ArcNews

Esri | Spring 2026 | Vol. 48, No. 2

Briefly Noted

Discover How AI Is Helping ArcGIS Users Everywhere
Find out how GeoAI works in Esri technology and what to use it for. Go to page 8 to get started using Esri's pretrained GeoAI models, and head to page 9 to read about geospatial foundation models.

Take a Moment to Learn Something New About ArcGIS Pro
When you only have a few minutes but need a refresh on how to do things in ArcGIS Pro—like search for color schemes or add a layer to your legend—check out ArcGIS Pro Shorts. These videos are about a minute long and help users quickly learn tips, workflows, and best practices for ArcGIS Pro. Go to links.esri.com/ArcGISProShorts and click the Playlists tab to begin exploring.

Esri User Conference Recognized for Innovation
RainFocus—provider of the next-generation event marketing platform that Esri uses to streamline event registration, content, and on-site operations—honored Esri with its prestigious Innovation Award for best user conference at the company's annual flagship event, RainFocus INSIGHT. The Innovation Awards recognize industry leaders and their efforts to drive impactful results for their customers. To be considered for this award, nominees must have a solid understanding of attendees to create better experiences; innovate with their use of the RainFocus platform; leverage data and insights to understand, pivot, and improve events; merge offline and online efforts to grow their company and events; or demonstrate efficiency improvements such as saving time or resources.

A New, Scalable System for Nationwide Biodiversity Monitoring

By Tamara Rudic, Dr. Claire Hoffmann, Elise Boos, Dr. Alexander Killion, and Dr. Walter Jetz, Yale University

Many countries have made commitments to protect biodiversity and safeguard its many benefits to people. But achieving these goals requires information systems that address the many facets of biodiversity and different forms of biodiversity data.

The successful implementation of such a system requires cooperation among the many agencies, organizations, and communities that take part in biodiversity data collection, management, and analysis. It also involves overcoming the technical challenges of reusing data, making it interoperable, and sharing it.

National geospatial biodiversity data comprises thousands of species, documented using a slew of data collection methods, naming conventions, formatting, and metadata. GIS tailored to these unique challenges must be used to integrate and harmonize the data.

Many governments want such a geospatial data system to support their robust, nationwide biodiversity monitoring strategies and analyses, which inform conservation decision-making. That's what Map of Life—a global initiative led by the Yale Center for Biodiversity and Global Change—is building. Working alongside Esri and with support from the E.O. Wilson Biodiversity Foundation, Map of Life participants are collaborating with national government partners worldwide to develop the National Biodiversity Information System (NBIS), a robust, private, and flexible platform for managing, visualizing, and analyzing biodiversity data.

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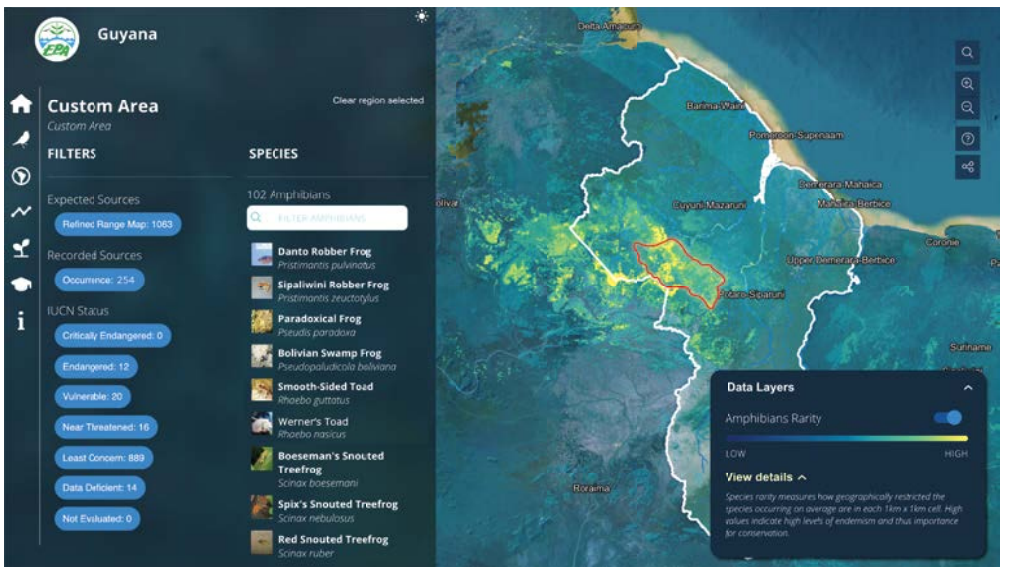
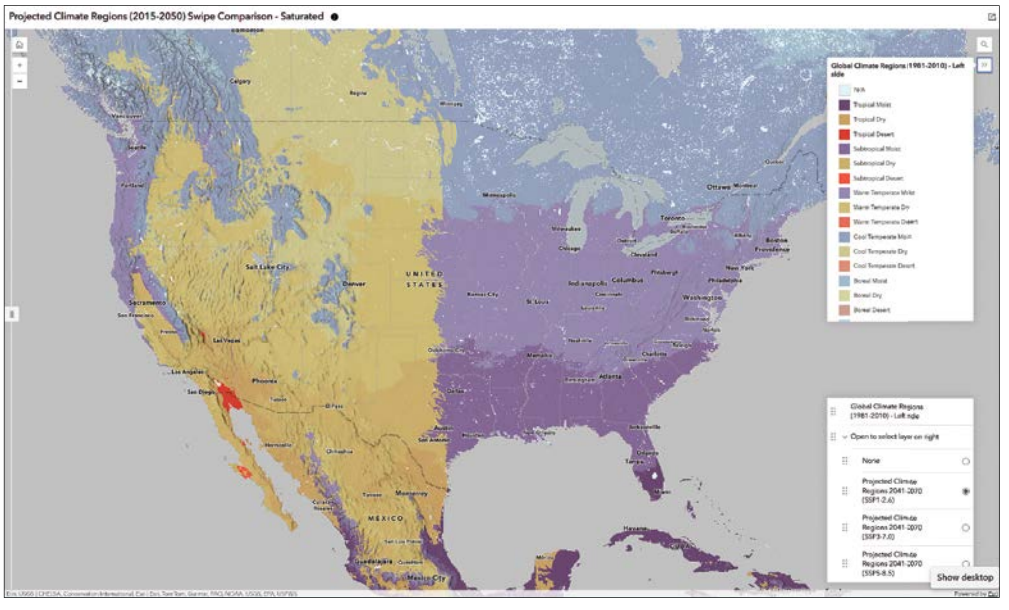


→ The National Biodiversity Information System (NBIS) Regions tool generates species lists for protected areas, provinces, and—as shown here—custom-drawn areas within Guyana. (Image courtesy of Map of Life.)

Creating Sustainability: "The Most Important Design Problem in the World"



↑ The United States has nine climate regions—which would change even if greenhouse gas emissions were kept relatively low and warming stayed below 2 degrees Celsius, as depicted in this map.

What if planners from neighboring communities or different parts of the world could share their planning information with one another? Using the same technology, the same language, the same maps, they could see how other cities are zoning new developments, building much-needed housing, and preserving green spaces. They could even evaluate how their plans either contribute to or detract from local, regional, national, and international goals to cut greenhouse gas emissions, protect natural resources, adapt to changing weather patterns, and promote economic growth.

Two interconnected projects seek to foster these connections among planners and the communities they serve. The Global to Local to Global (GLG) Climate Mitigation Implementation Project, led by geodesign expert Dr. Carl Steinitz and an international cadre of geospatial thinkers, is bringing together individual climate mitigation projects at the local, regional, and global levels in one platform to evaluate how they

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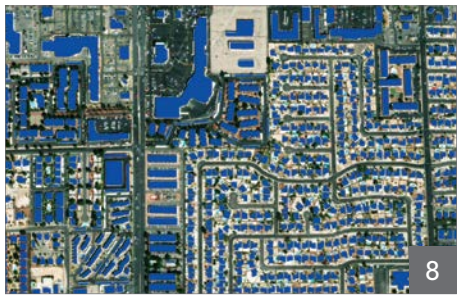
The nonprofit African People & Wildlife is helping Maasai pastoralists in Tanzania use GIS to document phenomena across the Maasai Steppe. But the point is not to change traditional ways. Rather, it is to connect the knowledge that's already being gathered and demonstrate to others how the Maasai have sustained their land for so long.



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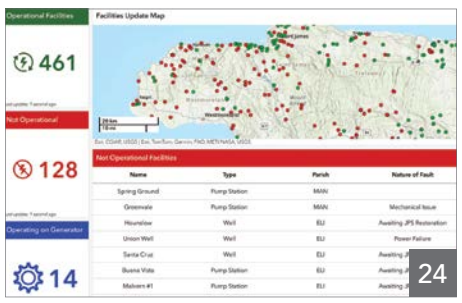

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High-Precision Mapping Reveals Where Biodiversity Faces Greatest Threats

In the arid landscapes of Arizona, Nevada, and Utah, surprising biodiversity hot spots glow red on conservation nonprofit NatureServe's portfolio of maps, called the Map of Biodiversity Importance (MoBI). The maps' revelations stem from a landmark collaboration between NatureServe, Esri, The Nature Conservancy, and Microsoft's AI for Earth program. This partnership has turned 50 years of NatureServe field observations in North America into maps and habitat models that guide land preservation and acquisitions to conserve biodiversity.

Translating Field Data into Actionable Maps

An online tool that launched in 2020, MoBI (links.esri.com/mobi) includes habitat models and maps for over 2,400 at-risk species, with more than 600 added in 2024. Stakeholders and researchers can access MoBI maps and layers in ArcGIS Living Atlas of the World (links.esri.com/mobi-livingatlas), the NatureServe Explorer Pro application, NatureServe's open data portal, and Microsoft's Planetary Computer platform.

MoBI data has been accessed more than 100,000 times in ArcGIS Living Atlas, with users ranging from land trusts to corporate sustainability directors, according to Regan Smyth, a conservation data scientist and NatureServe's president of strategic partnerships.

"If one of your goals is to save habitat for the plants and animals that are most threatened, then these maps show you where those places are," Smyth said.

Building on Field Data and Partnerships

Founded in the 1970s and an early GIS adopter, NatureServe has always combined ecological expertise with technological innovation grounded in local field knowledge.

"Good models require expertise both to inform and for scrutinizing," said Sunny Fleming, Esri's director of conservation solutions. "People take biodiversity data for granted—they just assume it exists. But in reality, there are very few, if any, other organizations like NatureServe."

NatureServe's work depends on a combination of philanthropic support and active collaboration with agencies, corporations, researchers, and other partners. To produce MoBI, Esri provided technical guidance, custom web apps, and outreach support, while The Nature Conservancy's science team guided the methodology. Microsoft's AI for Earth program provided the computational power to process thousands of models, and the US Fish and Wildlife Service helped NatureServe apply models to refine the service's own species range maps, which are the standard tool for evaluating regulatory compliance.

Working with these partners, NatureServe creates predictor sets for terrestrial and aquatic species, then feeds this data alongside documented species locations into machine learning algorithms. After generating initial models, NatureServe sends outputs to specialized biologists for review. The biologists identify which models work and which require alternative approaches, such as using more deductive modeling or only accepting documented locations for extremely rare species.

Some species present particular challenges. For certain pollinators, NatureServe first developed models for host plants, then used those predictions to map pollinator distributions. This approach was used in a recent landmark effort to apply the MoBI modeling methodology to better understand habitat for the western monarch butterfly—a species currently under consideration for listing as threatened under the US Endangered Species Act.

While this work on the monarch butterfly illustrates how NatureServe adapts modeling approaches for complex species, the real impact emerges when agencies partner with NatureServe to translate these models into on-the-ground action. In pilot projects for other species, NatureServe demonstrated that modeling could be used to refine US Fish and Wildlife Service species range maps by almost 70 percent on average. According to Smyth, this significantly improved screening precision while helping agencies and partners focus conservation efforts where they are needed most.

A Network Shaped by Local Knowledge

The models draw on data from the NatureServe Network, a North American biodiversity-focused collaboration that includes field scientists, botanists, and zoologists at more than 60 natural heritage programs and conservation data centers. Using ArcGIS Pro to access and analyze species habitat data, these experts provide species occurrence data that feeds MoBI's machine learning models.

For more information, read about how NatureServe uses GIS technology to prevent species extinctions at gisforscience.com/chapter2, or visit the NatureServe Access Data on Species & Ecosystems page at natureserve.org/access-data.

Some models enable what Smyth called "treasure hunts"—targeted field searches in areas that models identify as likely but undocumented habitat. This approach has resulted in discoveries of new populations of species, such as the pygmy rabbit.

Smyth described NatureServe's role as "stitching together" this distributed knowledge to produce seamless national coverage, allowing state-level expertise to help create actionable maps and targeted conservation efforts.

Making Real-World Conservation Decisions

There's an ongoing conservation movement called the 30x30 initiative that aims to protect at least 30 percent of lands and waters worldwide by 2030. But, according to Smyth, this elicits a critical question: "Which 30 percent?"

She emphasized the need to ensure that protected areas represent true biodiversity, including unexpected hot spots such as those in the Nevada and Utah deserts. In places where conservation and streamlined development are goals, Smyth sees MoBI as providing precise information that distinguishes truly important places from less critical areas.

Since the original release of MoBI in 2020, many organizations have used the data to guide land and water management. For example, the National Parks Conservation Association uses MoBI to evaluate landscapes that are next to US national parks. Corporate interest in biodiversity has also risen, particularly among timber companies.

"There's this big push to demonstrate you're nature positive," Smyth said, noting that many standards focus on species extinction risk—one of the factors that MoBI maps.

NatureServe also recently launched InSite by NatureServe (insite.natureserve.org), a web-based tool allowing anyone to define a site and receive a biodiversity report that translates MoBI data into metrics frameworks that emerging corporate biodiversity standards require.

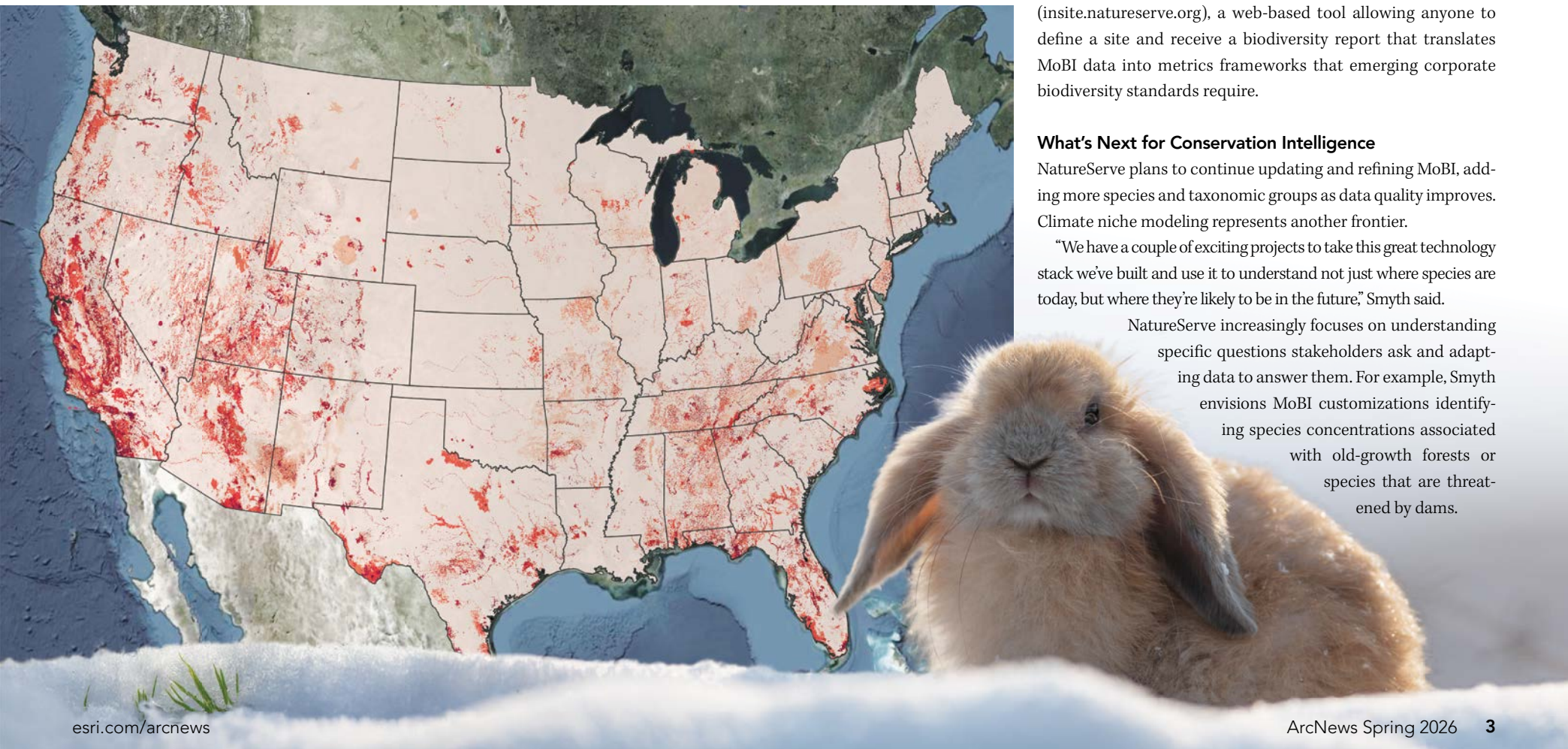
What's Next for Conservation Intelligence

NatureServe plans to continue updating and refining MoBI, adding more species and taxonomic groups as data quality improves. Climate niche modeling represents another frontier.

"We have a couple of exciting projects to take this great technology stack we've built and use it to understand not just where species are today, but where they're likely to be in the future," Smyth said.

NatureServe increasingly focuses on understanding specific questions stakeholders ask and adapting data to answer them. For example, Smyth envisions MoBI customizations identifying species concentrations associated with old-growth forests or species that are threatened by dams.

↓ NatureServe's Map of Biodiversity Importance (MoBI) highlights areas that are critical for imperiled species.



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A New, Scalable System for Nationwide Biodiversity Monitoring

← Guyanese president Dr. Mohamed Irfaan Ali announced at the Global Biodiversity Alliance Summit that Guyana would take bold action to be a world leader in protecting nature.

How the NBIS Works

The NBIS accommodates the diverse entities often involved in national biodiversity monitoring and conservation. It has built-in systems to harmonize and standardize data, plus customizable data-sharing options.

Using public global datasets supplied through Map of Life, the NBIS serves regularly updated information about thousands of species, including their conservation statuses; distribution data; and trends in habitat areas, connectivity, and protection. Additionally, Map of Life is developing high-resolution species distribution models to help fill data gaps and inform monitoring strategies. These models are the result of years of research and development by Map of Life participants, and they continue to be refined through global partnerships.

The NBIS is built on ArcGIS Enterprise and ArcGIS Online with a bespoke front-end design—a combination that provides a unique integration of robust data management infrastructure with a highly customizable and interactive user interface. This system delivers species data dashboards, regional biodiversity data layers, national and subnational biodiversity indicators, and integrations with ArcGIS Pro for more detailed analysis. These features were codesigned with government partners around the world to ensure they meet agencies' unique needs for both efficient data management and real-time decision support.

In addition to managing species-level data, the NBIS provides users with three biodiversity indicators:

- The **Species Protection Index**, which assesses how much species' habitat is under protection
- The **Species Habitat Index**, which tracks changes in species' suitable habitat
- The **Species Information Index**, which evaluates how well existing data covers species' expected ranges

These indicators, which are produced by Map of Life, have been adopted in the Kunming-Montreal Global Biodiversity Framework (GBF), so governments and organizations can use the NBIS interface to support their national reporting requirements.

Within the NBIS interface, users interact with subnational indicator data at annual resolution, as well as individual species-level scores. This allows users to conduct in-depth analyses of localized metrics and rapidly identify species of highest conservation priority.

The data products delivered through the NBIS are powered by the integration of public biodiversity databases from Map of Life and private databases held by government agencies and other collaborating institutions—a unique combination for each country's distinct system. The NBIS's standardized data and metadata reporting frameworks allow for the smooth integration and interoperability of these different data types without sacrificing

↓ The NBIS displays species-, province-, and national-level indicator metrics, shown here for the Species Protection Index. (Image courtesy of Map of Life.)

individual data ownership. This allows the many entities collaborating through the NBIS to retain data sovereignty while reaping the benefits of shared data for planning and reporting.

Guyana Serves as an Example

One of the first adopters of the NBIS is Guyana, a country that's teeming with biodiversity. Situated on the northeastern edge of South America along the Atlantic coast, it is blanketed by some of the world's largest intact rainforests—and is a global leader in biodiversity conservation.

Guyanese president Dr. Mohamed Irfaan Ali made an ambitious announcement at the inaugural Global Biodiversity Alliance Summit, held in July 2025 in Georgetown, Guyana.

"I am proud to launch Guyana's National Biodiversity Monitoring [Initiative]—a bold, unprecedented step from vision to action, advancing our leadership in global nature stewardship, with the people of Guyana at its heart," he said.

The summit brought together leaders from around the world to strengthen international commitments and chart a pathway to protecting biodiversity under the newly formed alliance. The cornerstone of Guyana's leadership in the alliance is the National Biodiversity Monitoring Initiative, which aims to standardize biodiversity monitoring across the country and serve as a model for other nations seeking to do the same.

The NBIS is the technological and data management foundation of this initiative. Through the NBIS, a collaborative consortium of Guyanese agencies, nongovernmental organizations, universities, international partners, and other institutions will consolidate existing data and develop standardized systems for future data collection, sharing, and interoperability.

Guyana's National Biodiversity Monitoring Initiative aims to be the first in the world to carry out a standardized, border-to-border biodiversity monitoring program and will serve as the basis of a transparent and high-integrity biodiversity data system for the whole country. With nearly 90 percent of the country covered by forest, it will take a lot to turn this goal into a reality. The NBIS supports this program by providing the infrastructure for the many organizations that make up the consortium to share and coordinate on ecological data.

Moreover, the NBIS allows the Guyanese government to use this newly standardized national dataset to not only inform additional biodiversity monitoring efforts but also support key national goals. The NBIS's adaptable data infrastructure, analysis, and visualization capabilities bolster Guyana's goal of protecting 30 percent of its land and seas by 2030—in line with the GBF's 30x30 initiative—as well as its Low Carbon Development Strategy.

With the technological innovation of the NBIS and support from Esri at its core, Guyana's National Biodiversity Monitoring Initiative is poised to position the country as a leader in the global biodiversity community.

A Scalable System That Serves Individual Needs

The balance of data sharing and sovereignty-protecting infrastructures, data standardization procedures, and spatially explicit decision-support tools that are built into the NBIS demonstrate the importance of systems that are designed specifically to address biodiversity conservation's unique data management and decision-making needs.

Thanks to Map of Life's global data coverage and Esri technology's processing capabilities and infrastructure, the NBIS is fully scalable. It allows users to rapidly create private, custom systems for additional partners while maintaining key functionalities and seamlessly plugging into agencies' existing GIS infrastructure.

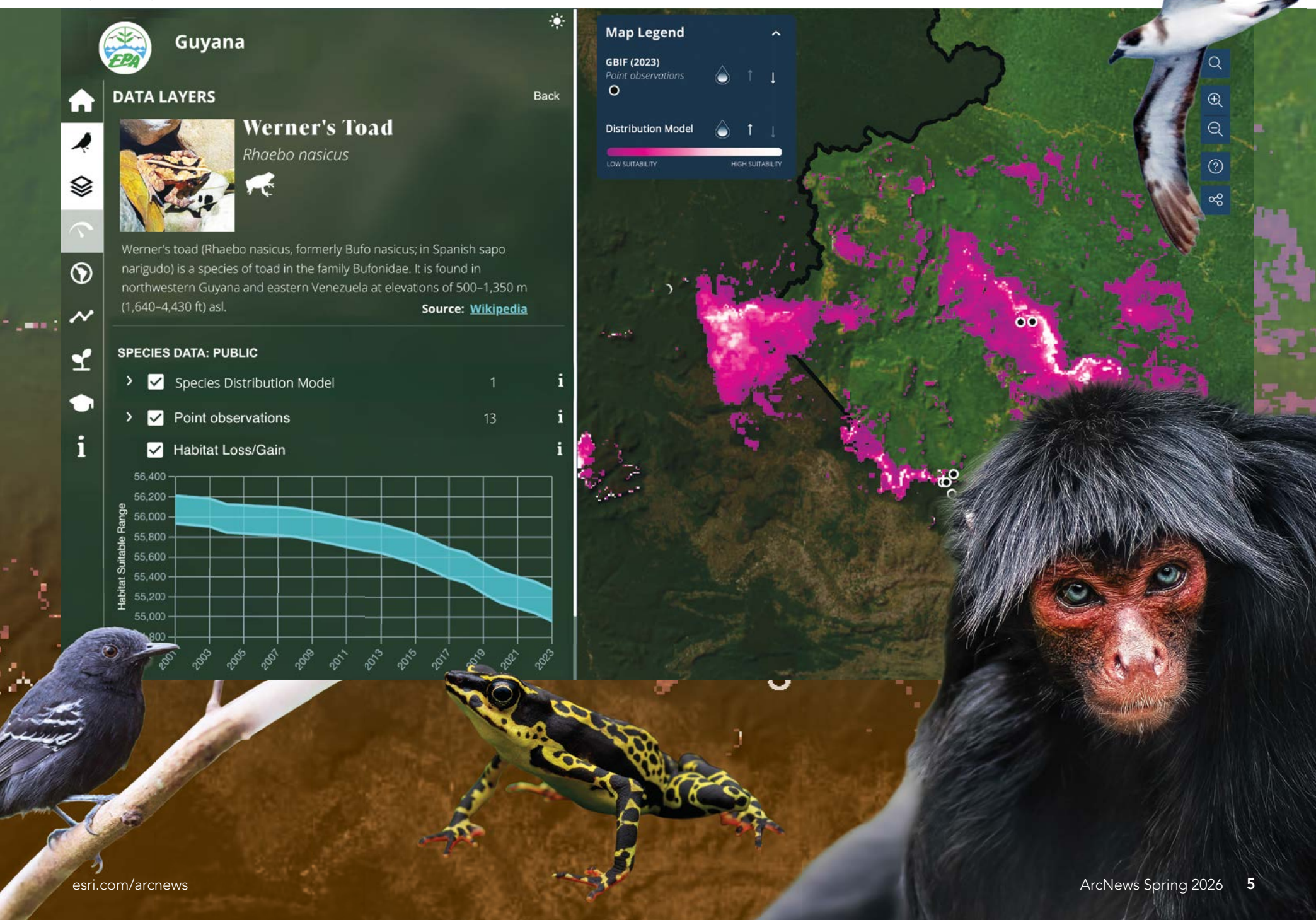
With its time- and cost-saving capabilities and powerful integrated systems, the NBIS can support governments around the world in meeting their commitments to biodiversity and people.

For more information, email Dr. Alexander Killion at ybgc@yale.edu.

About the Authors

At the Yale Center for Biodiversity and Global Change, Tamara Rudic is the user engagement and communications lead, Dr. Claire Hoffmann is the head of partnerships, Elise Boos is the biodiversity coordinator, Dr. Alexander Killion is the managing director, and Dr. Walter Jetz is the director. Jetz is also a professor of ecology and evolutionary biology and the environment at Yale University and the scientific chair of the E.O. Wilson Biodiversity Foundation. He leads Map of Life.

↓ For thousands of species, including the Werner's toad, as shown here, the NBIS delivers in-depth spatial data ranging from distribution models to habitat change estimates. (Image courtesy of Map of Life.)



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Creating Sustainability: "The Most Important Design Problem in the World"

would work together to cut global emissions by 2050. Open Plan Map, a forthcoming component of Esri's Community Maps Program, will encourage planners to share their planning data in ArcGIS Online so that they and others can compare their work with adjacent jurisdictions, explore plans from around the world, get a general understanding of their plan's CO_2 impact, and see whether local climate mitigation initiatives align with global goals.

"The idea is to let people view their communities' plans in context and see what's happening at other scales," said Esri president Jack Dangermond. "In Southern California, for example, hundreds of communities could share their plans and develop a patchwork quilt that provides a picture of what's happening across the region. If planners around the world share their information, then regional, state, national, and even global agencies can understand what's being planned at an aggregate level."

Both projects are ambitious. At a time when disconnect and disquietude seem to capture the prevailing mood, these undertakings deal in the art of the possible—in what communities may be able to achieve when it comes to sustainable, climate-friendly development.

