explore another path. As part of ENSTAR's GIS strategic plan, the utility wanted to more rapidly collect GIS data in the field as well as the as-built updates in the GIS. ENSTAR also wanted to efficiently and accurately add meter information, which did not exist in the GIS. These changes would increase data accuracy while decreasing paper waste and eliminate time spent scanning documents.

Bushwhacking a New Data Path

When ENSTAR rolled out its first modern data collection effort in 2011, the company had been using Esri technology for nearly five years. In the pilot program, workers collected atmospheric corrosion data using ArcPad on Trimble GPS units. Licensing costs and other challenges limited expansion of this application. ENSTAR was closer to digitizing data collection, but one more iteration was needed.

ENSTAR contracted with Anchorage-based custom software developer Resource Data, Inc. (RDI). It is built on Windows for Mobile 10.2 and Windows Presentation Foundation (WPF). Using Esri's software development kit (SDK) and ArcGIS for Server Advanced, RDI developed a flexible app that included GPS tracking, camera capability, bar code scanning, and a document viewer.

ENSTAR Mobile Maps was the result, and it was used in a pilot program in summer 2012 to carry out atmospheric corrosion inspections and meter data collection simultaneously.

Mobile Maps leverages existing work processes. It is completely self-contained and doesn't require an Internet connection. It updates ENSTAR's enterprise GIS back at the office each day.

Field-workers have found Mobile Map easy to learn and have required little training after initial adoption. Field-workers can edit maps in Mobile Maps. They enter meter information, record meter readings, and capture encoder receiver transmitters (ERTs) with the bar code scanners. With a click, they can enter everything ENSTAR needs to know about meter sets.

Records are time stamped to provide an audit trail that meets regulatory needs and documents compliance with triennial corrosion and leak requirements from the Pipeline and Hazardous Materials Safety Administration (PHMSA). Supervisors track work progress and review meter infractions using SQL Server Reporting Services (SSRS). *[SSRS is server -based report generation software that is part of Microsoft SQL Server services.]*

ENSTAR Mobile Maps uses mobile and tile caches. Field-workers download new work assignments daily. In the field, they can pull up and sort work lists in a map or grid view, and the GPS can guide them to jobs.

All editing is done offline. Fieldwork gets stored in mobile caches, which update through the app or through file synchronization at the office. ENSTAR synchronizes every day to avoid data duplication. Tile caches are updated through a manual file copy from portable hard drives.

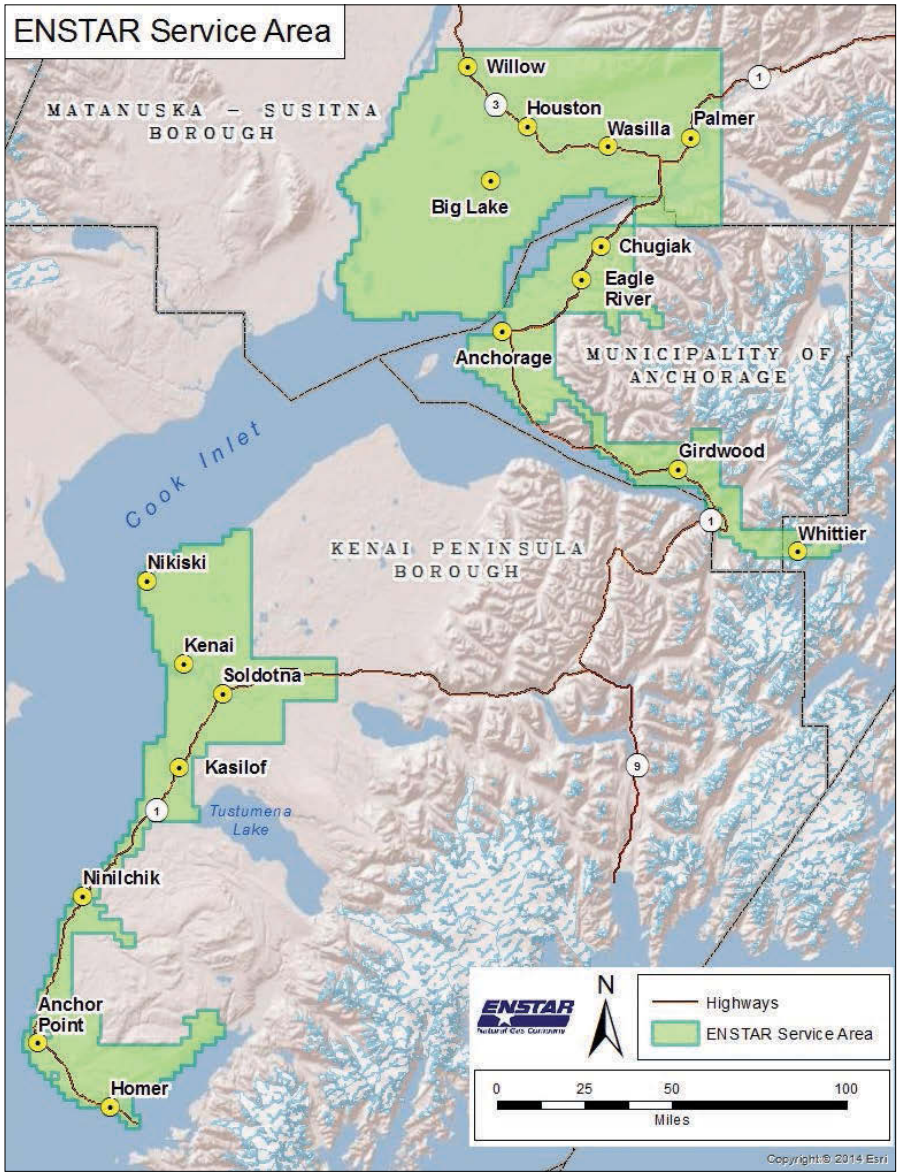
Data Gold Rush

During its inaugural year of use, ENSTAR used Mobile Maps to inspect more than 34,000 meter sets. Field crews added more than 37,000 individual meters to the GIS.

After the first year, a new module was added to the app that enabled a read-only mode for displaying map data for deployment to the service department. This replaced a legacy mapping application.

The utility continues to phase out its paper as-built books and replace them with computer records. New modules are under development that will allow ENSTAR to digitize new service lines in the field and capture cathodic protection inspection data.

Users like the app. The GIS is accurate. Work assignments are flexible. As-built data gets updated more often. Access to aerial imagery and scanned completion reports streamlines the workflow. Users can also locate all features within a selected polygon location.



Meters are searchable. Each meter entered into Mobile Maps includes a picture. These time-stamped photos provide proof the meter has been inspected. The app won't close out a job until such a photo accompanies the meter entry.

ENSTAR employees can search for features by address, subdivision, lot, block, or location ID. The search accepts wildcard queries. A Follow Me feature shows the user's location and the location of a feature chosen from search results. As the user approaches the chosen location, the map zooms in.

"Through ENSTAR Mobile Maps we have been able to collect valuable meter location information and quickly turn it around for use by our service technicians and others in our company," said Erick Johnson, ENSTAR GIS specialist.

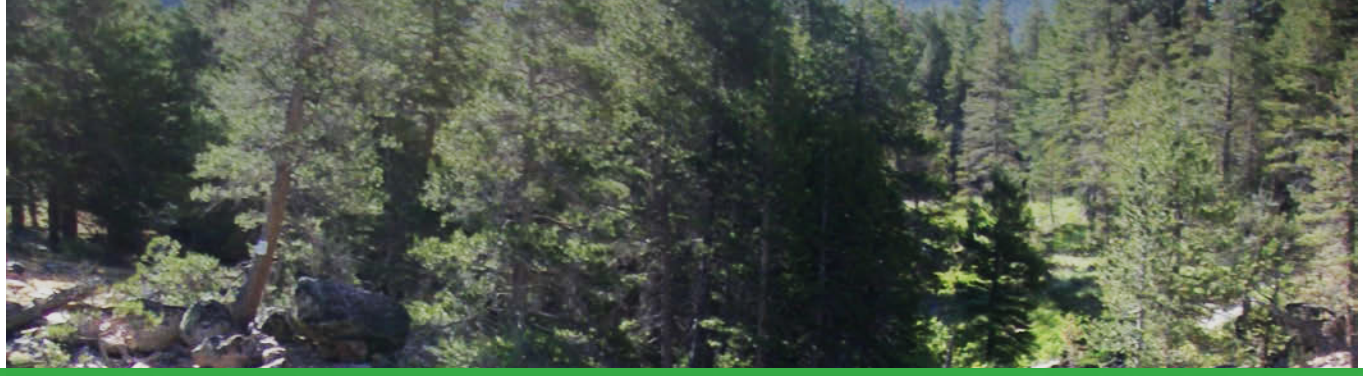
Field crews have direct access to completion report documents in the field. For many jobs, workers no longer have to call in to the office to have someone track down a completion report and then relay the information on it over the phone.

"It helps us identify and find meters which may need repair. As-built information can get out to the field more often, which increases safety," said Johnson.

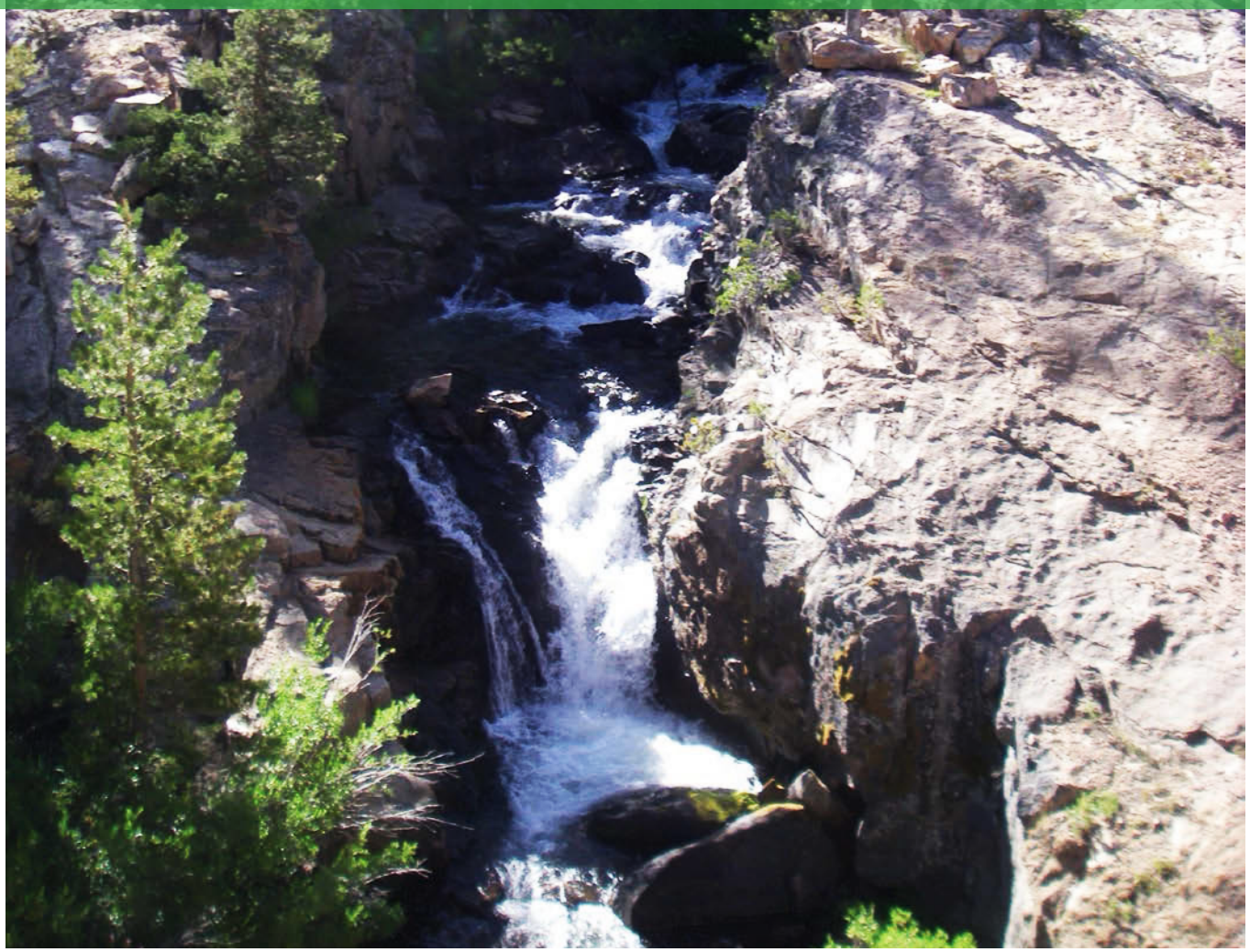
For more information, contact Erick Johnson at erick.johnson@enstarnaturalgas.com.

↑ ENSTAR Mobile Maps shows near real-time meter information in the field.

← The ENSTAR service area spans southern Alaska.



↓ The Paiute cutthroat trout is currently found only along a short reach of Silver King Creek, upstream of Llewellyn Falls. (Photo courtesy of CDFW)



Restoring Rare Trout to Its Native Range

By Will Patterson, Ken DeVore, William Somer, and Roger Bloom
California Department of Fish and Wildlife

↑ Paiute cutthroat trout (Photo courtesy of CDFW)

The California Department of Fish and Wildlife (CDFW) is using GIS in both the planning and implementation stages of a project that will restore a rare trout in a remote area to its historic range.

The Paiute cutthroat trout *[Oncorhynchus clarkii seleniris]* is one of the world's rarest trout species. It is the only western trout that consistently has no obvious spots on the body, and its native range is a single stream in California, Silver King Creek, located inside the Carson-Iceberg Wilderness.

Protected as a threatened species under the Endangered Species Act (ESA), the distribution of the fish is currently limited to a short reach of Silver King Creek upstream of Llewellyn Falls and other small isolated tributaries.

The Paiute Cutthroat Trout Restoration Project is an effort by the CDFW and several partner agencies to restore the fish to about nine miles of habitat downstream of Llewellyn Falls. This area is believed to be the historic range of the trout prior to its interbreeding with and displacement by introduced nonnative trout.

Although CDFW has been working on related restoration activities for decades, two critical phases of the project were implemented in August 2013 and August 2014 when chemical treatments were used to remove nonnative trout from the selected downstream habitat. A final treatment will occur in August 2015, followed by the reintroduction of the Paiute cutthroat into this habitat from donor populations. Once Paiute cutthroat trout are restored and a self-sustaining population has been established, the species can be considered for removal from ESA protection.

Geospatial technologies are helping to guide the project's planning and implementation. ArcGIS for Desktop is being used for GIS analysis, cartography, and data management, while Garmin GPS units are used for habitat mapping, treatment guidance, and navigation. Additional software applications in use include Map Product Creator (MPC) from Garmin and DNRGPS from the Minnesota Department of Natural Resources.

While the project's remote wilderness setting provides a uniquely scenic working environment, it also introduces some challenges. A source of sustained portable power was needed. Because all items must be carried in by foot or mule, the amount of equipment needed to be kept to a minimum.

Project Planning

The following datasets and GIS products were required for project planning, which took place between 2011 and 2014:

- Detailed hydrographic GIS layers were compiled by the project team for Silver King Creek and its tributaries. The high-resolution version of the National Hydrography Dataset (NHD) provided a basis for mapped water features and was enhanced using ArcMap to digitize additional detail from recent aerial photography. Several years of GPS data and field survey notes that indicated wet areas suitable as fish habitat were also converted into additional GIS layers. A DigitalGlobe WorldView-2 satellite image was used as well. It provided infrared bands that could be viewed in ArcMap to assist with water identification.
- Additional GIS layers were assembled by project staff, including locations for treatment drip stations, water quality monitoring stations, fish passage barriers, trails, and other important resources. A reference GIS layer of quarter-mile-square cells (an ArcGIS fishnet) was also created. Each cell was given a unique identification number to assist with field orientation and project deployments.
- Quick-reference field maps of the project area were created from GIS layers using ArcMap and printed on waterproof paper.
- A custom Garmin GPS compatible basemap was created from the GIS layers using Garmin MPC software. For consistency, the GPS basemap used the same GIS layers, colors, and symbols that were printed on the quick-reference field maps.

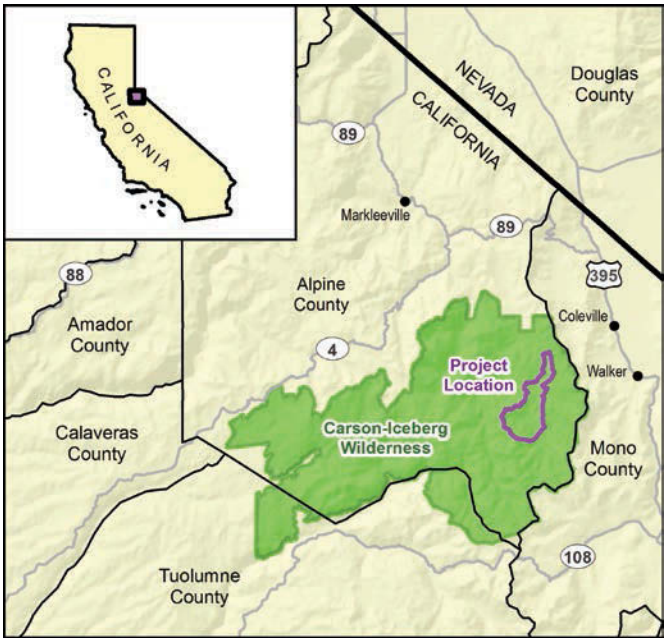
The on-site implementation took a week in August 2013 and a week in August 2014. Prior to hiking into the wilderness, project staff members were issued a quick-reference field map and a Garmin GPS unit loaded with the project basemap. Most of the equipment and camping gear were transported by mule pack trains.

The field GIS equipment consisted of one Hewlett-Packard laptop, one small ASUS laptop, several precharged laptop batteries, and one Brother mobile black-and-white printer, all carefully packaged for mule transport. A solar battery charger was also available. Most of the staff and equipment went to Connells Cow Camp (about a seven-mile trip one way), where a small historic cabin served as a cook station and base camp. Project staff camped nearby in tents.

