Sharing Files across the Agency

USDA Forest Service delivers high-quality imagery in seconds

By Emily Vines, ESRI Staff Writer

For years, the United States Department of Agriculture (USDA) Forest Service struggled to provide its 10,000 GIS software users, located in offices across the nation, with the imagery they needed. To improve the delivery of imagery, the Forest Service recently implemented ArcGIS Image Server. Now imagery can be delivered to regional, forest, and field offices within seconds.

Prior to the ArcGIS Image Server implementation, the Forest Service had limited imagery that included Landsat satellite imagery and digital orthophoto quadrangle (DOQ) imagery of Forest Service land and digital elevation models (DEMs). Each of the nine regions was responsible for getting imagery of its own area and managing it, and some offices did not have the resources to obtain this imagery.
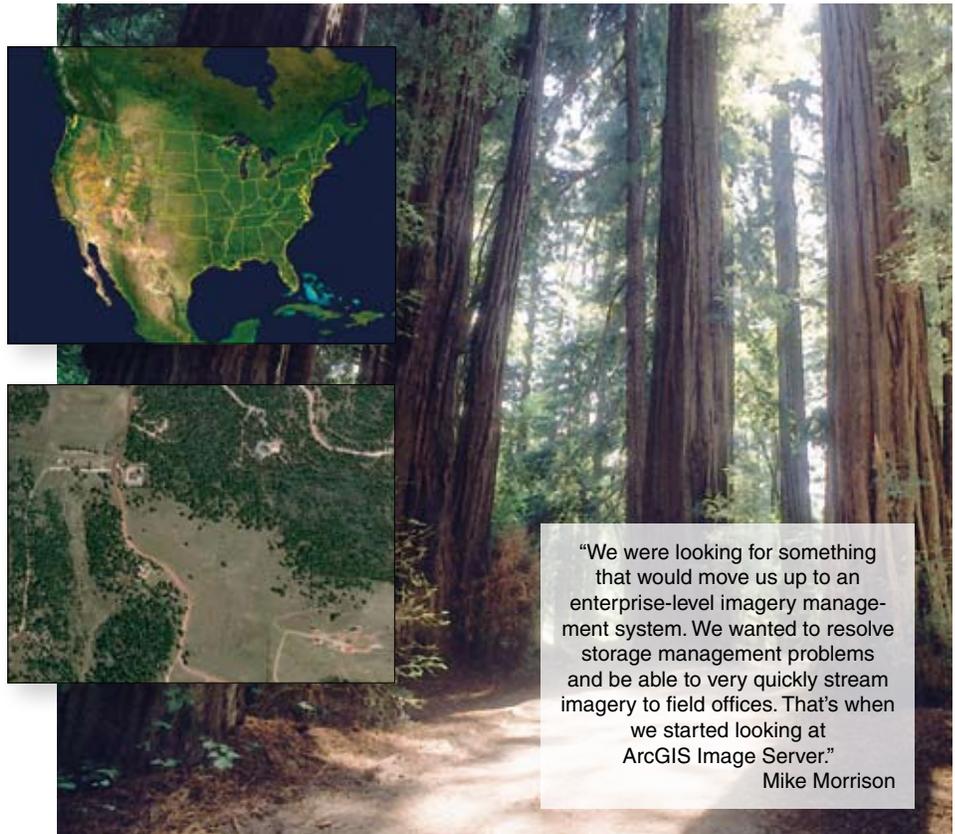
"We had some people who were managing well, while others starved," said Mike Morrison of the Forest Service. "We were looking for something that would move us up to an enterprise-level imagery management system. We wanted to resolve storage management problems and be able to very quickly stream imagery to field offices. That's when we started looking at ArcGIS Image Server."

Making the imagery accessible to staff in the regions had been the greatest challenge the Forest Service faced. Many staff members lacked sufficient storage capacity. Those who were able to load imagery into their computers via hard discs or CDs often had to immediately remove it after viewing.

Now, the agency can quickly and seamlessly serve large amounts of imagery throughout its enterprise via an intranet, eliminating the need for users to download large files to their computers. The ArcGIS Image Server implementation is in Salt Lake City, Utah, at the Forest Service's Remote Sensing Applications Center (RSAC) where Morrison, the training and technology awareness program leader for RSAC, manages the image software program deployment for the Forest Service.