The Urgency of Mitigation

The last 11 years have been the warmest on record, and ocean temperatures and concentrations of greenhouse gases continue to increase, according to the World Meteorological Organization. Rising sea levels, coastal erosion, thawing permafrost, and extreme weather are forcing residents to move from places as disparate as the Pacific Islands and the Arctic. Many millions of people may need to relocate in the next century due to lack of local water and food, according to "Future of the Human Climate Niche," a paper written by Dr. Chi Xu of Nanjing University, and others, and published in *PNAS*.

"Millions of people are in crisis now, and they need to adapt immediately," said Steinitz, honorary professor at University College London and the Alexander and Victoria Wiley professor of landscape architecture and planning, emeritus, at Harvard University. But what we urgently need to focus on, he says, is mitigation.

"Adaptation is short term because much will be overcome in two, maybe three generations if temperatures continue to rise," he explained.

There are mitigation plans being made—at the local, state, regional, and global levels. But how do they all connect? How can city government officials be sure their new housing, transportation, and zoning plans will protect water supplies and reduce the amount of carbon dioxide emitted into the atmosphere? And how can leaders of global organizations, such as the United Nations and the World Trade Organization, establish goals that aren't merely aspirational but are actually feasible?

Steinitz and a team of experts from international universities and Esri are taking concepts from geodesign to link localized plans with global goals. The team has created projective maps that compare existing climate conditions everywhere in the world, at one-kilometer grain, to what climate conditions and land use are credibly predicted to be in 2050 if current trends persist and if, on the other hand, targeted climate mitigation projects are implemented. Using AI, the team has developed a range of numbers assessing various emissions reduction scenarios, as well as what each of those scenarios would cost.

"Our experiments say that we can produce 80 gigatons of CO_2 reduction for around 3–5 percent of annual global GDP"—much less than what a one-degree-Celsius increase in temperature will cost the world, Steinitz said. "That's a very good investment with enormous secondary benefits."

The hope is that with this system, and by using modern geospatial technology, local government planners and GIS practitioners will be able to create planning documents that conform to what's needed nationally and internationally to mitigate Earth's rapidly changing environmental conditions.

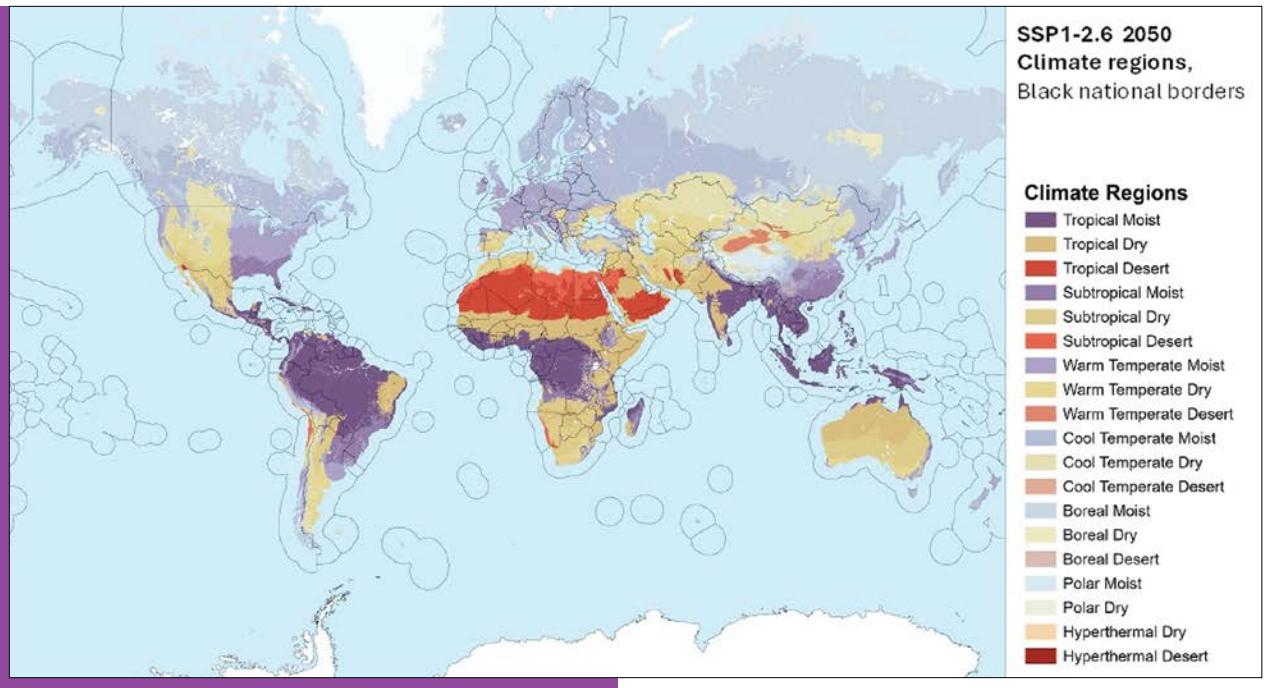
"The technology is finally here to be able to think about solutions to this global problem—not merely by looking at each national piece separately, but by thinking and designing across global to local to global scales," Steinitz said.

Connecting Local, Regional, and Global Projects

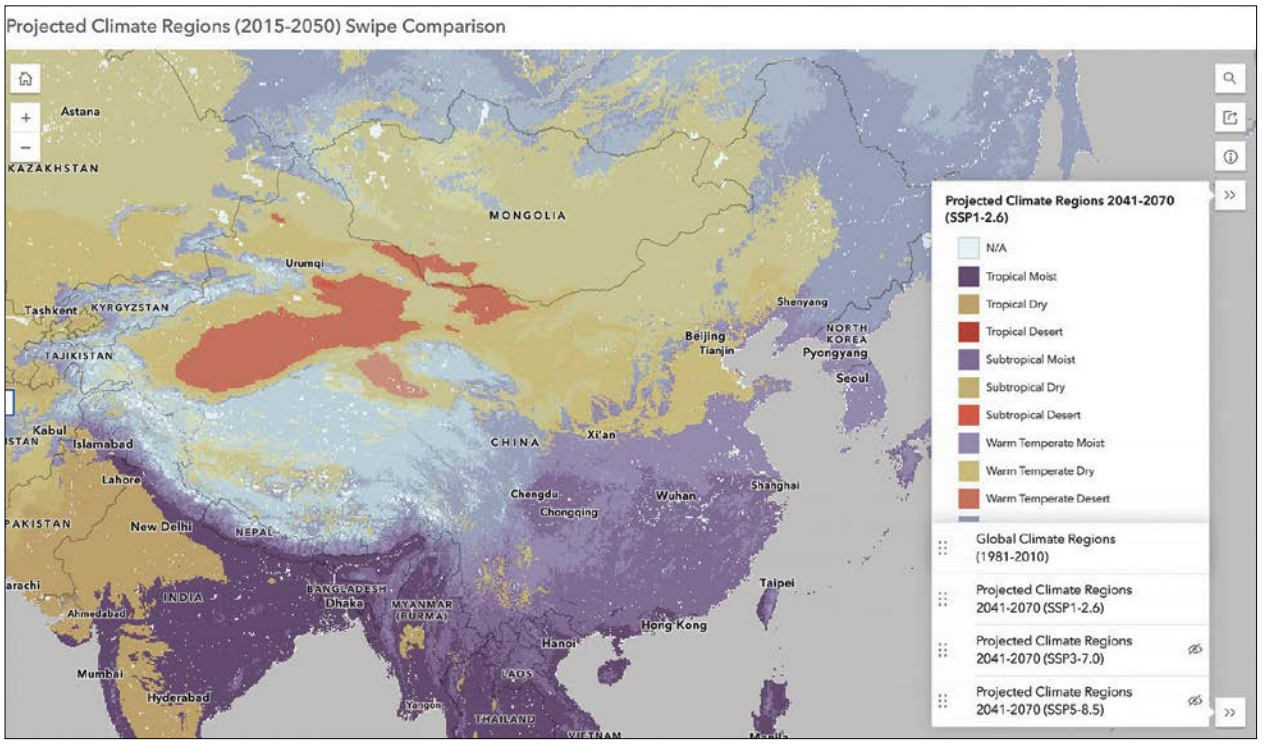
Most nations have between 3 and 12 climate regions—and those regions will change over the coming decades, according to Steinitz. China, for example, has 12 climate regions, which range from subtropical moist to polar moist and cool temperate dry. Each nation and its climate regions demand different ways of implementing broad policies, not least because of their economic, social, and environmental diversity, as well as how ready they are to tackle climate issues. But these more viable local plans also need to connect at larger extents.

Steinitz and his team have developed 117 climate mitigation project types spanning nine land-use and land-cover categories, such as energy, forest, agriculture, and ocean, that can be implemented across 10,000 jurisdictions in nearly 200 nations. Detailed Gantt charts, plus maps and simulations built in ArcGIS Pro, show the emissions reduction and cost impacts of these projects if carbon emissions increased at different rates through 2050.

The focus on climate regions is important. Plans developed at the national level shouldn't be monolithic. In the United States, for



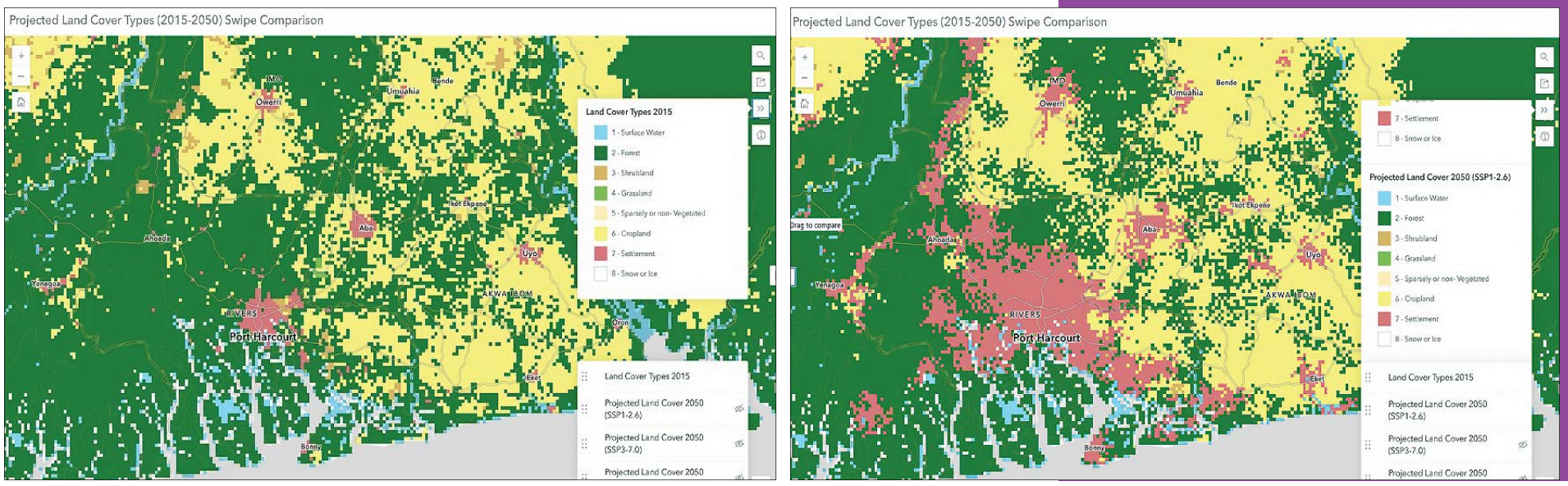
← Most nations have several climate regions, so plans shouldn't be monolithic.



↓ China's climate regions are diverse and range from subtropical moist to polar moist and cool temperate dry.

The following people have been instrumental in developing the Global to Local to Global project's methodology and technology:

- Dr. Carl Steinitz, Harvard University, United States, and University College London, United Kingdom
- Dr. Pedro Arsénio, University of Lisbon, Portugal
- Dr. Michele Campagna, University of Cagliari, Italy
- Dr. Tijana Dabovic, University of Belgrade, Serbia
- Dr. Stephen Ervin, Harvard University
- Laura Tolu, University of Cagliari
- Abir Benfradj, University of Cagliari
- Zach Aaberg, Esri
- Dr. Ryan Perkl, Esri
- Bern Szukalski, Esri
- Dr. Hrishi Ballal, Geodesignhub



↑ Climate regions, land use, and land cover will evolve as Earth's environment changes.

example, Phoenix, Arizona, and Madison, Wisconsin, shouldn't have the same climate plan, Steinitz pointed out.

The workflow that he and his team have developed is designed to test, not prescribe, pathways to climate mitigation. But the hope is that it can bring local planning initiatives out of their silos and into the global milieu, give context to climate mitigation projects of various scales, and inspire collaboration.

Increasing Access to—and Uses for—Planning Data

Currently, however, there's a data vacuum in the planning sphere—not just at the global scale but at local levels, too.

"No two jurisdictions use the same categorizations for land use and zoning. There is no common language where one city's map legend matches another's. They're similar in that they both have commercial and residential types of land use, but there's not a direct match," said Dr. Ryan Perkl, Esri's lead for geodesign and planning. "There's also no centrally located spot where people can find anyone's plan."

The initial vision for Open Plan Map is to make those plans available, in their original formats, in one place for the first time. This will open up planning data across entire landscapes instead of having them stop at jurisdictional boundaries. Open Plan Map will also translate plans into a common land-use classification—and into and from various languages—so that they're comparable across cities, counties, regions, states, and nations. In addition, Open Plan Map aims to share a plan's potential CO_2 impacts.

"This is a laborious task, given the heterogeneity of the plans that will be submitted to Open Plan Map," said Perkl. "We're engineering AI-assisted ETL [extract, transform, and load] processes to facilitate that translation, which is novel."

Once this data is accessible, people can start investigating it to see how their local plans might affect environmental factors in their cities, regions, and beyond. This will eventually allow planners and other users to work on climate initiatives across scales, like GLG is doing. The idea is to foster local, regional, national, and international cooperation on strategies to reduce carbon emissions around the world.

"The ambition of Open Plan Map is that it starts that dialogue," said Perkl. "When a jurisdiction is confronted with the impacts of its plan—whether it takes CO_2 out of the atmosphere or contributes more, or whether it improves forests by 1 percent or 5 percent—maybe it motivates that community to improve its sustainability efforts."

Eventually, the team would like users to feed their climate plans into Open Plan Map and have them assessed according to the GLG's parameters to see how much their projects will reduce carbon emissions and how much that will cost.

"The objective is to help people around the world decide what to do and how to get it done," Steinitz said.

Two Continually Evolving Projects

The Open Plan Map being released this year is the first version of a system that will evolve over time. The more jurisdictions that submit planning information—from places all over the world—the better the data will be.

"As planning frameworks get fed together, perhaps that inspires local jurisdictions to take part in the kinds of highly impactful climate projects that GLG is promoting," said Perkl.

The GLG project is also evolving. The team is working on automating the entire GLG workflow, and it is looking into how to apply AI to project the results of existing climate mitigation plans to 2050 so that their effects can be rigorously evaluated.

Climate mitigation is "the most important design problem in the world," according to Steinitz, so this is the kind of bold action that's needed.

"I hope Open Plan Map and the GLG methodology will be adopted and adapted as broadly and rapidly as possible," said Steinitz.

Hear more about this at the Geodesign Summit April 14–16. Register to attend in person or virtually at esri.com/geodesign.

A Quick-Start Guide to Esri's Pretrained GeoAI Models

While the world of AI is vast, the technology's practical application in GIS becomes more accessible every day. For many professionals, the primary barriers to using AI are the challenge of gathering large amounts of training data and the extensive time required to train a model from scratch.

But what if you could bypass much of that effort? Tucked within ArcGIS Living Atlas of the World are more than 100 pretrained GeoAI models, ready to extract features and classify pixels from imagery and other geospatial data.

Intelligent Pattern Recognition Meets Spatial Analysis

At its core, GeoAI combines the spatial analysis capabilities of ArcGIS technology with the pattern-recognition power of AI. The pretrained models in ArcGIS Living Atlas exemplify this synergy, performing specific tasks such as detecting trees, extracting roads, and classifying land-cover features.

Consider the Building Footprint Extraction - USA model, which can identify structures in high-resolution satellite imagery, and the Road Extraction - North America model, which automatically digitizes transportation networks. Each model is built on established deep-learning architectures and documented with information about required inputs, training data, and expected performance.

> To learn more about ArGIS pretrained models and get started with them, go to links.esri.com/pretrained-models.

Rapid Response in Critical Situations

In the high-stakes industries of public safety and insurance, timely and accurate information is a priority. After a hurricane or wildfire, a GIS user can run a pretrained Damage Assessment (Drone Imagery) model on aerial imagery recorded after the event to rapidly identify and classify damaged structures.

This automated process provides first responders with a clear operational picture, highlighting impassable roads and areas of greatest need. For insurance carriers, this same data accelerates the claims process, allowing policyholders to get financial disbursements more quickly and efficiently.

Infrastructure at Scale

Transportation departments can use pretrained models to automate road condition assessments by, for example, looking at drone imagery to identify cracks in the pavement. This data helps organizations prioritize repairs and plan long-term infrastructure investments. Similarly, utility companies use GeoAI to inspect extensive networks of poles, wires, and transformers.

Another critical use case involves vegetation management. Models can analyze aerial imagery or lidar data to identify trees and other vegetation, and utilities can employ additional spatial analysis techniques to verify if the plants are encroaching on power lines—a leading cause of outages.

Authoritative Data for Government

For national mapping agencies and state and local governments, maintaining authoritative and current geospatial data is a core function. Pretrained models can extract building footprints, road centerlines, and land-cover classes from high-resolution imagery, accelerating map production and updates.

An accurate building footprint layer is essential for tax assessment, population estimates, and emergency response planning. High-resolution land-cover data, which can be generated using models such as the High Resolution Land Cover Classification - USA model, is critical for monitoring urban growth and identifying areas suitable for conservation or development.

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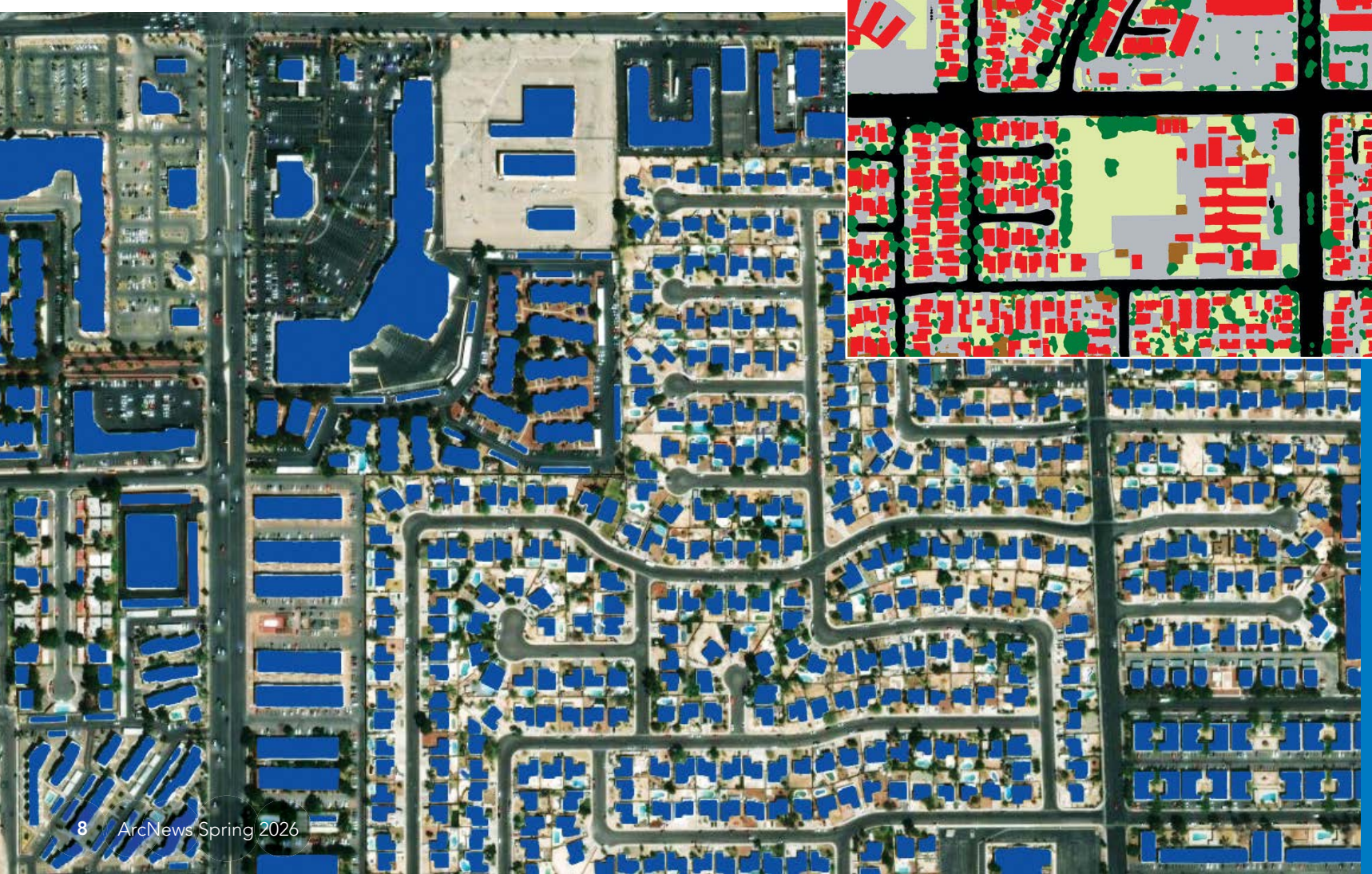
the Two Types of

Pretrained GeoAI models are task-specific deep learning models trained to perform particular functions, such as building footprint extraction, road digitization, or land-cover classification. These models are ready to use and require no additional fine-tuning. Organizations apply pretrained models directly to their imagery to extract features or classify pixels without gathering training data or building custom models. They are ideal for when an organization needs to rapidly deploy AI capabilities.

↑ Analysts can use pretrained models in ArcGIS to automate tasks such as land-cover classification.



← Users can leverage task-specific pretrained models in ArcGIS, such as building footprint detection. The model automatically identifies residential homes (shown in blue) within imagery.

GeoAI in the Age of Foundation Models

DING GeoAI Models

Geospatial foundation models are large-scale neural networks with billions of parameters, and they are trained on massive, diverse datasets. Rather than performing a single task, they learn general representations that can be adapted to many downstream applications. Data scientists use foundation models as starting points for developing custom workflows—fine-tuning them for specialized tasks or using their embeddings to enhance machine learning models. They provide more flexibility than pretrained GeoAI models but generally require more expertise, at least for now. Foundation models in GIS can enhance various applications and workflows, such as analyzing satellite data to predict environmental changes or improving the accuracy of imagery interpretations.

To learn more about using foundation models with ArcGIS, visit links.esri.com/foundation-models.

The rapid progress of AI has produced a new category of models that promise to revolutionize Earth observation. Foundation models, characterized by their massive scale and diverse training data, teach computers to understand the planet with unprecedented depth. Esri is at the forefront of this transformation, bringing these powerful models into ArcGIS workflows.

What Foundation Models Are

A foundation model is a large, deep neural network—a type of machine learning that processes complex, nonlinear data to recognize patterns. Foundation models often have billions of parameters and are trained on vast, diverse datasets.

Once trained, a foundation model can be adapted to a wide variety of downstream tasks, depending on the data format. For imagery, the tasks include object detection and tracking, along with pixel and feature classification. For natural-language text data, a foundation model can classify, transform, and extract entities from text. For vector, tabular, and time series data, the downstream tasks include prediction—including regression and classification—and forecasting.

The Building Blocks

The success of foundation models rests on several key innovations. Transformers—neural network architectures that process sequential data in parallel rather than sequentially—capture relationships in data, scale well, and are now widely adopted across domains beyond text. Autosupervised learning enables models to learn from raw, unlabeled data rather than requiring labeled examples. For imagery, this often involves masked image modeling, where parts of an image are hidden and the model learns to reconstruct them. Scale completes the picture: As a model's size and dataset volume grow, the model's predictive accuracy improves.

Embeddings as Geospatial Data

Foundation models learn to create embeddings, which are numerical representations of words, images, and other data. In geospatial models, embeddings encapsulate the essential properties of each location, such as geographic coordinates and contextual information like environmental factors.

Also, embeddings can be stored as feature layers in ArcGIS, where each geographic feature carries its own multidimensional embedding as part of its attributes. Machine learning tools in ArcGIS can use such embedding datasets for clustering; classification; regression; or other analysis tasks, including predicting places where certain things—like species or buildings—might be found.

Remote Sensing Foundation Models in ArcGIS

Remote sensing foundation models are large-scale computer vision models designed to extract insight from satellite and aerial imagery. These models use Vision Transformer architectures that are trained via autosupervised learning on vast collections of satellite imagery. Unlike traditional models trained on everyday photos, these are specifically pretrained on optical, radar, lidar, and multispectral images of Earth's surface.

ArcGIS integrates several innovative remote sensing foundation models as ready-to-use backbones for geospatial deep learning. These models include Prithvi, Dynamic-One-For-All, and Clay. Esri is also developing its own model, designed to perform effectively across multispectral and high-resolution satellite imagery.

Location-Embedding Models

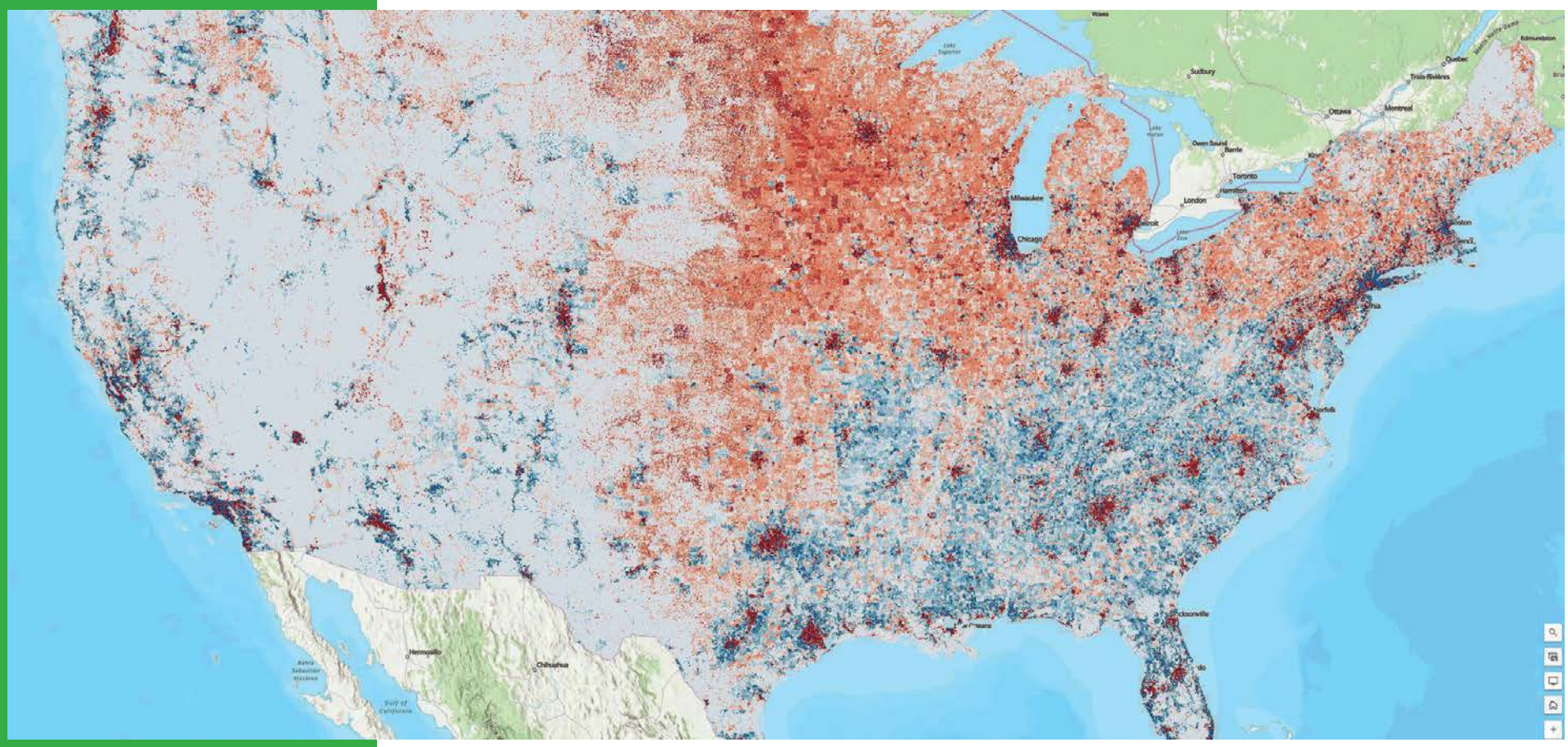
Location-embedding foundation models represent geographic coordinates as high-dimensional feature embeddings. These embeddings encode spatial context, capturing human-environment interactions, natural geography, and socioeconomic patterns. Unlike traditional approaches that treat latitude and longitude as simple numbers, these models learn to represent *place*, not just position.