The chemical treatments of the creek and its tributaries involved applying rotenone *[a pesticide that kills fish]* using stationary drip stations and portable backpack sprayers. The staff carrying backpack sprayers used GPS units to navigate to areas that had been identified for treatment. GPS also recorded the paths traveled, recording them as GPS tracks. Upon returning to base camp, the sprayers' GPS tracks were converted to GIS layers using DNRGPS and ArcGIS for Desktop.

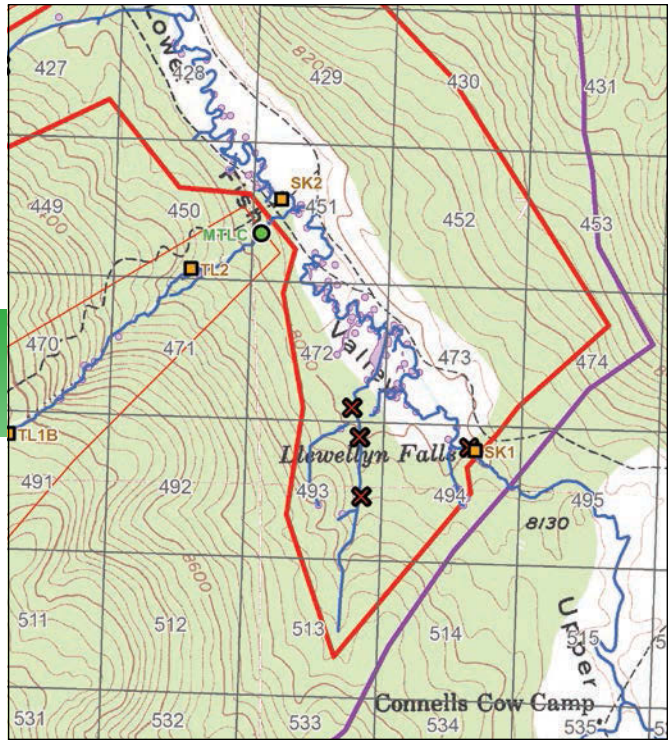
GIS layers created from the tracks were plotted on maps and printed so project leaders could confirm the backpack sprayers had traveled to the designated treatment locations. Symbolizing

↓ The rare Paiute cutthroat trout's native range is a single stream in California, Silver King Creek, which is located inside the Carson-Iceberg Wilderness.



↓ Silver King Creek (Photo courtesy of CDFW)

↑ Project staff using a quick reference field map for a discussion (Photo courtesy of CDFW)



↑ Quick-reference field maps, based on US Geological Survey topographic maps, were used as a basemap and integrated improved hydrographic features and other reference data acquired for the project.

the data effectively to produce useful output using the mobile black-and-white printer proved challenging.

ArcGIS for Desktop and other geospatial technologies are helping with this important effort to restore this rare and unique federally protected species of fish, the Paiute cutthroat trout, to its historic habitat. These technologies are improving the efficiency of the project's planning, helping to ensure a minimal treatment footprint, and providing essential tools to evaluate success of implementation.

For more information, visit the Paiute Cutthroat Trout Restoration Project website at www.dfg.ca.gov/fish/Resources/WildTrout/WT_Paiute/WT_PaiuteCutRestor.asp.

About the Authors

The authors are among the many individuals and field teams that have worked toward the success of the Paiute Cutthroat Trout Restoration Project.

Will Patterson is a GIS specialist with the CDFW Biogeographic Data Branch in Sacramento.

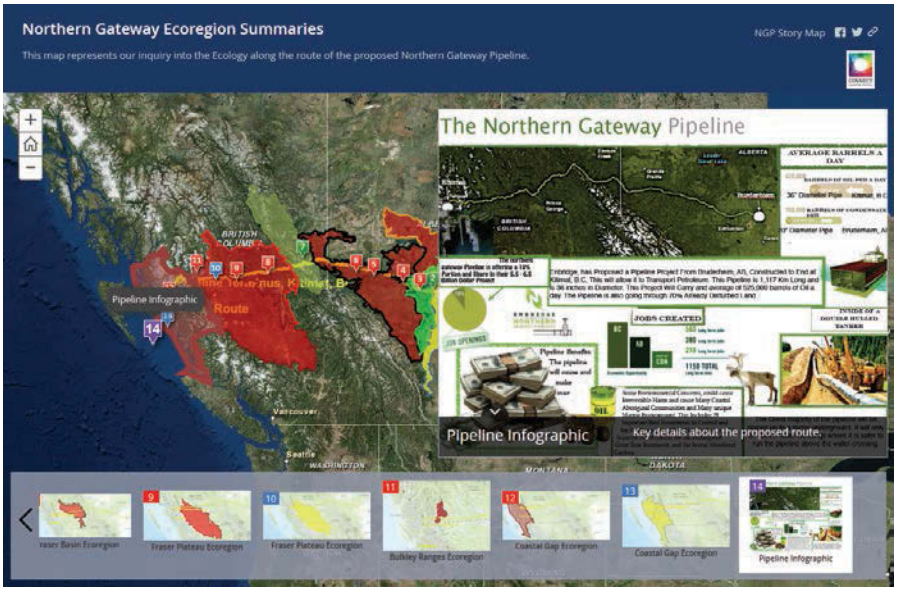
Ken DeVore is a GIS specialist with CDFW South Coast Region in San Diego.

William Somer is a senior environmental scientist with CDFW North Central Region in Rancho Cordova.

Roger Bloom is an environmental program manager with CDFW Fisheries Branch in Sacramento.

Students Study the Pros, Cons of Oil and Gas Pipeline

By Adam Buchholz, Esri Canada Limited



↑ Using an Esri Story Map template, the class created Northern Gateway Ecoregion Summaries, an interactive Story Map that summarized each group's final decision.

GIS helped a seventh grade class in Canada better understand both the benefits and drawbacks of the Northern Gateway Pipeline (NGP). The proposed 1,177-kilometer route for twin pipelines that would run between the provinces of Alberta and British Columbia has drawn opposition for environmental reasons, and support for its economic benefits.

Greg Neil, a teacher at Connect Charter School in Calgary, Alberta, wanted to help his seventh grade science class develop informed opinions about the project. Before starting the class project, Neil looked for technology that would give his students tools to visualize and map the NGP and the land that would be impacted by its pipelines and help them organize information and present project findings in a visually meaningful way.

"ArcGIS Online was a powerful tool to help my students understand what questions they needed to ask before conducting their research because, in the end, it was their research that informed their opinions," Neil said.

Neil applied for and received Esri Canada's GIS in Education Grant on behalf of the school in 2013. The grant, which is awarded to five Canadian schools each year, provides both desktop and online ArcGIS software and services for all computers in a school, as well as maintenance for two years and education resources.

As part of Esri Canada's GIS in Education Grant, Connect Charter School was given a school-wide subscription to ArcGIS Online at no cost. Each student received an individual login to the school's subscription to create, save, and share maps using personal laptops. Since ArcGIS Online is a hosted solution in Esri's secure cloud, installing software on each student's machine was not necessary.

Neil had no previous formal training using ArcGIS Online, so he contacted Esri Canada's Education and Research group to take advantage of its training resources and integrated the platform's features into his lesson plan.

The students used Esri's ArcGIS Online as a mapping, research, design, and information management tool to study the project so they could then decide whether or not to approve of the pipeline's construction. After formulating questions about the NGP to frame their research, Neil's students worked in groups to learn how to plot the pipeline's proposed route using ArcGIS Online. The students worked independently to delineate their own study areas. Each student was responsible for studying the potential social and environmental impacts of the NGP within their study area.

To do this, the students added layers to their study areas from ArcGIS Online, including ecology, population density, forest cover, endangered species, seismic activity, hydrology, First Nations treaties, and land claims.

Students organized themselves into groups, summarized their findings, and decided whether or not they would approve construction of the NGP in their specific study area.

Using the Esri Story Map template, the class created Northern Gateway Ecoregion Summaries, an interactive Story Map that summarized each group's final decision. Students said the online GIS technology made learning the project's subject matter more interesting and authentic.

The students' opinions about the pipeline shifted quite a bit during the course of the mapping project, according to Neil. Many started out favoring the pipeline but ended up opposing it. But many others who had started out against it supported it in the end.

"It really depended a lot on the specific regions they researched and the impacts the pipeline might have in those regions," Neil said.

The innovative class project won a City of Calgary Mayor's Environmental Expo award in 2014. In a postproject survey, the 30 students unanimously agreed that ArcGIS Online was a useful learning tool.

Since the project was so successful, Neil hopes to help the school expand the use of ArcGIS Online to other subjects. Neil said his class has continued to use ArcGIS this year to study topics related to physical geography, geology, and ecology.

For more information, contact Greg Neil at greg.n@connectcharter.ca. Follow him on Twitter, @CGEDNeil.

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Driving Business Integration with GIS

By Steve Benner, Esri

GIS professionals should take the lead on SAP/GIS integration projects. It's good for business, and it's good for GIS.

GIS teams often ask me how to integrate mapping features into SAP enterprise applications. The question usually comes up right after they find out that their IT department is moving all legacy business data sources to SAP.

Unfortunately, this "who moved my cheese" scenario often results in the GIS team simply reestablishing links to the same old data. By doing so, they are essentially paving the same old cow paths, rather than seeing the move to SAP as an opportunity to make the processes that drive the business more efficient. Leading an innovation-focused collaboration with the SAP team and business stakeholders can deliver productivity-enhancing business process improvements and create a higher profile for the GIS team within the enterprise.

Good for Business and Good for GIS

GIS is moving out of the back office. While people used to come to the GIS department for maps, today they expect maps to come to them. It's not enough to wait for users to come knocking with requests. Innovative businesses are embedding live maps and location analytics directly into SAP applications to improve workflows, productivity, and decision making. You can use real-time maps and location analytics in SAP mobile apps for field-workers, embed them into SAP dashboards and data visualization tools, and integrate them into a wide range of core SAP Business Suite applications.

But spatially enabling SAP introduces change, and change never comes easily. GIS professionals should work closely with their SAP counterparts and business users to explain and promote the benefits of integrating live maps and location analytics and then provide the expertise needed to ensure that those integration projects succeed.

The resultant benefits aren't just good for business. GIS/SAP integration is a win for the GIS team itself.

- It expands your stakeholder base, bringing the benefits of your work to new users in other parts of the business.
- It ties your work to mission critical applications and business processes, making it "sticky" when times get tight and budgets scrutinized.
- It frees you up to focus on more challenging work while empowering users by giving them self-service access to maps and spatial analysis within the context of the business applications they use every day.
- It raises the GIS department's profile, demonstrates business value, and could lead to the allocation of budget dollars for additional GIS projects.

Lead the Charge

GIS professionals can and should be the catalyst and the champion for change. Now is the time to walk down the hall to the business team and start a conversation. The key to success lies in figuring out how to work with the SAP team and individual business units to build lasting alliances. Here's how to get started:

Understand the business.

It's not just about maps. It's about developing content that enables the business to identify new markets and customers, more efficiently run operations, and beat the competition. Find the business opportunities and talk in terms of business goals and measurable results.

Find out what users outside your traditional constituency are trying to accomplish.

Spend up to half of your time outside your department talking to other business units and the SAP team to understand the challenges they face and how the GIS team can help them.

Ensure that spatial integration becomes a win for the SAP team and the business.

Become a prominent part of the team. Act as a creator, curator, and aggregator of location assets. Your GIS group should become the go-to-resource for location analytics and be seen as the home base for business users. So step out of the GIS department. Find new constituents. Then strategically redefine, reinvent, and rebuild your organization to deliver broader business value for relevance—and success.

For more on the business and technical details of bringing live maps and location analytics to SAP, visit esri.com/partners-alliance/sap/solutions or send your question or comments to sapinquiries@esri.com.

About the Author

Steve Benner has been working with location analytics for more than 10 years helping users and business intelligence (BI) vendors bring the power of mapping and analysis to bear on critical business problems. He manages BI relationships for Esri. He has worked with Teradata and all the major BI vendors including SAP BusinessObjects, MicroStrategy, Information Builders, SAS, Panorama, and others, as they've implemented location into their solutions.

Creating a Sustainable GIS

A COTS-based approach ensures your applications will stand the test of time

By Keith Cooke, Esri

> "Government agency leaders recognize that pre-recession business models are not sustainable, and are willing to pursue radical service changes by making targeted IT investments."
>
> Gartner, "Top 10 Strategic Technology Trends for Smart Government, 2013"

This quote from Gartner is one I use frequently because I think it says a great deal about our situation in the GIS industry today. The game plan we used in the late 2000s is no longer sustainable. Even if GIS professionals don't immediately recognize it, IT and agency directors do, and they are ready to spend money on it. This article takes a look at why that is and how it impacts today's GIS professionals when it comes to applications.

Sure, We Can Code That

With the advent of ArcGIS for Server in the last decade, many organizations hired developers to create custom applications. At first, this was a sound strategy. ArcGIS for Server was new, and there weren't many templates available. So it made sense to create applications where a workflow was defined.

Even when there were commercial off-the-shelf (COTS) applications out there for workflows like permitting or work order management, many organizations declined those for various reasons. Some were convinced their workflows were so unique that they weren't a perfect fit for the app. Some believed, since they had developers in-house, that building it themselves meant they were getting it for free.

But even with full-time developers, many organizations were overwhelmed trying to support existing apps while upgrading older apps to the latest version of the software. Unable to keep up with these demands, many found themselves lagging one or two versions behind the latest functionality, which ultimately held back the organization as a whole.

Then, the recession hit. Many organizations had to drop some or all of their developers. Those that were already struggling to keep their heads above water found their ability to continue to sustain an internal suite of custom applications all but eliminated.

Debunking Some Myths about Applications

Here was one of the core problems. Too many IT departments and agency directors were convinced their workflows were *special*, that there was no way a COTS application could meet their needs. Here is another important quote from the same Gartner report discussing business process management:

> "In the belief that every agency or government program business process is unique, program managers have historically favored the development of highly customized IT solutions over commercial off-the-shelf (COTS) products or cloud-based business services. *More often than not, the presumed uniqueness of a business process is overstated.*"

The other problem was that the total cost of ownership wasn't always factored into the business decision to deploy a customized application. If you're an IT director reading this, you probably laughed a little when I mentioned that some organizations thought developing an app in-house meant they were getting it for free. We all know that's clearly not the case.

Maintaining and supporting an application in-house can take an inordinate and unsustainable amount of resources. Many organizations have learned the hard way that just because they can code a customized app doesn't mean they should.

The old 80-20 rule (as applied to this situation) was that if you had a COTS app that accomplished 80 percent of your workflow, you customized the other 20 percent to meet your workflow needs. The new 80-20 rule states that now you *change the 20 percent of your workflow* to meet the functionality of the COTS app, because even though it can cause a temporary disruption, doing so is much less costly in the long run than coding and maintaining the customization.

Changing Technology, Changing Expectations

Take a minute to look at the apps on your smartphone. On my smartphone, I have Pandora and TripCase. One plays music. One gives me details about my travel schedule. Notice a pattern? Each of these apps does one thing. Each one addresses a single need or workflow. That's it.

For better or worse, your executives and users have been "trained" to expect that from their applications. Creating the do-everything app with 30 layers and a dozen buttons worked well eight years ago, but it doesn't work anymore. Your solutions have to be focused. So this means that instead of deploying a few general applications, your customers are expecting many focused applications.

Supporting a Sustainable Strategy

Over the last several years, Esri has created dozens of focused, configurable, fully supported COTS solutions and deployed them on its Solutions page (solutions.arcgis.com). There are ArcGIS suites for Local and State Government, Emergency Management, Utilities, Telecommunications, and others. Each suite addresses a set of verticals, such as health, land records, economic development, planning, and natural resources.

These applications are free. They're fully documented and supported by Esri Technical Support. You can even download the code for each of these apps.

If you're using ArcGIS Online, you're probably already aware of the numerous free apps that you can plug your web maps into to perform tasks like editing in the field, creating elevation profiles, geoenabling spreadsheets, or monitoring social media. Esri Story Map apps are an increasingly popular way to turn ArcGIS Online web maps into attractive, interactive applications. Again, these apps require no coding to implement. A diverse group of Esri partners are also creating low-cost and free COTS solutions. Check them out in the ArcGIS Marketplace.

Migrating to a COTS-based approach may seem a little overwhelming at first. A productive first step would be to look at your existing customized applications. What workflows do they specifically address? Are they still applicable? Compare them to what's available for free as a COTS app, and put together a timeline for migrating. Start small and work your way up to more complicated applications. You'll likely find there are several low-hanging fruits…some quick wins…that you can easily grab. Many organizations are already doing this with great success.

And Finally…

No one is saying that you should never again customize an application. It's reasonable to think there may come a time when that's the most feasible path. Choosing to create a customized app is a long-term business decision that should be made by an executive. It shouldn't be your first instinct. *Configure first. Customize only when necessary.* That should be your first instinct.

About the Author

Keith Cooke is a state government account executive for Esri. A graduate of Auburn University, he has been a GIS professional since 1994. He has worked for planning and community development agencies at the regional and local levels in Alabama and North Carolina. In addition to his state government duties at Esri, Cooke works with the Elections Solutions team, as well as the planning and community development team. He is an active participant in the American Planning Association's annual conference, where he has conducted more than two dozen hands-on GIS workshops for planners since 2004.

Esri Solutions Tools on GitHub

By Bob Booth, Software Products Group

solutions-geoprocessing-toolbox

The ArcGIS Solutions Geoprocessing Toolbox is a set of models, scripts, and tools for use in ArcGIS for Desktop. These tools provide specialized processing, workflows, and analysis for defense, intelligence, emergency management, and other solutions domains.