Now Serving New Imagery Online
With its new GIS server-based technology, the Forest Service now provides four main types of image services: NationWide Select, eTOPO,

"We were looking for something that would move us up to an enterprise-level imagery management system. We wanted to resolve storage management problems and be able to very quickly stream imagery to field offices. That's when we started looking at ArcGIS Image Server."
Mike Morrison

Forest Service Regions, and shaded relief. There are approximately 28 image services that are published via ArcGIS Image Server.

NationWide Select image service has the most recent, high-resolution 1-meter orthophotography available for the lower 48 states. This service utilizes overviews of eSAT 15-meter satellite imagery from ESRI business partner i-cubed along with Moderate Resolution Imaging Spectroradiometer (MODIS) satellite imagery from the National Aeronautics and Space Administration (NASA). Also from i-cubed, eTOPO provides enhanced digital topographic raster maps at varied scales. Additionally, the Forest Service is using i-cubed's DataDoors archival and retrieval software to expedite imagery processing and delivery.

The Forest Service Regions image service

includes a soft-copy primary base series, which is a georeferenced raster image of the Forest Service topographic map and digital raster graphics (DRGs). These datasets are at 1:24,000 scale and are available for the areas the Forest Service administers. The Regions image service also includes the secondary base series (Forest Visitor Maps); both products are produced by the Forest Service's Geospatial Service and Technology Center (GSTC).

The shaded relief image service includes DEMs of various parts of the United States at 10-, 30-, 60-, and 200-meter resolution (depending on location). This data, when combined with other imagery, enables users to create three-dimensional effects.

The Forest Service's most popular imagery is 1-meter color National Agricultural Imagery

Program (NAIP) imagery. After some additional processing, this high-quality imagery is included in the NationWide Select imagery from i-cubed and allows users to easily detect changes in landscapes. Users typically view imagery using ArcGIS Desktop although some consume it as a Web Map Service (WMS).

A Ripple Effect
In addition to dramatically enhancing its delivery of imagery to field offices, the Forest Service has improved collaborative planning and information sharing with other agencies. Historically, the agency obtained mapping data and aerial photography of Forest Service lands but that data stopped at agency boundaries, which often caused problems when joint planning projects were undertaken with other agencies. Now, those agencies can access the image data for not only Forest Service land but also for land beyond those borders. In Oregon, the Service First partnership with the Bureau of Land Management is an example of this kind of project. GIS-based server technology has provided cost savings across agencies and standards at a multiscale level.

Just as the Forest Service is feeding imagery down to the local level, regional offices are now feeding their unique imagery up to the Forest Service to enhance the imagery data at the RSAC level. One of ArcGIS Image Server's unique features is the ease with which it facilitates integrating new imagery into existing services.

"ArcGIS Image Server meets our main goal of
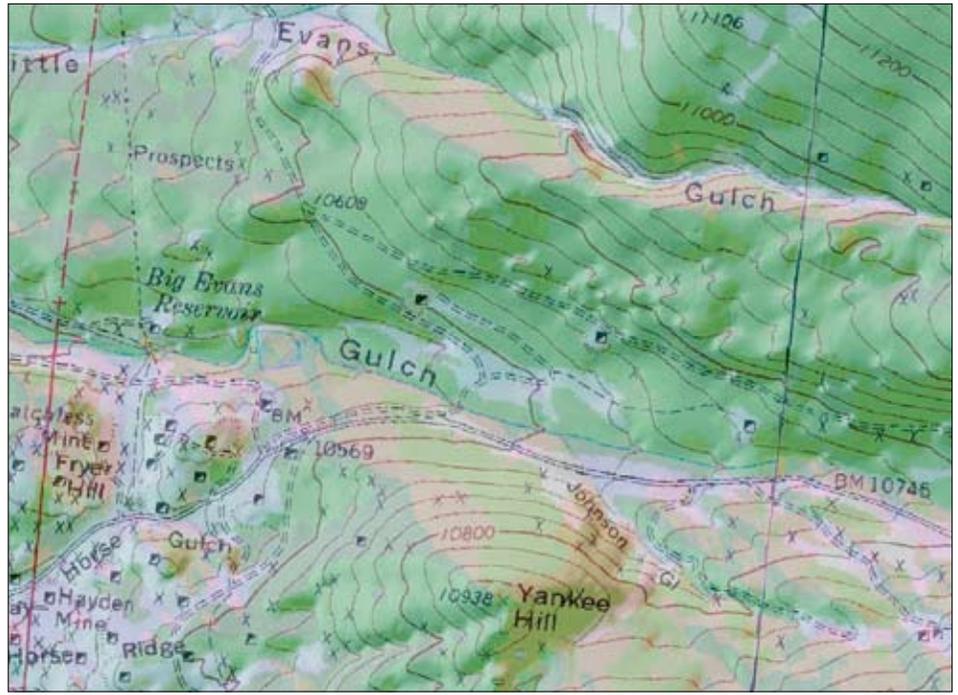
A transparent eTOPO layer is combined with shaded relief and aspect raster layers at a 1:10,000 scale.

creating and maintaining a seamless one-meter product that covers all of the ground in the lower 48 states and parts of Alaska at a different resolution," says Morrison. "It allowed us to get the areas we manage, as well as adjacent areas that are beyond our land, into a system that was easily accessible by our users. We're really pleased with that."