ArcGIS integrates location embeddings with its AutoML machine learning tool to enhance regression and classification on vector data. Users access this via the Use Location Embeddings option in the Train Using AutoML tool in ArcGIS Pro. Esri is extending this approach to incorporate high-resolution imagery and curated demographic data.

The Road Ahead

As foundation models become central to geospatial science, their integration into ArcGIS marks a major step toward more intelligent, data-driven ways of understanding the world. Users can apply AI-based methods for geospatial analysis via graphical tools in ArcGIS, even if they don't have specialized programming expertise.

↓ Esri is developing new tools and workflows that simplify the use of geospatial foundation models and location embeddings (shown here on a map of the United States).



Latest Land-Cover Data Release Shows More Change Over Time

From vanishing forests in Central Europe to shifting agricultural patterns across continents, Earth's surface tells stories of environmental change that unfold year after year. Bearing witness to these chronicles are high-resolution land-cover maps, which decision-makers in many sectors and around the world use to understand land-use planning, resource management, surface water availability, food security, and more.

Esri is releasing updated global land-cover maps that extend the record of how the planet's surface has transformed since 2017. In addition to this data's being available in ArcGIS Living Atlas of the World, users can access it in a web-based app—Esri's Sentinel-2 Land Cover Explorer—which provides dynamic viewing and analysis capabilities.

"Anybody can drill in to a location of interest anywhere in the world to conduct analysis and gain a global perspective," said Robert Waterman, who leads the ArcGIS Living Atlas of the World imagery team at Esri.

A Growing Temporal Record

Esri released 2025 data for its Sentinel-2 10m Land Use/Land Cover Time Series in partnership with Impact Observatory, which provides AI-powered geospatial monitoring and on-demand data for environmental risk analysis. The update extends the dataset to eight consecutive years, from 2017 through 2025. Annual updates like this use the same deep learning methodology across all years to help ensure reliable comparisons.

"The more time slices we add, the more valuable it gets," said Waterman.

The maps identify nine surface classes including water, trees, crops, built areas, and bare ground. Government resource agencies use land cover as a basis for understanding trends in natural capital, which helps define planning priorities and budget allocations.

Ensuring Accessible Data

Making this information accessible is a key component of Esri's mapping initiative.

"Availability doesn't necessarily mean accessibility," Waterman said. "Up until recently, this kind of data was only accessible to those with the hard skills and financial and computing resources required to process it."

That's why Esri decided to democratize access by developing the Land Cover Explorer app. It lets users visualize changes in land cover through Animate and Swipe modes, filter by class, and view statistical coverage charts.

More than 10 million GIS users have direct access via web services in ArcGIS Living Atlas. Esri also makes the data available for download through the Land Cover Explorer app. To ensure that everyone can use these maps and downloads, they are distributed using a Creative Commons by Attribution (CC BY 4.0) license.

Real-World Applications

Having annual data allows users to understand how things have changed and help predict how things might change into the future, Waterman explained. The time-series approach is particularly valuable for detecting environmental transformations that unfold gradually. The maps support monitoring of forest cover changes, agricultural cycles, and urban expansion patterns.

One application of the maps involves tracking forest loss in Germany, where bark beetle infestations have devastated spruce stands. Between 2018 and 2021, Germany lost about 5 percent of its forests, mainly due to beetles, drought, and storms. A land-cover time series helps visualize these changes.

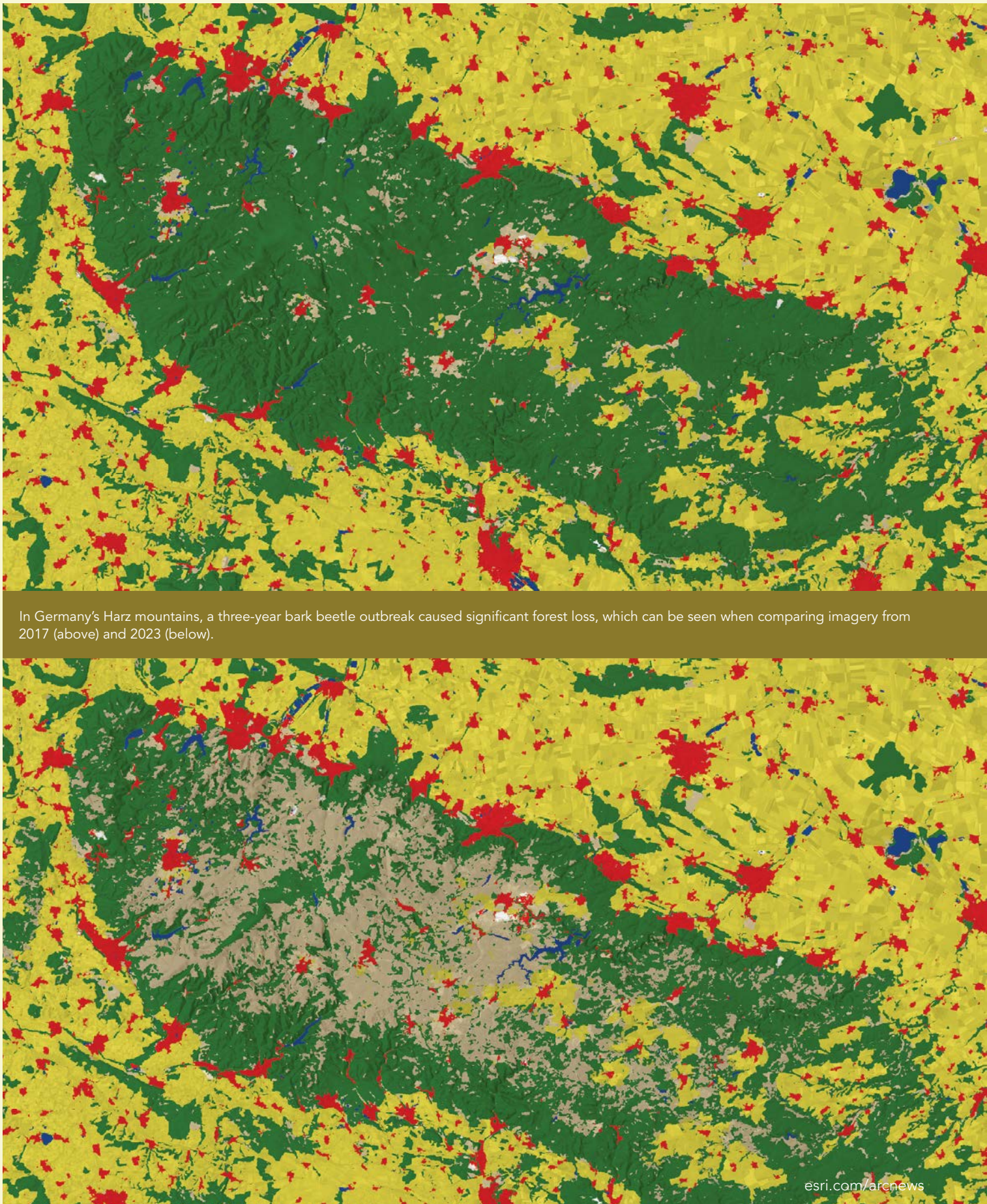
Technology and Accuracy

Impact Observatory's deep learning model processes more than 2 million Earth observations annually from Sentinel-2's multispectral imagery. The approach scales computing resources in the cloud to generate global coverage in days rather than years.

Thanks to this unique methodology, an entire year of observations can be processed and mapped globally in a matter of days. But while the maps excel at regional and global-scale analysis, highly localized results can vary, according to Waterman.

"It's important to keep in context what this map is," he said. "Given the spectral and spatial resolution of the source data, coupled with the classification strategy and methodologies, its strengths are rooted in global and regional applications."

The 2025 land-cover data is readily accessible at livingatlas.arcgis.com/landcoverexplorer.



In Germany's Harz mountains, a three-year bark beetle outbreak caused significant forest loss, which can be seen when comparing imagery from 2017 (above) and 2023 (below).

How AI Is Reshaping US Electricity Rates

The electricity industry landscape in the United States is entering a transformative era. For decades, retail electricity prices rose gradually, largely in step with inflation and infrastructure costs. Over the last several years, however, a new set of drivers—the explosive growth of data centers and AI workloads—has begun to reshape how power is consumed, planned, and priced across regions.

A newly published ArcGIS Living Atlas of the World layer, USA Electricity Rates - Electric Retail Service Territories and Hexagons, provides spatial and temporal insight into how residential electricity rates have changed from 2000 through 2024. The layer is a resource for planners, policymakers, utilities, and researchers seeking to understand emerging electricity cost patterns in the near future.

Rising Demand, Rising Rates

Electricity demand nationwide has surged alongside digital infrastructure growth. Hyperscale data centers—essential to cloud computing, AI training, and real-time apps—consume vast amounts of power, often comparable to small cities. In 2023, US data centers accounted for roughly 4 percent of national electricity use, with demand projected to grow significantly by the end of the decade, according to a recent report from the US Department of Energy.

At the same time, residential electricity prices have climbed. According to the US Energy Information Administration (EIA), the average price of electricity in the United States increased by nearly 10 percent between 2022 and 2024, with additional increases projected through 2026. These changes reflect a combination of factors:

- Deferred infrastructure investment and grid hardening in response to extreme weather
- Rising operational costs tied to aging generation and transmission systems
- Rapid load growth driven by energy-intensive AI and data center facilities

Mapping Trends and Geographic Variability

The ArcGIS Living Atlas layer integrates EIA electricity rate data with electric retail service territory boundaries and introduces hexagon grids to improve visual clarity and analytical consistency. By using uniform spatial units, analysts can compare rate trends across regions without distortion from irregular utility boundaries.

Key patterns revealed by the dataset include the following:

- Broad nominal electricity rate increases over the past two decades
- Inflation-adjusted regional differences, including areas with real price declines driven by efficiency gains or competitive markets
- Emerging hot spots where electricity rates have risen sharply over the last two years, often aligning with areas that are rapidly developing data centers

Interactive maps derived from the layer, including percent-change and cents-per-kilowatt-hour views for 2022–2024, help reveal where affordability challenges may be intensifying.

Using H3 Hexagon Grids for Consistent Spatial Analysis

To support consistent analysis of electricity rate trends nationwide, the ArcGIS Living Atlas layer uses H3 resolution 5 hexagon grids created in ArcGIS Pro. H3 is a global, hierarchical hexagonal indexing system that provides uniform spatial units, reducing the distortion caused by irregular service territory boundaries. Resolution 5 hexagons offer an effective balance between geographic detail and performance, supporting regional-scale analysis while maintaining visual clarity.

When the H3 grid was generated in ArcGIS Pro, it was filtered to include only hexagons that intersect electric retail service territories, ensuring that all summarized values represent areas where electricity rates apply. Electricity rate features were then aggregated to the hexagons using the Spatial Join tool.

Within Spatial Join, the Field Map parameter was used to calculate descriptive statistics for each hexagon, including median, mean, and maximum electricity rates. The median provides a measure of central tendency, the mean reflects overall average conditions, and the maximum highlights localized high-cost areas.

Using hexagons improves comparability, scalability, and map readability, making it easier to identify regional patterns and emerging hot spots associated with data center- and AI-driven electricity demand.

Data Centers, AI, and the Grid

The scale of modern data center energy use is reshaping utility load profiles across the country.

For example, in an area stretching from North Carolina to Pennsylvania to Michigan that is served by one regional transmission organization, the PJM Interconnection, data center demand has become a dominant source of new load growth. This has prompted significant investments in generation, transmission, and distribution infrastructure. Recent results from PJM capacity auctions, which ensure that enough electricity is available for future demand, reflect tightening supply relative to demand, signaling upward pressure on future electricity costs.

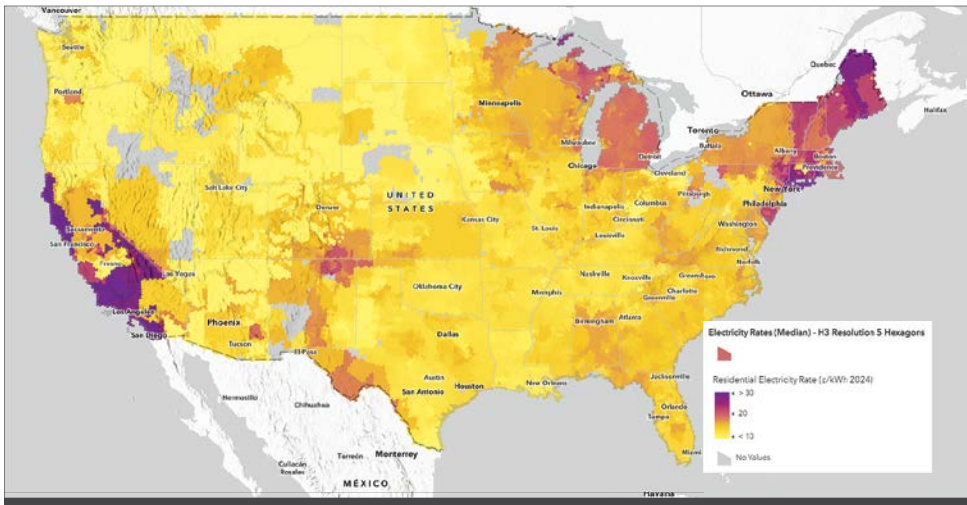
Looking ahead, forecasts suggest that by 2030, data centers could consume up to 12 percent of US electricity, intensifying challenges for grid reliability and long-term planning. Utilities and regulators are increasingly grappling with how to accommodate large industrial loads while maintaining equitable rate structures for residential customers.

Planning for the Future

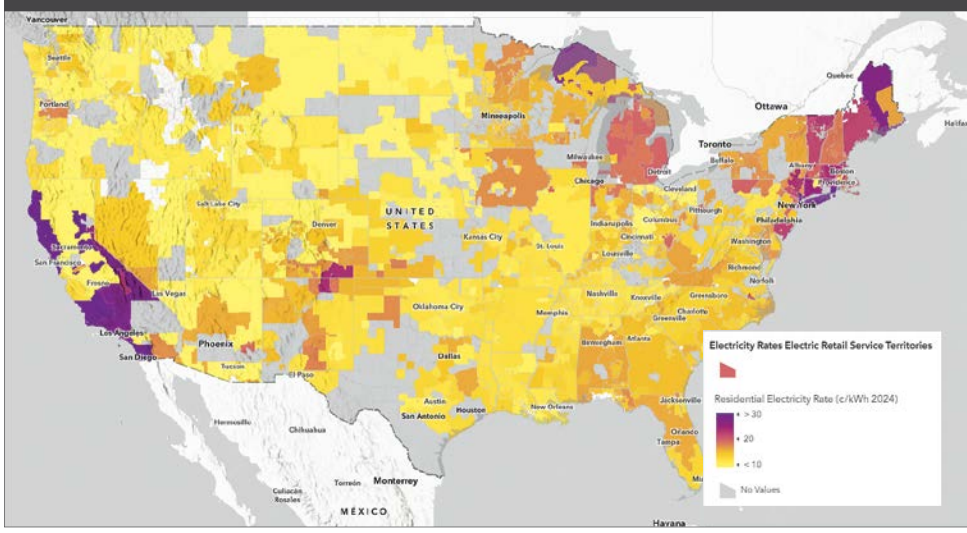
Understanding the evolving electricity landscape requires both robust data and strong spatial context. The ArcGIS Living Atlas layer enables users to

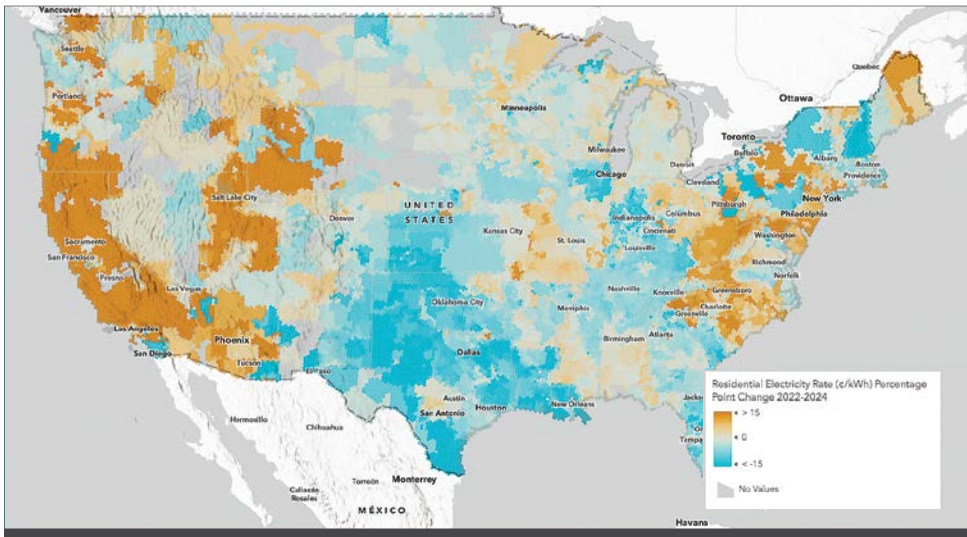
- Conduct spatial analysis of electricity rate changes at local, regional, and national scales.
- Do temporal comparisons that highlight how regions have diverged over time.
- Plan different scenarios to assess future demand growth, infrastructure needs, and rate impacts.

As AI-based computing demand continues to accelerate, resources like the USA Electricity Rates layer provide visibility into how past trends are shaping today's electricity markets—and can help stakeholders anticipate the challenges and opportunities ahead.

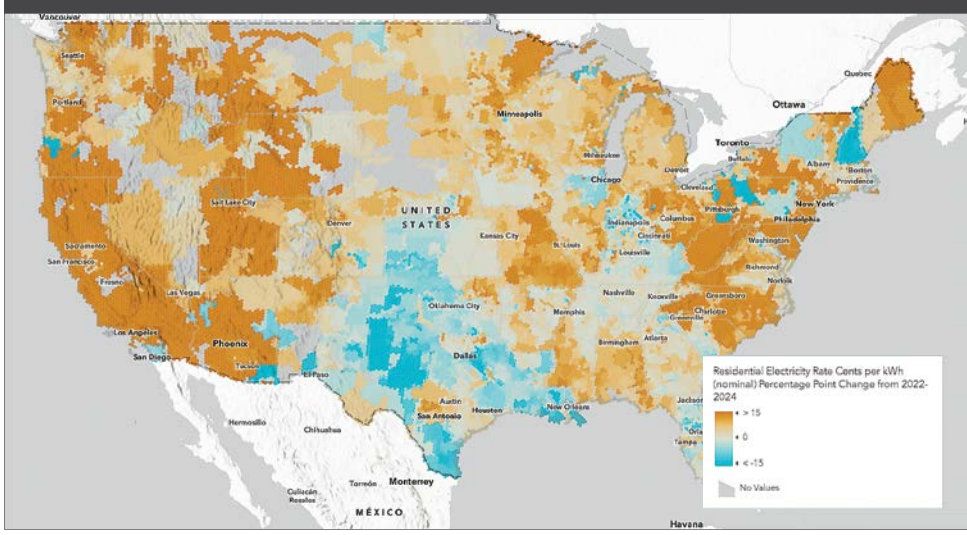


H3 resolution 5 hexagons, shown in the map above, reduce the distortion caused by irregular service territory boundaries, shown in the map below.





Electricity rates have generally gone up from 2022 to 2024, shown as a percent change in the map above and relative to what they were before (a nominal percent change) in the map below.



Esri Achieves International Security Certification

ISO 27001 Provides Additional Assurance for Organizations Around the World

All organizations face increasingly complex data protection and security requirements. Esri has taken a significant step forward in supporting its users' data security needs by achieving the ISO 27001:2022 certification.

Customers using ArcGIS Online and ArcGIS Location Platform products hosted in the European Union and other regional data centers have long requested more stringent alignment with local data standards. Now, this Esri technology meets those requirements.

What ISO 27001 Means for ArcGIS Users

ISO 27001 is recognized globally across more than 170 countries as a premier standard for information security management systems. Unlike industry-specific certifications, ISO 27001 provides a comprehensive framework for protecting organizational data through systematic risk management and continuous improvement.

For Esri customers, here's what the certification offers:

- Independent validation of security controls protecting geospatial data
- Compliance support for organizations subject to European Union data protection regulations
- Risk management assurance through internationally recognized standards
- Ongoing security commitment verified through annual surveillance audits

Building on FedRAMP Foundations

Esri's existing Federal Risk and Authorization Management Program (FedRAMP) Moderate authorization for ArcGIS Online in the United States—which took effect in 2024 with no disruption to users—put the company on an accelerated path to ISO 27001 certification. Both security frameworks share principles on risk management, access control, and continuous monitoring, allowing Esri to leverage its robust security infrastructure to meet international standards.

The certification process involved a comprehensive independent assessment of Esri's Information Security Management System that evaluated technological, organizational, and people-based procedures. Maintaining the certification requires annual surveillance audits to ensure that Esri continues to meet evolving security requirements.

A Seamless Transition for Existing Customers

All Esri users automatically benefit from the technology's certified security controls, with no action required on their part.

Organizations that are considering implementing ArcGIS cloud services can now reference the ISO 27001 certification when evaluating security requirements and demonstrating compliance to stakeholders.

For more information about Esri's commitments to security, privacy, and transparency, visit the ArcGIS Trust Center at trust.arcgis.com.

Customized Esri Training Helps Utility Modernize Workflows

↑ Employees did hands-on exercises using real data to make learning stick.

The Albuquerque Bernalillo County Water Utility Authority reached a milestone in its GIS journey in 2024. With guidance from Esri experts, the Water Authority began its migration from a legacy ArcMap technology-based geometric network model to ArcGIS Pro and ArcGIS Utility Network, the modern solution that helps utilities unlock new GIS capabilities for data accuracy, infrastructure modeling, and operational efficiencies.

The Water Authority's migration went beyond technology replacement. Leaders took a people-centered approach to manifest an organization-wide shift. Training from Esri played a pivotal role in the organization's successful transformation.

Strategic Planning, Tailored Support

As the largest water and wastewater utility in New Mexico, the Albuquerque Bernalillo County Water Utility Authority serves more than 650,000 water users across city and county boundaries. The organization manages water distribution, wastewater collection and treatment, and reclaimed water delivery.

Like many established utilities, it had long depended on ArcMap and the geometric network model for GIS data editing, network visualization and analysis, and asset management workflows. But with the retirement of ArcMap in March 2026 and a growing demand for smarter infrastructure, the organization saw an opportunity to modernize.

"Staff were really looking for better support for network tracing and quality assurance," said Kathryn Browning, an Esri technical adviser who works closely with the Water Authority. "ArcGIS Utility Network provides all the functionality they need, but it also requires a different way of thinking about data."

Because adopting ArcGIS Utility Network required migrating to ArcGIS Pro and implementing a new model for multiuser data editing, the modernization effort was multilayered. Familiar apps and everyday workflows would be completely replaced.

Paul Davidson, GIS IT application supervisor at the Water Authority, recognized the technical and cultural impacts of the modernization effort. "Adopting [ArcGIS] Utility Network required a paradigm shift, and we knew we needed to bring everyone along for the ride," he said.

As a member of the Esri Advantage Program, the Water Authority has access to Browning and other experts, who helped Davidson plan a holistic approach to the transition. A robust technology implementation plan was accompanied by a tailored workforce training program crafted by Esri senior training consultant Tosca Ruege. The training program supported the short-term learning needs of technical staff while also addressing key skills development that would be needed to sustain efficient operations in the long term.

"Having that level of coordinated support through the Advantage Program made a big difference," said Ruege. "We were able to align training directly with staff's migration timeline, reinforce learning using the context of their specific workflows and data, and work toward a unified vision of the future."

A New Kind of Learning Experience

When the Water Authority's new technology was deployed, Davidson consulted with two colleagues: GIS administrator Marshall Grebe and GIS system analyst II Jessica Ridout. Most of the editors had limited experience with ArcGIS Pro. Some team members had attended ArcGIS Utility Network courses before the new system was in place. Months later, information retention was low, since they hadn't immediately applied their new skills.

Davidson, Grebe, and Ridout agreed that their teams needed a unique training experience to fully prepare for the transition. What they got was a hands-on, role-specific refresher that brought everything together—including their people.

Working with Ruege and Esri instructor and principal technical lead Jim Gough, Davidson, Grebe, and Ridout designed a custom, three-day private class that combined content from two of Esri's standard ArcGIS Utility Network courses. The class was augmented with coaching sessions, during which Gough provided expert guidance as participants worked with a copy of the Water Authority's data in course exercises instead of the standard course data. Esri's training systems team also created a virtual machine environment that simulated the Water Authority's utility network, providing a safe space for the class to practice new workflows while learning their new system's interface.

"This wasn't generic data being used, and the course concepts weren't theoretical. Students were solving problems they actually encounter," Gough said.

Gaining Clarity on Complex Concepts

The class brought together GIS editors, administrators, modelers, and IT professionals to explore branch versioning, topology, network tracing, and attribute rules—topics that can be abstract without familiar context. Branch versioning (the multiuser editing model used with ArcGIS Utility Network) was a particular source of confusion. In-depth class discussions and examples using the Water Authority's own data sparked a breakthrough that changed everything.

"Once we explained how it works, you could see the lightbulbs go off," said Gough.

Davidson agreed. "That class was an aha moment for me. It helped me understand how [ArcGIS] Utility Network fits our needs," he said. "And it wasn't just me—everyone came out of it energized."

More than Training—Team Building

Beyond the technical knowledge gained, the training helped clarify how different departments interact with GIS, and it unified staff across roles and departments. They all left with a shared vocabulary and understanding.

"We had our water modeler, compliance staff, and utility development folks in the room," Davidson said. "The training helped us all understand how the pieces fit together."

Gough, who has taught hundreds of classes in his 22 years at Esri, knows firsthand how beneficial a shared learning experience can be for teams.

"Having everyone in the same room—learning together, using the same terminology—is huge," he said. "It eliminates confusion and builds a stronger foundation for collaboration."

Browning agreed. "You can't overstate the value of a shared experience when implementing new technology," she said. "When people understand not just the how but the why, it brings teams together in powerful ways."

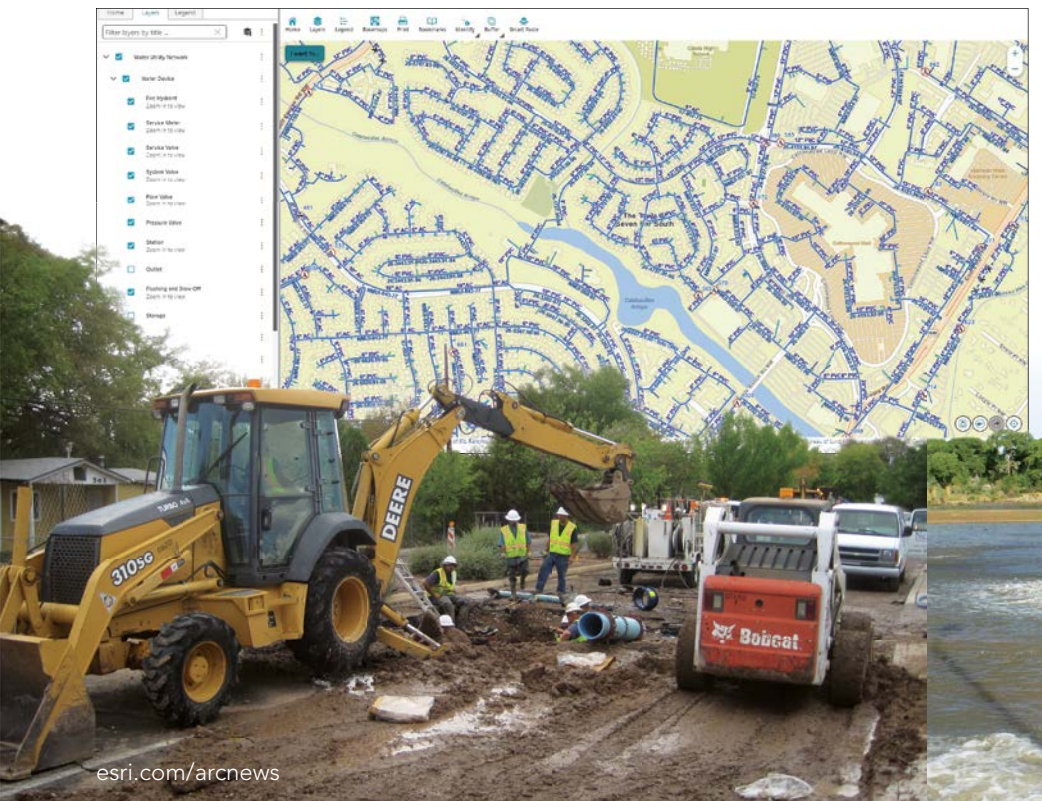
This was certainly the case for the Water Authority. Davidson organized a lunch for participants the day after class ended. "I thought no one would show up—they'd be burned out," he recalled. But instead, he said, "they were excited. They couldn't stop talking about it."