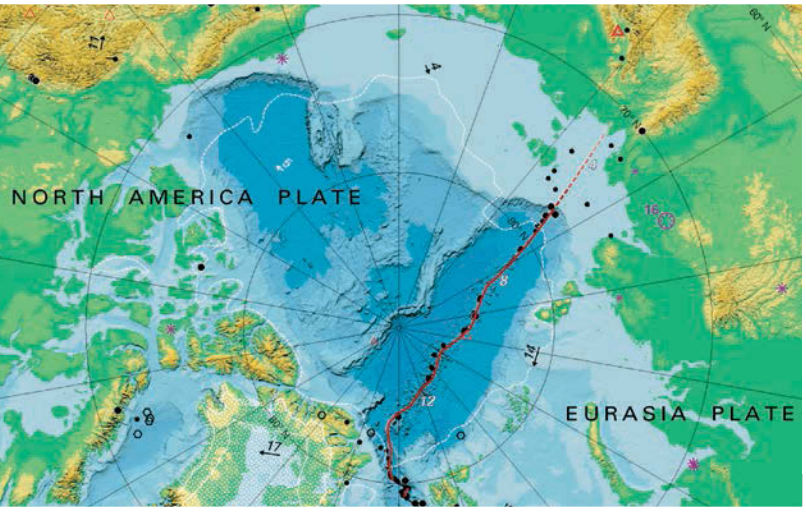
Esri Solutions tools are available on GitHub in the Solutions Geoprocessing toolbox repo at github.com/Esri/solutions-geoprocessing-toolbox. This repo contains a set of toolboxes of Python and model tools that you can use in military, intelligence, and emergency management workflows.

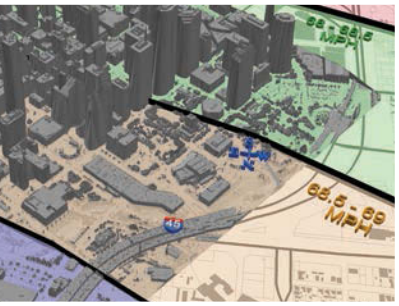
We've made this a public repo, so you can grab it anytime and inspect the source code and models for yourself. You can use these tools as they are, or you can modify them. Since it is a public repo, you can fork it, make changes, and submit a pull request to have your changes incorporated into the repo. You can also view the issues list and submit issues if you happen to encounter a bug or a tool that doesn't work the way you think it should.

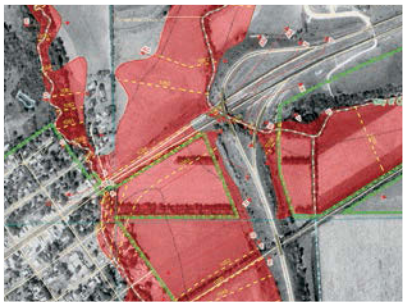
This is a living project. These tools are continually being updated. To make it easier for you to track progress on these tools and identify the version that is compatible with your version of ArcGIS for Desktop, Esri has begun creating Tagged Release branches in the repo. The latest named release is version 10.2.2.2, the third release of the repo for ArcGIS 10.2.2 for Desktop.

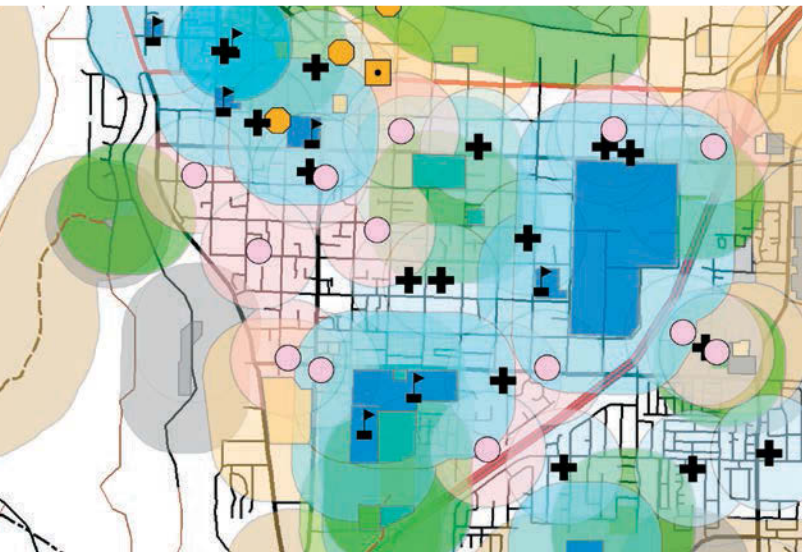
↑ Grab models and source code from the Solutions Geoprocessing toolbox. You can see all releases on the Releases page: github.com/Esri/solutions-geoprocessing-toolbox/releases.

The latest changes are always found in the Master branch of the repo: https://github.com/Esri/solutions-geoprocessing-toolbox.









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ArcGIS Runtime and Xamarin

By Euan Cameron and Rex Hansen, Esri ArcGIS Runtime Team

Over the last year, there have been a number of requests from developers for information regarding Xamarin technology in relation to the ArcGIS Runtime.

Xamarin is attractive to many of our developers because it allows them to leverage their existing Microsoft .NET development skills when building Android, iOS, Mac, Windows, and Windows Phone apps.

What Is Xamarin?

Xamarin is an evolution of the Mono project, which is a cross-platform, open-source .NET development framework. When Microsoft created the .NET technology, it did two things: it defined a specification and implemented that specification for the Windows operating system. The specification defined and subsequently published was, in fact, composed of several specifications. Microsoft implemented these and released them to the world as the Microsoft .NET Framework. Microsoft, Intel, and Hewlett-Packard then worked to standardize the specifications, which was accomplished in 2003.

Xamarin Implementation

The situation with user interface (UI) components is more complex. Xamarin Forms, released in May 2014, is a technology similar to Microsoft's XAML that allows developers to capture a form layout within a visual designer. Xamarin will bind UI components in the layout to native UI widgets appropriate for the platform the UI is executing on.

Since the various platforms that Xamarin supports have very different UI capabilities, a subset of UI controls are supported by Xamarin Forms. Xamarin Forms can coexist with native UI controls that are also accessible through Xamarin, although when using the native controls the UI code is not portable between platforms.

Third-party components that extend the capabilities of the operating system, such as ArcGIS Runtime, can expose their capabilities to Xamarin by creating platform-specific Xamarin bindings or enabling access to functionality in C/C++ libraries.

Xamarin bindings are a mechanism by which Objective-C or Java components can be utilized from .NET code. Since code for a binding depends on a platform-specific library, the binding code itself is platform specific. The .NET API on top of the binding will usually match the underlying structure of the library but can be adjusted. One major benefit of this approach is that Xamarin tools are provided to autogenerate bindings for a given library.

On the other hand, building functionality in C/C++, compiling for the Mono platform, and invoking from .NET code also enable sharing logic across platforms. Since the C/C++ source code is the same, the .NET API surface is the same regardless of the target platform (e.g., iOS, Android). Since Xamarin technologies rely on Mono, these native libraries can be used in Xamarin solutions. While this provides the most refined and consistent developer experience, it does require managing interops and referencing platform-specific dependencies to build a native library.

ArcGIS Runtime and Xamarin in Practice

To expose the capabilities of ArcGIS Runtime to the Xamarin developer today, Xamarin bindings need to be created. These Xamarin bindings must be created for each platform by binding onto the appropriate ArcGIS Runtime API for the respective platform.

While this architecture allows Xamarin developers to access the ArcGIS Runtime, it does not present the developer with a way to easily write cross-platform code, since the differences in ArcGIS Runtime APIs are exposed directly to the developer. Developers must learn the specific ArcGIS Runtime API, and with that knowledge, they can code against that API using C#. In addition, since the bindings map very closely to the underlying API, as the API evolves, the bindings must be maintained. This can be a time-consuming task.

To provide a more consistent and stable experience for ArcGIS Runtime .NET developers across the Windows, iOS, and Android platforms, Esri needs to build an API for Xamarin that invokes native capabilities in the C++ core that underlies ArcGIS Runtime. No bindings will be required, but the process will take time. With that in mind, Esri plans to have a commercial release of ArcGIS Runtime supporting Xamarin in the latter half of 2015. Esri is also seeking to provide a beta version in the first half of 2015.

What Can You Do Now?

Developers can create their own Xamarin bindings on the current ArcGIS Runtime SDKs for iOS and Android. While this is technically possible, Esri will not directly support any development work via third-party Xamarin bindings. Of course, Esri will continue to support use of the underlying native API.

Keep in mind, third-party bindings will need to be re-created when Esri releases updates to the underlying ArcGIS Runtime SDKs. This will be required to enable developers to take advantage of new features or pick up bug fixes and performance enhancements. Also consider that any application code written against third-party bindings will need to be rewritten to work with Esri's commercial product that supports Xamarin next year.

What Should You Do Now?

If possible, Esri recommends waiting until the official release of an ArcGIS Runtime product that supports Xamarin. If you are unable to wait, please take into account the time and effort that will be necessary to migrate ArcGIS Runtime applications you create today to Esri's commercial product available later this year.

The State of ECLIPSE with ArcGIS Android 10.2.5 SDK

By Dan O'Neill, Esri Software Product Release

The recent 10.2.5 release of ArcGIS Runtime SDK for Android is intended for use with Android Studio, the official integrated development environment (IDE) for Android development using the Gradle-based build system. This release of the Android SDK is primarily for users who want to use the official Android Development IDE. Please refer to the release notes to see if they affect your ArcGIS Android app workflows.

If you have been using Eclipse with Android Development Tools (ADT) and the ArcGIS Android Eclipse plug-in, you should be aware that Android Studio is the official IDE for Android. You should migrate to Android Studio as soon as you can. For help moving projects, see my blog post "Migrating to Android Studio" on December 19, 2014.

If migrating to Android Studio is not an option in the short term, you can continue to use the ArcGIS Android Eclipse plug-in with ArcGIS Android 10.2.4 SDK, but begin thinking about a migration strategy as Esri will not be supporting the Eclipse plug-in with 10.2.5 or later versions of the SDK. However, Esri will continue to support alternative IDEs, such as Eclipse and IntelliJ IDEA, through manual project setup.

Using Eclipse with ArcGIS Android 10.2.5 SDK

To manually set up projects in Eclipse, you will need to download the Android SDK. Eclipse development in Android requires the ADT plug-in. You will also need to uninstall any previous versions of the ArcGIS Eclipse plug-in.

1. Select Help > Installation Details.
2. Select ArcGIS for Android Core and ArcGIS for Android Doc and Samples and click Uninstall.

Note: In older versions, you might need to run Help > About Eclipse > Installation Details or Help > Software Updates > Manage Configuration.

With a clean Eclipse with the ADT developer environment, you can follow the manual project setup instructions provided here.

Create an Android Application Project

Use the New Project wizard to create a new Android project.

1. Select File > New Project from the Eclipse toolbar.
2. Select Android > Android Application Project and click Next.
3. Fill out the application and project names and ensure the Minimum Required SDK is set to API 15 or higher, and click Next.
4. Accept the defaults on the next four dialogs and click Finish.

Add ArcGIS Android Libs

Copy the contents from your local SDK download libs/ folder to your new project libs/ folder.

```
<uses-permission android:name="android.permission.INTERNET" />

<uses-permission android:name="android.permission.WRITE_EXTERNAL_STORAGE"
<uses-permission android:name="android.permission.ACCESS_FINE_LOCATION" /
<uses-feature
android:glEsVersion="0x00020000"
android:required="true" />
```

↑ Figure 1

Update the Android Manifest

Open your Android Manifest file by double-clicking the AndroidManifest.xml file in your project directory. Add the elements to your project shown in Figure 1. Note: You should add the appropriate <use-permission> that your application requires. You do not need to add ACCESS_FINE_LOCATION if your app is not using location sources such as GPS or WRITE_EXTERNAL_STORAGE if your app is not reading or writing files from external storage.

Now you are ready to start programming with the ArcGIS Android API. Please refer to Esri's Developer IDEs document for more information about Eclipse and other IDEs.

Esri understands many may want to continue to use Eclipse in the near term but strongly encourages you to consider migrating to Android Studio, as Google has definitively stated that Android Studio is the official IDE for Android development. You can always use alternative IDEs, such as Eclipse or IntelliJ IDEA, but until another IDE supports the Gradle Android-based project structure, Android Studio will be the IDE recommended by Google and Esri.

The Evolution of GIS Software

By Dave Peters, Esri Principal Technical Architect

From tightly scripted software code to the cloud, understanding our history can help guide us in building the technology of the future.

There is much we can learn from our past. Each technology advance has been a trade-off between heavier processing loads and deploying software that was easier to build and maintain. Faster hardware processors and improved network bandwidth provide opportunities for more software innovation. As platform and network capabilities improve, new advances in software move technology forward at an increasingly rapid pace.

Software development history gives us insight into the basic principles that guide us in building the technology of the future. The diagram below shows a high-level overview of the major GIS technology changes over the past 20 years.

Tightly Scripted Software Code

The early ARC/INFO software provided developers and professional GIS users with a rich toolkit for geospatial query and analysis and demonstrated the value of GIS technology. It was followed by other Esri products. ArcView GIS introduced easy-to-use commercial off-the-shelf (COTS) software that could be used directly by GIS operational users. MapObjects empowered developers with a simple way to integrate GIS in focused business application environments. Terminal servers enabled remote user access to centrally managed GIS desktop applications. ArcIMS web services introduced a framework for publishing GIS information products to web browser clients. ArcStorm and ArcSDE introduced better ways to maintain and share GIS data resources.

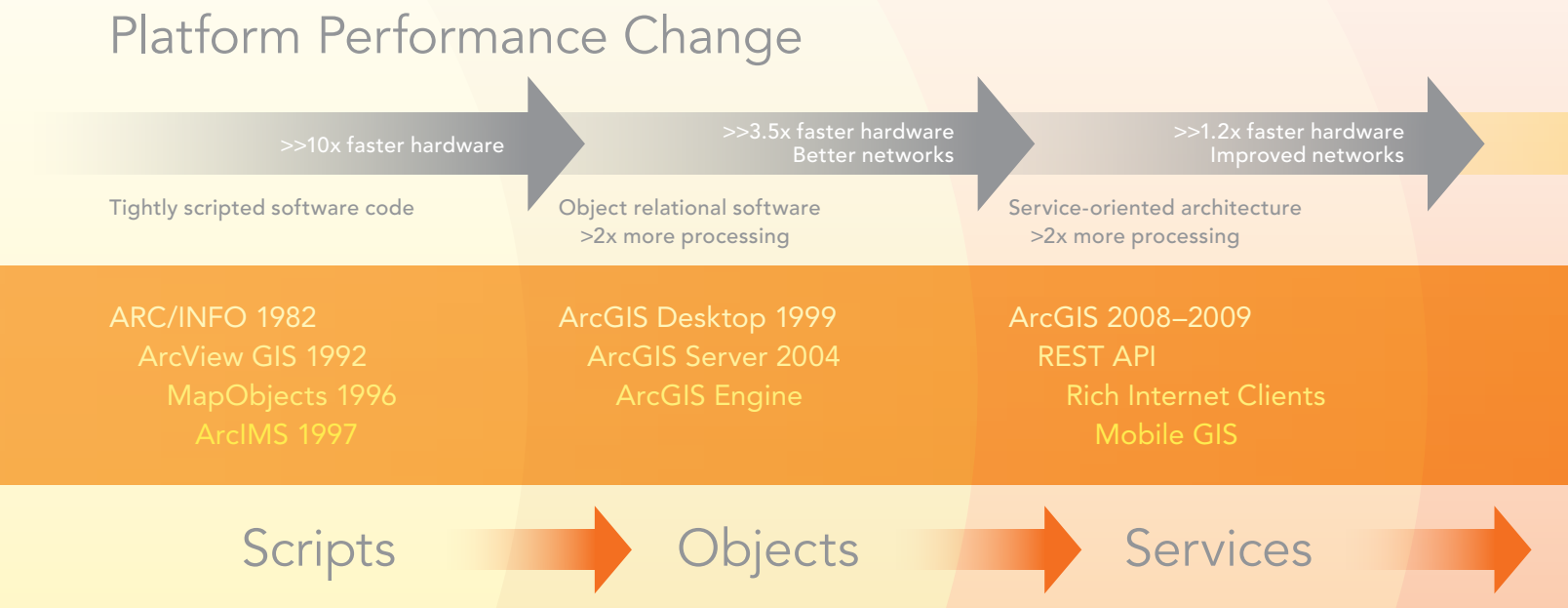
Object-Relational Software

Hardware performance improvements led to the adoption of more efficient programming techniques in the late 1990s. ArcGIS Desktop software gave users a simple and powerful application interface for many standard GIS operations. ArcGIS Server and ArcGIS Engine provided developers with rich processing tools and full GIS functionality for custom application development and deployment. Distributed geodatabase management tools and replication services provided better integration and sharing of geospatial data.

Service-Oriented Architecture

Web technology introduced more ways to share data and services, introducing a services-oriented component architecture along with interoperability standards that enable open and adaptive applications developed from multivendor component architecture.

Google and Microsoft introduced preprocessed (cached) online global basemap imagery, providing free access to geographic information products from home and mobile devices. Online data and services have become an important extension of the GIS user experience. Rich Internet client technology improves display performance and server capacity.



↑ Highlights of the evolution of Esri software from 1982 to present

Cloud Computing Platform Architecture

Hardware virtualization, data center automation, and self-service cloud computing provide simpler ways to administer and support GIS applications and services. ArcGIS Online provides a cloud-based self-service framework for sharing intelligent maps and building an online community basemap. Free web mapping tools encourage collaboration and sharing within groups and communities throughout the web.

Imagery is fully integrated into ArcGIS, including a rich set of imagery management and analysis tools. ArcGIS is available for mobile phones, tablets, and a variety of new mobile clients.

New Technologies Bring New Opportunities

Software technology migration from scripts to objects to services and to the cloud accelerated the rate of technology change while increasing demands on hardware performance and network connectivity. The change in technology impacted business processes in an evolutionary way, opening new opportunities for GIS to support enterprise and community operations, helping customers better understand their world, and empowering business with more informed decisions.