For more information about this implementation, contact Bentley Patterson, ESRI, at bpatterson@esri.com or 303-449-7779, ext. 8251.

Why Use ArcGIS Image Server?

As federal agencies and other larger organizations are very aware, the volume of imagery is growing at a rapid rate. The importance of updated imagery, from aerial photography and satellite capture, is also growing. Decision makers need current, high-quality images to visualize and analyze data for applications, such as land use, forest quality, storms, military operations, and emergency situations.

When images are needed, they are needed quickly. The expectation is that imagery will be accessible in the same amount of time it takes a Web page to appear. This immediacy requires that the imagery be stored on a server where users can easily access it without downloading or storing large files locally. ArcGIS Image Server is a unique and powerful tool that provides quick access to vast amounts of imagery.

ArcGIS Image Server also diminishes the interval between when an image is collected and when it is available to users. Traditionally, image processing and distribution were considered two separate stages in image utilization. Imagery was first processed and mosaicked into a large dataset, then put on servers for dissemination. This separation has caused many problems for users—long preprocessing and loading times and data redundancy that exacerbates data storage issues and hinders efficient data management. With ArcGIS Image Server, these two stages are combined into one. The data received from an imagery supplier can be directly served. This enables administrators to maintain only the primary imagery as well as create multiple specialized products on the fly when required. This is a significant and unique paradigm shift in how imagery is managed, processed, and distributed.

Because ArcGIS Image Server is integrated with ArcGIS Server, data can also be distributed to Web-based, mobile, and Open Geospatial Consortium, Inc.-compliant clients. This enables an agency to share its valuable imagery with more people, maximizing its investment in imagery.

A few of the many benefits of implementing ArcGIS Image Server:
- Direct use of multiple file formats and compression
- Fast access to both imagery and important image metadata
- Data security and access logging
- On-the-fly processing, including reprojection, mosaicking, and enhancements
- Multiple representations of the same imagery reduces duplication and storage needs
- Simultaneous viewing of imagery by multiple users

Q&A

A Closer Look

The USDA Forest Service is one of the first federal agencies to implement the new ArcGIS Image Server. Mike Morrison, training and technology awareness program leader for the Forest Service's Remote Sensing Applications Center (RSAC), frequently receives questions about the software and how his agency is using it. Here are the top five questions he has received and his responses.

Q: If you're on a wide area network, instead of a local area network (LAN), how fast are you really seeing the data?

A: The speed of the system on the LAN is one to three seconds per screen refresh. When you're off the LAN, it slows down by one to two seconds with an average of two to five seconds per refresh. Our users are very happy with that. Part of this is due to changeable compression, which many people ask about. The datasets from i-cubed are JPEG compressed GeoTIFFs. Other datasets are not. On transmission, by default, the data is JPEG compressed for fast speed and little quality loss.

Q: What is the quality like? How does it look?

A: The quality is not that of raw data, but it's compressed so people expect that. The majority of our users are very happy with the clear imagery ArcGIS Image Server provides at 1:2,000 scale. Users can also vary the transmission compression to balance speed for quality.

Q: How easy is it to set up ArcGIS Image Server? And, what do I have to do as a client to get access to the imagery?

A: Both of these are quite easy to do. The client-side setup is very simple; it's just like installing an extension. Access to the imagery once the client is in place just requires one click on an icon and then you're into it. There are also directories that make it visually easy for users to navigate.

Setting ArcGIS Image Server up is also quite easy. It's a well-developed program, and ESRI has set it up so the install is simple. It's easy to get it operational and to build the image services and publish them out. You don't need someone who knows Oracle to set up this software. What is helpful is to have some understanding of imagery and different file types, but you don't necessarily need an IT person or database manager to help you through the process.

Q: What hardware do I need to operate ArcGIS Image Server?