Davidson appreciates the long-term value of the private class. "We've done training with other vendors where it's just a four-hour lecture. Six months later, no one remembers it," he said. "Esri's format—with hands-on exercises, real data, and experienced instructors—makes the learning stick."

A Holistic Model for Modernization

Technology will continue to advance, empowering organizations with new capabilities to optimize their operations. As leaders at the Albuquerque Bernalillo County Water Utility Authority discovered, partnering with experts to strategically plan innovative enterprise technology implementations, paired with aligned and timed workforce preparation, is a formula for success.

From Browning's viewpoint, a holistic approach was the key ingredient. "It was an intentional strategy to support real modernization, tailored to their goals and their team," she said. "The people and planning brought the vision to life."



← Adopting ArcGIS Utility Network required migrating to ArcGIS Pro and implementing a new model for multiuser data editing.

↙↓↘ The Albuquerque Bernalillo County Water Utility Authority serves more than 650,000 water users.

Metro de Medellín Builds an Intelligent Asset System with ArcGIS Enterprise

Managing 1,330 properties scattered across a sprawling transit network is complex, requiring financial analysis, tenant relations, maintenance, and strategic planning. When the number of properties is about to nearly double, effective management becomes critical.

Colombia's second-largest mass transportation system, the Metro de Medellín, faced this challenge. The organization needed to ensure regulatory compliance, maximize commercial opportunities, and maintain public safety across a growing real estate portfolio. The solution was a specialized real estate asset system called Sistema de Activos Inmobiliarios, or SAI. Built on ArcGIS Enterprise, SAI has helped the Metro de Medellín optimize operations and improve efficiency.

A Complex, Interconnected Area

Located in the Andes Mountains at an altitude of about 5,000 feet, Medellín is part of the Aburrá Valley. The city is administered by the Aburrá Valley Metropolitan Area, which manages 10 municipalities, with Medellín as its core city.

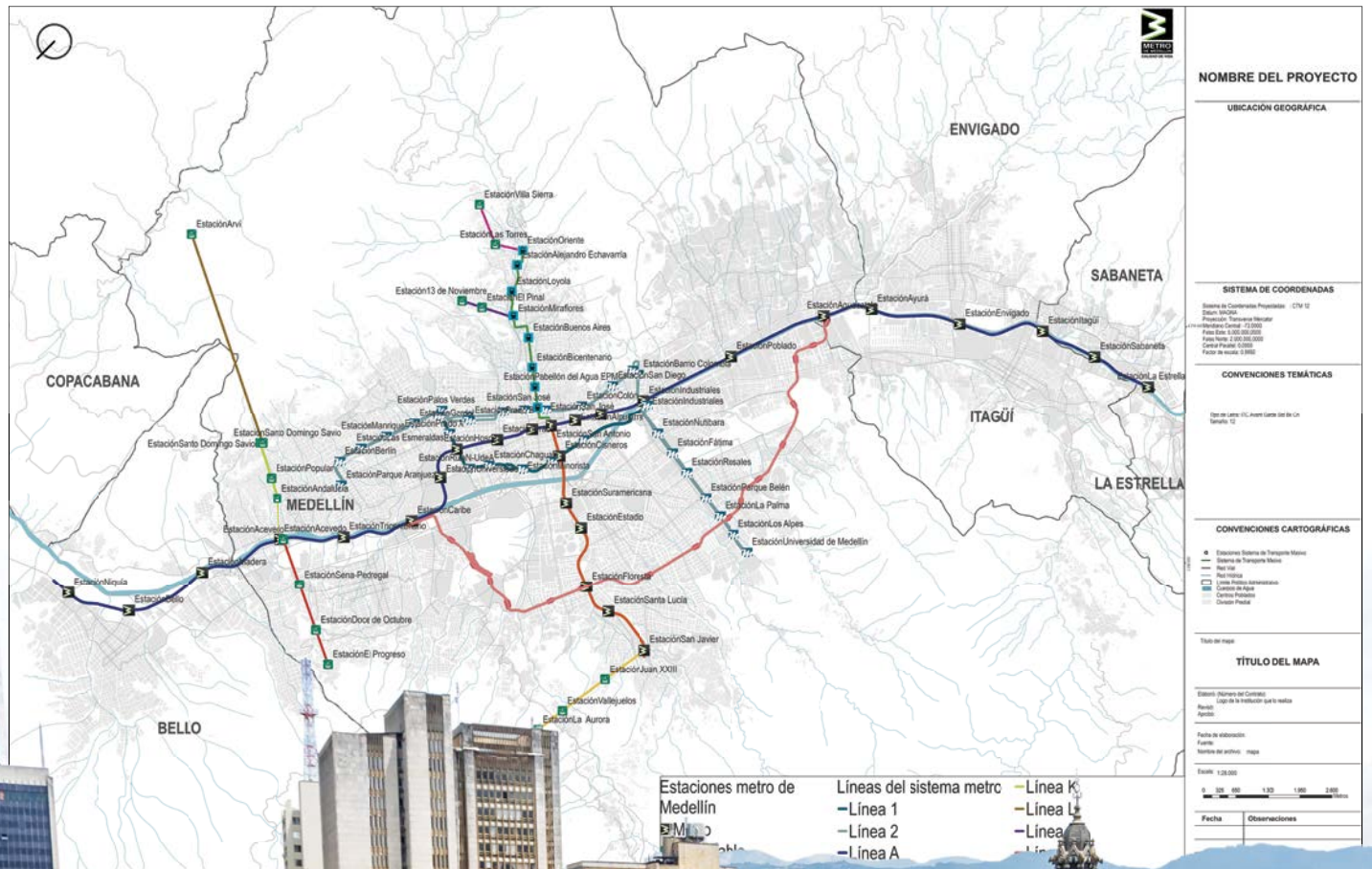
One of the challenges that residents of the valley face is mobility. To address this problem and promote integration between municipalities, the Aburrá Valley mass transportation company—known as the Metro de Medellín—was founded in 1979. It builds, operates, and manages a mass transportation system aimed at promoting development and improving quality of life for the region's inhabitants.

As of 2025, the Metro de Medellín public transportation network included 27 train stations, 28 bus rapid transit stations, 20 cable car stations, and 9 tram stations. The network spans six municipalities and includes integrated routes to nearby areas, transporting more than 308 million passengers every year.

Planning for Growth

The Metro de Medellín implemented ArcGIS Enterprise in 2017, and it became the organization's first real estate management system. Initial development included creating an enterprise geodatabase to centralize the location and management of geospatial data, as well as an open data platform to simplify data access and reduce data requests.

Benefits included enhanced route tracking, improved vehicle management, and faster emergency response. Staff also used ArcGIS Enterprise to develop a system expansion plan, with a goal of expanding the system network with additional or augmented public transit lines.



← The Metro de Medellín transportation system includes dozens of stations across Colombia's Aburrá Valley.

↓ Launched in 1995, the Metro de Medellín transports an average of more than 308 million passengers per year.

The software platform also helped the company develop a smart card app. The app enables contactless payments across Medellín's public transportation system, including the metro, buses, and a bike-sharing system.

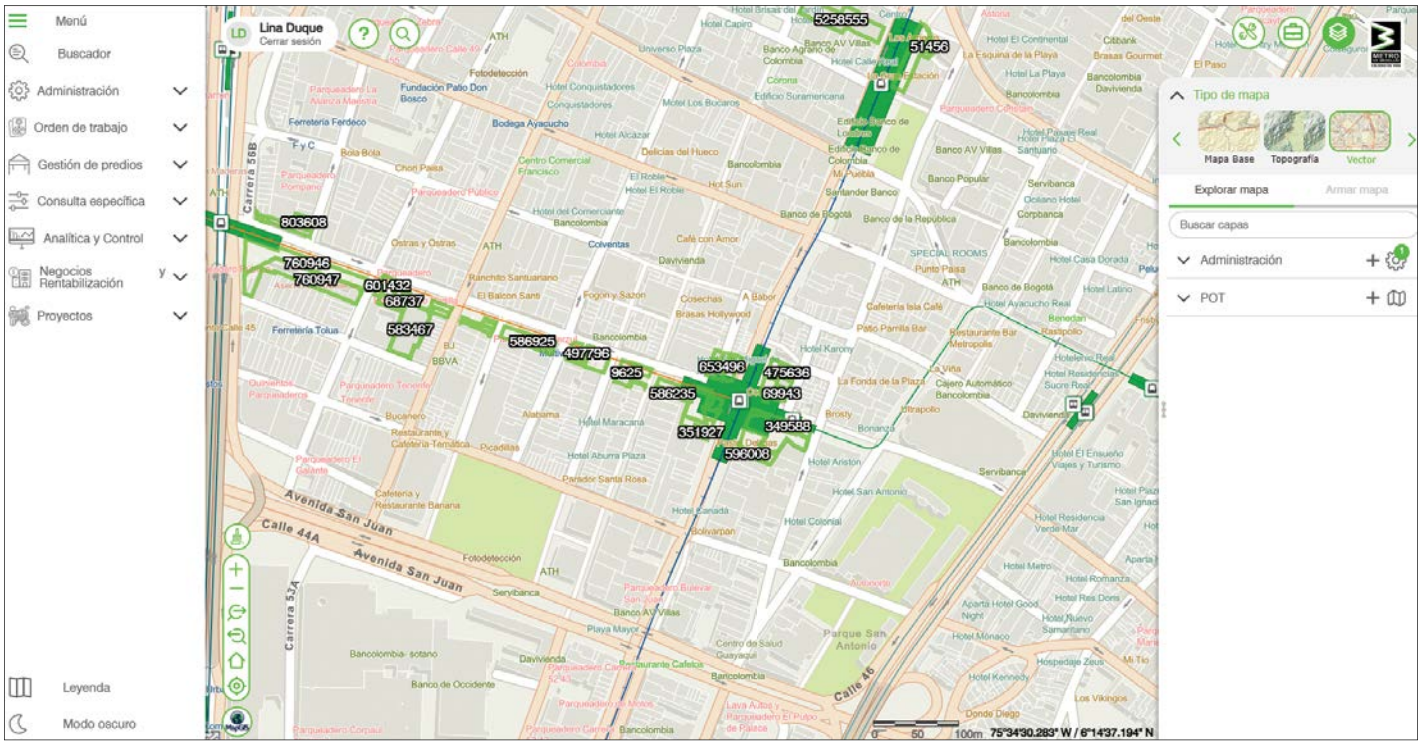
More recently, the company developed the SAI to provide the extensive spatial analysis capabilities the company needs to manage its real estate assets. Eventually, the system will incorporate AI to further optimize asset management and profitability.

Refining Real Estate Asset Management with Geospatial Analysis

"The SAI arose from the Metro de Medellín's need for an innovative technological tool based on geospatial data," said Lina María Duque González, a GIS professional at the Metro de Medellín. "It enables the agile and timely management of properties, commercial spaces, and other real estate assets."

The SAI platform also helps ensure compliance with Colombia's Land Administration Domain Model, a framework for land administration that improves data interoperability and resolves ownership issues.

As of February 2026, the Metro de Medellín manages approximately 1,330 properties. The new 80 Avenue line—scheduled to open in 2028—will add 1,239 more. This will bring the total to 2,569, Duque said, adding that geospatial analysis allows the Metro de Medellín to determine the best use of these properties for residents and the company.



↑ A drop-down list in the Metro de Medellín's real estate asset system allows users to turn linked layers on and off, load new information in different formats, and create and customize maps.

The Metro de Medellín developed the SAI by integrating the company's corporate systems—including ArcGIS Enterprise and other enterprise software—in a process that took more than a year. The SAI's administrative modules include data visualization, work order management, tax and legal requirements, commercial and profitability information, management tracking, and historical documentation.

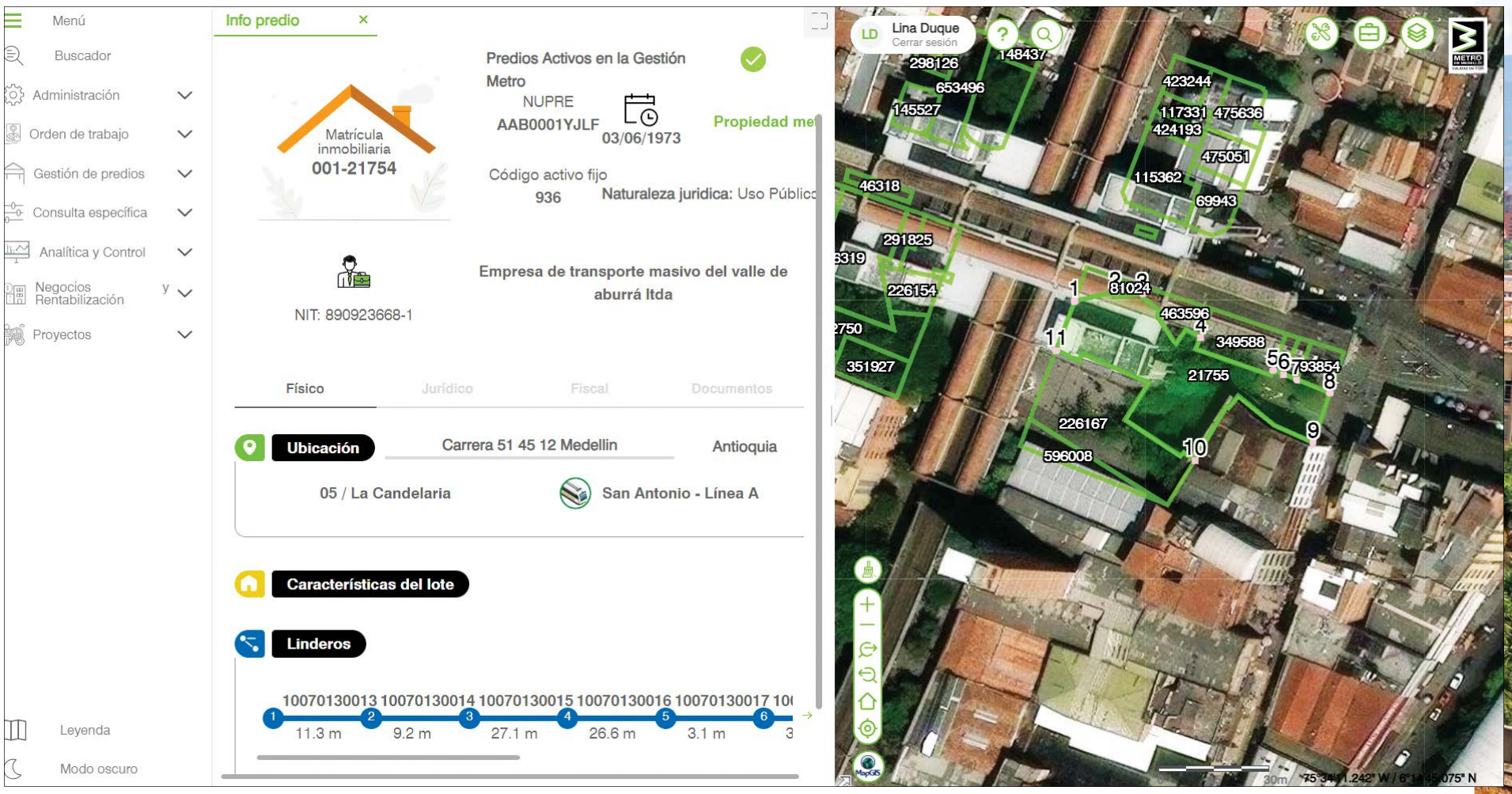
"Thanks to the inclusion of national standards in the SAI and the integration of recognized management systems, the platform can be easily adapted to enable other organizations in the region to manage their real estate assets," Duque said. "We hope to expand this capability in the future."

The ArcGIS technology used in the SAI system is integrated with the Metro de Medellín's corporate geodatabase to process cartographic information. Staff use ArcGIS Maps SDK for JavaScript to create web apps. ArcGIS Server broadens data access by providing web access to SAI data. And ArcGIS Survey123 has transformed the Metro de Medellín's asset inspections and maintenance workflows by enabling staff to collect data from around the transportation system and upload it to the SAI.

Data Centralization Results in Savings

All departments at the Metro de Medellín can use the SAI system to obtain information about the company's properties. Data centralization increases productivity and helps minimize the duplication of efforts in real estate asset management. These GIS solutions have streamlined workflows and boosted efficiency across the organization.

"Proper management of real estate assets has allowed us to reduce the tax burden on the company's properties," Duque said. "We generated savings of $2.71 million between 2021 and 2024."



↑ A pop-up window in the Metro de Medellín's real estate asset system allows users to see the physical, legal, and fiscal status of the company's properties.

In Atlanta, GIS Transforms Data into Community Impact

Home to nearly half a million residents, Atlanta, Georgia, is one of the most diverse cities in the Southeastern United States, according to US census data. A rich demographic mix of Black, white, Hispanic, Asian, and multiracial populations span urban and suburban neighborhoods. Residents have varying income and education levels, as well as employment opportunities in fields that range from government and education to film and small business. These varying lifestyles influence everything from housing and business development to transportation, food access, and neighborhood investment.

To foster prosperity and equity across its diverse communities, the city's economic development authority, Invest Atlanta, is now leveraging interactive maps and visual storytelling to turn complex datasets into actionable insight. Invest Atlanta's use of GIS technology, particularly ArcGIS Online, has enabled initiatives in affordable housing, small business growth, and neighborhood revitalization with precision and transparency.

Quickly Deploying Different Tools

When Invest Atlanta started using GIS to give clarity to economic and social data, it changed the authority's approach to economic development, according to Nicole Torno, manager of data analysis at Invest Atlanta. Torno described this as a twofold transformation—of technology and communication—that addresses the technological challenges often faced by municipal teams and nonprofit organizations.

"One of the great things about ArcGIS is that I have one license for a platform that enables me to develop and deploy a lot of different tools a lot more quickly than if I were to write code to deploy a web app myself," she said.

This functionality and flexibility enable Invest Atlanta to rapidly create and release web apps and interactive maps. Instead of stakeholders having to wait for data, which can delay critical projects, they get access to it quickly in easy-to-understand formats.

The second aspect of the organization's transformation is communication. GIS technology provides a personal and relatable way to convey the importance of Invest Atlanta's work, Torno explained.

"People relate to maps, and when you give community members something interactive to work with, it allows them to feel a personal connection to that data they're looking at," she said.

Promoting Equity and Prosperity

Invest Atlanta's decision to use ArcGIS Online was inspired by the success of its partners. Torno's predecessor noticed that many of the organizations Invest Atlanta worked with—including the City of Atlanta and local counties—had gained a lot from using ArcGIS. The platform's ease of use and the availability of valuable data in ArcGIS Living Atlas of the World led Invest Atlanta to acquire its own ArcGIS license in 2021.

Today, GIS technology is essential to Invest Atlanta's goal of advancing equity and prosperity for all in Atlanta. The organization has specific place-based key performance indicators (KPIs) that are part of its strategic plan, including investing in places that have historically lacked opportunities for economic advancement. For example, Invest Atlanta mapped the areas where residents face the highest risk of getting displaced from housing to discern who should benefit from an antidisplacement tax relief initiative. The initiative pays property tax increases for low-income seniors so that they can continue living in their homes.

Likewise, the GIS-powered City of Atlanta Affordable Housing Tracker (links.esri.com/atl-housing) is a critical tool for monitoring progress toward Atlanta's goal of creating or preserving 20,000 affordable homes by 2026. Invest Atlanta collaborates with Atlanta Housing and the City of Atlanta to show progress toward city housing goals, while interactive maps help identify suitable locations for new affordable-housing developments. Tools such as the neighborhood planning units dashboard (links.esri.com/atl-npu) use census tract data to help organizations understand and address disparities in economic mobility and build support for neighborhood revitalization.

GIS has proved critical for Invest Atlanta to monitor its progress in intentionally investing in the areas of greatest need.

"If we weren't using geospatial analysis to question where in the city our projects are and where our money is going, we would never be able to track that accurately," Torno said.

Local public mapping databases also help Invest Atlanta verify parcel information, zoning, and eligibility for incentive programs such as Tax Allocation Districts (TADs), which guide Atlanta's reinvestment in underserved communities for infrastructure, blight remediation, and affordable housing. TAD-funded success stories that Invest Atlanta supported include the City of Refuge Transformation Center, which provides housing solutions, employment help, and basic medical care to residents of an underserved area; and Azalea Fresh Market, a first-of-its-kind municipally run grocery store in Atlanta's downtown area.

Supporting Small Business Growth

Invest Atlanta uses GIS-powered insights to foster small business development as well. One notable example is when unforeseen business disruptions occur and Invest Atlanta has relief funds to disburse. When a water main break impacted small businesses, for instance, eligibility for recovery grants was mainly determined by whether businesses were located in the impact area.

That program set the precedent for how other grants have been handled since then. When Atlanta's Cascade Road experienced two years of delays on a construction project—reducing traffic and customer access to shops, restaurants, and service providers—precise mapping ensured that financial assistance reached the businesses most in need. It also provided clarity.

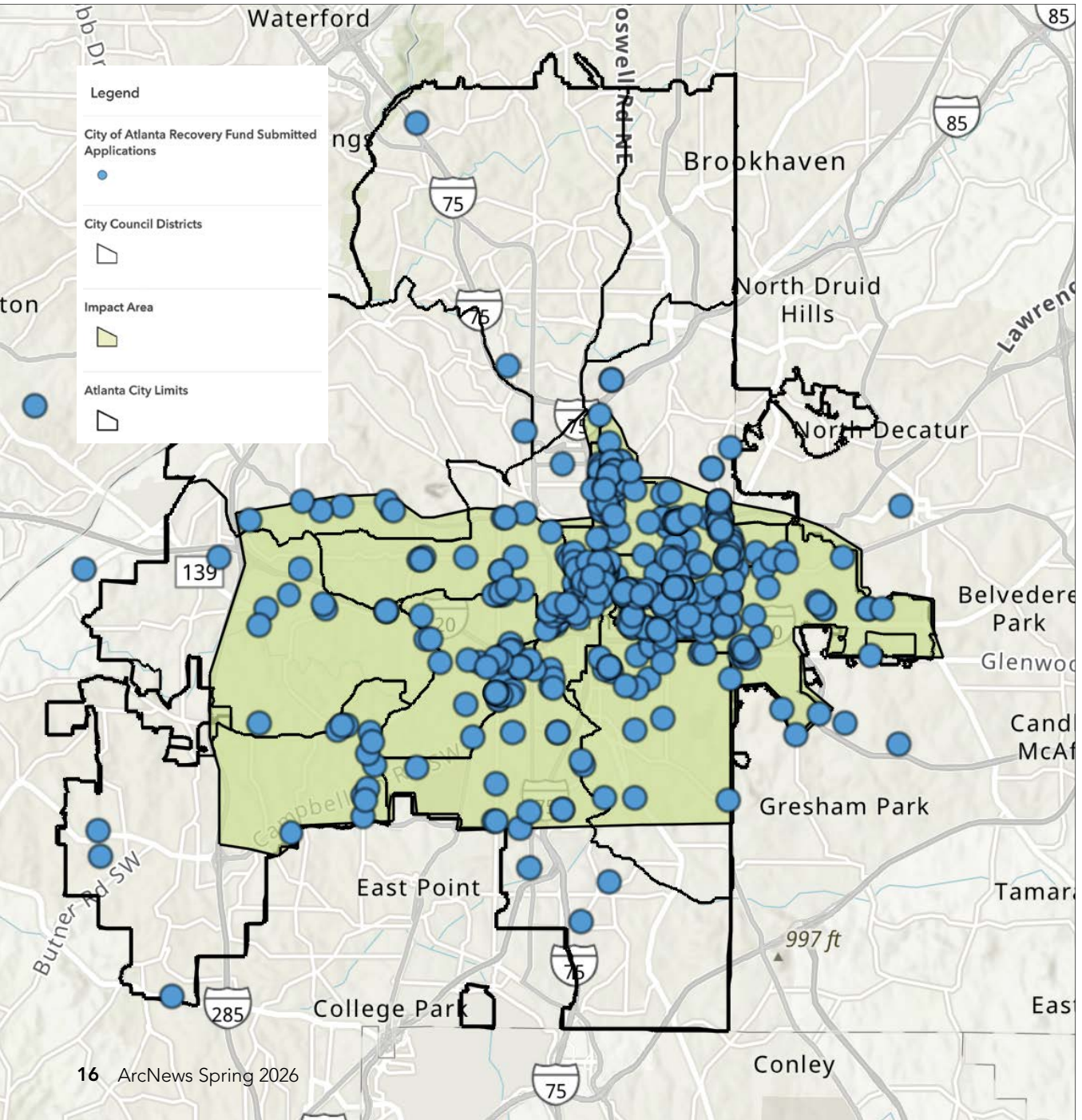
"By being able to show people exactly where [the area of eligibility] is, exactly how they're eligible, and how we're going to verify their eligibility, you have a really high level of data transparency," Torno said.

To ensure that its GIS tools and data are accessible to small business owners, Invest Atlanta focuses on clear communication and user-friendly design with simple instructions and intuitive interfaces, Torno explained. This includes providing direct links to maps, splash screens with usage instructions, and accessible legends that avoid jargon. Features such as direct search capabilities and hiding less relevant layers make the tools useful for busy entrepreneurs.

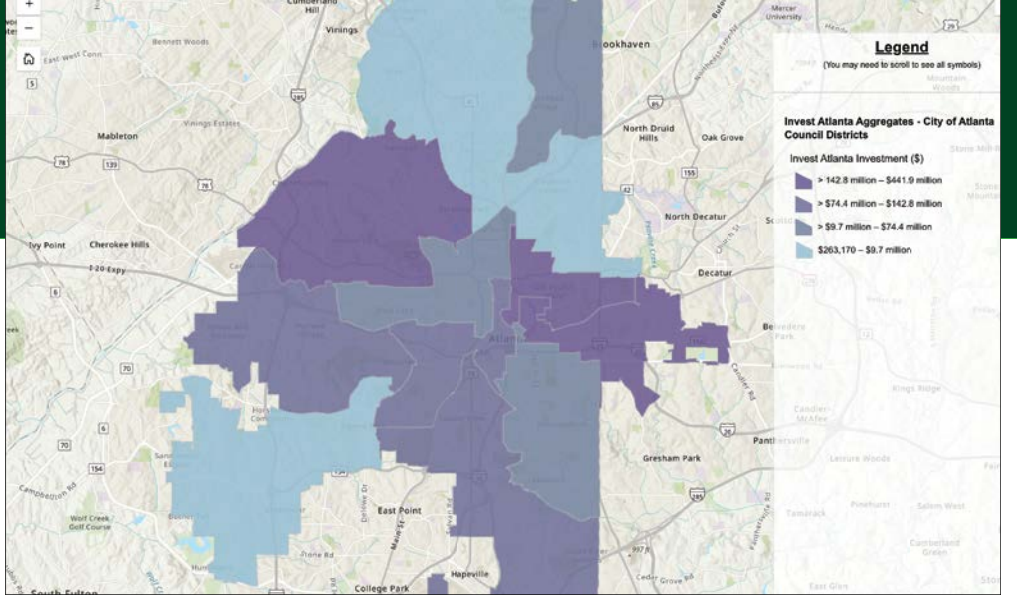
Measuring Impact and Future Horizons

Invest Atlanta measures the success and impact of its GIS-driven initiatives through place-based KPIs, such as the percentage of investment in underserved neighborhoods and the proportion of small businesses served in those areas. The marketing team also tracks website visits; unique page views; and time spent on pages, including those featuring interactive maps and KPI dashboards. While specific performance metrics for individual GIS tools are not yet established, these tools are integral to the success of broader programs.

↓ After a water main break, Invest Atlanta mapped which small businesses were eligible to submit recovery grant applications.



→ Using an ArcGIS Experience Builder web app, stakeholders can see all the projects Invest Atlanta is working on.