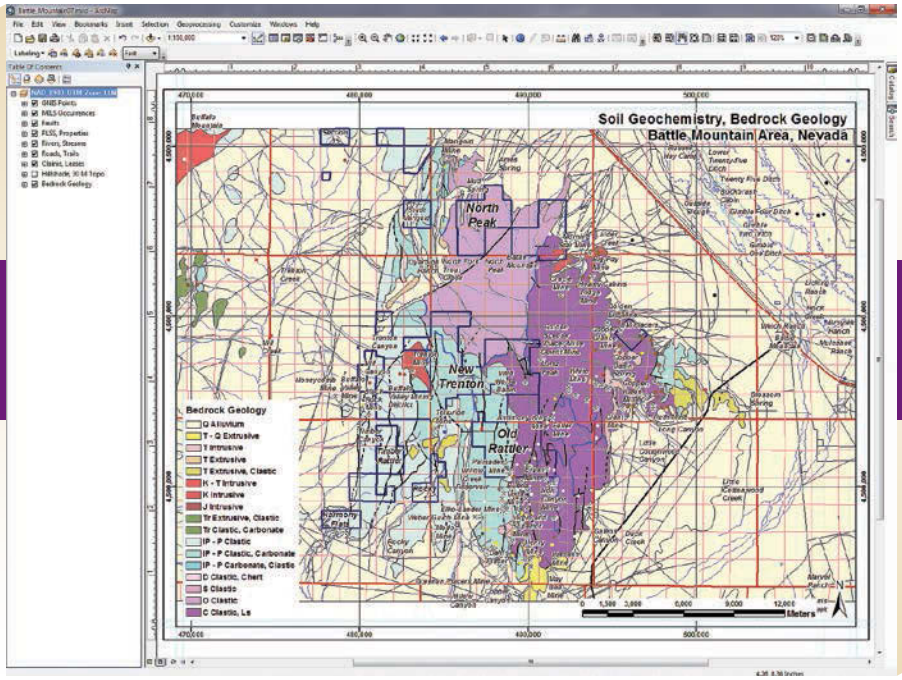
This article is an excerpt from Dave Peters's book Building a GIS: System Architecture Design Strategies for Managers. *Extensive information about successful system design can also be found on the System Design Strategies wiki (www.wiki.gis.com) and in the System Architecture Design Strategies training class (training.esri.com).*

About Dave Peters

Dave Peters is Esri's principal technical architect, and his primary focus is helping Esri customers implement successful GIS operations. Under his direction, Esri has established a solid foundation for system architecture design consulting services. He is the author of *Building a GIS: System Architecture Design Strategies for Managers*, published by Esri Press. He is also content manager and principal instructor for Esri System Architecture Design Strategies educational services and travels the world teaching system architecture design to a variety of GIS audiences.

Interactively Create and Apply Logarithmic Legends in ArcMap

By Mike Price, Entrada/San Juan, Inc.



← This exercise uses the dataset for Battle Mountain, Nevada, that was used in previous exercises. The Geochemistry geodatabase contains soil, rock, and stream sediment data.

What you will need

- ArcGIS 10.2 for Desktop
- Sample dataset from the *ArcUser* website

It is not easy to create simple, standardized legends of values for datasets that have nonlinear distributions. This exercise will show you an easy and quick way to make these legends in ArcMap.

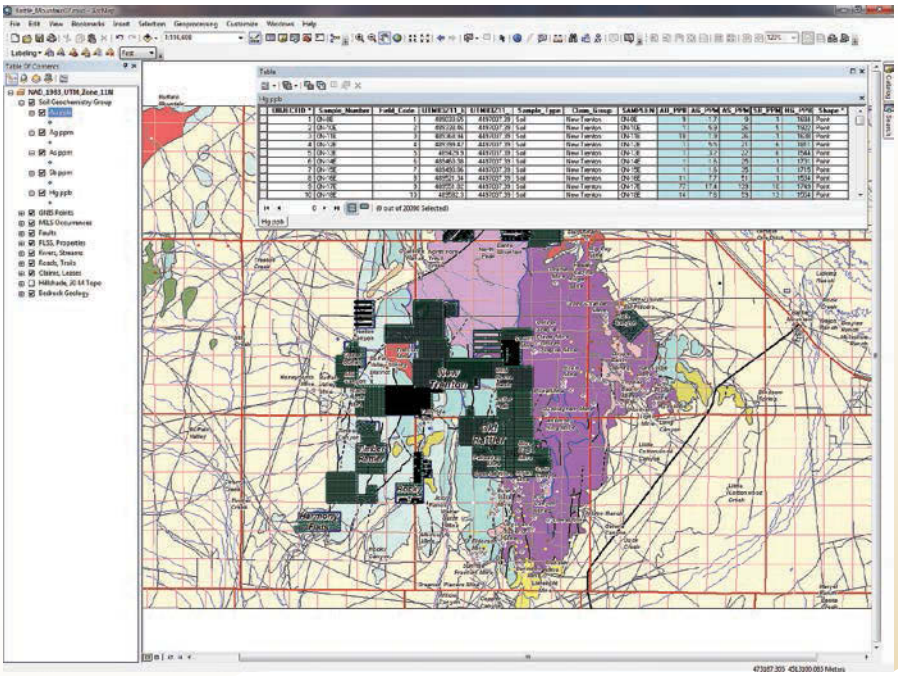
In the natural sciences, public safety, demographics, and many other fields, data may display nonlinear value distributions. In these distributions, many samples display low to moderate values, while some samples display very high outlying values. Geochemical data typically exhibits this exponential distribution.

Often, these datasets contain many elements, and it may be desirable to use the legend for each element multiple times. The ArcMap legend tool can create a logarithmic legend, but it is often difficult to quickly define legend intervals (or bins) that use rounded numbers.

Years ago, while exploring a logarithmically distributed geochemistry dataset plotted on a sheet of semi-log graph paper, I recognized a simple numeric series that closely approximates a common logarithmic (base 10) distribution.

I found that by starting a series with a decimal multiple of 1, 2, or 5 and building an increasing decimal series using these intervals, I closely approximated a one-third common log division (three nearly equal bins) between each major Log10 decimal interval (e.g., 1, 10, 100...). Table 1 shows this distribution. I find that legends created using these "almost" logarithmic breaks are easy to create, reproducible, and reusable.

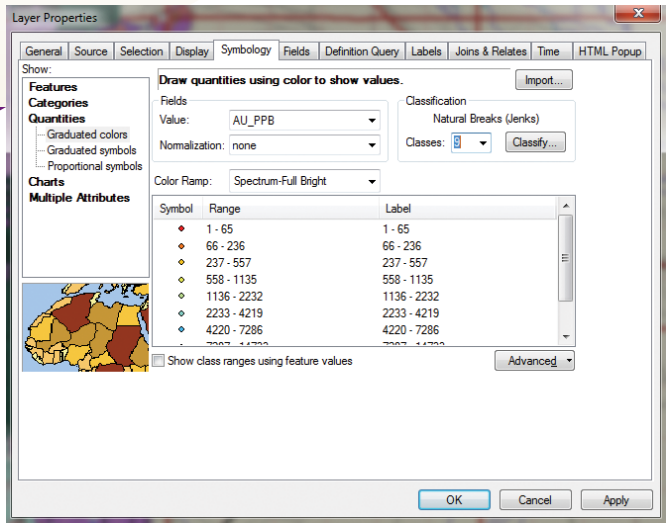
This exercise shows how to create these legends quickly. It also stresses data discovery and investigation and revisits useful tools including Symbol Levels and Graphs.



procedures for ArcGIS 10" in the Spring 2012 issue of ArcUser, *which is available from the* ArcUser *website.]* Completing previous exercises in the series isn't necessary. This data supports a stand-alone tutorial.

In ArcCatalog, inspect the Soil_Points feature class. Open its attribute table and inspect the five elements, AU_PPB, AG_PPM, AS_PPM, SB_PPM, and HG_PPB. Notice that the elements are either in parts per billion (ppb) or parts per million (ppm) and that the unit used has been incorporated into the field name. Sort the data and inspect minimum and maximum values for more than 20,000 elements.

The first Battle Mountain exercise standardized this data stored in a spreadsheet and imported the sample records into a file geodatabase table. In the next exercise, that data was displayed in ArcMap and saved as point feature classes. Prebuilt



↑ Create five copies of Soil_Points—one for each element—and place them in a Group layer renamed Soil Geochemistry Group.

← In the TOC, select Au ppb, right-click, and open Properties. Choose the Symbology tab and specify Quantities > Graduated colors legend.

↓ Table 1

Low	High	Log10	Split
0.0	0.1	-1.000	
0.1	0.2	-0.699	One-third
0.2	0.5	-0.301	Two-thirds
0.5	1.0	0.000	
1.0	2.0	0.301	One-third
2.0	5.0	0.699	Two-thirds
5.0	10.0	1.000	
10.0	20.0	1.301	One-third
20.0	50.0	1.699	Two-thirds
50.0	100.0	2.000	
100.0	200.0	2.301	One-third
200.0	500.0	2.699	Two-thirds
500.0	1,000.0	3.000	
1,000.0	2,000.0	3.301	One-third
2,000.0	5,000.0	3.699	Two-thirds
5,000.0	10,000.0	4.000	
10,000.0	20,000.0	4.301	One-third
20,000.0	50,000.0	4.699	Two-thirds
50,000.0	100,000.0	5.000	

Getting Started

Training data for this exercise is available on the *ArcUser* website (esri.com/arcuser). Download the data and unzip it on a local machine. Start ArcCatalog and inspect the dataset. This dataset for Battle Mountain, Nevada, has been used in previous training exercises. The Geochemistry geodatabase contains the same soil, rock, and stream sediment data that was imported from a Microsoft Excel spreadsheet in the first exercise of this series. *[See "Importing Data from Excel Spreadsheets: Dos, don'ts, and updated*

Element	Symbol	Units	Minimum	Maximum	Mean	Standard Deviation
Gold	Au	ppb	1.0	43,574.0	37.62	37.62
Silver	Ag	ppm	0.1	4,087.4	3.00	33.12
Arsenic	As	ppm	1.0	41,541.0	64.63	406.94
Antimony	Sb	ppm	1.0	21,130.0	13.02	175.40
Mercury	Hg	ppb	2.0	89,798.0	177.88	862.28

↑ Table 2

Element	Symbol	Units	Interval									Suggested Color
			1	2	3	4	5	6	7	8	9	
Gold	Au	ppb	5	10	20	50	100	200	500	1,000	99,999	Yellow to Red
Silver	Ag	ppm	1	2	5	10	20	50	100	200	99,999	Yellow to Green to Dark Blue
Arsenic	As	ppm	5	10	20	50	100	200	500	1,000	99,999	Green Bright
Antimony	Sb	ppm	20	50	100	200	500	1,000	2,000	5,000	99,999	White to Black
Mercury	Hg	ppb	10	20	50	100	200	500	1,000	2,000	99,999	Yellow to Dark Red

↑ Table 3

continuous legends were then applied. This exercise will present a method for creating a clean legend for this logarithmically distributed data.

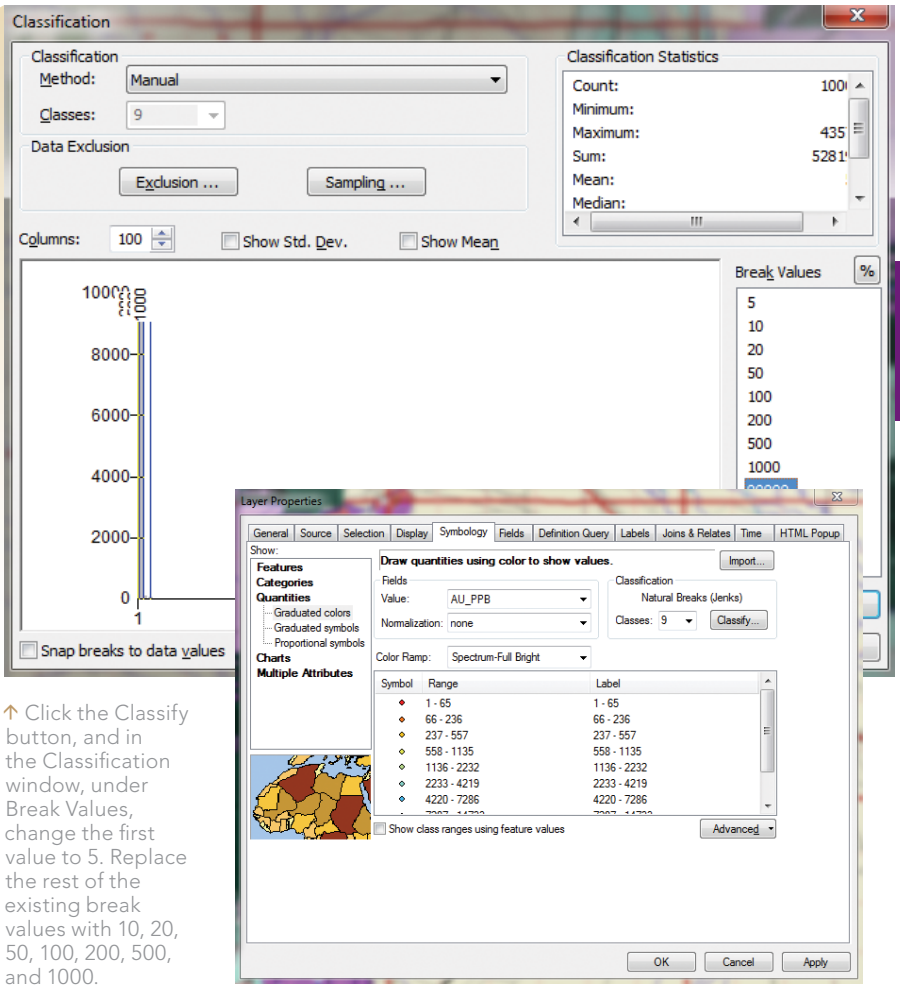
Battle Mountain Basemap

Close ArcCatalog and open ArcMap. Navigate to the new Battle_Mountain07 folder and open Battle_Mountain07.mxd. Inspect the project area, initially shown in layout view at a scale of 1:150,000. Notice that all layers in the TOC are visible, except a topographic hillshade raster. Geochemical data is not shown but will be added after performing some housekeeping.

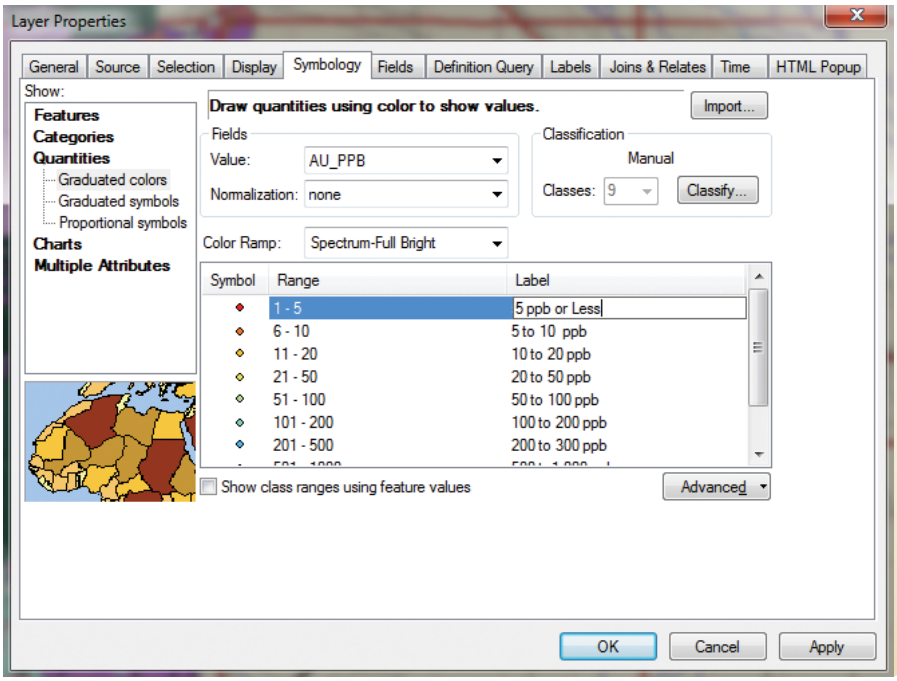
In ArcMap's text menu, click File and select Map Document Properties. Set the Default Geodatabase to \Battle_Mountain07\GDBFiles\Geochemistry.gdb.

Check mark Store relative pathnames. Save these updates and save your project.

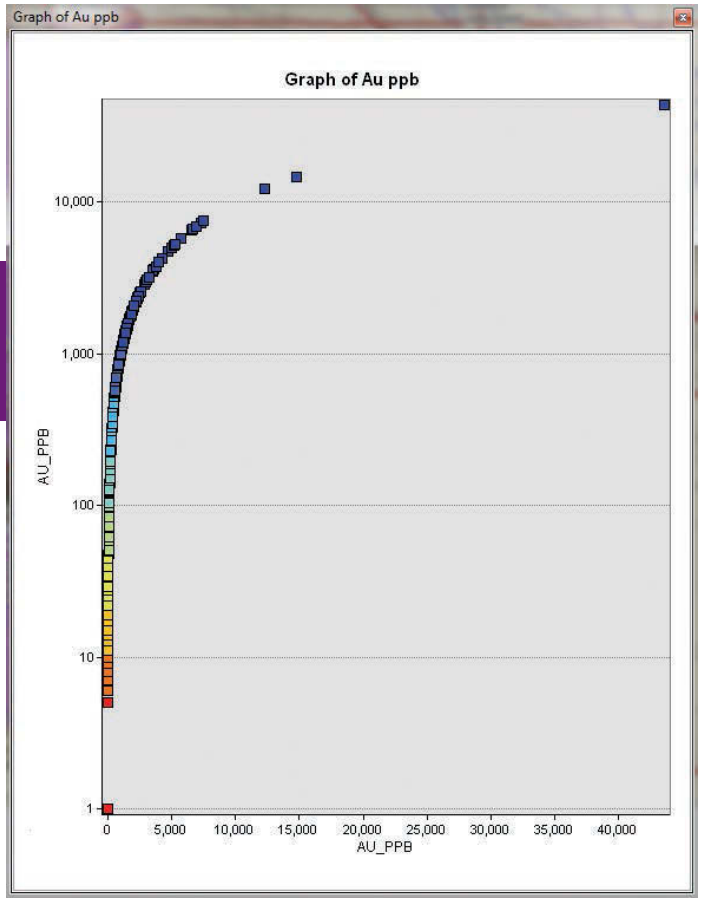
Switch from layout view to data view. Notice that the display scale is no longer 1:150,000. This is okay. In the TOC, right-click the data frame name and open Properties. Enable the Maplex Label Engine and explore properties. Notice that the projection is universal transverse Mercator (UTM) Zone 11N, the datum is North American Datum 1983 (NAD 83), and units are meters.