A: When we did the initial testing on this, we only had one server, a Windows 2003 server with a dual processing unit and four gigs of RAM tied to a six-terabyte NAS *[network attached storage]* box. We stood up three of the main services: the 1-meter dataset, the 1:24,000 DRG *[digital raster graphics]* dataset, and the eTOPO dataset. With 150 people receiving these services, it was running quite smoothly. We didn't have any mainline issues. Now, of course, we have more servers tied to it and a lot more storage capacity.

Q: How stable is it after it's been in operation for a while?

A: We've found the product to be very stable. We had our formal launch in October 2006, and the service has only gone out on us two times for a total of about 15 minutes lost service. It's been running for many months, and that's the only issue we've had with it—that's pretty good.

For more than 35 years, ESRI has been helping people make better decisions through management and analysis of geographic information. A full-service GIS company, ESRI offers a framework for implementing GIS technology and business logic in any organization from personal GIS on the desktop to enterprise-wide GIS servers (including the Web) and mobile devices. ESRI GIS solutions are flexible and can be customized to meet the needs of our users.

For More Information

1-800-GIS-XPRT (1-800-447-9778)
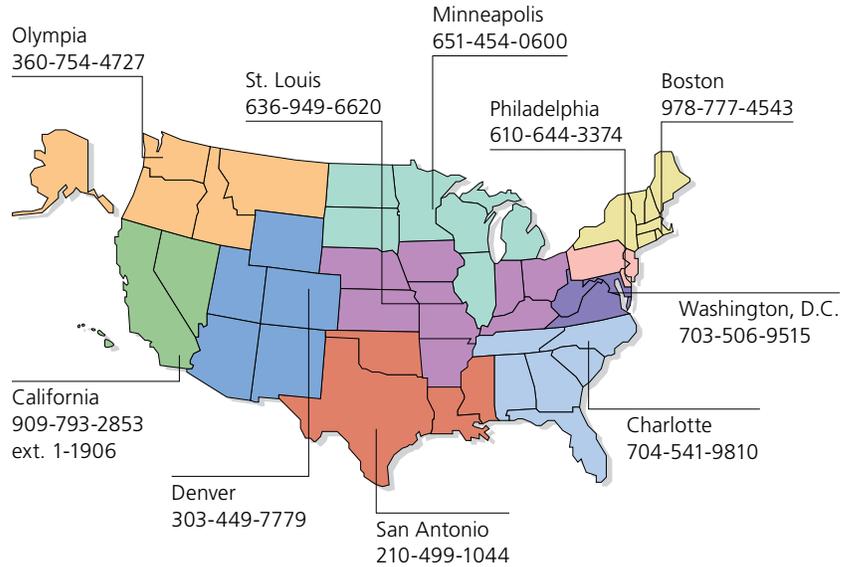
www.esri.com

Locate an ESRI value-added reseller near you at

www.esri.com/resellers

Outside the United States, contact your local ESRI distributor. For the number of your distributor, call ESRI at 909-793-2853, ext. 1-1235, or visit our Web site at

www.esri.com/distributors

ESRI Regional Offices

Olympia
360-754-4727

Minneapolis
651-454-0600

St. Louis
636-949-6620

Philadelphia
610-644-3374

Boston
978-777-4543

Washington, D.C.
703-506-9515

California
909-793-2853
ext. 1-1906

Charlotte
704-541-9810

Denver
303-449-7779

San Antonio
210-499-1044

ESRI International Offices

Australia
www.esriaustralia.com.au

Belgium/Luxembourg
www.esribelux.com

Bulgaria
www.esribulgaria.com

Canada
www.esricanada.com

Chile
www.esri-chile.com

China (Beijing)
www.esrichina-bj.cn

China (Hong Kong)
www.esrichina-hk.com

Finland
www.esri-finland.com

France
www.esrifrance.fr

Germany/Switzerland
www.esri-germany.de
www.esri-suisse.ch

Hungary
www.esrihu.hu

India
www.esriindia.com

Indonesia
www.esrisa.com.my

Italy
www.esriitalia.it

Japan
www.esrij.com

Korea
www.esrikr.co.kr

Malaysia
www.esrisa.com.my

Netherlands
www.esrinl.com

Northeast Africa
202-516-7485

Poland
www.esripolska.com.pl

Portugal
www.esri-portugal.pt

Romania
www.esriro.ro

Singapore
www.esrisa.com

Spain
www.esri-es.com

Sweden
www.esri-sgroup.se

Thailand
www.esrith.com

Turkey
www.esriturkey.com.tr

United Kingdom
www.esriuk.com

Venezuela
www.esriven.com