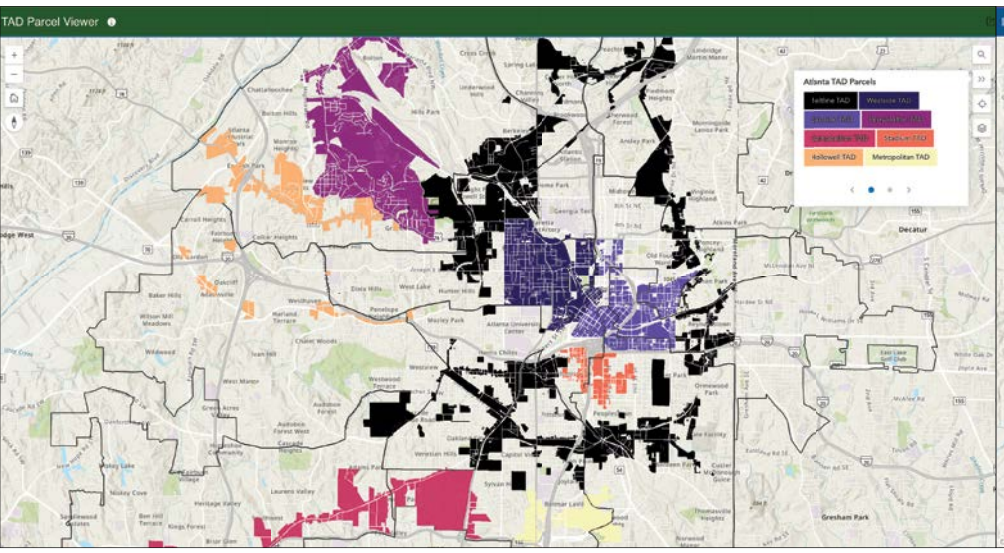
Reflecting its commitment to transparency in reporting, Invest Atlanta offers an ArcGIS Experience Builder web app (links.esri.com/atl-investment) that allows anyone to easily view Invest Atlanta projects sorted by neighborhood, project type, and amounts invested.

"All of our projects are uploaded every single month so that people can see exactly what kinds of projects are being funded, know where our resources are going, and understand the impact directly," said Torno.

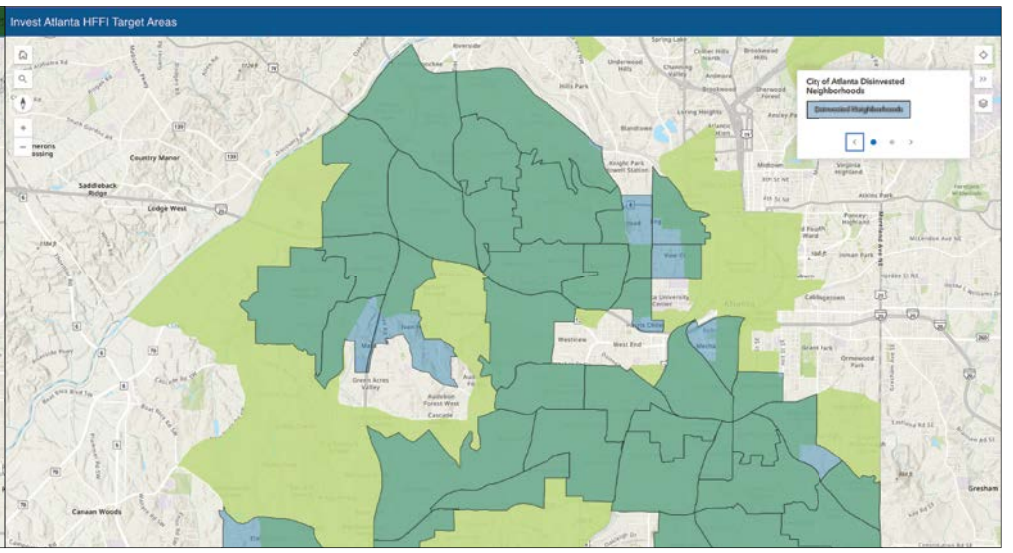
Plans for expanding its use of GIS include developing a more comprehensive way to track fresh food access initiatives. Invest Atlanta has created its own food desert dataset, and this custom data—combined with disinvested area maps—helps guide funding for projects that improve residents' access to produce and other healthy foods. The goal is to track progress toward the mayor's objective of ensuring that 100 percent of Atlantans have access to fresh food within a half mile of where they live. This will be similar to how the housing affordability tracker monitors Atlanta's housing goals. Enhanced collaboration with its partners is also a key focus for future GIS expansion.

Invest Atlanta's GIS approach stands out for its commitment to transparency and data integrity. Project data is uploaded monthly, allowing the public to see where resources are allocated and understand their impact. Invest Atlanta also often provides GIS services and data to city, county, and state entities that lack similar technical capabilities.

For more information about economic development resources available from Esri, go to links.esri.com/economic.



↑ Invest Atlanta uses maps to show parcel-level information on eligibility for incentive programs such as Tax Allocation Districts (TADs), which help guide Atlanta's reinvestment in underserved communities.



↑ For a federally funded food financing initiative, Invest Atlanta created a web map to show underserved neighborhoods (in blue) and food deserts (in light green) so that business owners could check for program eligibility.

While Learning Sports, Youth in Cape Verde Take a Shot at GIS

For five summers, young people in Mindelo, Cape Verde, have attended the AMINGA Youth Sports Development Program to practice handball, volleyball, and basketball with international coaches. But the learning goes beyond sports. Campers also receive instruction from international teachers in the arts, computer science, and English. And in 2025, AMINGA offered a course in GIS to strengthen students' understanding of geography's central role in daily life.

Working in groups of three, the campers—who hail from underserved areas of the island of São Vicente, part of the Cape Verde archipelago off the coast of West Africa—had two and a half hours to explore a topic and use ArcGIS StoryMaps to build a map-based narrative about it. The range of resultant stories included the histories of basketball and volleyball, an overview of the theory of continental drift, and detailed maps of tourist hot spots in Cape Verde.

According to those involved in the project, it was a success. The ArcGIS StoryMaps workshop brought a playful and enriching geography-based component to the summer camp, motivating campers to learn the basic concepts of geography while discovering new things about their world.

"It was a dynamic process that went very smoothly, and everyone worked incredibly hard," said Nuno Coelho, CEO of Esri partner ALL4INNOVATION, which was involved in the project.

A Team Effort to Build Curriculum

The geography program at AMINGA began to come together when one of the organization's cofounders, Sean Bennett, reached out to Esri chief scientist and oceanographer Dr. Dawn Wright. She had been a US Department of State science envoy to Cape Verde in October 2024, and he wanted to see if she would be interested in supporting Cape Verdean youth in learning geography and GIS. She was intrigued.

"Sport is the ultimate bridge builder between communities, cultures, and countries," Wright said. "Similar to maps, it is a type of universal language."

Wright brought in Dr. Jason Sawle, Esri's global industry manager for K–12 schools, to help develop curriculum. She also looped in Esri Portugal (Esri's official distributor of technology to Cape Verde) and Coelho, who, after 13 years working for Esri Portugal, took on a full-time leadership role with ALL4INNOVATION, which specializes in systems integration with a strategic focus on GIS.

Coelho got in touch with leaders from AMINGA to assess their needs. They wanted to spark participants' curiosity about geography and help them learn how to not only read and interpret maps but also add information to them. The team planned a series of field activities and classroom sessions.

They also built a hub for data sources that the young participants could interact with and use to develop their thematic projects. Bennett and his AMINGA cofounder Elisabete Gomes were instrumental in developing the platform, preparing the content, and sharing knowledge about the technology.

"Our job was basically to prepare the entire platform [and] help them organize the data and collect information," said Coelho. "The goal was for them to retain the know-how so they can later explain to … students in the classroom how everything was done and how it all works."

Developing Skills for the Future

In July 2025, for approximately 15 days, high school-age AMINGA campers in the GIS and Mapping class used Esri technology to explore topics related to geography. They dove into environmental issues, such as proper waste management, especially in coastal areas; the importance of sustainable behavior; and the impacts of pollution. They spent about two and a half days—alternating with their sports training workshops as well as their other academic classes, of course—learning how to use ArcGIS Online and ArcGIS StoryMaps.

With these digital tools, the campers succeeded in exploring Cape Verde and the world beyond in a fun and educational way. By gathering data, learning how ArcGIS StoryMaps works, and using it to quickly build geography-based narratives, they developed data literacy and technical skills that will be useful to them far into the future.

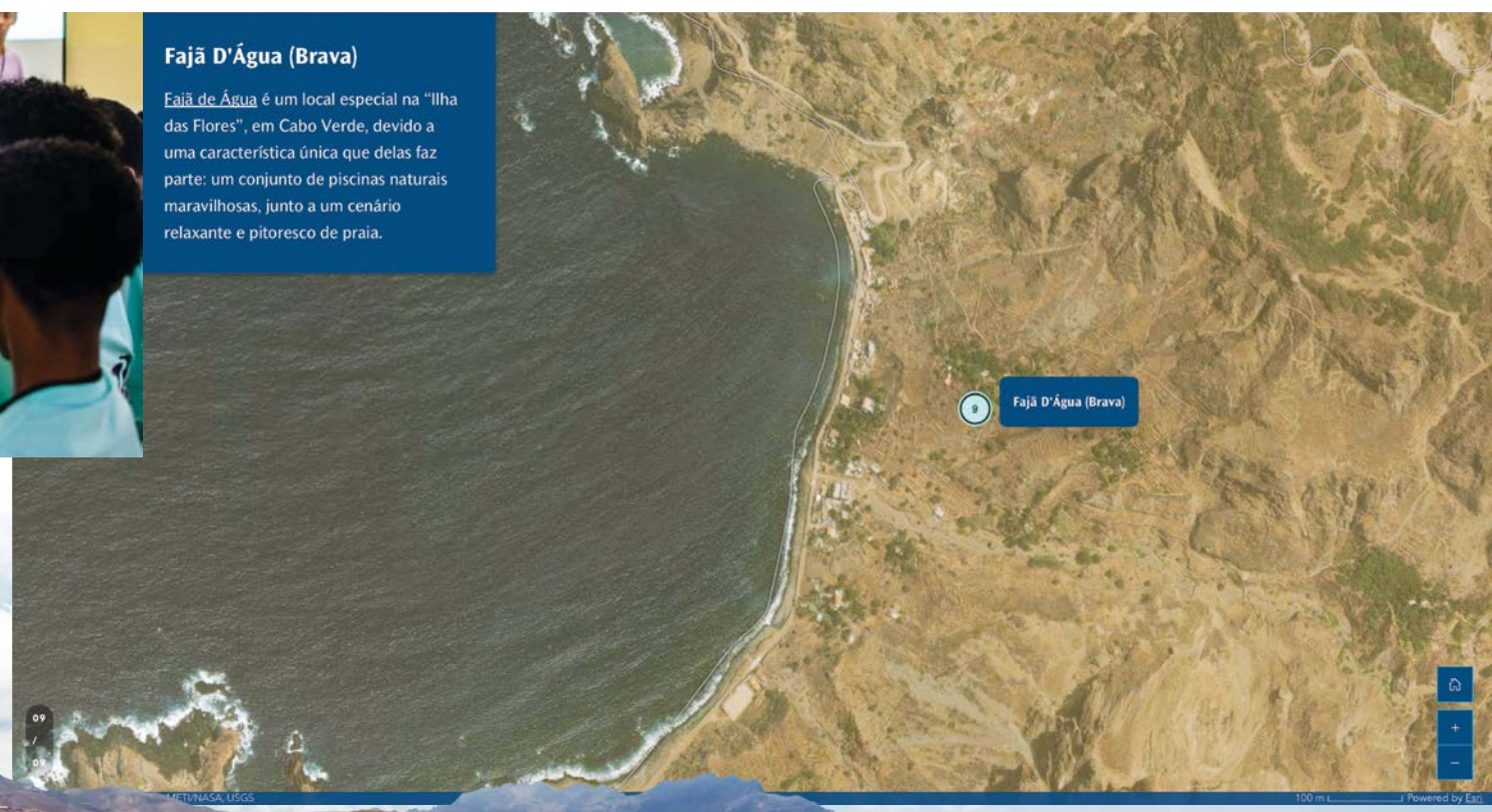
"It was our first time using Esri tools at the camp, and the students responded with curiosity, enthusiasm, and some truly thoughtful work," Bennett reflected.

Wright added, "I'm so thrilled to see what AMINGA is accomplishing along these fronts, and only too thankful to have experienced the magic of Cape Verde when working there briefly the year prior."

AMINGA plans to continue the GIS module in future summer camp sessions.

↓ Students created ArcGIS StoryMaps stories that covered a range of topics, from the histories of basketball and volleyball to tourist hot spots in Cape Verde.

↑ Campers used ArcGIS StoryMaps to build a map-based narrative around topics they cared about.



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TOP 10 BEST VALUE IN THE WEST

U.S. News and World Report 2025

Located in Redlands, California—close neighbors and partners with geospatial leader, Esri—we offer academic programs that enable access to Esri technology, training, people, events, and internships, including classes taught by Esri employees.

Jesse Hamlin's path to becoming a renowned GIS professional with the HALO Trust, a humanitarian organization dedicated to clearing landmines and other explosives, was fueled by a passion, a purpose, and commitment to meaningful work.

Hamlin '14 chose to study at what he said is the "best GIS school in the world," — University of Redlands. He was drawn by U of R's prestigious program and its close relationship with Esri®, the global leader in GIS technology. While earning his MSGIS degree, Hamlin said he enjoyed the unique access to Esri's resources and staff which gave him an invaluable mix of theoretical and hands-on learning, preparing him for the challenges of his future career.

" I don't want to be one of these people that realizes late in life, when it's too late, that I failed to make a positive difference...I can confidently look back and say when I retire that I helped some of the most vulnerable and forgotten people in the world get back on their feet, minimized my environmental impact, and was a true humanitarian."

— Jesse Hamlin '14 MSGIS

From Big Cats to Big Data

Striking a Balance on Tanzania's Maasai Steppe


(Photo credit: Ngoteya Wild.)

Balancing human livelihoods with wildlife conservation requires precision and patience. African People & Wildlife (APW), a US-based nonprofit operating in Tanzania, initially set out to help Maasai pastoralists protect their herds from big cats.

Two decades later, the nonprofit has expanded its mission into an even more complicated balancing act, using GIS as foundational technology. Working closely with the Maasai people and leaning into their deep, historical knowledge of the land, APW is helping them document phenomena across the Maasai Steppe, from the changing plant heights and heavy rains to invasive plants and insect habitats.

But the point is not to change traditional ways. Rather, it is to connect the knowledge that's already being gathered and demonstrate to others how the Maasai have sustained their land for so long.

In 2025, APW's Sustainable Rangeland Initiative won the Tech4Nature Award from the International Union for Conservation of Nature (IUCN).

Lions at the Gates

APW's Sustainable Rangeland Initiative helps Maasai pastoralists preserve their traditional way of life in the heart of the Tarangire-Manyara ecosystem. Also called the Maasai Steppe, the region spans over 15,000 square miles of wetlands, rangelands, and savannahs.

Around 600,000 ethnically Maasai people live in the area, tending to millions of cattle, sheep, and goats. Around half of the villages APW partners with lie between two national parks, Tarangire and Lake Manyara.

Under a legal framework created in the 1990s, the Maasai manage the rangelands between the parks while practicing certain conservation approaches, such as rotating fields to provide passage for migratory animals. Migration heightens the potential for conflict with wildlife—through predation or grass trampling—but herders are prohibited from harming the animals.

APW's original mission was to work with villages via its partner organization, Tanzania People & Wildlife (TPW), to reduce conflict caused by big cats—mostly lions—moving between protected areas and communal lands, where livestock are vulnerable to carnivores.

The Maasai had long used nighttime corrals, called bomas, surrounded by thornbushes to deter wildlife. These bomas tended to decay rapidly, giving lions access. Their attacks on livestock often led to killing the protected animals.

APW helped the herders design sturdier bomas called Living Walls, which have thick groves of trees reinforced by chain-link fences. They were a success, but there were larger, more holistic issues.

"You couldn't just solve the problem of lions eating cows," said Katy Teson, APW's communications and outreach manager. "What about poverty? What about the land?"

Old Ways, New Methods

When TPW launched the Sustainable Rangeland Initiative nearly a decade ago, the organization worked with three villages. They

↓ After herders collect data, it gets added to a dashboard for that village.

↓ African People & Wildlife (APW) initially helped Maasai pastoralists protect their herds from big cats. (Photo credit: Ngoteya Wild.)

↑ Herders survey each plot of land by walking it and entering data every five meters. (Photo credit: Emmily Tunuka, APW.)

(Photo credit: Emmily Tunuka, APW.)

(Photo credit: Ngoteya Wild.)

used open-source software to gather and process the data, along with ArcGIS Desktop. The results were presented to villagers through slideshow presentations.

"The process was very cumbersome for the team," said Elizabeth Naro, TPW's director of monitoring, evaluation, learning, and adaptation. "The program couldn't expand drastically until we received ArcGIS Online."

Around 2019, TPW began working with ArcGIS Solutions for Protected Area Management—now called the Conservation Land Management toolset.

"That was a real game changer," Naro said.

TPW transferred data collection workflows to ArcGIS Survey123 and adopted ArcGIS Dashboards for visualization.

"That let us grow the program quickly to meet the demand of villages requesting support," Naro said.

TPW loads Survey123 on smartphones used by the pastoralists. Once a month, herders survey each plot of land by walking it and entering data every five meters. TPW staff then use ArcGIS Online to add the data to a dashboard for that village.

The data for all plots in a village goes into a larger dashboard, which pastoralists can view at small technology centers that TPW helped build. Some of the dashboard data is shared with other villages via sites built with ArcGIS Hub.

Naro stressed that the initiative is more about reframing old ways than introducing new ones, with GIS being used to help quantify and explain Maasai pastoralist methods.

"These herders are still using indigenous methods," she said. "We're just providing the opportunity to integrate this knowledge with modern technology."

Grass height, for example, has always been a carefully watched metric of a field's health. Herders would make scratches on their legs to mark the height. Over time, a herder's scarred legs would become a living record of several years of herding on a plot.

"Older generations can have scars that provide amazing datasets, going back 50 years," Naro said.

These methods were the Maasai's version of the penciled-in data that field observers worldwide make while collecting data. One might argue that scarred legs are a more practical way of storing and accessing data than filing cabinets filled with years of spreadsheets. The drawback of both methods is that they make it hard to visualize data and discuss it with others.

For the Maasai, GIS also gives them increased visibility of official sources of knowledge and funding.

"Unfortunately, we've noticed there's often not a lot of credence in the scientific community given to indigenous methods," Naro said.

Plant Invaders

Naro recently demonstrated how the dashboards organize information. On her monitor, she zoomed in on a village called Ngoley (pronounced *n-go-LAY*). The screen was populated with the various plots used by Ngoley's herders.

Graphics on the dashboard showed the last few years of grass height, vegetation cover, and "perceptions of the state of the rangeland," she said. "That one is very important to me because I'm not a pastoralist, so I care what the other community members think."

Another graph measured the presence of invasive plants, which also tracked closely with rainfall. Naro focused on the rainy season months of 2023, when an especially strong El Niño season produced record-setting torrential rains.

The rains had been a welcome respite from a two-year drought. But for the herders, they also represented the kind of imbalance the Sustainable Rangeland Initiative tries to rectify.

A pink line revealed the proliferation of the *Sphaeranthus* plant on the fields. Like other invasive plants, it had increased after the El Niño rains. But it can also survive dry periods, so even as the rains receded, the plants remained.

The only livestock that will eat the plant are goats—and even they soon tire of it.

"It's thorny and nasty," Naro said. "It makes a pasture useless."

As *Sphaeranthus* takes over the land, wildlife is forced to find different routes to healthy grasses, which can lead to more conflict with humans and livestock.

Herders didn't need a dashboard to tell them about the problem—they could see the plant spreading across the rangelands. The dashboard made it easier for the village to apply for funds to mount a massive eradication effort. The data also provided a good baseline to monitor the aftermath of the project.

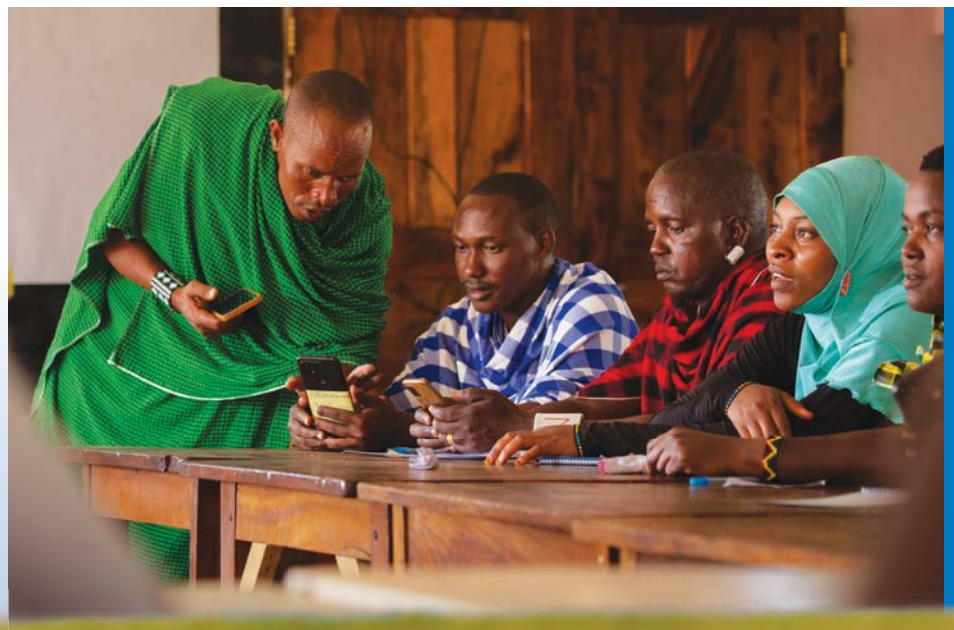
From Cats to Bees

APW continues to find new ways to help people on the Maasai Steppe and in other regions of Tanzania address problems of imbalance. A women's beekeeping program, though separate from the rangeland initiative, has similar habitat benefits.

The honey that bees produce offers economic advantages to the villages. The pollination helps the continued proliferation of native plants. Tanzanian law also protects trees with beehives and the land around active hives, extending conservation benefits even further.

"One of the reasons we cocreated the beekeeping project with communities is to help women have a sustainable income in a way that ties closely to the rangelands," Teson said. "We have the same data-driven GIS approach for conflict, rangeland, and beehive data—there are now so many different layers to our map."

"We want to keep formalizing the data collection process in a way that lets the outside world truly appreciate what the Maasai people do and give them financial support for programs like the invasive species uprooting," Naro added. "And also, ideally, make it so they don't have to cut their legs every year."



→ Tanzania People & Wildlife (TPW) trains pastoralists on how to use ArcGIS Survey123 on their smartphones. (Photo credit: Emmily Tunuka, APW.)

GIS for Good: Esri's Commitment to People, Planet, Prosperity, and Peace

Esri has always been dedicated to facilitating positive change. The company's objective is to not only build powerful GIS technology but also empower a community of users to apply it to solve real-world problems.

In 2022, Esri gave this a name: GIS for Good. The ongoing initiative is a collection of programs, resources, and people across the company who work together to support organizations that strive to create a more sustainable future. Specifically, GIS for Good links Esri's conservation, disaster response, education, and nonprofit programs, along with focused support around key challenges the world faces, to form a powerful, collective force for change.

The Four Pillars of GIS for Good

According to Ryan Lanclos, Esri's director of national government solutions and the lead for GIS for Good, these four programs represent Esri's long-term commitments to specific GIS communities.

"These Esri programs were established to provide our users with the support, resources, capabilities, and expertise they need to be successful," Lanclos said.

Esri's **Conservation Program**, founded in the 1980s, has contributed to more than 5,000 organizations' efforts to safeguard biodiversity and the environment. One of the earliest grantees was the Jane Goodall Institute, which has used GIS technology for everything from research and operations to youth education. By putting technology in the hands of conservationists and communities at little to no cost, Esri helps them not only protect critical habitats but also inspire the next generation of environmental stewards.

The **Disaster Response Program**, which provides GIS support during emergencies around the world, originated soon after the 1994 Northridge earthquake in Southern California, when Esri employees mobilized to help local agencies map damage and coordinate responses. Since then, the Disaster Response Program has worked closely with more than 11,000 organizations during crises, from the 9/11 attacks to the COVID-19 pandemic.

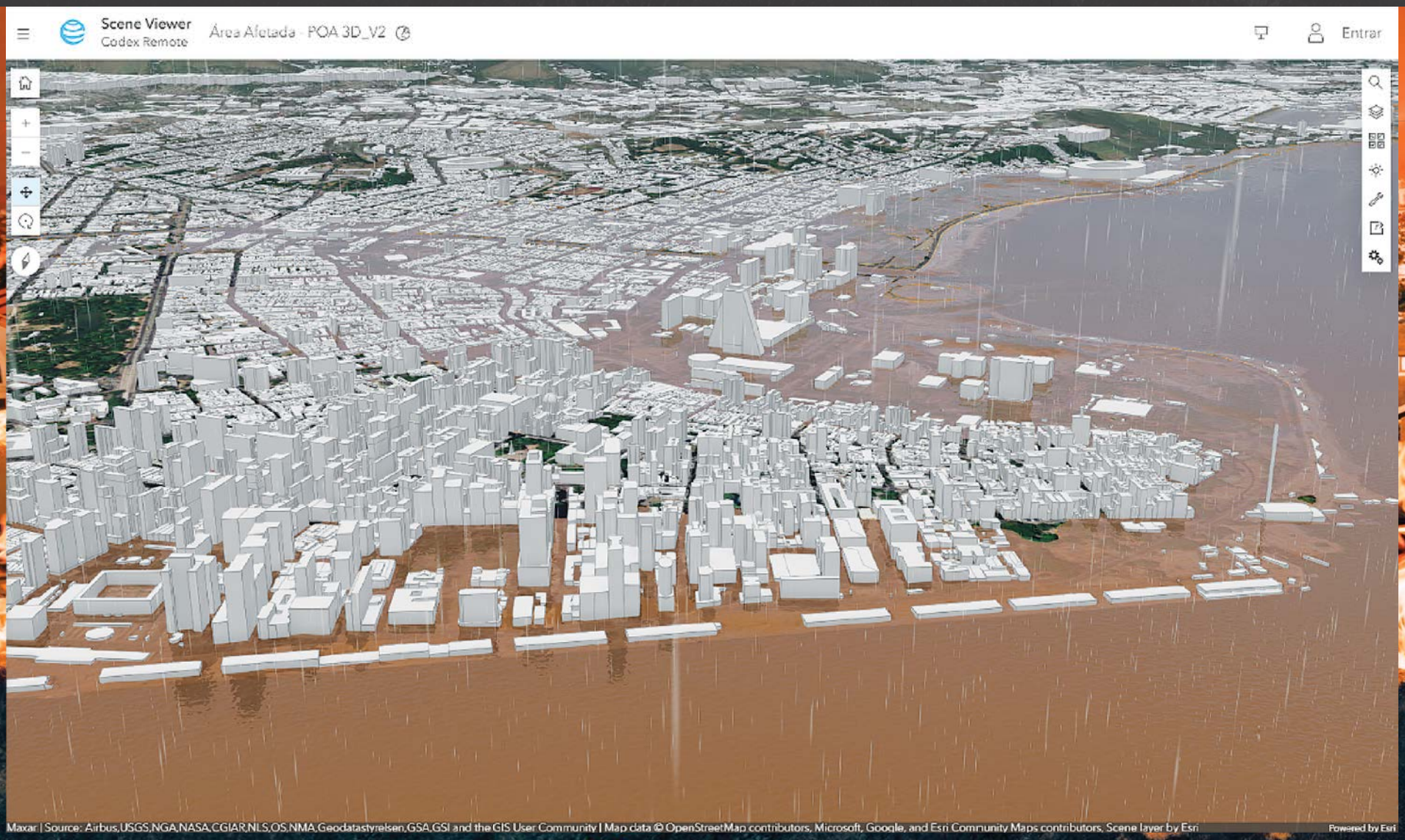
The **Nonprofit Program** has supported more than 15,000 charities, foundations, and other mission-driven organizations since its launch in 2010. These groups address a wide variety of issues, from public health to food security and policy to arts and culture. The program provides free or deeply discounted access to ArcGIS software, data, and resources, helping these organizations better understand the communities they serve and measure their impact.