↑ Click the Classify button, and in the Classification window, under Break Values, change the first value to 5. Replace the rest of the existing break values with 10, 20, 50, 100, 200, 500, and 1000.



↑ On the Symbology tab, change the labels for the classification to friendlier ones that include the units (e.g., for the range 6–10, change the label to 5 to 10 ppb).



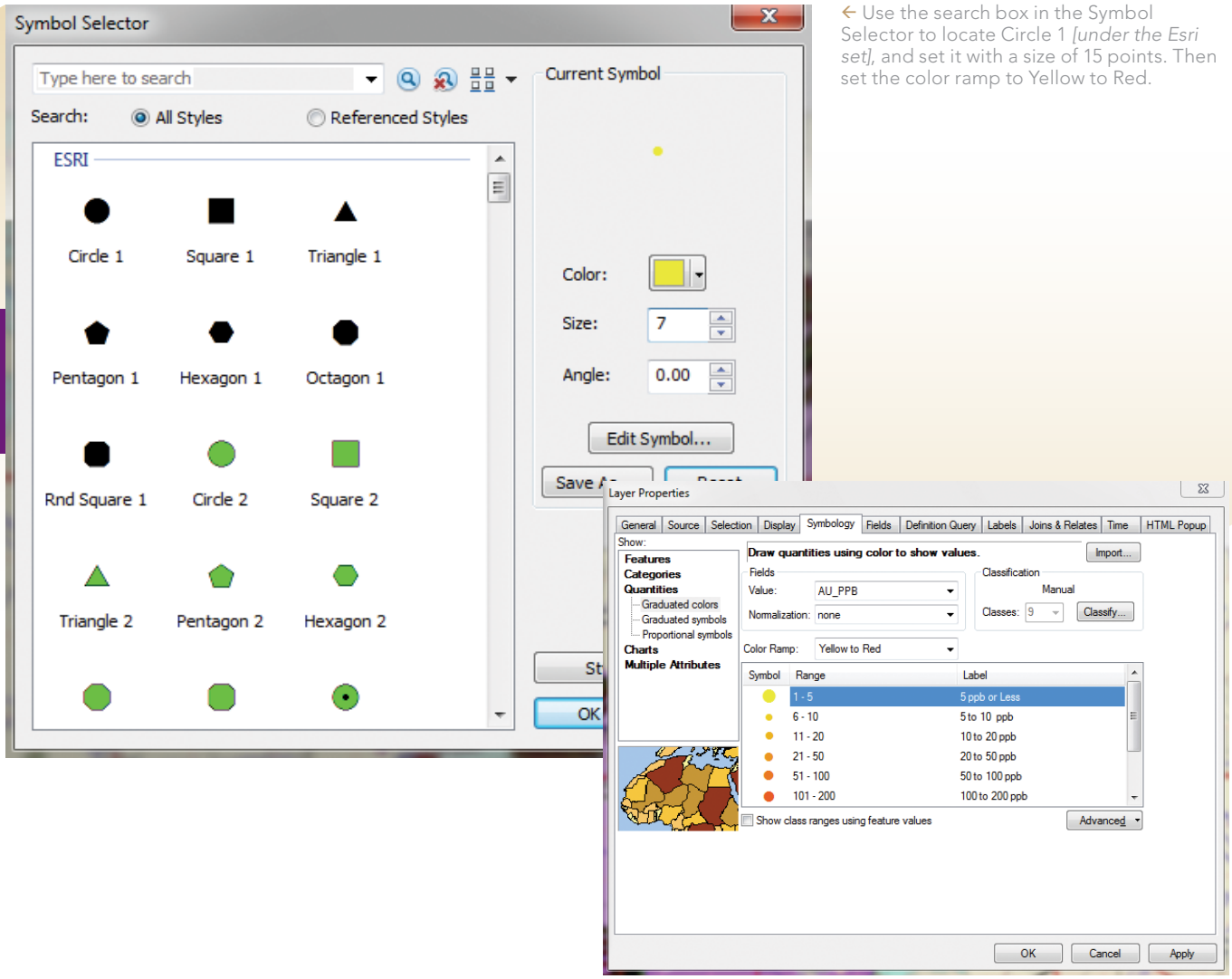
↑ In the graph, the y-axis represents the logarithmic plot of Au data, compared to a linear plot along the x-axis. There are many low values and just a few extremely high values.

Loading, Replicating, and Grouping Soil Geochemistry Points

1. Click the Add Data button, and navigate to and open \Battle_Mountain07\GDBFiles\Geochemistry.gdb. In the Catalog window, verify that Geochemistry.gdb is now set as the Home geodatabase.
2. Highlight Soil_Points and click Add. Once Soil_Points loads, open its attribute table and inspect the fields for all five elements. Close the attribute table.
3. Now, create five copies of Soil_Points—one for each element. In the TOC, right-click Soil_Points and select Copy. Select Layer name, right-click, and choose Paste Layer(s). Repeat Paste Layer(s), creating three more copies of the Soil_Points layer, making a total of five copies of Soil_Points in the TOC.
4. Select all five layers, right-click, and select Group. Rename the new group Soil Geochemistry Group.
5. In the group Soil Geochemistry Group, rename each layer to represent individual elements, beginning with Au ppb. Don't forget to include the units in the name. Name the rest of the layers Ag ppm, As ppm, Sb ppm, and Hg ppb. Save the project.
6. Open the attribute table for Au ppb and right-click each element in the table and choose Statistics to display a histogram of the values. Compare the statistics for each element to the values in Table 2. The numbers should match exactly.
7. Right-click the header for each element in the table and choose Properties. Notice that units and data types are different. Au, As, Sb, and Hg are all long integer data types. Ag is a double precision type. Au and Hg are measured in ppb, while Au, As, and Sb are measured in ppm.

Creating a Legend for Gold

1. In the TOC, select Au ppb, right-click, and open Properties. Choose the Symbology tab and specify a Quantities > Graduated colors legend. Under Fields, set Value to AU_PPB. Under Classification, change the number of classes to 9. Change the display of the color ramp from graphic to text by right-clicking the Color Ramp and unchecking Graphic View.
2. Click the Classify button, and in the Classification window, under Break



← Use the search box in the Symbol Selector to locate Circle 1 *[under the Esri set]*, and set it with a size of 15 points. Then set the color ramp to Yellow to Red.

Values, change the first value to 5. Replace the rest of the existing break values with 10, 20, 50, 100, 200, 500, and 1000. (Hint: After typing each value, use the down arrow to move to the next line. If you mistype a value, you can update it manually or start over.)

3. Replace the final value with 99999 to include all Au values. The maximum Au value for this dataset is 43,574. By specifying 99999 as an upper limit, this legend may be applied to other datasets with Au values between 0 and 99,999 ppb.
4. To view the new logarithmic intervals, draw a small box with your mouse along the Classification's y-axis, beginning just below 1 and extend slightly to the right. Watch as the graph redraws.
5. Continue your selection until you bracket values between 0 and 500. Observe that intervals (bins) increase exponentially in size as you move to the right.
6. Inspect the histogram in the background to see how many records might be in each bin. Zoom in further, if you wish. Click OK to close the Classification window.
7. On the Symbology tab, change the labels for the classification to friendlier ones that include the units (e.g., for the range 6–10, change the label to 5 to 10 ppb). For Au, As, Sb, and Hg, which are integer values, you can include actual values (6 to 10) or data ranges (5 to 10, with 5 not included in the range). For Ag, a double precision field, you must use data ranges. Label the final classification value More than 1,000 ppb.
8. Click OK and inspect the legend. Save the project.

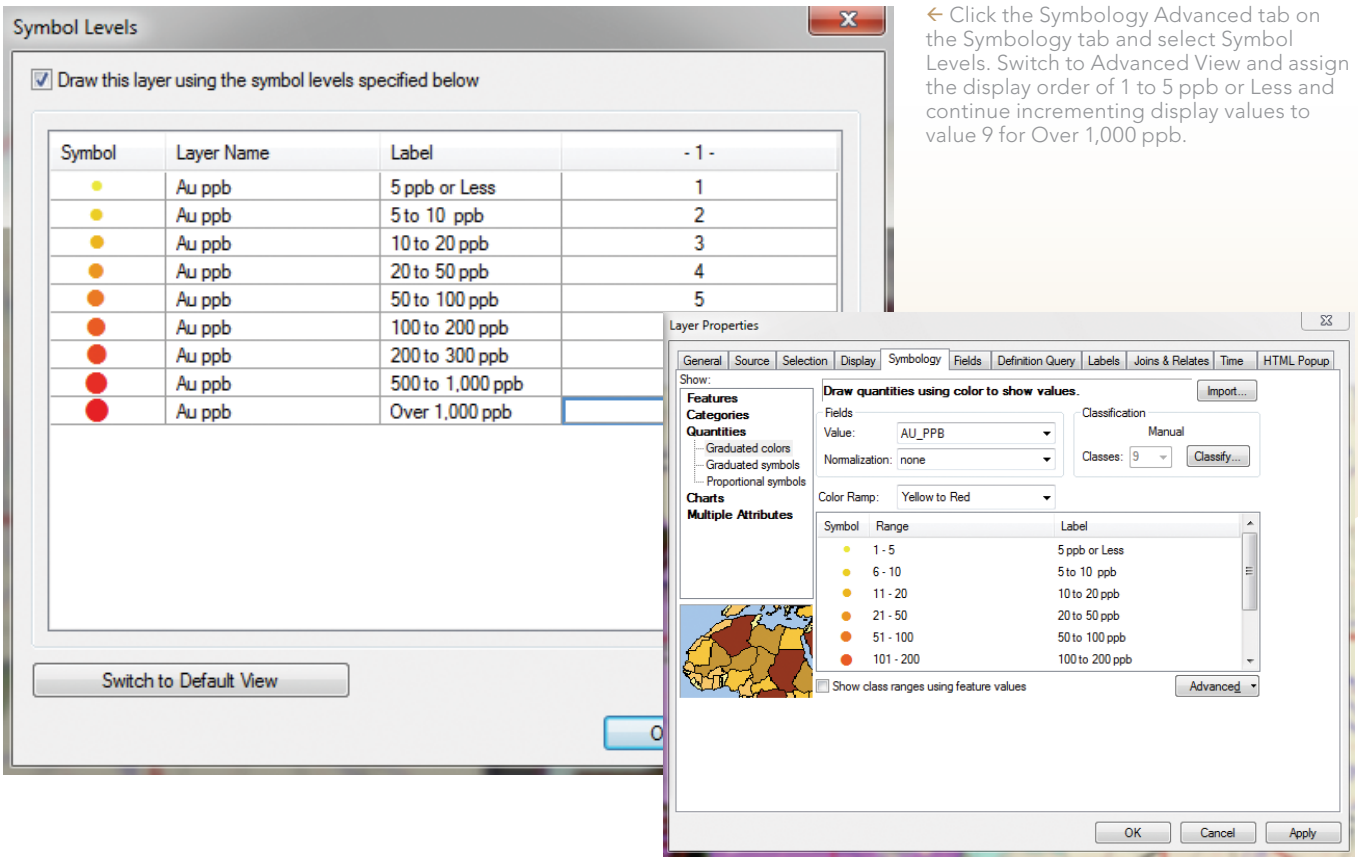
Inspecting Data in a Scatterplot Graph

Let's use a scatterplot graph to quickly view the Au data in these new classifications or bins.

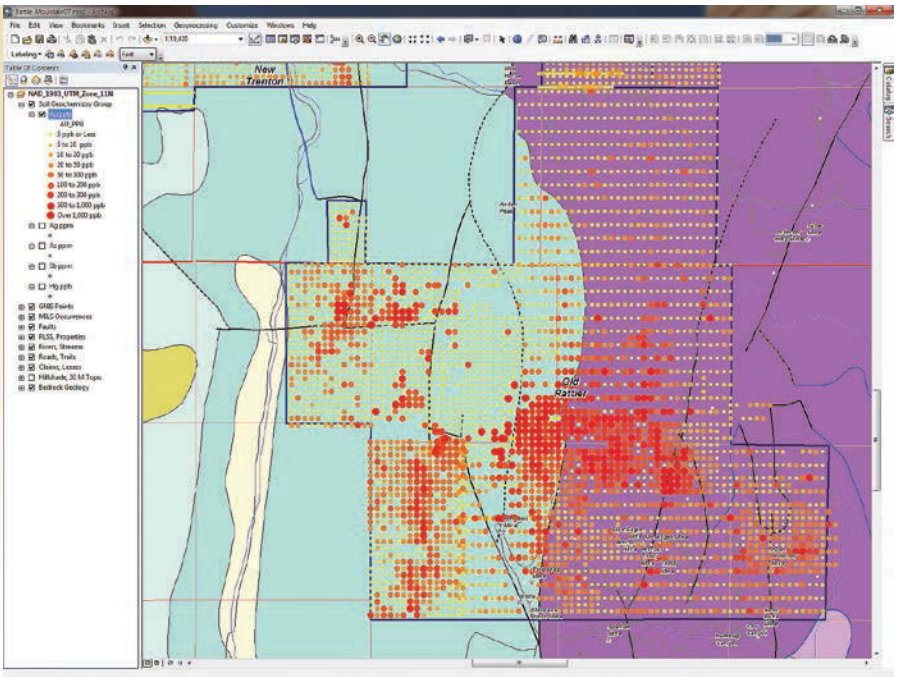
1. In the ArcMap standard menu, select View > Graphs > Create Graphs.
2. In the first Create Graphs Wizard pane, set Graph type to Scatter Plot. For the Y field, select AU_PPB from the drop-down. For the X field (optional), also select AU_PPB. The interim results are displayed. Leave other fields unchanged. Click Next.
3. In the Axis Properties box, check Logarithmic to reset the y-axis. Inspect and confirm your logarithmic distribution. Notice the nine spectral color intervals, from red to violet.
4. In the graph, the y-axis represents the logarithmic plot of Au data, compared to a linear plot along the x-axis.

Low	High	AU_PPB	AG_PPM	AS_PPM	SB_PPM	HG_PPB
0.0	0.1	8,703	12,310	7,668	12,670	6,285
0.1	0.2					
0.2	0.5					
0.5	1.0					
1.0	2.0		2,866			
2.0	5.0		2,573			
5.0	10.0	3,208	1,553		3,936	
10.0	20.0	3,613	453		2,024	1,497
20.0	50.0	2,697	193	8,053	825	3,943
50.0	100.0	928	95	2,528	268	4,027
100.0	200.0	452	31	1,021	188	1,708
200.0	500.0	287	22	490	149	1,137
500.0	1,000.0	110		171	24	397
1,000.0	2,000.0	98		133	12	1,007
2,000.0	5,000.0			26		95
5,000.0	10,000.0			6		
10,000.0	20,000.0					
20,000.0	50,000.0					
50,000.0	100,000.0					
Total Samples		20,096	20,096	20,096	20,096	20,096
Legend Intervals		9	9	9	9	9

↑ Table 4



← Click the Symbology Advanced tab on the Symbology tab and select Symbol Levels. Switch to Advanced View and assign the display order of 1 to 5 ppb or Less and continue incrementing display values to value 9 for Over 1,000 ppb.



↑ Zoom to Bookmark Old Rattler 1:25,000, inspect the map, and save it.

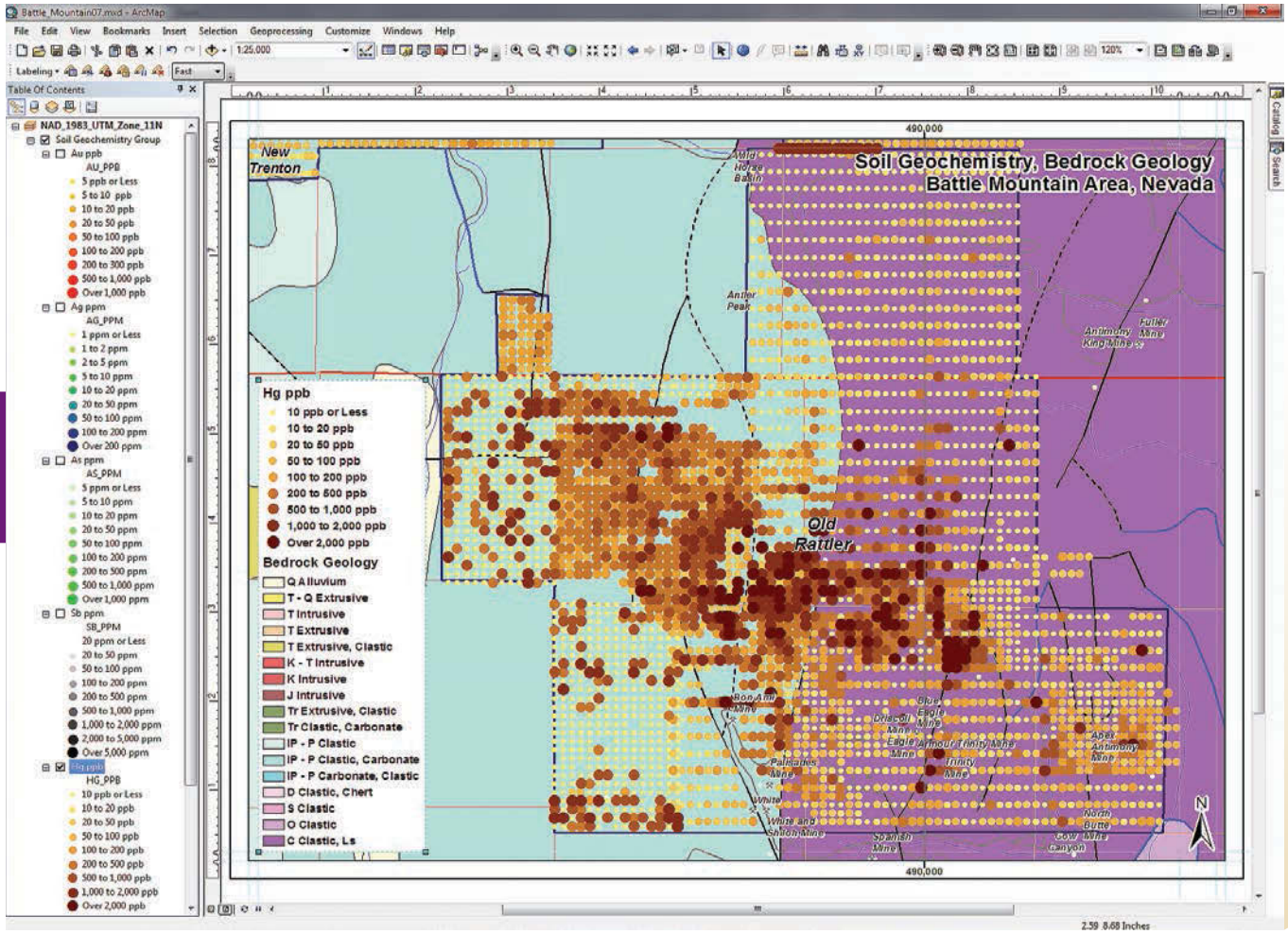
There are many low values and just a few extremely high values.

5. Click Finish to complete the graph.
6. You can close this graph and revisit or modify it later using View > Graphs > Graph Manager. By the way, 43,574 ppb represents 1.400 troy ounces of gold per short ton of material. This is quite high for a soil sample. Perhaps a small particle of gold in a stream was collected. We should revisit this point! In any case, save your project. Later you can create similar graphs for Au, As, Sb, and Hg.

Including Creating a Combined Color and Size Point Scheme

1. Double-click Au ppb to reopen the symbology. In the grid under the Color Ramp section, left-click the header labeled Symbol and choose Properties for All Symbols.
2. The Symbol Selector will open. Use the search box to set all symbology to Circle 1 [under the Esri set], with a size

↓ After repeating the procedure used for Au for the rest of the elements, add all five layers to the map legend.



of 15 points and accept the default color.
3. Set the color ramp to Yellow to Red.
4. Manually set the symbol size. Begin by double-clicking the symbol for 5 ppb or less and setting the size to 7 points. Go through and change the symbol size for all symbols using a 1 point increment (i.e., 5 to 10 ppb is 8 points, 10 to 20 ppb is 9 points, and so on.)
5. Click the Symbology Advanded tab and select Symbol Levels. Check the Draw this layer... box and Switch to Advanced View.
6. Assign a display order of 1 to 5 ppb or Less and continue down to value 9 for Over 1,000 ppb. Click OK twice to apply these updates.
7. Zoom to Bookmark Old Rattler 1:25,000, inspect your work, and then save the project.
8. High gold values plot as large red circles on top of lower values. Now, we can visualize and locate that nugget, which appears to be about 100 meters east of a mapped stream.

Symbolizing Other Elements

Continue creating logarithmic legends for Ag, As, Sb, and Hg. Use the same workflow that you used for Au and apply the intervals and color ramps listed in Table 3 on page 49. All legends will include 9 internals, but the beginning and ending values will vary. Proceed carefully and save your work often. If you are especially curious (and to validate your legends), see if you can match the sample count in each elements bin to the values in Table 4 on page 49.

Saving Logarithmic Legends as Layer Files

Because all layers for these elements have been added to a group layer and are a single TOC object, they can be saved together as a Layer file for the entire group. The symbology for each element can also be saved as an individual Layer file. Be sure to store each Layer file inside the \Battle_Mountain07\GDBFiles folder, using relative paths. Although only Au ppb is visible, the other elements are available and can be individually displayed.

Adding Soil Geochemistry Layers to the Legend

The next step is to add all five layers to the map legend.

1. Switch to layout view, right-click on the legend, and select Properties.
2. On the General tab, select all five elements in Map layers and copy them into Legend Items.
3. Switch to the Items tab and use the General tab to set fonts for all layers. Set each item's Layer Name Symbol to Arial 11 points black and the Layer Symbol to Arial 11 points black. Be sure to set them all!
4. Close Legend Properties, turn on each layer individually, and inspect your work. If satisfied, save your map once more, and you are finished.

Summary

This tutorial presents many tools, shortcuts, and tricks that I have developed over many years, going way back to the days when I used log graph paper. I use this symbology workflow almost daily, and it has stood the test of time. Try these tricks out on your own data.

Acknowledgments

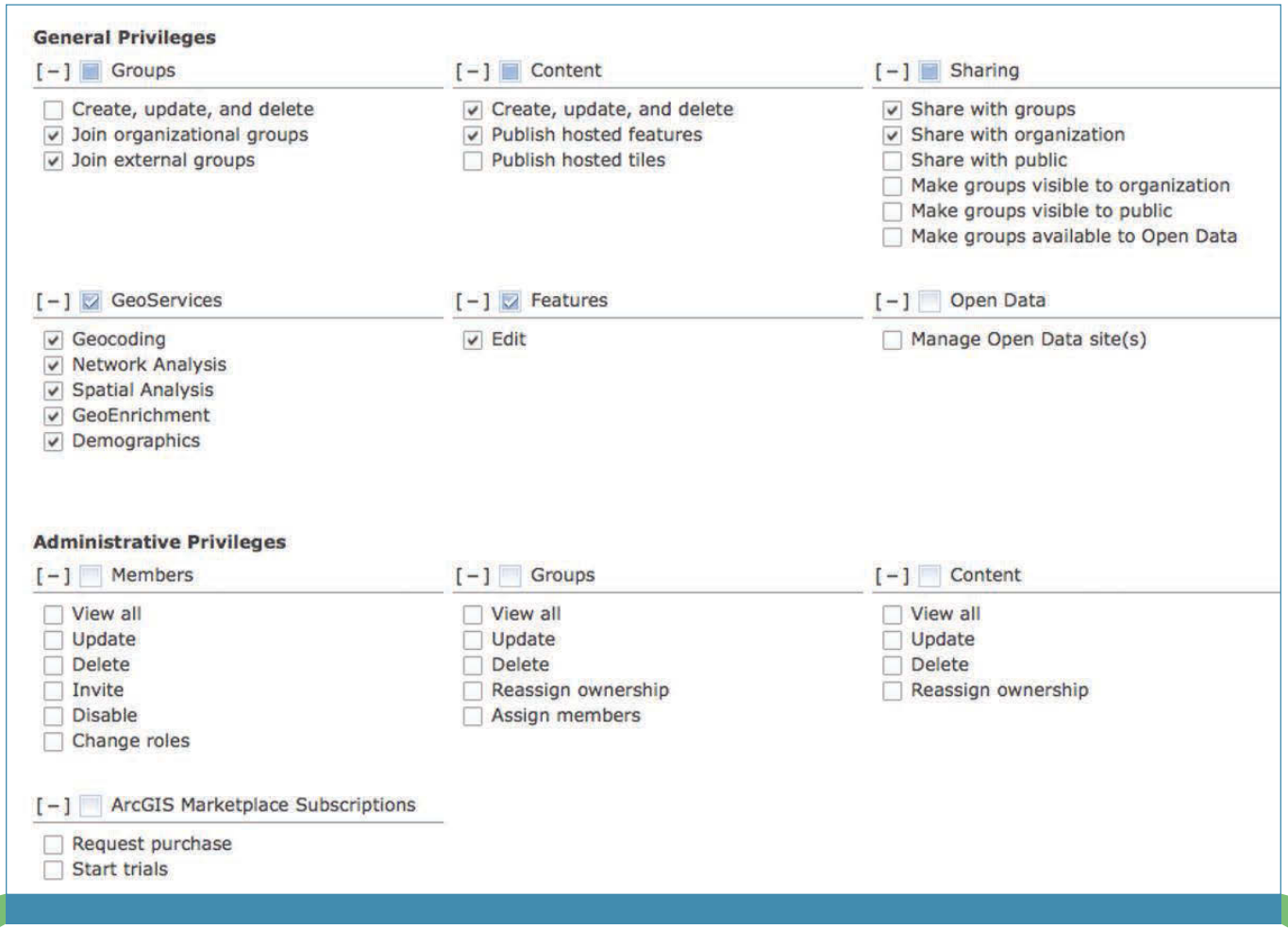
Thanks again to my Battle Mountain data providers and my peers in earth sciences and public safety for their invaluable contributions.

Designing Custom Roles for Your Organization

By Owen Evans, Esri National Government Sales Team

This article describes how administrators can implement custom roles and presents an example showing how roles were implemented in a real ArcGIS Online organization.

↓ The privileges assigned to the Analyst role template



Role	Job Title/Description	Privileges
Sales Team Viewer	Newer account managers who create maps with existing layers and/or small file data sources and mostly rely on solution engineers for other needs	General: No publishing or open data; only network and demographics geoservices Admin: None
Sales Team Publisher	Account managers who are comfortable working with and publishing their customers' data and designing maps and apps	General: All except open data, GeoEnrichment Services, and spatial analysis Admin: Activity Dashboard, ArcGIS Marketplace (trials only)
Sales Team Power User	The most technically savvy account managers who want access to all mapping features	General: All Admin: Activity Dashboard, assign members to groups, ArcGIS Marketplace (trials only)
Solution Engineers	Technical experts who support account managers with demonstrations and frequently build layers, maps, and apps using a variety of data sources and analysis techniques	General: All Admin: Activity Dashboard, assign members to groups, ArcGIS Marketplace
Administrator	Solution engineer team leads who are responsible for the management and administration of the organization	General: All Admin: All, include reserved privileges

↑ Table 1: New custom roles created for the National Government Sales team

Core Roles and Custom Roles

A role is simply a collection of privileges that can be assigned to a group. It controls what actions members of that group can perform and what services they can use. There are three core roles that are preconfigured for all organizations: User, Publisher, and Administrator. These core roles are a good start for providing members with what they need to use the various features and services ArcGIS Online offers.

The downside of sticking with just the core roles is that administrators must place each member into one of these three preconfigured buckets. These buckets may not fit your requirements from a management or security perspective. For example, you might want all members to participate in open data activities (not just Administrators). You might need to limit the use of GeoEnrichment Services to just a few people (not all Publishers). Designing and configuring your own custom roles will help you impose or relax permissions as required to fit the needs of your organization.

Privileges

There are two main categories of privileges, General and Administrative, that can be assigned to each custom role. General privileges relate to members creating, using, and sharing their own items and groups. Administrative privileges enable members to view and manage all users' groups and items.

There is also a set of reserved privileges. Reserved privileges are only available to members in the core Administrator role and cannot be assigned to any custom roles. Examples of reserved privileges include configuring custom roles, removing other administrator accounts, and viewing and editing the organization's configuration settings.

In creating a custom role, you simply review the list of general and administrative privileges and enable the ones required by a collection of members. To get started, you can use one of the available custom role templates, such as Analyst, Author, or Student.

Benefits of Using Custom Roles

ArcGIS Online provides incredible value for its cost, and most organizations include sufficient credits to cover anticipated annual usage. But as an administrator, it's your job to

manage your organization, so you'll want to implement sensible policies and controls that minimize wasteful or mistaken usage of ArcGIS Online credits and also provide security.

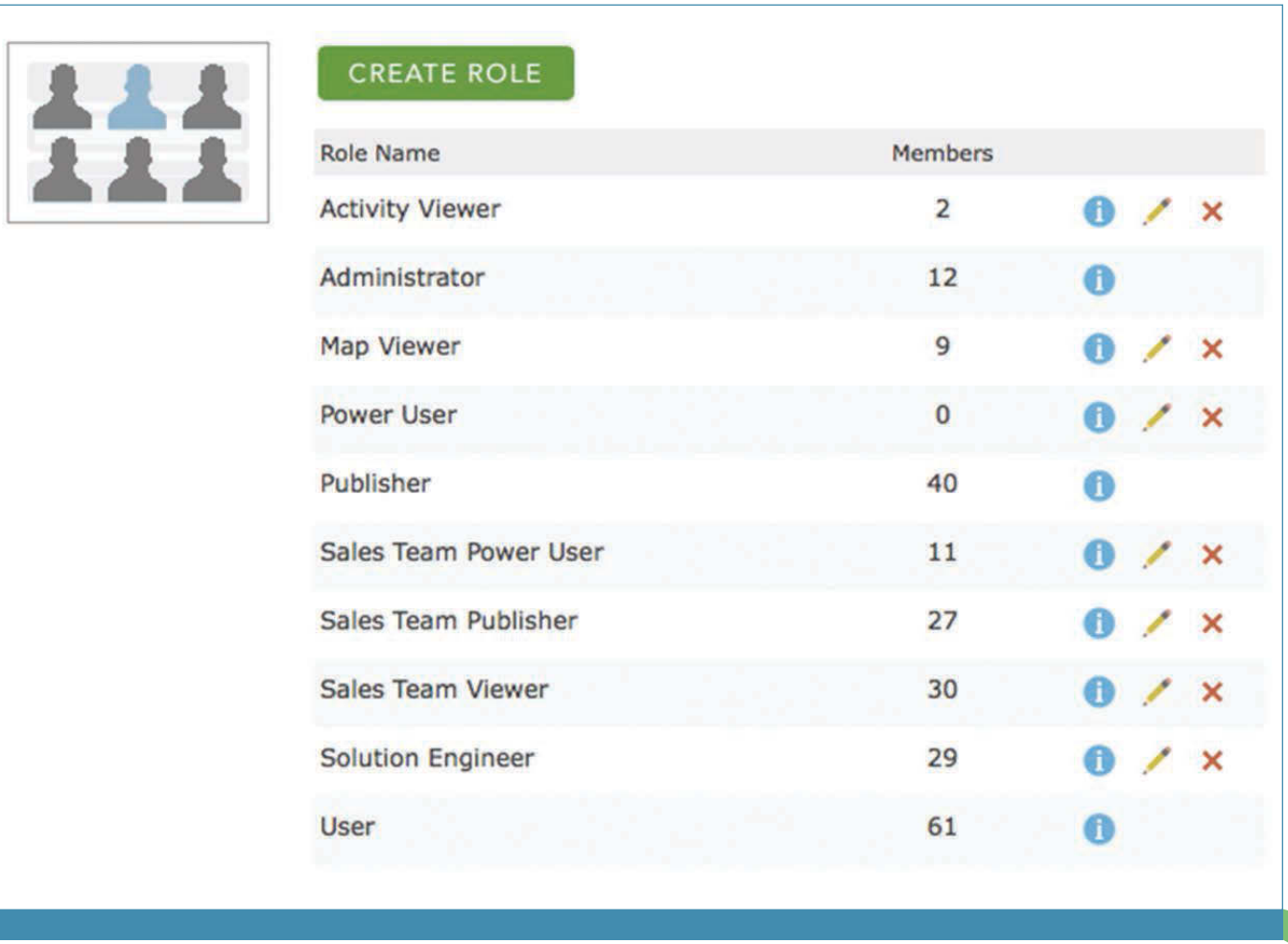
As you manage your organization, it is likely that you will outgrow the core roles. You'll notice yourself being conflicted about which role to place a new member in. When this occurs, you should configure custom roles so you can assign members only the privileges they need to perform their job function.

There are several areas where administrators will see benefits from using custom roles. Improve security in your organization by allowing actions based on role (i.e., job function). For example, only authorized members should be able to share maps with the public. Reduce unwanted/mistaken credit usage by limiting access to credit-using functionality such as GeoEnrichment and geocoding. Simplify management by changing many members' privileges with a single action.

Strategy for Implementation

The recommended way to implement custom roles is to start by considering the creation of a role for each job title in your agency, department, or company. You will mimic your organizational structure inside ArcGIS Online. From there, you can look for opportunities to consolidate or break out roles as needed, based on how people in different job functions use ArcGIS Online.

↓ Custom roles for the National Government Sales team



Activity Viewer	Senior management staff and others who only require visibility into the usage of our organization via Activity Dashboard
Map Viewer	Esri employees outside our sales team who need to view maps shared with our organization
Power User	Esri employees outside our sales team who need "power user" level privileges
Publisher (core)	Esri employees outside the National Government Sales team who need Publisher level privileges
User (core)	This role will be phased out over time, as all members will be transitioned to other roles

↑ Table 2: Roles for overview and external collaborators

The creation of custom roles for Esri's National Government Sales team provides an example. After the custom roles feature was enhanced with additional privileges in July, I took a look at our National Government Sales team and thought about how custom roles would look for my organization of 220 members. Job titles on our sales team include a director, sales industry managers, sales team leads, account executives, and account managers. In technical positions, we have solution engineers and solution architects.

We also work with geospatial analysts and project managers in Esri's Professional Services division, training specialists in the Education Services division, and product engineers and developers from the core software development team.

One possible solution would have been to create a role for every type of job title. However, this typically would be an overly complex solution that would have created additional administrative overhead.

Instead, I decided to consolidate and expand roles beyond just job titles. Here's how I did it. I combined solution engineers and architects into a single role. These technical staff utilize ArcGIS Online in a similar way and can share the same set of privileges. I then created three roles—Sales Team Viewer, Sales Team Publisher, and Sales Team Power User—with gradually expanding permissions.

Job responsibilities and experience with ArcGIS Online varies greatly among members of our team. Some are very comfortable publishing services and running analysis tools, while others mostly create maps using existing layers and rely on solution engineers to help with more advanced tasks. All roles can create, manage, join, and share items and groups. Table 1 summarizes the roles, job function, and privileges for each custom role on the sales team.

Earlier, I mentioned that the National Government Sales team also works with other teams within Esri. For these external collaborators, I created several additional roles that have similar privileges to their sales team counterparts. Having these roles helps administrators keep track of how many external collaborators have been invited into our organization and also enables us to change privileges for sales team and external staff independently, if needed.

Finally, I created an Activity Viewer role to provide access to Activity Dashboard for our sales director and other staff who required visibility into how we use our ArcGIS Online organization.

About the Author

Owen Evans is a solution engineer with Esri's National Government Sales team, located just outside Washington, DC. He has been with Esri since 2004. His main areas of interest are server, cloud, and online GIS. He periodically contributes to ArcGIS Online and ArcGIS for Server blogs and also collaborates with the Esri Story Map team on projects and best practices documents.

Three Tips for GIS Content Sharing

By Suzanne Boden, Esri Training Services

More organizational leaders have grasped the business value of getting geospatial content out of department silos and into the hands of knowledge workers using ArcGIS Online and a variety of enterprise applications.