The **Education Program** contributes GIS technology and learning resources to more than 4 million students and scholars, from K–12 schools to higher-education institutions. Its goal is to embed geographic thinking in school curricula, teaching students to use maps as a way to understand their world. A recent example from the 2026 Esri User Conference featured students from Panama who use GIS technology to study biodiversity in their community, demonstrating the power of connecting education with real-world conservation efforts.

From Reactive to Proactive

Over the years, Esri has listened to its users' needs and developed solutions to address their most common challenges. In disaster response, for example, Esri identified four key areas where organizations typically need support: impact analysis, data collection, public communication, and data sharing. This led to the creation of Esri's emergency management operations tools. Built in ArcGIS Online, these tools help organizations follow best practices and expedite their emergency response efforts.

While the Disaster Response Program might be most visible when emergencies happen, it focuses equally on creating



↓ A detailed map of floods' impacts is used to inform policy changes and address resiliency challenges. (Image courtesy of Flying Labs.)

long-term, proactive, community-based solutions. The hope is that organizations will have the tools they need to support any emergency from a GIS capability standpoint—and that they can move beyond reactive problem-solving during emergencies and toward building a safer and better future with ArcGIS.

One organization that is doing this is the Food Bank of Central & Eastern North Carolina. This nonprofit uses GIS technology not only during challenging times but also on a regular basis to do things such as understand the linguistic diversity of the communities it serves every day. By using data from ArcGIS Living Atlas of the World, the food bank identifies what languages people speak in different areas; staff and volunteers can then show up at the organization's pop-up food distribution sites with the right resources to communicate effectively.

"There's a lot of interconnectedness in the work that happens under the GIS for Good umbrella," said Emily Swenson, lead for Esri's Nonprofit and Conservation Programs. "Formalizing the GIS for Good initiative shows that people at Esri are committed to our user communities, and it's really a powerful collective effort."

Overcoming Challenges

For many nonprofits and other groups that benefit from GIS for Good, adopting GIS often requires resources they don't have. Limited funding, a lack of GIS staff, and the learning curve associated with implementing new technology are common challenges.

"Very few nonprofits that are newly joining the program have dedicated GIS staff," Swenson said. "Some don't even have technical staff."

To address these challenges, Esri collaborates with organizations such as TechSoup, an industry leader in nonprofit technology, to streamline the process of accessing software at a discount. Esri also works with GISCorps, a network of thousands of GIS volunteers who contribute their expertise to support nonprofit, conservation, and education organizations.

How to Get Involved

GIS for Good is about collective action. For GIS professionals, this means looking for opportunities to mentor and support nonprofits in their communities—whether through an organization such as GISCorps or via a more informal approach.

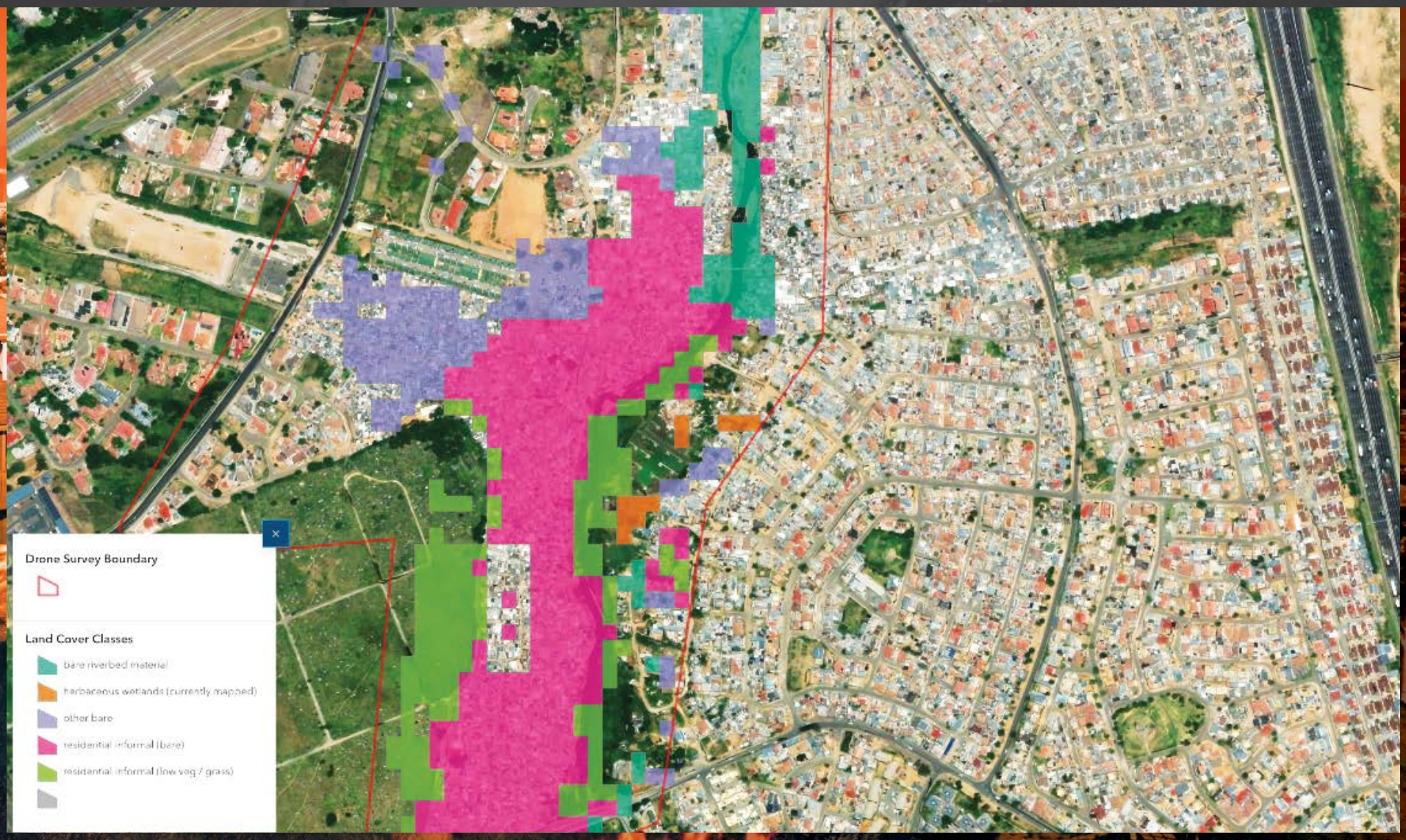
"You can find a nonprofit and mentor them or get them to sign up for the GIS for Good initiative to access Esri technology while providing your GIS expertise to help them get started," Lanclos said. "If you're a parent of a student, you can make sure that their school is signed up for the GIS for Schools program. You can also be a mentor and go to schools, talk about maps and the power of geography, and inspire students to join the next generation of mapmakers and geospatial thinkers."

For nonprofit leaders who want to find out more, the first step is to apply to the program that best fits their organization's mission. The GIS for Good website (links.esri.com/gis-for-good) serves as a gateway to Esri's related initiatives, providing a clear path to get started with one or more of the four related programs.

Looking to the future, Esri's commitment to GIS for Good remains steadfast, according to Lanclos and Swenson. As new challenges emerge, Esri will continue to listen to its user community and apply its resources to support the work that needs to be done.

"Our stakeholders are our user community, so their success is our success at the end of the day," Lanclos said. "If there are things in the world that we hear our community mobilizing around or struggling with or needing support for, it's an opportunity for Esri to commit and help out."

↓ Esri partner Codex's 3D flood simulation of Porto Alegre, Brazil, helped officials predict which buildings would be affected as water levels rose during historic floods in 2024.



Creating Geospatial Infrastructure That Delivers During Disasters

When Category 5 Hurricane Melissa slammed into Jamaica on October 28, 2025, Alicia Edwards and her team at the National Spatial Data Management Branch of Jamaica's Ministry of Economic Growth and Infrastructure Development moved quickly. Within days, they identified about 191,000 damaged buildings across the island—nearly 20 percent of Jamaica's structures.

As principal director of the branch, Edwards had spent the previous year building the geospatial infrastructure that proved essential when disaster struck.

From River Rapids to Geospatial Technology

Edwards' path toward GIS began with observation. As a teenager, she went on driving trips that took her over Jamaica's historic Flat Bridge, which connects the capital, Kingston, with the north coast. She often reflected on the connections between nature and humanity—in this case, a river, a road, and a bridge. That recognition of how Earth and humans coexist led her to focus on geography for her secondary school studies.

In her second year of college, Edwards encountered Esri software and recognized it as a powerful tool for someone who thought about landscapes and patterns. She quickly saw how spatial analysis could reveal trends and provide insights.

Since then, Edwards has built a career spanning more than 25 years across Jamaica's government. Starting as a GIS technician with the National Works Agency of Jamaica, she progressed to manager and moved into forestry. Each role taught her that geospatial technology transcends any single sector.

"It's all about ensuring that authoritative, quality data exists so decision-making can be easily integrated within critical workflows," she explained.

Alicia Edwards

Building the Foundation Before the Storm

By March 2024, Edwards led Jamaica's National Spatial Data Management Branch. Under her direction, the branch revamped the country's National Geospatial Repository, which has consolidated 95 percent of Jamaica's spatial information.

"The repository is a game changer for Jamaica," Edwards said, noting how it can be put to a range of uses, from distributing water and designing climate-resilient roads to preparing for disaster response.

Edwards also helped strengthen the National Emergency Response GIS Team (NERGIST), which includes GIS professionals from various Jamaican government agencies to support the country's Office of Disaster Preparedness and Emergency Management (ODPEM). During Hurricane Beryl in 2024, the team learned valuable lessons about managing national operations during crises.

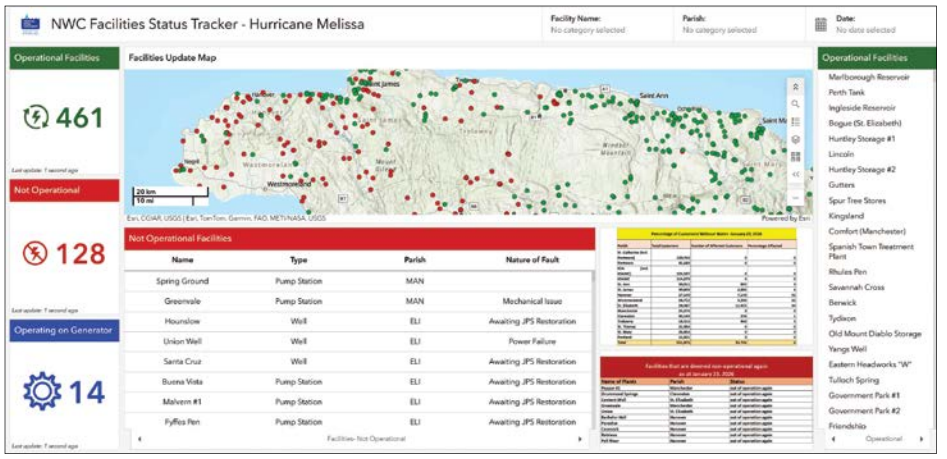
Dealing with Hurricane Melissa

In October 2025, throughout the days leading up to Hurricane Melissa's landfall, Edwards and NERGIST mobilized, treating the event as a time-critical national data operation.

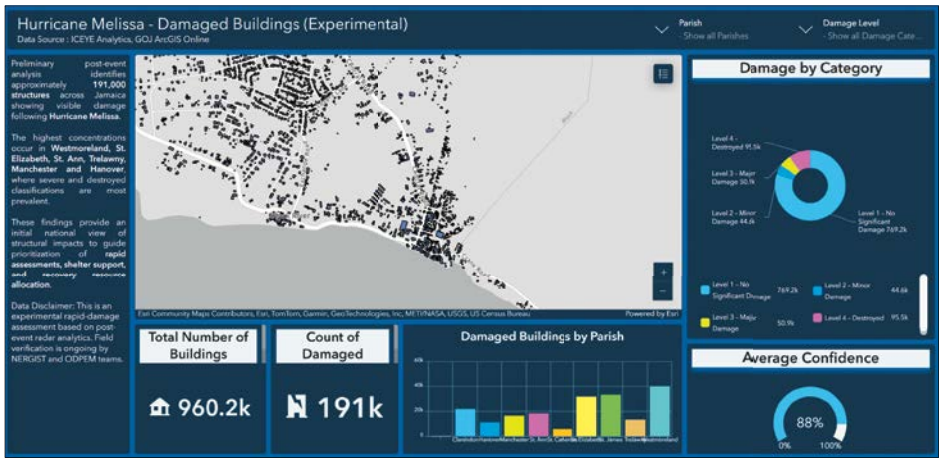
Using the Government of Jamaica's ArcGIS Online environment and authoritative layers from the National Geospatial Repository, NERGIST created a common operating interface before impact so that agencies could move immediately into coordinated operations once conditions deteriorated. The team prepared and tested shelter datasets, baseline operational maps, partner access, and reporting workflows to support the first phase of emergency management.

As the hurricane made landfall and disruptions increased, the interface became the central tool for real-time coordination. Dashboards displayed shelter locations and occupancy rates, facilitating comparisons between available resources and local needs. Transportation agencies updated road conditions, while utilities mapped outages and restoration points to identify areas that lost essential services and those that still had them. This shared environment also supported relief logistics.

These coordinated efforts enabled partners like ODPEM and the Jamaica Defence Force to focus on the most affected communities. They were able to monitor distribution packages and delivery points to reduce duplication and quickly address service gaps.



↑ Jamaica's National Water Commission created a dashboard during Hurricane Melissa to show maps and data for facilities, including operational status and outage details.



↑ Edwards' team created a dashboard to rapidly assess structural damage from Hurricane Melissa and submitted the data one week after the storm made landfall.

Help from A Variety of Partners

As leadership requirements sharpened, Jamaica's prime minister, Dr. Andrew Holness, appealed for international support.

Esri's Disaster Response Program provided hands-on technical support and accelerated connections to key partners. Esri partner ICEYE, an Earth observation company, provided satellite imagery to better show national damage. Jamaica Flying Labs worked with WeRobotics, the Caribbean Disaster Emergency Management Agency, and the Jamaica Civil Aviation Authority to provide targeted drone imagery where hurricane damage restricted ground access. Humanitarian mapping charity MapAction collaborated with NERGIST and ODPEM to create operational maps that humanitarian teams could use to quickly plan routes, target relief, and coordinate field operations.

As services began to come back online, partners used the same data environment to track restoration of critical facilities and lifelines such as water, roads, electricity, and communications. Damage assessment outputs helped prioritize recovery efforts and the shift to rebuilding.

Raising Geospatial Awareness More Broadly

Edwards also serves on the United Nations Committee of Experts on Global Geospatial Information Management. She noted that the recent hurricanes helped demonstrate what Small Island Developing States—57 nations that face challenges related to their small size, geographic isolation, and vulnerability to natural disasters—can achieve with strong data governance and preestablished partnerships.

From her vantage point, Edwards helps drive coordination across Jamaica's geospatial information community, which reverberates far beyond the island. She gets partners to align on priorities and collaborate on practical initiatives, strengthening GIS capacity and public awareness of geography.

"Creating trusted data and understanding the governance and the strategy that works with your sector matters because decision-makers want workflows that help move from uncertainty to verified information," she said.

Edwards' journey illustrates how geospatial technology creates trusted pathways from uncertainty to action. Data systems designed for resilience, combined with national and international partnerships, help the island respond with speed and precision. Her leadership shows that thoughtful preparation, collaboration, and geospatial technology can help even small nations mount sophisticated responses when catastrophe strikes.

↓ Aerial imagery from drones shows flooding in Manchester after Hurricane Melissa. (Image courtesy of Jamaica Flying Labs.)

A Human-Centered Approach to Deploying ArcGIS Enterprise

By Andrea Santoro, Jefferson County, Colorado

Jefferson County, Colorado's Business Innovation & Technology (BIT) Department's GIS team has used web mapping apps since the late 1990s. Around 2015, the department developed the county's jMap gallery, a compilation of internal and external web mapping apps that became critical for both staff and the public to access information about the county and perform daily tasks. The apps averaged more than 5,000 weekly views in 2024.

But all technology evolves, as do the people and departments using it. Given that the jMap apps were initially built using stand-alone ArcGIS servers and the developer edition of ArcGIS Web AppBuilder (which is now retired), the apps' underlying infrastructure was outdated. Changes in staff also caused a disconnect between end users and the GIS development team, making it difficult to know which app components were still needed, and by whom.

Considering all this, BIT GIS elected to modernize its GIS infrastructure and use this process to rebuild relationships with partners across the county.

A Move to Enterprise Technology That Focuses on Users

Leaders at BIT GIS determined that ArcGIS Enterprise would provide both the modern infrastructure for redesigning the jMap apps and enable county employees to gain greater access to GIS tools and data. Having a browser-based solution makes GIS accessible to more staff without needing to install desktop software and conduct extensive training.

So in 2023, BIT GIS received assistance from Esri Professional Services to deploy a multimachine instance of ArcGIS Enterprise, establishing the Jefferson County GIS Enterprise Portal. From there, the department connected with other staff to introduce them to the new system, learn about their typical workflows, and offer them greater efficiency.

In addition to managing Jefferson County's GIS, BIT has what's called the Innovation Lab, which supports change management, process improvement, and human-centered design. Human-centered design is "the radical notion that if you're designing products, services, [or] processes for people, you should get those people's input and use that to inform your design," according to Sue Anderson, the Innovation Lab's coordinator. The idea doesn't categorize people simply as end users; it brings them in as stakeholders and partners who will be directly affected by the apps and solutions that get implemented.

The GIS team worked with Anderson to develop customized training for the rollout of the GIS Enterprise Portal. The human-centered design approach to the training aligned GIS staff with the project's objectives early in the process and introduced tools that established or rebuilt relationships with stakeholders. The training also allowed the GIS team to collect information on employees' daily needs and workflows to guide future redevelopment of the apps in jMap.

Drilling Down into Specifics for Each Team

BIT GIS rolled out the Jefferson County GIS Enterprise Portal on a department-by-department basis. Within each department, a series of subgroups were identified. For example, in the planning and zoning department, subgroups included permitting, zoning inspections, and long-range planning.

Members of the BIT GIS team met with each of the subgroups to get an overview of their daily workflows, including how they use the current jMap apps, which datasets and custom tools they require, and what additional needs they had. The interviews were recorded, summarized, and documented in a place where all GIS team members could access them for reference and tracking.

The GIS team used the interviews to identify short-term fixes and long-term opportunities. One new solution that the team implemented is a browser-based editing app, built using ArcGIS Experience Builder, where users can directly edit a feature layer and have the updates reflected in real time in the associated map image layer in a jMap app.

In addition to collecting feedback from the subgroups, BIT GIS team members used the information sessions to introduce the new system and provide training resources. These resources were designed in the GIS Enterprise Portal using ArcGIS StoryMaps and compiled in an Experience Builder app. Each story focuses on a different topic. One goes over how to navigate the portal and explore the content. Others show more complex workflows, such as how to compile web maps and apps, how to publish content from ArcGIS Pro, and how to use groups to organize and share content.

Having these resources available in the ArcGIS StoryMaps format—and accessible from a single Experience Builder landing page—also promotes the apps and tools that are available to all county employees in the GIS Enterprise Portal.

Considerable Demand and Strengthened Relationships

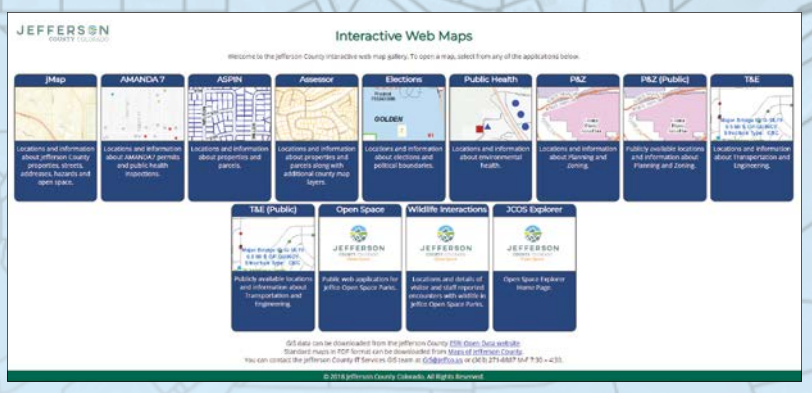
Although BIT GIS hasn't started redesigning the jMap gallery yet, use of the Jefferson County GIS Enterprise Portal has taken off. It currently has more than 300 active users and over 1,700 items. The team had to federate an additional ArcGIS Server site in 2025 to accommodate the demand.

What's more, the human-centered design approach that BIT GIS took to modernize its GIS infrastructure has strengthened relationships throughout Jefferson County. The team and its county partners continue to communicate and support one another in this and other endeavors.

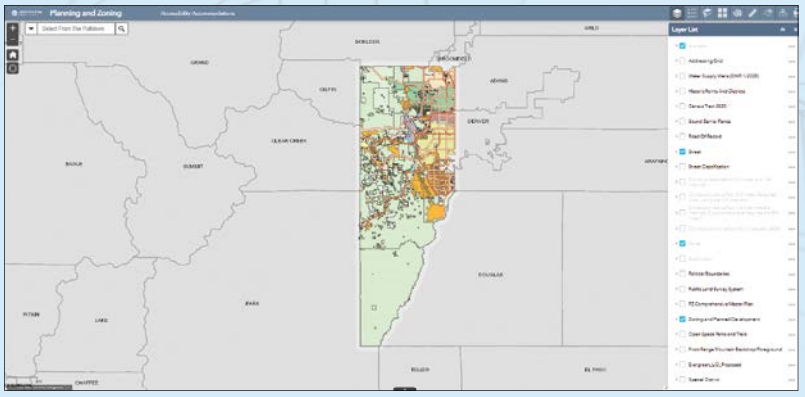
To get more information on this project, email Andrea Santoro at asantoro@jeffco.us.

About the Author

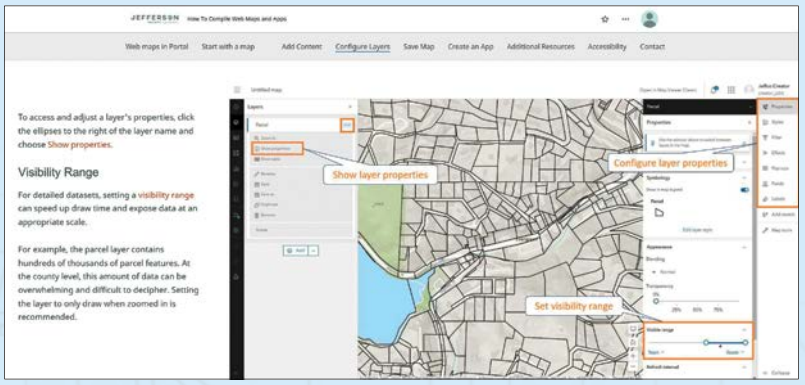
Andrea Santoro is a senior GIS analyst at Jefferson County, Colorado. She has a master of science in geographic information science from the University of Denver and is a certified geographic information system professional (GISP).



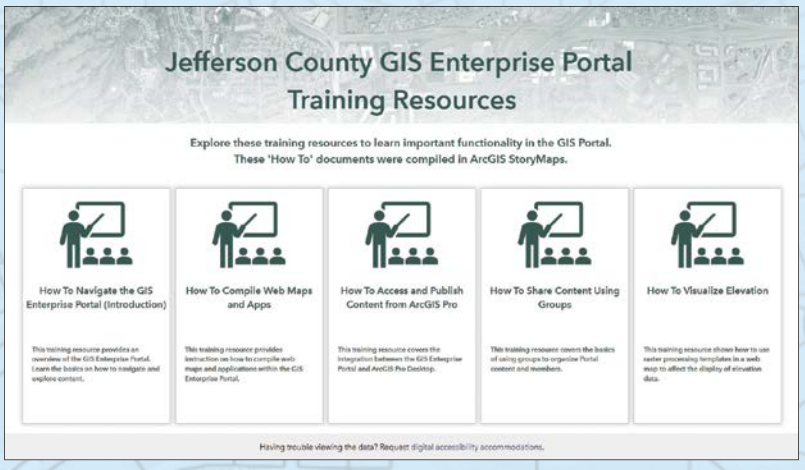
↑ The Jefferson County Business Innovation & Technology (BIT) Department's GIS team built an internal gallery of interactive web maps.



↑ The Planning and Zoning app from the jMap gallery is customized to show the county's zoning layer.



↑ Training resources are presented in ArcGIS StoryMaps stories, like this one on how to make web maps and apps.



↑ The Jefferson County GIS Enterprise Portal Training Resources home page was created using ArcGIS Experience Builder. It brings together ArcGIS StoryMaps stories that contain information about how to use the portal.

How to Build a GIS Movement

By Thomas Fisher, Cuyahoga County, Ohio

In the world of government technology, *management* often gets confused with *leadership*. We manage data, servers, licenses, and vendor contracts. But we don't *manage* culture shifts or cross-departmental collaborative ecosystems. To do those things, we must *lead* a movement.

As the enterprise geospatial technologies administrator for Cuyahoga County, Ohio, my role isn't solely to ensure that the servers are running; it is to foster a regional spatial data infrastructure (SDI) that serves more than 1.2 million people. And it is wrapped around an initiative called the North Coast GIDE (pronounced like "guide")—the Geospatial Information and Data Exchange—a continuously expanding resource hub for Cuyahoga County.

Esri president Jack Dangermond talks about GIS as a planetary nervous system—a distributed infrastructure that connects isolated datasets. In Cuyahoga County, we are building the local nerves of that system. Our North Coast GIDE is establishing a community on a federated common operating platform that is informed by high-level standards from the Federal Geographic Data Committee (FGDC), the National Emergency Number Association (NENA), and robust data governance best practices.

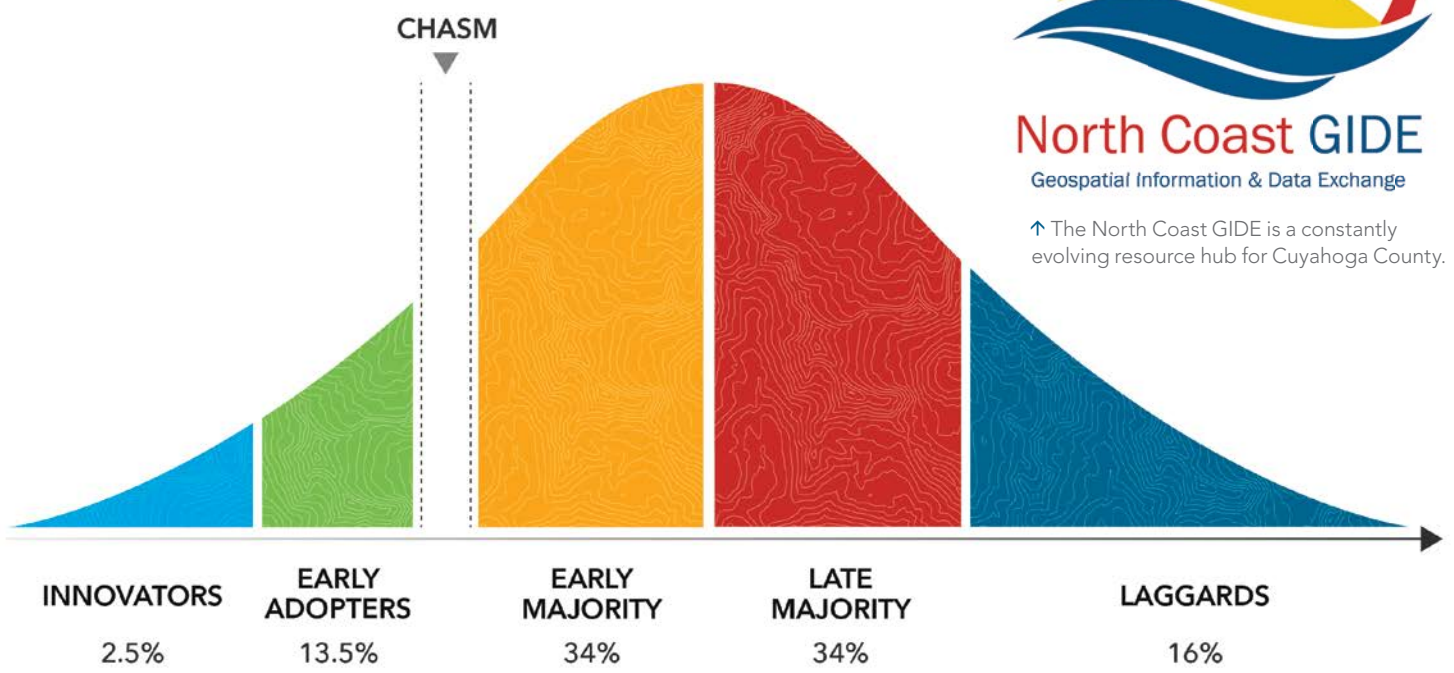
Cuyahoga County has 59 different entities, each with its own politics, budget, and priorities. So how have we convinced these departments to opt in to this nervous system? By not dictating policy but, rather, building and sustaining a movement.