As a result, many GIS professionals are being asked to share. GIS professionals have always been a generous lot, so sharing is nothing new. What's new is the ease with which things can be shared.

ArcGIS Online has become an integrated content platform that supports enterprise GIS workflows and the information needs of both GIS and non-GIS professionals, collaborative working groups, and the public.

With many potential content consumers, the question of what to share should be carefully considered. If you're in the process of crafting a sharing strategy for your ArcGIS Online organization (or on-premises portal), here are three tips to help the process along.

1 Prioritize Consumer Relevance

Although you could share all types of geospatial content, that might not be feasible or desirable. When faced with an overwhelming number of choices, site users may opt out. Feature the content that your organization's users are most likely to be interested in.

Site users will be most interested in content that helps them do their work faster, easier, and better. Think about your organization's structure (or its constituents) and imagine you're a content consumer. Why have you come to this site? What are you hoping to do with the content you find?

For example, an analyst with a market research group might want maps showing customer and physical business locations, demographic data, and drive times. Templates for branded web apps could also be useful.

Make a list of frequently requested items. How many times does your team create the same or very similar information products for different groups? Share that content.

Have you ever thought to yourself if only the folks in other departments knew how our data could help them? Well, now's your chance to showcase your data to school the non-GIS teams on the value that geographic insight brings to their projects.

Once you've settled on what to share, decide how to share it. It may make sense to create hosted feature layers for data that will be especially popular.

2 Provide Guideposts

Never underestimate the power of clear directions. Think about your favorite e-commerce sites. How do they direct you to products? Their home pages likely have prominent links to

- The latest products.
- The five or ten most popular products.
- Recommended items for specific use cases ("Dorm essentials for your new college student!").

Adopt these familiar techniques for enhancing your organization's ArcGIS Online home page. It is the "front door" of your site. A front door should be welcoming but quickly passed through. You want visitors to get inside and join the party.

The home page description section is a great and prominent place to add links that will guide users to the relevant content you've shared.

3 Teach Them to Fish

Who better to help the masses create accurate, impactful maps and apps than a GIS professional? Your ArcGIS Online organization is a rich source of authoritative content. However, a lot of people may not know exactly how to use it at first.

You can help content consumers get up to speed by adding frequently asked questions and tips from the GIS team on your organizational site. Of course, you should always document essential information in item properties, including

- Who created the data and when
- The accuracy of the data
- An explanation of numeric attributes shown in a map legend or table (unless the data is clearly unambiguous).
- Access and use constraints.

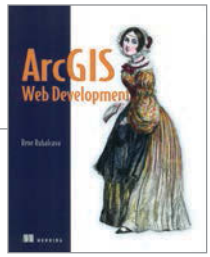
To make sure consumers see this information, you can get creative. As you're documenting your content, support searching. That is how people find things these days. Create a set of standard tags—both geographical and topical—and consistently apply them.

By sharing relevant content and helping consumers understand how the content can be used to shed new light on their work, you extend the benefits of GIS well beyond its current boundaries.

About the Author

Suzanne Boden works with Esri Training Services in Redlands, California, and enjoys writing about Esri technology and other topics.

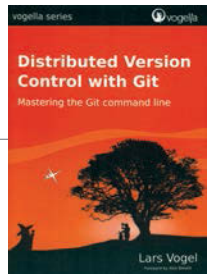
GIS Bookshelf



ArcGIS Web Development

By Rene Rubalcava

This trim tutorial book teaches the reader how to build custom GIS web applications using the ArcGIS API for JavaScript. Its straightforward, structured approach can benefit GIS professionals who want to expand their skill set, developers new to GIS, or students who want to get an edge in the job market. *ArcGIS Web Development* is divided into two parts. The first section introduces the reader to the basics of the ArcGIS API for JavaScript and shows how to use it to incorporate various ArcGIS services into responsive web apps. Interacting with ArcGIS for Server for information that isn't easily accessed using the API and extending the API by building tools that meet specific needs are also covered. The second section delves into the challenges of mobile application development by walking the reader through the creation of a sample field collection app. The appendixes cover development environment options, the basics of the Dojo toolkit, and how to use the proxy files provided by Esri. Author Rene Rubalcava, GISP, who is the cofounder of SmartGeoTech, Inc, a GIS development company specializing in Esri technologies, is also a GIS analyst and developer/environmental planner for the Sanitation Districts of Los Angeles County. Manning Publications, 2014, 248 pp., ISBN: 978-1617291616

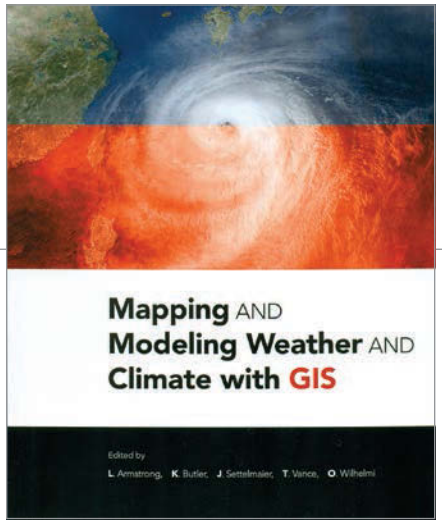


Distributed Version Control with Git: Mastering the Git command line

By Lars Vogel

A slender, no-frills book, *Distributed Version Control with Git: Mastering the Git command line* provides a practical introducation to the Git version control system. Beginning with an overview of Git installation and setup, it teaches best practices for adding and committing changes using a local Git workflow as well as merging and rebasing changes, and using online Git hosting platforms such as GitHub or Bitbucket. It also includes a chapter on typical Git workflows. Lars Vogel, 2013, 240 pp., ISBN-13: 978-3943747065

Mapping and Modeling Weather and Climate with GIS



Edited by Lori Armstrong, Kevin Butler, John Settelmaier, Tiffany Vance, and Olga Wilhelmi

Weather mapping goes beyond what is broadcast on the evening news. *Mapping and Modeling Weather and Climate with GIS* describes how GIS technology can be coupled with atmospheric and climate sciences data to do research.

"Weather and climate information is innately geospatial," May Yuan, Ashbel Smith professor of geospatial information sciences at the University of Texas, Dallas, wrote in the book's foreword. "*Mapping and Modeling Weather and Climate with GIS* offers both concepts and *[best]* practices of mapping and modeling weather and climate with GIS."

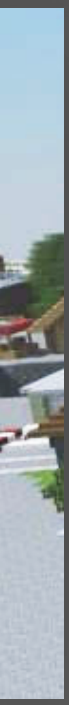
The book is aimed at meteorologists, climatologists, and GIS practitioners interested in integrating weather and climate data into their GIS workflows. For example, early chapters cover how modeled atmospheric data and weather radar can be used in ArcGIS. There's also a chapter on how weather- or climate-related social media feeds and posts—such as reports of debris from a tsunami—can be integrated into a GIS and used in research.

A later chapter focuses on a GIS-based analysis of the tornado in Joplin, Missouri, in 2011. That chapter shows how combining weather, demographic, and weather-based web map services data helps answer such practical questions as How many miles of roadways were in the tornado path? and Which roads likely need to have signs replaced or debris cleared?, or Which lights will need to be repaired? There is also a five-chapter section on tools and resources such as Python scripts and the Weather and Climate Toolkit, which is free software from the National Oceanic and Atmospheric Administration (NOAA)'s National Climatic Data Center.

Lori Armstrong, Esri global atmospheric, climate, and weather industry manager, is the book's lead editor. Other editors are Kevin Butler, a product engineer with Esri; John (Jack) Settelmaier, a digital techniques meteorologist at the National Weather Service; Tiffany Vance, geographer with NOAA's Alaska Fisheries Science Center; and Olga Wilhelmi, a geographer with the National Center for Atmospheric Research. Esri Press, 2015, 370 pp., ISBN: 9781589483767

Creating a Smarter Future

By Carla Wheeler, Esri Writer



"Geodesign is both an ancient idea and a new idea supported by new and advancing technology," said Esri president Jack Dangermond as he welcomed more than 300 people from around the world to the 2015 Geodesign Summit in Redlands, California. "I see GIS integrating into almost anything we do."

Geodesign combines the art of design with the science of geospatial technologies—such as GIS—to find smart and sustainable design solutions. Most often these solutions have focused on landscape architecture, urban planning, and environmental conservation, but the geodesign tent is getting bigger. Geodesign is also being increasingly embraced, albeit on a smaller scale, as an approach to economic development, urban transportation, and even gaming. And geodesign is increasingly being done in 3D.

The summit, which was held January 22–23, is in its sixth year. It was obvious from the breadth of topics covered in the presentations and Lightning Talks that modern geodesign concepts, practices, technologies, and education are maturing quickly. Geodesign in 3D also had a big wow factor.

Keynote speaker Noel Cressie, distinguished professor at the University of Wollongong in Australia, also added spatiotemporal statistics and the importance of conditional probabilities to the geodesign equation.

Game for Geodesign?

Gamers (and the parents of gamers) in the audience were intrigued by Ulf Månsson's presentation that showed how geodesign was integrated into the popular video game Minecraft.

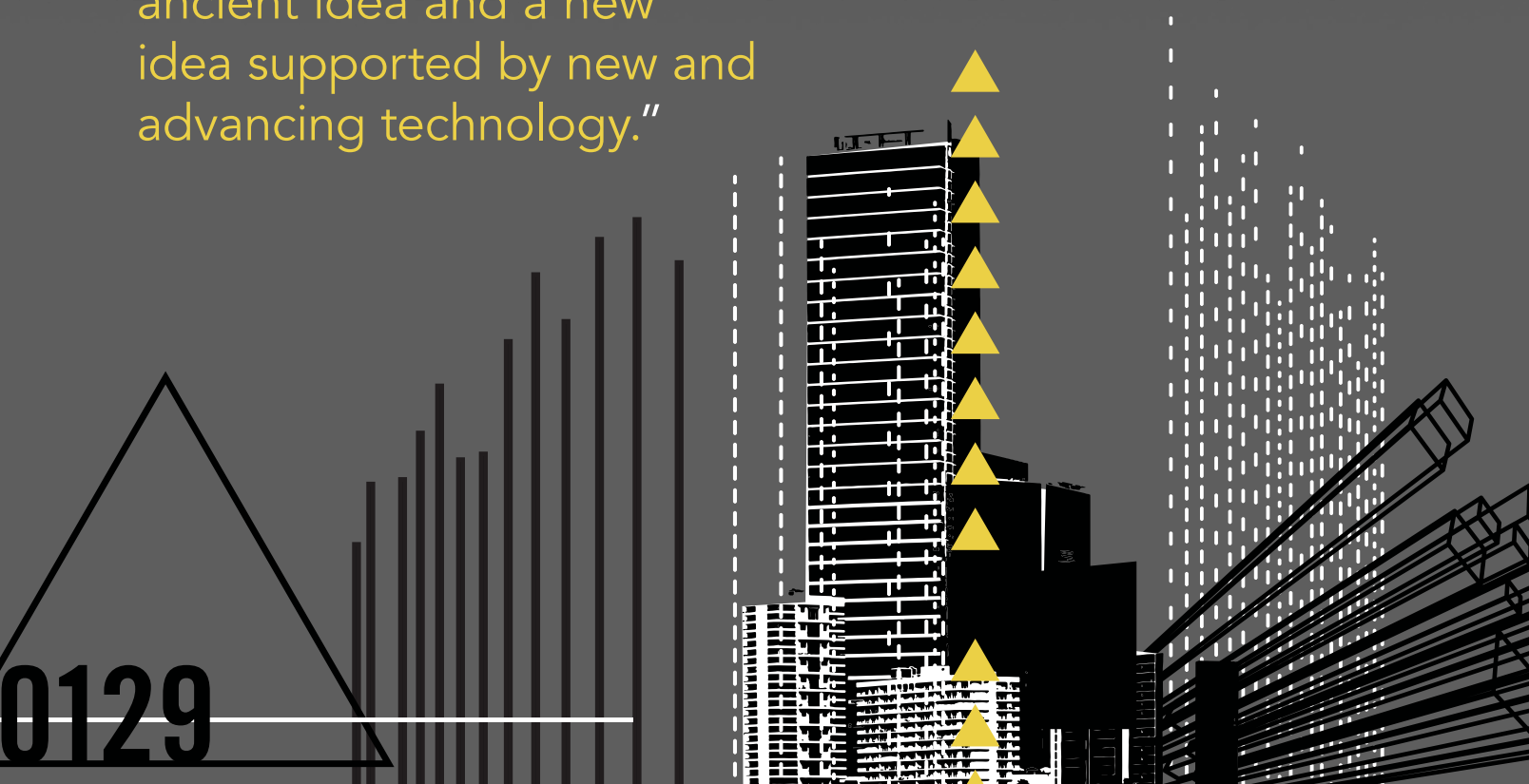
Månsson, a senior project manager for the Swedish sustainable engineering and design firm Sweco, was a gamer as a youth. His son and his friends now build things together in Minecraft. They create 3D virtual worlds. Inspired by seeing his son doing what was essentially the same design work he does at the office, Månsson created a method to stream geospatial data into the Minecraft server.

Assisted by his Sweco colleagues, Månsson used GIS tools to build the land data that would form part of the foundation for Blockholm, a replica of Stockholm, Sweden, that would be added to Minecraft. They used Esri's ArcGIS Data Interoperability, an extension for ArcGIS for Desktop, to process real spatial data, such as topography, waterways, roads, and property information, and generate it in 3D.

Blockholm, a project conceived by the Swedish Centre for Architecture and Design, essentially married geo and design in a virtual world. More than 10,000 Minecraft players later used its roadways, water features, and property information as a foundation to rebuild Stockholm as they envisioned it.

↓ Ulf Månsson, a senior project manager for Sweco, created a method for incorporating geospatial data into the Minecraft game.

"Geodesign is both an ancient idea and a new idea supported by new and advancing technology."



Because the ArcGIS Data Interoperability extension now natively supports Minecraft formats, the data can also be read back. "So if you set up a project like this where you invite players to rebuild a world, you can compare (worlds) before and after and just take out the pieces that have changed and bring them back to a GIS system such as *[Esri]* CityEngine," Månsson said. "You could go from a CityEngine model to Minecraft, have it edited there, and then bring those edits back to CityEngine."

Geodesign of Land-Use Patterns

Joseph Minicozzi, architect, urban designer, and principal of the econometric consulting firm Urban3 in Ashville, North Carolina, gave a featured presentation. He uses geodesign to show officials and citizens how downtown areas in cities can be economically vital and viable as compared to strip malls.

"What is a city? For me, a city is a finite boundary of land that has to be managed," said Minicozzi. "It is essentially a farm that grows a crop of buildings. There is a cash flow behind all of that. My task here is to explain that cash flow."

In ArcScene, an application that is part of the ArcGIS 3D Analyst extension, Minicozzi's maps showed the taxable value per acre of land as elevations. He showed a map of Travis County, Texas. The highest extrusion was located in downtown Austin, the county seat. Another map showed a high spike for alcohol sales in downtown versus the mall areas in the suburbs.

He mapped other tax data for Travis County, including mixed beverage and food sales per acre. "You see downtown popping off the map," Minicozzi said. The maps starkly illustrate how buildings downtown can often generate much more property tax and city retail tax revenue than suburban strip malls.

Minicozzi recalled hearing Dangermond once say, "If you put it on a map, people get it quickly." That made an impression. "We've seen this time and time again; when we make these three-dimensional models of the taxes, people get it," said Minicozzi.

Geodesign Technologies Demonstrated

Esri has worked hard to develop new and nimble geodesign tools including GeoPlanner for ArcGIS, the ArcGIS Pro application in ArcGIS for Desktop, and Esri CityEngine. Esri's Rob Matthews used the tools in GeoPlanner for ArcGIS to create a hypothetical Bus Rapid Transit (BRT) route through downtown San Diego, California, leveraging a geodesign approach. He used the app's tools to study planning issues at multiple scales, from a city-wide BRT routing to the fine-grained placement of stations and the

↑ Joseph Minicozzi, architect, urban designer, and principal of the econometric consulting firm Urban3, gave a featured presentation, maps tax revenue in 3D.

evaluation of land-use regulations to support Transit Oriented Development (TOD) at the site scale.

He also demonstrated the app's capability to do live analysis in the cloud, such as walk times from proposed BRT stations, design schemes with enriched curated demographic data, and suitability for BRT station placement using a weighted raster overlay service. He demonstrated how the app can be used to compare project alternatives using a dashboard for key performance indicators. Finally, he prepared a higher density development option to export to ArcGIS Pro for further refinement in 3D.

Esri's Nathan Shephard used ArcGIS Pro to take this downtown San Diego design to a larger scale. Existing 3D buildings (courtesy of Pictometry) provided context around potential building development sites. A proposed building outline was digitized in 2D using precision editing tools. A synchronized 3D view rendered the simple shape as a constructed 3D building—complete with realistic texturing.

A simple spatial query identified which buildings would impact existing underground water mains. The results of previously run solar and wind analyses revealed areas of the design that would create heat islands. Rather than use ArcGIS Pro interactively to place individual trees to reduce the heat, Shephard said the problem was better attacked parametrically as part of the street design process.

Shephard then turned the demo over to his colleague Brooks Patrick, who demonstrated the 3D capabilities in Esri CityEngine. CityEngine supports rapid design iterations, giving users the tools and rules to create a city, neighborhood, or even a street.

Using data from Shephard's downtown San Diego demonstration, Patrick showed the audience Complete Streets, a procedural street sample that incorporates knowledge and ideas from transportation planning guidelines and standards, to generate a default street, then added 2.5-meter-wide bike lanes with 1.2 meter buffers for each lane and planters, curbs, and trees. Not only can Complete Streets be used to visualize the bike lanes, curbs, and trees in 3D, it can also generate analytical reports on various aspects of the street's geometry that are useful in coming up with rough cost estimates for construction work.

"Planning our environment carefully—leveraging GIS, 3D, and the best possible design practices—will be critical for building a sustainable future," said Esri's Eric Wittner.

Make plans early for the next Geodesign Summit, which will be held January 27–28, 2016. Check in regularly at geodesignsummit.com or contact geodesignsummit@esri.com. And be sure to follow happenings on Twitter at @geodesignsummit.

↑ In one demo of CityEngine, the Complete Streets sample was used to quickly generate visualizations of bike lanes, curbs, and trees in 3D.

Developing Apps and Relationships

By Suzanne Boden, Esri Training Services

The City of Virginia Beach, Virginia, a longtime user of Esri technology, wanted to replace its existing real property information web application with one with enhanced search capabilities and would be accessible from mobile devices. The city used private Esri instructor-led training events to build expertise and teamwork within its organization.

Virginia Beach is home to thriving businesses, major US defense installations, and approximately 440,000 residents. The Virginia Beach Department of Communications and Information Technology (ComIT) houses the Center for Geo-Spatial Information Services (CGIS). CGIS maintains the city's geographic data and creates maps and applications to support city operations. An Esri customer since 1992, Virginia Beach has contributed content to the Esri Community Maps Program and currently has 150 ArcGIS users in more than 20 city departments.

In 2014, CGIS decided to replace an existing web application that provided access to property information from the Real Estate Assessor's Office. The application allowed users to search and view parcel-level property data, including assessment values over time. A mix of ArcIMS and open-source map layers was being used.

ComIT is committed to providing its constituents with simple and open access to city services and information. The objectives for the new self-service property information application were improved search capabilities and mobile accessibility.

"We're moving away from one big, centralized app with hundreds of layers toward smaller, more focused apps," said GIS coordinator Robert Jessen.

CGIS decided to standardize on the ArcGIS platform for new application development. GIS staff would create ArcGIS services for map layers and search functionality, and developers would use ArcGIS application programming interfaces (APIs). A JavaScript and HTML5-based web application and two mobile applications that would run natively on iOS and Android devices were planned.

To prepare their staff to create the new applications, Jessen and systems analyst Sridhar Katragadda arranged for two private Esri instructor-led training events.

Bringing Teams Together

The CGIS staff who were working on the new property information applications are spread over four teams. They include GIS professionals and desktop, web, and mobile application developers. They had different training needs. Most of the developers were not familiar with the city's geospatial datasets or how they could be leveraged in applications. The GIS staff would benefit from learning how to create map services optimized for the new applications.

Three staff members from each team participated in nine days of instructor-led training, which included two days of instructor coaching. Ben Ramseth, Esri instructor and developer technical lead for Esri Training Services, facilitated all training.

Historically, interaction among the four CGIS teams had been limited. Each team had only a cursory understanding of what the other teams worked on. For Jessen and Katragadda, it was important for all 12 staff members to participate in the entire training together, even though all the content did not directly relate to each person's work.

Jessen and Katragadda saw the training as an opportunity for participants to connect personally and professionally and build a foundation for future collaboration. "We wanted to get everyone communicating and on the same page," said Jessen.

A challenge for Ramseth was keeping everyone engaged throughout the nine days. With the variety of technical skill sets and workplace responsibilities in the room, it would have been natural for participants to

> "As a coastal city on the Atlantic Ocean and Chesapeake Bay, Virginia Beach needs to be prepared for the event of a significant hurricane, tropical storm, nor'easter, or ice storm."
>
> City of Virginia Beach Master Technology Plan FY2015–FY2019

tune out portions of the training that didn't apply to their specific role. Fortunately Ramseth and the class members had time to build relationships.

Going to Class and Getting to Work

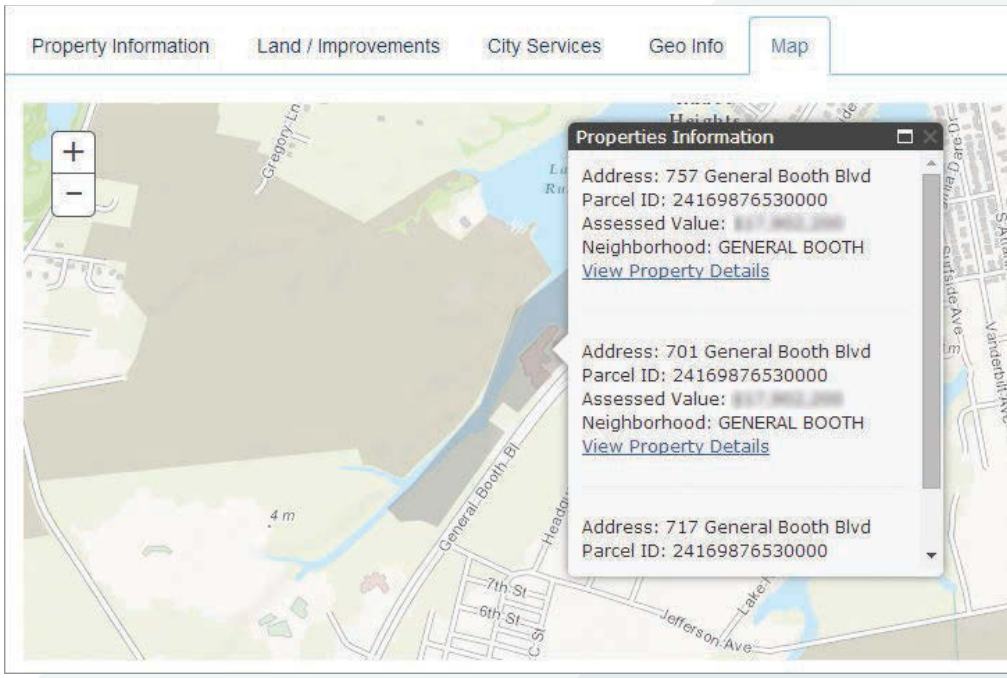
The training was divided into one week of web development and one week of mobile development. Ramseth taught the *Building Web Applications Using ArcGIS API for JavaScript* course for the first two days, then coached the group for the next two days. Coaching focuses on applying course concepts in the context of organizational workflows and data. A five-day abridged version of two ArcGIS Runtime SDK bootcamp courses comprised the second session.

Several weeks elapsed between the two sessions, which turned out to be a key ingredient in the success of this training. During the gap, the web developers worked on their application, honed their new coding skills, and encountered issues they hadn't expected. In the second training session, they brought those issues up. With Ramseth's guidance, the group considered potential causes of these problems and potential solutions. The discussion was relevant to all participants, because all applications feature the same content and capabilities.

Ramseth encountered his own unexpected challenges during the mobile development week. By design, instructor-led bootcamps are flexible and intensely hands-on. Participants are encouraged to direct activities. The Virginia Beach mobile developers worked in project mode during this part of the training. Their goal was to write the actual code for the new applications.

When the iOS developers wanted to use Swift, Apple's new programming language for iOS and OS X, Ramseth was surprised. He hadn't completely familiarized himself with it, but he granted the request. Ramseth and the group dove into the inner workings of Swift syntax and code.

The Android developers requested Android Studio as their integrated development environment (IDE), even though it was still in beta. Ramseth, who had planned to use the Eclipse IDE, once again was flexible and supported the request.



↑ Virginia Beach's new Real Estate Assessment Search app uses ArcGIS Online basemaps and map services published using ArcGIS for Server.

When the teams broke into groups to work on their applications, they ran into an issue relating to rendering map services. Ramseth arranged conference calls with Esri software developers Divesh Goyal and Eric Bader, who answered questions and provided valuable insights into the ArcGIS Runtime SDKs. When it was over, Ramseth called the Virginia Beach training "the most challenging and rewarding thing I've done in a long time."

Moving Forward with Mobile

With the successful completion of the Real Estate Assessment Search application in early 2015, CGIS is now developing a mobile application to support emergency response. Using a smartphone or tablet, city field crews and contractors will be able to provide damage assessments and report debris locations to the city's Emergency Operations Center (EOC). Citizens will be able to use the app to access information about road closures, city services, power outages, and more.

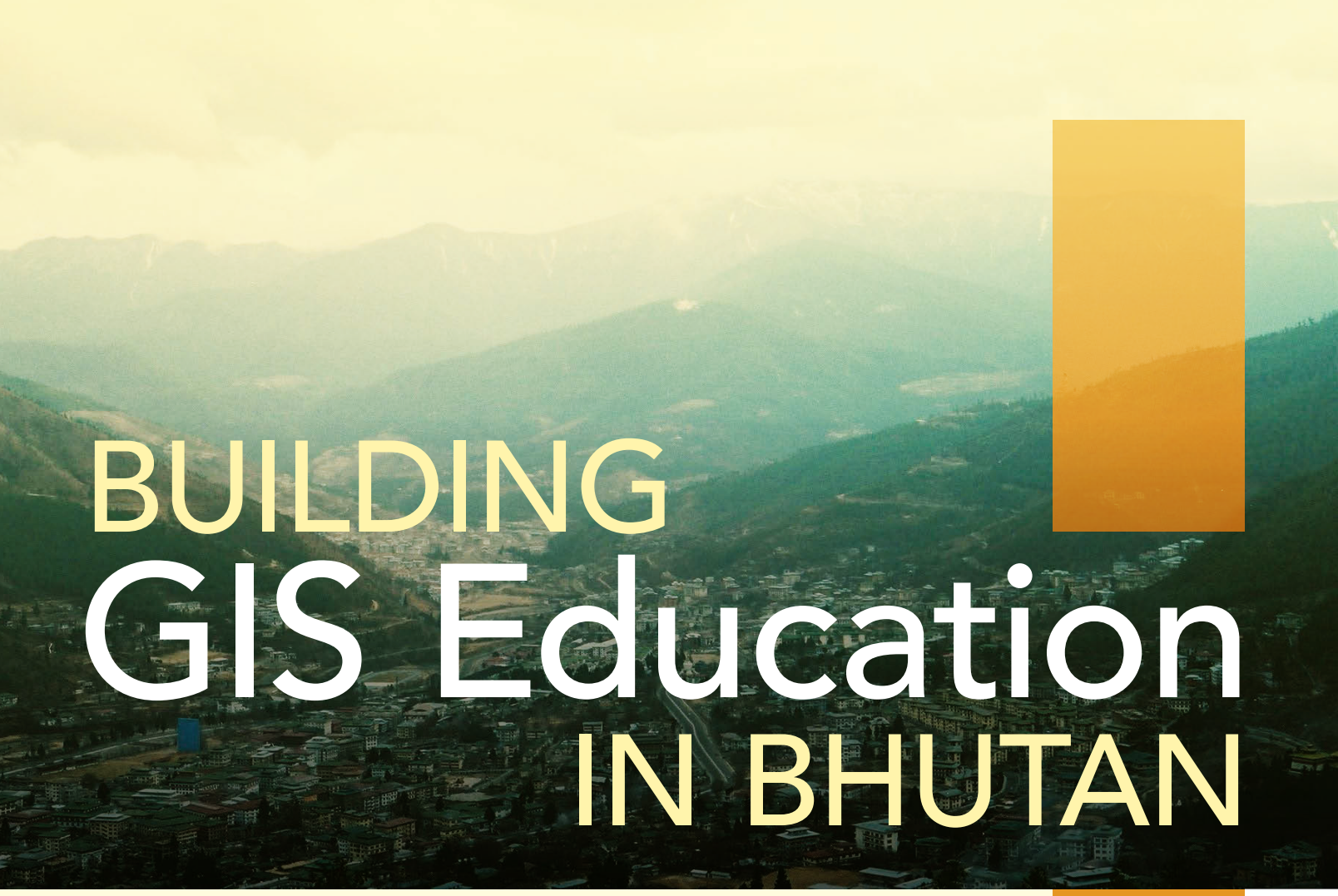
"During power outages, people still have their devices and they charge them in their cars. It's important to have access to storm-related information and the ability to report damage available to citizens," said Jessen.

Toward a Bright Future

The city's new web and mobile applications will provide fast access to geospatial content at any time from any device—desktop, smartphone, or tablet. For Jessen, the most beneficial outcome of the training was "developing the common understanding from separate lines of business into a single vision for GIS service deployment."

There was another simple but gratifying outcome of the training: participants learned each other's names. Jessen and Katragadda are convinced the personal connections forged during the training events have paved the way for future cross-team collaboration. "Our teams are now ready to work together to create great apps in the future for the city," said Katragadda.

For more information about the City of Virginia Beach applications, contact GIS coordinator Robert Jessen at RJessen@vbgov.com. For information about private Esri instructor-led classes and coaching, contact GIStraining@esri.com.



BUILDING GIS Education IN BHUTAN

On October 13, 2014, the small mountainous country of Bhutan convened the National Geospatial Exposition, a historic unveiling of Bhutan's online GIS data repository. The event included an outdoor display showing the GIS capacity of several ministries; a geospatial competition for secondary school students; and the launching of the Bhutan Geospatial Portal by the lovely 24-year-old queen of Bhutan, Her Majesty the Gyaltsuen.

Several international organizations were also present, including representatives from the International Centre for Integrated Mountain Development (ICIMOD), which developed the Bhutan Geospatial Portal with the Bhutan National Land Commission (NLC), and Esri. Thanks to the Esri Education Ambassador program, Dr. Karen Beardsley was also among those present.

Beardsley first traveled to Bhutan with her husband and young daughter in late 2013 to visit a Bhutanese friend who works for the Department of Forests and Park Services in the Ministry of Agriculture and Forests. Because they were traveling as personal guests, they weren't required to pay the normal daily tourist fees. They spent most of their time in and around the capital city of Thimphu, which has a population of approximately 100,000.

About 20 minutes outside of Thimphu, in a serene forested area nestled in the mountains, lies Royal Thimphu College (RTC). It was the first private college in Bhutan. Established in 2009, RTC offers bachelor's degrees for students who might not qualify for the relatively few government-sponsored slots at Bhutan's universities. RTC educators will incorporate GIS training as part of their new bachelor of science degree in environmental management program that will start in fall 2015. RTC's GIS lab is the best such facility in Bhutan.

After returning from Bhutan in January 2014, Beardsley kept in contact with RTC faculty and helped them develop the geospatial science curriculum for the new environmental management degree.

By spring, RTC obtained a university site license from Esri. In September, Beardsley helped RTC arrange for the delivery and

← Karen Beardsley and Canserina Kurnia dressed in traditional Bhutanese attire while teaching ArcGIS Online at Royal Thimphu College, Bhutan.

↓ Instructors and participants in the ArcGIS Online course at Royal Thimphu College in Bhutan. M Abdullah Abu Diyan, Karen Beardsley, and Canserina Kurnia are in the front row 7, 8, and 9 positions from the left.

installation of the software for the GIS lab. RTC needed assistance but, at that time, the local Esri distributor based in India was unavailable. Subsequently, Beardsley was offered an Esri Education Ambassador Award to cover airfare for a two-and-a-half week visit to Bhutan in October 2014.

While in Bhutan, she attended the Bhutan National GIS Exposition; helped RTC install and initialize its Esri university site license; and taught two introductory GIS workshops for RTC faculty and staff as well as participants from the government of Bhutan, a nongovernmental organization (NGO), and the private sector.

The course content for the workshops was donated by Juniper GIS (www.junipergis.com). This content provided just the right mix of technical instruction and project design and development experience.

The first workshop was two days long and covered basic skills, beginning with creating and adding data in ArcCatalog and ending by developing a layout to convey results of the analyses performed during the course. The second workshop repeated the course

work from the first workshop but included a third day that covered more advanced topics, such as georeferencing an image and editing geodatabase geometry. The workshops, which had a combined attendance of 59 participants, were very well received.

The Society for Conservation GIS (SCGIS) provided a grant to cover travel expenses for M Abdullah Abu Diyan, a Juniper GIS certified trainer, who assisted during the workshops. Diyan lives in nearby Dhaka, Bangladesh. He spent 10 days in Bhutan helping set up and prepare the lab and assisting participants with the hands-on portions of the introductory workshops.

Following these two workshops, Canserina Kurnia of Esri South Asia Pte. Ltd. in Singapore arrived in Bhutan to teach a third workshop at RTC. This workshop on ArcGIS Online was attended by 23 participants from RTC, the government of Bhutan, and NGOs.

Participants of the three training sessions came from a variety of organizations including (but not limited to) the following:

- National Environment Commission
- National Land Commission
- National Soil Services Center
- World Wildlife Fund
- Department of Geology and Mines
- Royal Thimphu College
- Bhutan Telecom
- Royal Society for Protection of Nature
- Bhutan Power Corporation
- Bhutan Electricity Authority
- Department of Hydropower and Power Systems
- National Biodiversity Center
- Penden Cement Authority Limited
- Ugyen Wangchuck Institute for Conservation and Environment
- Election Commission of Bhutan
- Jigme Namgyel Polytechnic
- Ministry of Works and Human Settlement
- National Housing Development Corporation Limited
- National Center for Animal Health

The GIS workshops held at RTC in October 2014 could not have been successful without the support and dedication of many individuals and organizations. Dr. Samir Patel, associate dean at RTC, worked diligently to prepare the GIS lab

←← Bhutan convened the National Geospatial Exposition for the historic unveiling of its online GIS data repository.

← Royal Thimphu College, Bhutan

and organize all aspects of training at RTC.

RTC provided accommodations and transportation for Beardsley, Diyan, and Kurnia during their entire stay in Bhutan as well as supplied tea/coffee breaks, lunches, and other support for trainees and instructors during the workshops.

The Esri Education Ambassador program provided Beardsley's airfare, and Esri covered the cost of printing the laboratory manuals for all RTC GIS workshops. Juniper GIS donated the curriculum and content for the introductory workshops. SCGIS provided funding for Diyan's participation as an assistant instructor.

The NLC secured visas and generously provided transportation, meals, and other support. NLC also hosted the Bhutan National Geospatial Exposition and continues to serve as a key coordinating body for GIS software and technology within Bhutan.

In addition to teaching the workshops at RTC, Beardsley and Kurnia worked to build a stronger connection between RTC and the GIS managers and technicians in Thimphu and surrounding areas. Since serving as an Esri Education Ambassador, Beardsley has been awarded a Fulbright Scholarship to teach GIS at Royal Thimphu College.

These efforts have gone a long way toward building and supporting a national spatial data infrastructure in Bhutan and building GIS education and technical capacity within Bhutan's higher education sector.

For more information, contact Karen Beardsley, PhD, GISP, managing director of the Information Center for the Environment (ICE), Department of Environmental Science and Policy at the University of California, Davis, at 530-752-5678 or kbeardsley@ucdavis.edu.

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