The "Lone Nut" and the First Follower

There is an oft-cited video in leadership circles that features a shirtless man dancing at a music festival. At first, viewers see one person dancing wildly on a hill. He looks ridiculous—like a "lone nut," as the narrator, entrepreneur Derek Sivers, calls him. For a long time, the shirtless man is alone, and the crowd ignores him.

In the GIS world, most GIS practitioners have been that lone nut. We've stood in meetings, waving our arms and proselytizing the importance of topology rules, unique IDs, and schema standards. To the uninitiated—city managers, police chiefs, mayors—we might look like we are dancing wildly, alone on a hill.

But in the video, something happens. A second person starts dancing with the shirtless man, and the original dancer embraces this person as an equal. Crucially, the focus shifts from the leader to the follower. Sivers notes that the first follower is an underestimated form of leadership itself. The first follower is what transforms a "lone nut" into a leader. In the video, it doesn't take long for dozens of other festivalgoers to join the two men in their wild dancing.



↑ The innovators and early adopters convince the majority to adopt new systems.

This aligns with Dangermond's view of the modern GIS leader. He argues that today's leaders must facilitate rather than control—and build an ecosystem in which partners can specialize and extend the work.

For the North Coast GIDE, success didn't come from one person standing at a podium demanding compliance. It came from nurturing our first followers.

We identified the municipalities that were ready—the innovators that understood the vision of a federated platform—and we treated them as partners. We started a movement and then made it public, showing other municipalities that it wasn't the county demanding that everyone move to an enterprise system; it was their neighbors building it up.

When leaders embrace their first followers, they make joining the movement look easy. They show that contributing to an enterprise platform isn't a burden—it's a party that no one wants to miss.

Crossing the Chasm: The Innovation Adoption Curve

After the first followers come on board, how does scaling work? This is where the Innovation Adoption Curve, first introduced by Dr. Everette Rogers in 1962 and, more recently, popularized by leadership speaker Simon Sinek, comes in. The curve demonstrates that the mass market (68 percent of the total target audience) can't be reached until the innovators (2.5 percent) and the early adopters (13.5 percent) are captured.

In Cuyahoga County, if I had tried to force the North Coast GIDE on the most resource-strapped, skeptical municipalities first, the project would have failed immediately. Members of the mass market are pragmatic; they want proof that a new system works. In GIS, they don't care about the theory of FGDC metadata standards. They want to know if the address points will help ambulances get to emergencies faster.

So we focused our energy on the 2.5 percent of municipalities that are innovators. We worked with them to build a federated common operating platform that solved the problems they were encountering when preparing their authoritative data for the State of Ohio's implementation of Next Generation 911 (NG911). We demonstrated that by aligning with NENA standards, we weren't just checking boxes—we were saving lives by ensuring that emergency services have interoperable data.

With the early adopters, we validated the *why*—that we needed to do this to build a safer, more connected region. From there, the *what*—the technical specifics of the platform—became easier to sell to the majority.

We didn't have to push the technology on the remaining municipalities. The tipping point occurred naturally. They saw the success of their peers and wanted in.

The Technology Is the Easy Part

While the Innovation Adoption Curve explains the macro strategy, the micro strategy is grounded in personal relationships. A federated system requires immense trust. Municipalities need to trust the county to steward their data responsibly, and the county needs to trust municipalities to maintain data fidelity.

The only way to build this trust is via personal, one-on-one, in-person communication. In an era of video calls and emails, showing up in someone's office makes a statement. It says, "I value your partnership more than my convenience."

This is where empowerment meets accountability. In Cuyahoga County, we empower our partners by giving them the tools they need—simple web apps, licenses, and cloud infrastructure—to manage their own geospatial destiny. But we also hold them accountable to uphold the standards we agree on.

Accountability is sometimes viewed negatively, as a form of control. But in a healthy culture, accountability is a form of respect. When I sit down with a municipal stakeholder and review their data governance workflow, I am telling them, "Your work matters too much for us to let data governance slide." We nurture our followers by setting a high bar and then helping them reach it.

The GIS Leader's Mandate

As we look to the future of the North Coast GIDE, we know things will change: the technology, the software, the standards. But our leadership principles will remain constant.

We're willing to be the shirtless guy dancing on a hill—standing up for the vision of a connected, data-driven region, even when that feels lonely. We will always embrace our early followers and turn them into the true heroes of the story. We will also have the patience to build momentum with the willing rather than battling with the resistant.

Most importantly, we will remember that our regional SDI—our local slice of the planetary nervous system—is not built on fiber optics and servers. It is built on handshakes; shared visions; and the trust that's established during quiet, one-on-one conversations.

By leading with empathy and governing with standards, we aren't just making maps or managing systems. We're building a community.

North Coast GIDE
Geospatial Information & Data Exchange

↑ The North Coast GIDE is a constantly evolving resource hub for Cuyahoga County.

About the Author

Thomas Fisher is the enterprise geospatial technologies administrator for Cuyahoga County, Ohio. He has more than 25 years of experience in public and private sector GIS.

A Small Utility Sees Big Gains with GIS and AI

→ In less than seven hours of drive time, Noteworthy AI collected data on more than 2,300 utility poles in Starke, Florida.

In a community with a population of just over 6,000, the City of Starke, Florida, operates one of the smallest municipal utilities in the state. But that doesn't mean its technology needs are slight.

For decades, the utility relied on institutional knowledge, veteran line workers who knew the power grid by memory, and 35-year-old paper maps to manage its infrastructure. Without a modern GIS implementation or digital records, the city faced growing operational risks and limited visibility into critical assets, including poles, attachments, and lighting infrastructure.

That changed when the city's newly appointed director of utilities, David Sparks, deployed ArcGIS Online to manage and maintain the city's grid. Collaborating with two Esri partners—1898 & Co. (1898andco.com/GIS), a leading technology consulting firm, and Noteworthy AI (noteworthy.ai), a provider of AI-powered utility asset inspection solutions—Starke quickly transitioned from analog processes to a digital-first approach without exceeding the city's budget.

Building a GIS from Scratch

At the outset, Starke had no formal inventory of its utility poles, only estimates that ranged from 2,500 to 3,000 total. With limited internal resources and no prior digital records, the city faced a fundamental problem: how to cost-effectively collect field data and populate the city's new ArcGIS instance with accurate, up-to-date information.

Initial estimates to manually collect geolocated images for each pole, even without attribute or defect data, were drastically over budget. The cost exceeded the city's available funds and would not have provided the necessary asset intelligence to justify the investment.

To keep costs low, the city tried to train its line workers to collect pole data manually in their spare time. After several months, progress was minimal, as line workers necessarily placed higher priority on active grid maintenance. It became clear that a new approach was needed—one that was fast, accurate, scalable, and within budget.

A Strategic Partnership

Recognizing the need for a technology-forward solution, 1898 & Co. introduced the City of Starke to Noteworthy AI. Known for its vehicle-mounted camera system and AI-powered collection and analysis of utility asset data, Noteworthy AI—a recent graduate of the Esri Startup program—offered a turnkey solution that addressed Starke's needs far beyond simple pole counts.

Instead of just capturing photos and locations, Noteworthy AI proposed a collection-as-a-service model that would provide comprehensive field data using the company's vehicle-mounted camera systems. Noteworthy AI's solution automatically captured geolocation and high-resolution imagery for every pole; modeled asset inventories using AI; and detected defects, including structural issues and stubbed poles (remnants of old utility poles often left next to new ones). Noteworthy AI also provided vegetation growth analytics, lighting audits, and counts of joint-use poles as well as poles with third-party attachments.

All data was delivered directly into the city's new ArcGIS Online system, furnishing an integrated and immediately actionable digital record of the grid.

"Noteworthy AI was a transformative partner on this project," said Darris Friend, senior GIS specialist at 1898 & Co. "Their AI-powered approach allowed the City of Starke to collect the mission-critical data needed to populate ArcGIS quickly and cost-effectively."

All the Poles in the City, Captured in Seven Hours

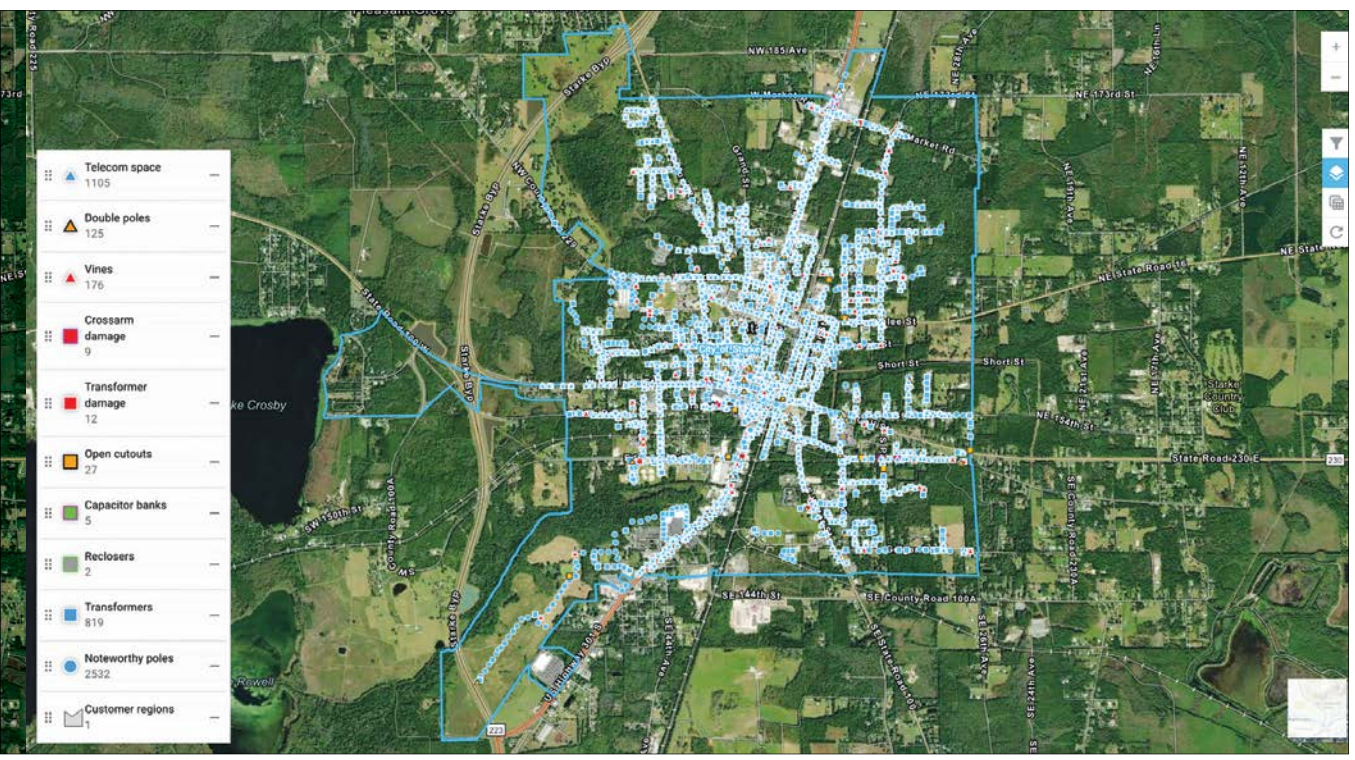
Over just two days, Noteworthy AI completed field collection across the entire service territory, capturing more than 2,300 utility poles in under seven hours of drive time. Using its vehicle-mounted camera system and AI-powered analysis, Noteworthy AI delivered a complete pole inventory that included imagery, GPS coordinates, and attribute data. All of this was delivered directly to ArcGIS Online.

In total, the project cost up to 80 percent less than traditional manual inspection methods. What would have likely taken several months or longer was instead completed in a single day with a fast, accurate, and scalable solution.

Better Data and Smarter Operations

With its ArcGIS Online data fully populated, City of Starke staff began making more informed decisions across grid planning, maintenance, and storm response.

Instead of relying on outdated maps or institutional knowledge, utility employees could access a centralized, searchable GIS with real-time visibility into pole material, locations, and ownership; streetlight status and condition; vegetation encroachment; asset defects; and anomalies such as leaking transformers. In addition, the new system provided data on joint use and third-party attachments, open fuses, and arrester material.



↑ Utility employees now use a centralized, searchable GIS with real-time visibility into asset information.

Noteworthy AI's automated defect models flagged structural issues such as damaged, leaning, or stubbed poles, helping Starke prioritize repairs and reduce safety risks. These early insights give a baseline for predictive maintenance strategies, which can prevent outages and extend asset life.

The joint-use audit delivered a full accounting of third-party attachments across the system. For a smaller utility like Starke's, this was especially valuable. Many of these attachments were previously unbilled, representing missed recurring revenue. With verified counts now in ArcGIS Online, the city can reconcile billing records and potentially recover tens of thousands of dollars annually.

Industry averages suggest that unbilled attachments could equal $10–$30 or more per attachment in lost revenue per year, making this audit a meaningful financial win that helps offset project costs and fund future improvements.

"This project was a big leap forward for our utility," said Sparks. "Moving from institutional knowledge and paper maps to a fully digital view of our grid in ArcGIS gives us the tools to better serve our community. Noteworthy AI's data collection made this transition possible in a way that was affordable and fast."

Scalable for Utilities of Any Size

While many technology deployments begin with large investor-owned utilities or well-funded cooperatives, the City of Starke proved that GIS- and AI-powered asset data collection is accessible to utilities of any size. The city's successful execution also shows that a utility can conduct a full territory scan in a single day, at a fraction of the cost previously thought possible.

"Timely and actionable grid insights are critical to utilities of all sizes. A project like [the one at] the City of Starke shows what's possible when you combine scalable data collection with smart GIS integration," said Noteworthy AI CEO Chris Riccuiti. "If we can deliver this level of value for even a small municipal utility, the potential impact for larger organizations could be exponentially greater."

A New Standard for Cost-Effective Grid Visibility

The City of Starke's GIS journey underscores the power of collaboration among Esri, its partner network, and forward-thinking startups like Noteworthy AI. With 1898 & Co. leading implementation and ArcGIS serving as the central platform, Starke successfully transitioned from legacy mapping to a real-time, data-driven grid without exceeding its budgetary constraints.

By combining AI-driven data collection with the analysis capabilities of ArcGIS, small municipal utilities can unlock new efficiencies, reduce operational risk, and improve service to their communities. In the case of Starke, a few hours of data collection delivered decades' worth of progress.

For more information on the Esri Startup program, go to links.esri.com/startup.

Esri Partners
SCALE UP GIS

When organizations ranging from pipeline operators to public health agencies need to modernize their GIS implementations, Esri partners can help. Their expertise in deploying and maintaining Esri software and systems can transform a company's GIS operations from basic mapping to enterprise-wide systems management.

Discover how four Esri partners collaborated with customers of varying sizes, from large electrical contractors to small-town utilities, to ensure that everyone working on key projects has the comprehensive geographic context they need.

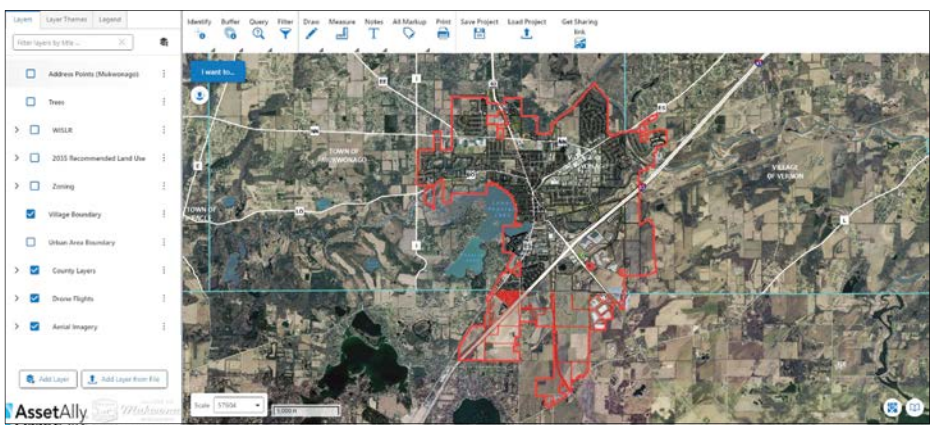
A More Efficient Way to Manage Utilities and Public Works

For the utilities and public works departments at the Village of Mukwonago, Wisconsin, antiquated and siloed systems with fragmented workflows and cumbersome reporting made it difficult to operate efficiently and maintain regulatory compliance. To modernize the departments' asset management processes, the village brought in **Ruekert & Mielke, Inc.** (ruekertmielke.com), to implement its GIS-based asset management solution, AssetAlly 2.0.

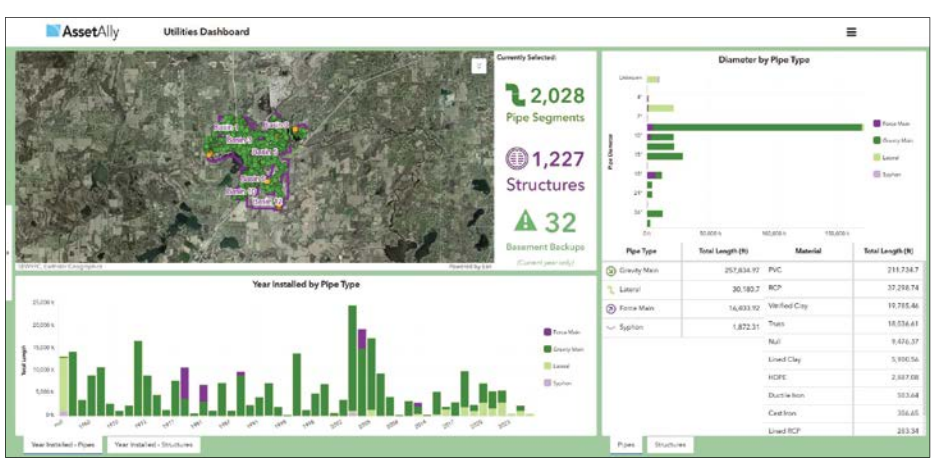
The solution leverages VertiGIS Studio, from another Esri partner, VertiGIS, for advanced web and mobile app development. AssetAlly is fully integrated with ArcGIS Online and relies on ArcGIS Dashboards and ArcGIS Hub to unify data and workflows across departments.

Mukwonago's utilities department manages the village's water distribution and wastewater collection systems, and AssetAlly supports the department through routine valve exercising, hydrant flushing, maintenance hole inspections, sanitary pipe jetting, and more. The public works department uses AssetAlly to administer its forestry, street maintenance, and stormwater management systems. The solution helps staff streamline tree planting; detect illicit stormwater discharge; inspect stormwater systems; clean catch basins; and record data on street plowing, salting, and brining. It also simplifies compliance by collecting and summarizing data for water system reporting to the US Department of Natural Resources.

In short, AssetAlly 2.0 has transformed Mukwonago's operations. Workflows are streamlined, data accuracy has improved, and compliance reporting is simpler. The village now operates with a modern, GIS-driven asset management system that enhances efficiency and transparency for staff and residents.



↑ A public-facing map shows residents of Mukwonago information about zoning, future land use, and more.



↑ A dashboard delivers real-time operational data to Mukwonago utility department staff.

GIS Modernization Has Short- and Long-Term Gains

Across the pipeline industry, operators are modernizing their GIS environments to address growing regulatory complexity, improve data governance, and establish scalable platforms that support both current operations and future digital initiatives. As GIS evolves from a mapping tool into an enterprise system of record, many organizations are reassessing legacy architectures in favor of more standardized, integrated approaches.

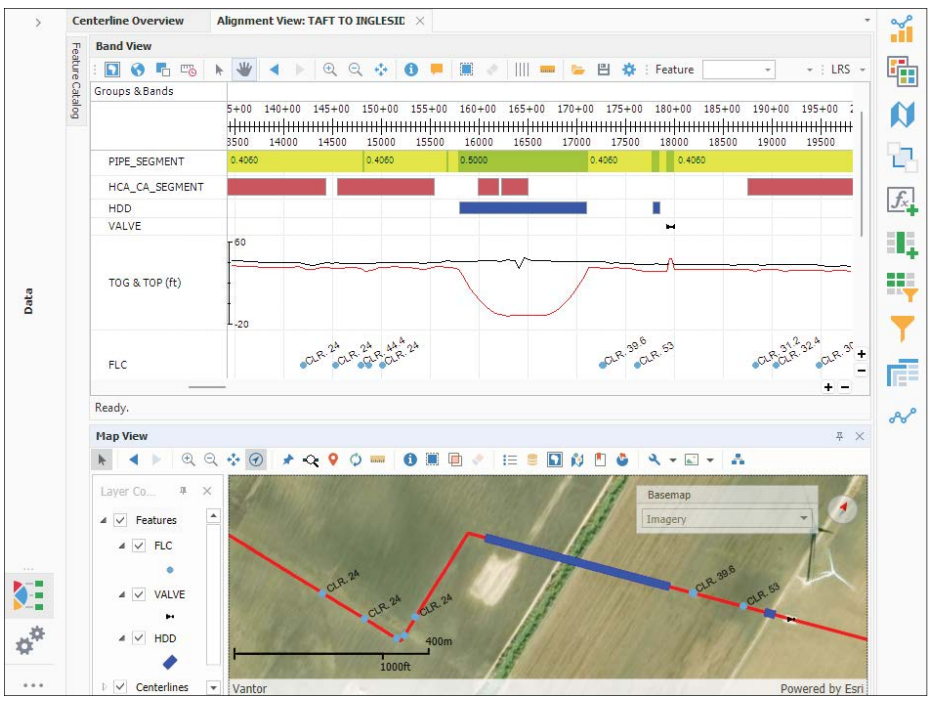
Geonamic (geonamic.com) worked with Plains All American Pipeline to modernize its GIS environment. The project fortifies the midstream infrastructure company's existing operational needs and longer-term enterprise requirements.

Plains' legacy systems constrained data governance, workflow efficiency, and the company's ability to scale its GIS capabilities. Geonamic focused on establishing a standardized GIS platform for spatial data management, mapping, reporting, and analytics that spans pipeline operations. The work included upgrading Plains' GIS foundation, adopting an industry-standard data model, implementing a new linear referencing system, modernizing infrastructure, and establishing consistent enterprise workflows.

These types of modernization efforts reflect a broader industry emphasis on creating authoritative geospatial systems that can support regulatory reporting; operational visibility; and collaboration across engineering, integrity, and operations teams. Setting up a common GIS framework allows organizations to better align spatial data with business processes while providing a foundation for future expansion.

Esri is supporting the program through ArcGIS Pipeline Referencing (Esri's software for pipeline data management) and by providing ArcGIS Utility Network configuration and architectural design services. The partner-led implementation of Esri technology is enabling Plains to develop a modern, scalable pipeline GIS environment.

The objective was to create a single, integrated GIS environment that supports regulatory reporting, informs operational decision-making, and provides a framework that can be extended to additional business units and workflows over time. For Plains, this vision is now becoming a reality.



↑ Geonamic set up a GIS platform that Plains All American Pipeline can use for spatial data management, mapping, reporting, and analytics.

For Infrastructure Projects, Geographic Context Comes First

Aldridge Electric, a leading electrical contractor in the United States, delivers complex utility construction that spans coasts and climates, with regulatory requirements that vary by jurisdiction. Long before crews begin work, estimators must weigh site conditions, supplier reach, subcontractor performance, and schedules. But getting that information in a consistent, continually updated way was difficult.

It lived in spreadsheets and emails. Files tailored to personal preference were hard to share and easily lost. Legacy KMZ files were useful but inconsistent. Searching past bids and outcomes for comparison was not easy. Staffing and revenue planning often came down to guesswork.

To bring a full picture into one workflow, Aldridge worked with **Woolpert** (woolpert.com) to build an ArcGIS technology-based portal that assembles location context, project history, and schedules in a map-first workspace and presents everything in the order that estimators use. The system shortens the path from intake to action and supports daily decision-making.

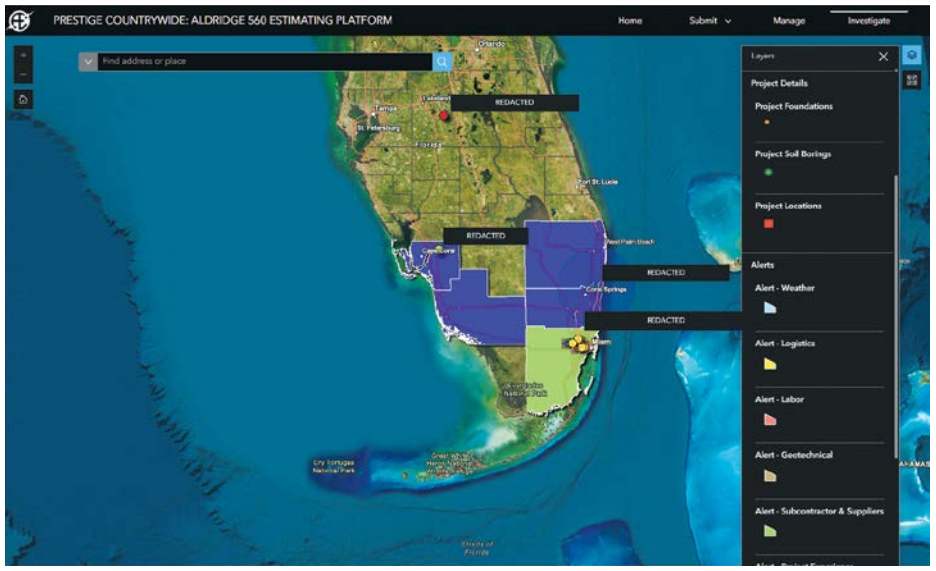
Developed inside the company's own ArcGIS environment, with data stewardship remaining in-house, Aldridge's new internal workflows moved staff off spreadsheets and ad hoc KMZ exchanges to a live ArcGIS ecosystem.

Intake begins with three ArcGIS Survey123 forms that capture the essentials of a new project, such as its scope, schedule, costs, and supplier information. An ArcGIS Experience Builder web app mirrors the steps estimators take from there, so the map is where their work happens. Using ArcGIS Notebooks to automate data tasks, categories and units stay aligned as data gets updated, and it all feeds the estimating report. As a result, the geographic context arrives in real time—with the opportunity, not after it.

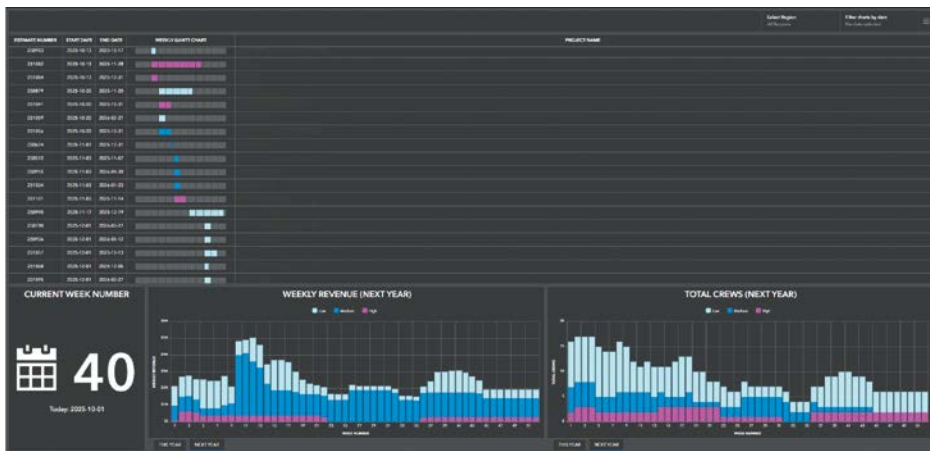
In coastal Florida, for example, a dashboard shows active and pending bids alongside a weather layer that informs planning during storm season. This puts history, capacity, and local constraints on the same screen as the bid.

The new system also converts data into weekly revenue results and crew needs, so Aldridge can anticipate demand and forecast staffing needs and revenue. As projects accumulate, estimates carry more context with less effort, meaning the system's value builds with use. All this continually improves bid comparisons and subcontractor management.

Aldridge will keep refining the portal so that decision-making is clear and hard-won insights remain within reach.



↑ Active and pending bids are displayed on a map alongside suppliers and county weather to gauge local risk.



↑ A Gantt chart-style dashboard shows probability-weighted weekly revenue and crew demand across schedules.

Enhancing Public Confidence in 5G Technology

The Lithuanian National Health Center (known by the acronym NVSC) is responsible for protecting public health. This includes ensuring that electromagnetic field (EMF) radiation remains within legally established limits.

Although leading international health authorities, including the World Health Organization and UK Research and Innovation, have found no conclusive evidence of harm from exposure at regulated levels to radiofrequency electromagnetic fields (RF-EMFs), the rapid deployment of 5G across Lithuania raised public concern. NVSC faced the challenge of not only monitoring EMFs nationwide but also providing clear, trustworthy information to the public to assure people that EMF levels are under control.

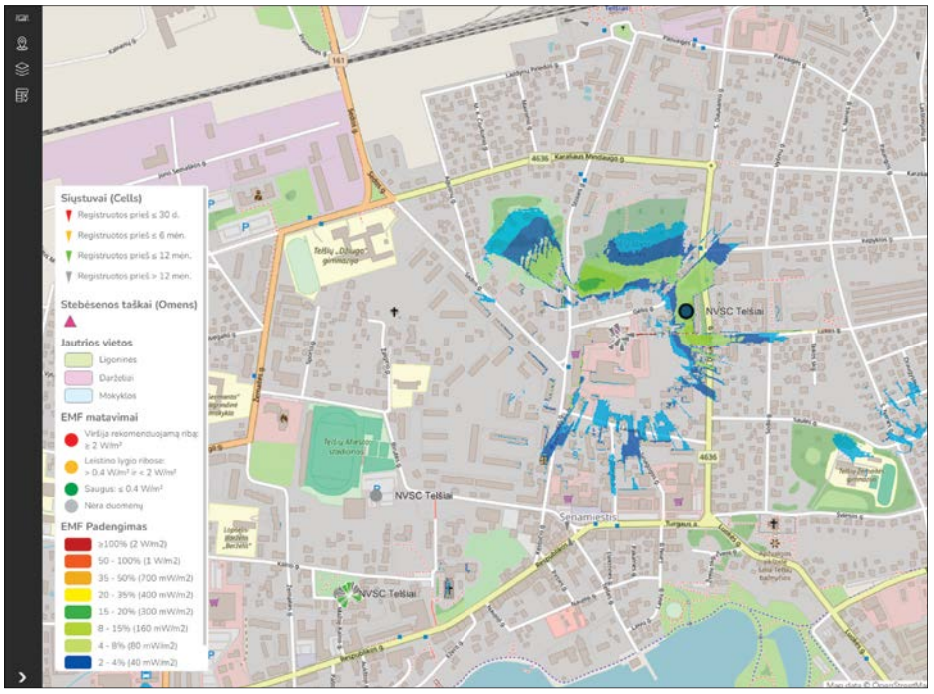
Traditional approaches—such as reacting to complaints by making on-site measurements or deploying dense networks of fixed EMF sensors—were either inefficient, slow, or prohibitively expensive to implement and maintain at a national scale. So NVSC engaged with **Cellular Expert** (cellular-expert.com), which develops radiofrequency planning and EMF modeling solutions, such as CE Express EMF, that are based on ArcGIS technology.

Together, NVSC and Cellular Expert (CE) deployed the NVSC EMF control system, built on ArcGIS Online and CE Express EMF, to shift from a reactive monitoring model to a proactive, data-driven approach. The system automatically integrates authoritative data from Lithuania's Communications Regulatory Authority, including all active radio antennas and time stamps indicating when the antennas were installed or modified.

CE Express EMF automatically and regularly calculates a theoretical nationwide EMF heat map that publishes as an ArcGIS Online web service. NVSC experts can view and analyze it within their NVSC EMF control system environment. This allows them to instantly identify antennas that have been installed or modified within the last 30 days, six months, or year or earlier, and assess potential EMF exposure areas. Instead of investing in an extensive fixed-sensor network, NVSC operates a limited number of movable telemetry EMF measurement stations. The stations are distributed to NVSC's regional offices and deployed selectively for preventive inspections or complaint-based investigations—guided by the EMF heat map.

The ArcGIS Online environment integrates theoretical EMF modeling with real measurement data, enabling NVSC to precisely and cost-effectively oversee EMFs nationwide. Additionally, the public can access select EMF measurement results via an interactive web app, built with ArcGIS Experience Builder. The app (links.esri.com/NVSC) increases transparency and expands public trust in 5G safety.

Through this collaboration, NVSC has improved operational efficiency, reduced monitoring costs, sped up response times, and enhanced confidence in EMF regulation and control.



↑ In the NVSC EMF control system environment, a heat map published in ArcGIS Online shows electromagnetic field (EMF) radiation measurements.

Esri partners represent the rich ecosystem of organizations around the world that work together to extend the ArcGIS system and implement it in distinct ways to solve specific challenges. Find partners that meet your needs at **esri.com/partners**.

Rich, Location-Infused Business Data Informs Sound Strategies

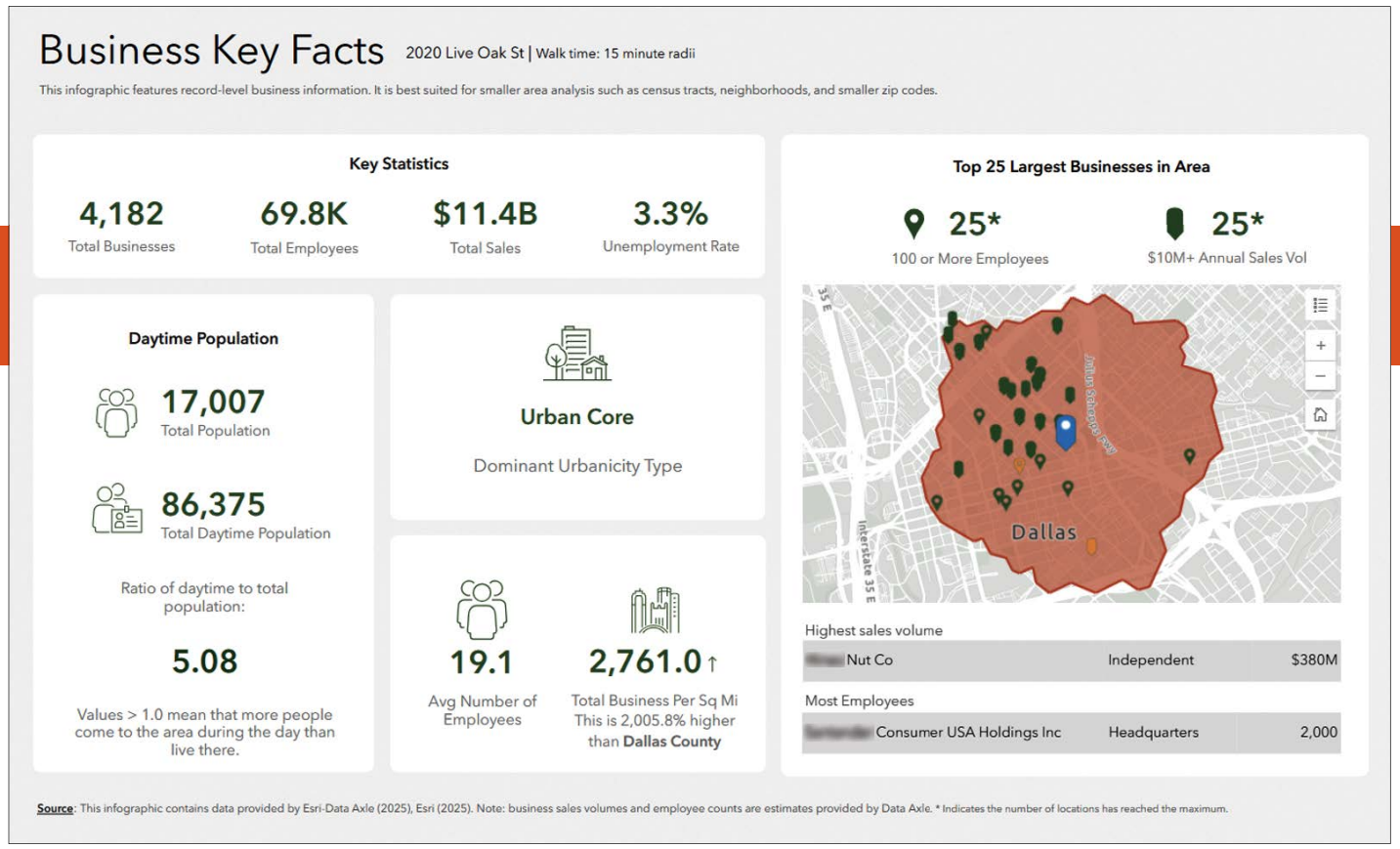
Understanding the business landscape in a city or town is critical for decision-making in both the private and public sectors. Maybe an area has an abundance of senior living communities but a shortage of essential health-care services. Perhaps there's an empty storefront in a highly trafficked area, and there's an opportunity for a local business to open another location. Knowledge like this shapes business strategies. When business owners and government departments have access to business data, it can help them identify market gaps, validate expansion opportunities, and evaluate where to invest in infrastructure or services.

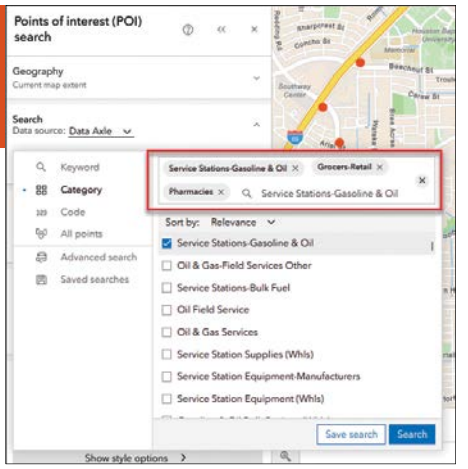
Esri partner Data Axle supplies rich business information for the United States and Canada to ArcGIS Places, Esri's business-focused points of interest (POI) dataset that powers the ArcGIS Business Analyst group of products, including ArcGIS Business Analyst Pro, ArcGIS Business Analyst Enterprise, ArcGIS Business Analyst Web App, and ArcGIS Business Analyst Mobile App. The dataset features more than 14 million verified business records for the United States and Canada and includes valuable business-focused information such as employee and sales volume counts, business descriptions from the North American Industry Classification System (NAICS), and specialty information.

Read on to find out how various sectors can use Data Axle's business information in the POI search in Business Analyst.

Granular Business Data Promotes Rich Insight

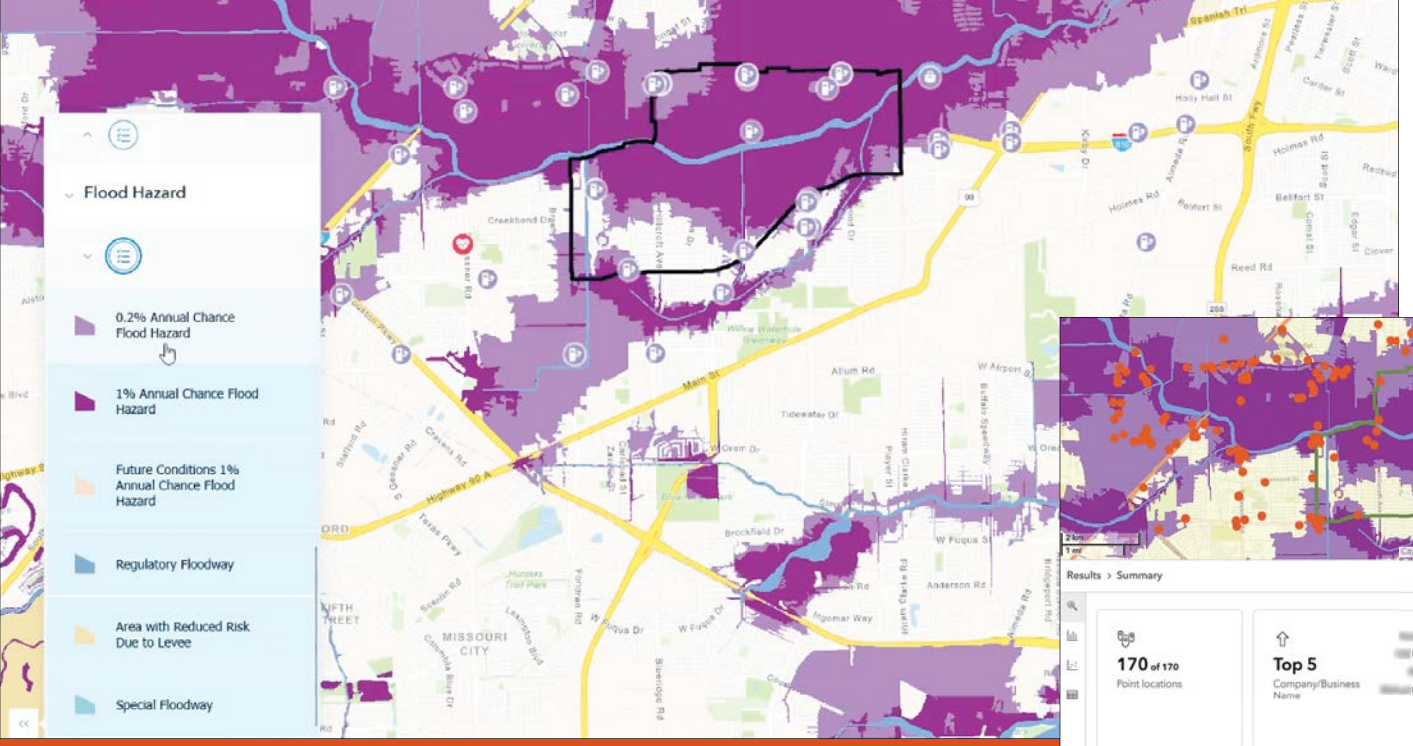
Data Axle's business data goes beyond mapping business addresses. Each record includes business-type classifications—independent, branch, headquarters, or kiosk—plus estimated employee counts.





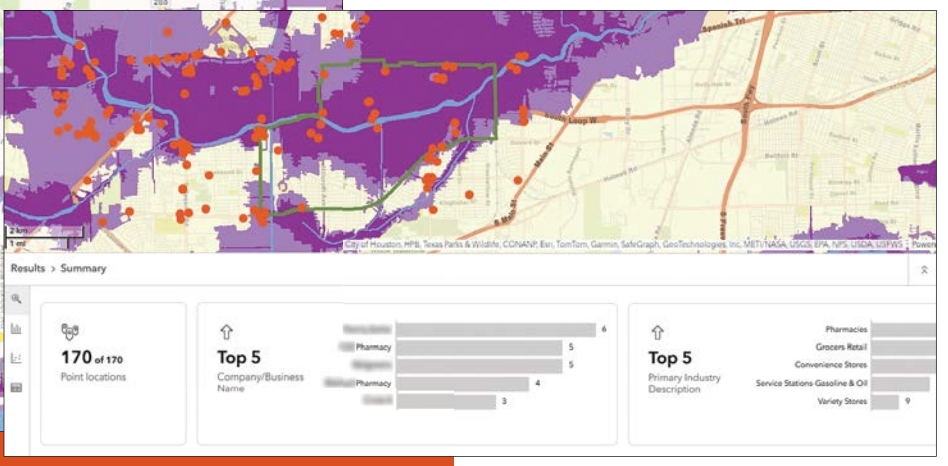
↑ When planning for weather events, users can search the points of interest (POI) dataset for specific types of businesses.

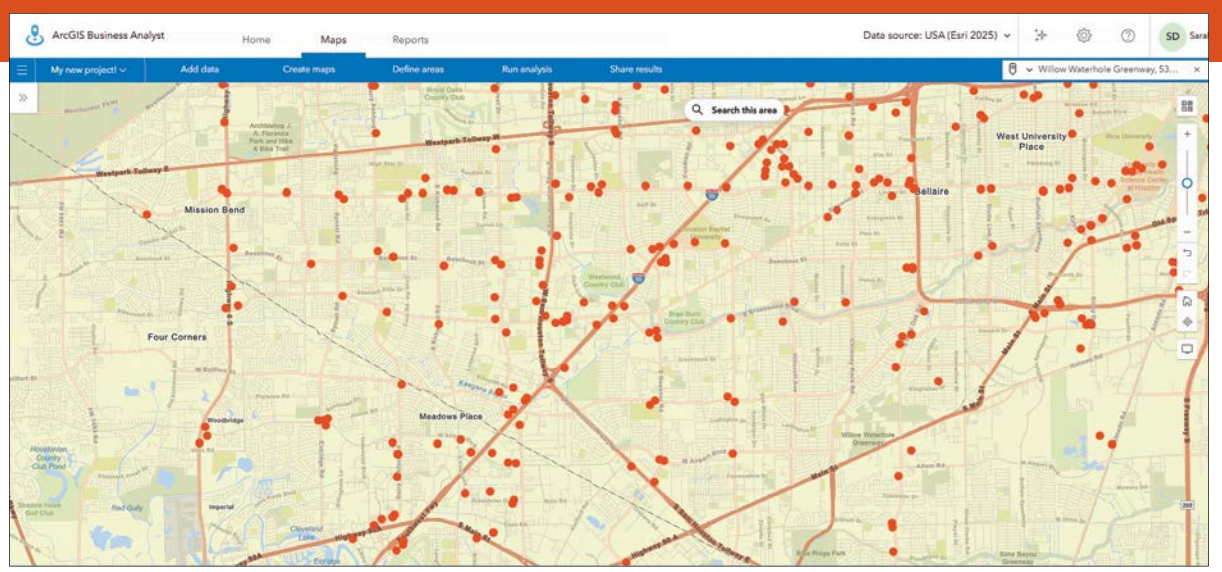
← Users can see detailed business information for specific areas.



← Putting business data alongside flood hazard data from ArcGIS Living Atlas of the World reveals areas and businesses that are at high risk of flood damage.

↓ The data can be filtered to show the top five businesses in an area.





← Data Axle provides business information for ArcGIS Places, Esri's business-focused POI dataset that powers the ArcGIS Business Analyst product suite.

Business-type classifications can help economic development teams provide targeted support for independent businesses. For example, if a county is launching a grant program for independent businesses with 10 or fewer employees, county staff can use Business Analyst to filter by employee count and business type, then visualize concentrations of these types of businesses using heat maps to guide outreach and engagement.

Points also show layered activity on a single property—like when there's a coffee shop inside a grocery market or a pharmacy inside a general merchandise store. This granularity supports richer local business insights, including opportunities for strategic partnerships and increased brand visibility.

Retail and Real Estate:
Conduct Highly Specific Searches

The new Nearby Analysis workflow in Business Analyst Web App allows users to quickly look at key measures, like store counts and concentrations of businesses, and compare these between different areas.

Retailers can leverage this workflow to assess development opportunities by analyzing proximity to anchor businesses—such as big-box retailers or entertainment venues—that drive foot traffic to nearby stores. Quick-service restaurant chains, for example, can evaluate competitive density within defined drive-time areas, uncover underserved markets, and combine demographic data with business intelligence to target expansion in areas with high potential.

Data Axle also provides proprietary eight-digit NAICS codes and specialty tags that enable highly specific searches. Instead of performing a search for "restaurants," users can employ filters like "full-service breakfast" or "Asian fusion" to pinpoint exact competitors. Retailers and real estate developers can perform site selection based on surrounding businesses, identify complementary businesses for mixed-use projects, and find secondary business types such as fitness centers that have a juice bar.

By combining detailed business classification, location intelligence, and visualization tools, this dataset empowers decision-makers to identify high-potential areas, streamline market analysis, and optimize growth strategies.

Health and Human Services:
Analyze Health-Care Availability Against Need

In today's evolving health-care landscape, understanding health-care facility locations within a community is critical for effective planning and research. Data Axle business listings cover facilities that range from major hospitals to assisted-living centers. They're also tagged with rich specialty information, such as "pediatrician" or "optometrist," to help with detailed analysis.

In Business Analyst, users can analyze these health-care facilities against critical demographic variables such as age, household size, income, and insurance status. For example, planners can map where senior populations live and compare that to existing facilities to pinpoint gaps in access. Similarly, hospital networks might discover that rural residents face long drives to the nearest urgent care. By layering POI data with household income and insurance coverage information, planners can prioritize where to open satellite clinics to expand their reach to economically vulnerable populations.

This data-driven approach enables hospitals, urgent care facilities, and senior-care providers to address service discrepancies, strategically expand, and deliver care where it is needed most.

Disaster Preparedness and Response:
Plan for Populations That Need Help During Extreme Weather Events

Natural hazards such as floods, storms, and fires can cause costly damage and disrupt essential services like grocery stores and gas stations, leaving communities without access to food, medicine, and fuel. Understanding where these vulnerabilities exist is critical for decision-makers. Business location data, coupled with environment and natural resources layers from ArcGIS Living Atlas of the World, can help conduct this important analysis.

Drought intensity, flood hazard areas, and storm reports layers—all available in ArcGIS Living Atlas—reveal zones that are at high risk of damage from natural hazards. When used in concert with Data Axle's business location data, users can see which hospitals, assisted-living facilities, fuel stations, and grocery stores lie within these zones.

This gives local decision-makers a good idea of which populations may need extra support during weather events. Government agencies can identify where to make infrastructure improvements, emergency managers can pinpoint resource gaps, nonprofits and community groups can target outreach and preparedness efforts, and businesses can evaluate the risks for current and future operations.

Government and Public Works:
Model and Analyze Community Needs

Government agencies—from transportation departments to economic development offices—rely on POI data to address diverse needs. They use it to model travel demand, identify food deserts, look up critical infrastructure, and streamline tax and revenue operations.

With POI data, agencies can conduct predictive analyses, such as benchmark comparisons or suitability reviews, to identify optimal locations for public facilities including libraries, parks, and community centers. They can also analyze the population's ability to access essential services like public transit, health care, and grocery stores.

POI data empowers government agencies to make informed, location-based decisions that improve service delivery, optimize resource allocation, and enhance residents' quality of life.

Geographic Patterns Influence the Real World

In an increasingly data-driven world, location intelligence has become fundamental to robust decision-making across every sector. By integrating Data Axle's in-depth business data with ArcGIS Business Analyst, users can move beyond surface-level analysis and uncover the geographic patterns that drive real-world outcomes.

Whether identifying underserved communities, mitigating disaster risks, optimizing retail site selection, or planning essential public services, combining authoritative business location data with rich demographic and geographic context can transform how organizations understand and respond to the needs of the populations they serve. By leveraging these powerful analytical tools, leaders can make more informed, strategic decisions that not only drive business success but also enhance community resilience, improve access to critical services, and contribute to an area's economic vitality.

Building Communities Beyond Borders at the University of Minnesota

When Dr. Rebecca Cunningham joined the University of Minnesota as its president in 2024, she brought something unusual: extensive GIS experience from her work as a public health professor. Recognizing the university's leadership in spatial analysis, she made GIS central to the institution's strategic plan.

University of Minnesota professors Thomas Fisher and Len Kne are leveraging that commitment with the GeoCommunities initiative (geoc.umn.edu), which uses ArcGIS Knowledge to map the shared research questions and educational activities of the university's faculty, staff, and students.

From Infrastructure to Innovation

ArcGIS Knowledge allows users to create knowledge graphs—models that simulate real-world systems—in ArcGIS Enterprise. The professors' team recently used ArcGIS Knowledge to map the university's 341 research centers and institutes based on how their work relates to the United Nations' 17 Sustainable Development Goals, or SDGs. The resultant knowledge graph provides a unified view of the scale and scope of the university's research activities. By modeling relationships among researchers, topics, places, and goals, it reveals communities of practice, previously unknown connections, and opportunities for collaboration that would not be visible through traditional maps or databases.

Other applications for ArcGIS Knowledge are more local, such as focusing on faculty members' goals as they relate to Minnesota's Hennepin County, where the university's main campus is located, or mapping university courses as they relate to the SDGs.

Building Global Communities with Shared Ecosystems

GeoCommunities is also developing tools to help create global communities based on the World Terrestrial Ecosystems maps—available in ArcGIS Living Atlas of the World—that Esri developed with the US Geological Survey, the United States' largest civilian mapping agency for water, earth, and biological science.

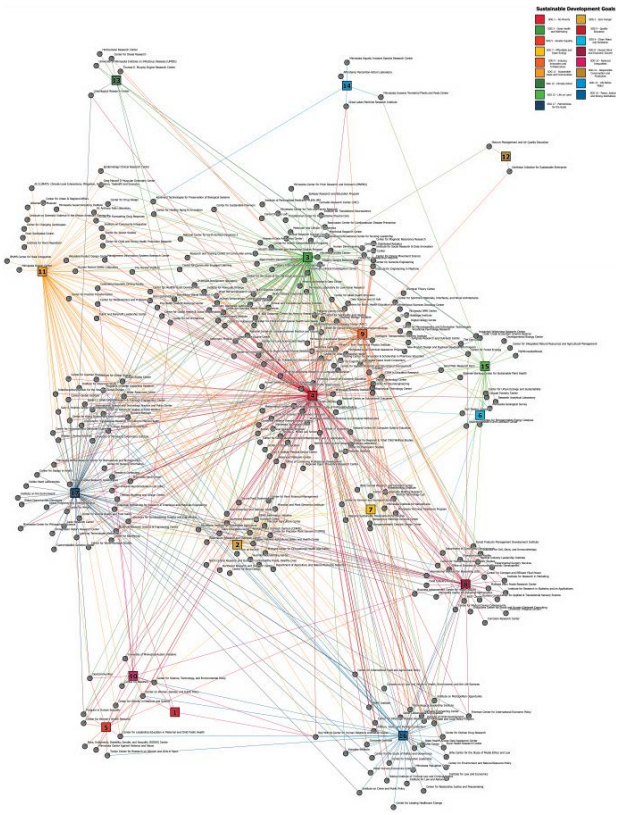
With an ArcGIS Experience Builder app that enables users to locate ecosystems on a 3D global map, the GeoCommunities team used ArcGIS Maps SDK for JavaScript to create an app called Connected Through Climate, which helps identify communities around the world that share ecosystems. With data on ecosystem areas, populations, population densities, and average particulate matter, the app's dashboards allow communities to share common challenges, best practices, and effective policies to protect natural environments.

Sharing the Spatial Turn with Higher Education

Fisher and Kne have also coauthored a book for Esri Press. Scheduled for release before the 2026 Esri User Conference, the book describes how universities and industries use GIS technology for research, teaching, community engagement, facilities management, workforce preparation, and more.

Similar to the Guide to the Geographic Approach—a collaborative effort from educators and the GIS community to develop teaching modules for modern GIS—this book examines how different institutions make GIS available to their communities and what geospatial technology champions can do to expand the use of GIS.

For more information on the Guide to the Geographic approach, read the Scientific Currents column on page 33. For more information on GeoCommunities, email Len Kne at lenkne@umn.edu.



↑ A knowledge graph shows hundreds of research centers mapped to the United Nations' 17 Sustainable Development Goals, including relationship connections.

The Connected Through Climate app displays ecosystem locations along with related data such as total area, estimated population, and particulate matter metrics.

Calling All GIS Educators: The Guide Is Here!

Scientific Currents

By Dr. Peter Kedron and Dr. Sarigai (Rose) Sarigai, University of California, Santa Barbara; and Dr. Dawn Wright, Esri

Professionals need to continually learn new technology and update their skills, whether working in the geospatial technology industry, engaging in scientific research, or teaching students to prepare for careers in GIS. Society and the environment constantly evolve, new data and technologies emerge, and analytical methods get more sophisticated.

But it is hard to keep up—especially for scientists and university professors who not only have teaching responsibilities but also engage in research and academic service. As scientists and university professors, the three of us have, at times, felt a gnawing panic that we might be holding students back by not teaching them the very latest in modern GIS technology and associated scientific principles. So much work goes into updating courses and labs, let alone enhancing GIS curricula.

Continuous change, however, does present opportunity. If educators can anticipate where the geospatial technology industry is heading, they can prepare students for tomorrow's innovations. The Guide to the Geographic Approach helps educators seize this opportunity.

Developed collaboratively by educators and the broader GIS community, the guide is a collection of ready-to-use teaching models that bring modern GIS techniques and spatial data science into the classroom. Contemporary case studies equip learners to address real-world problems by applying spatial thinking and the latest geospatial technologies. Modules are delivered as editable ArcGIS StoryMaps stories that contain short, conceptual video lectures, technical skills training, class and lab exercises, and ethical lessons. It all aligns with the topics, skill areas, and learning outcomes emphasized in the GIS&T Body of Knowledge (a comprehensive catalog of the GIS and technology field) and the geographic information system professional (GISP) certification.

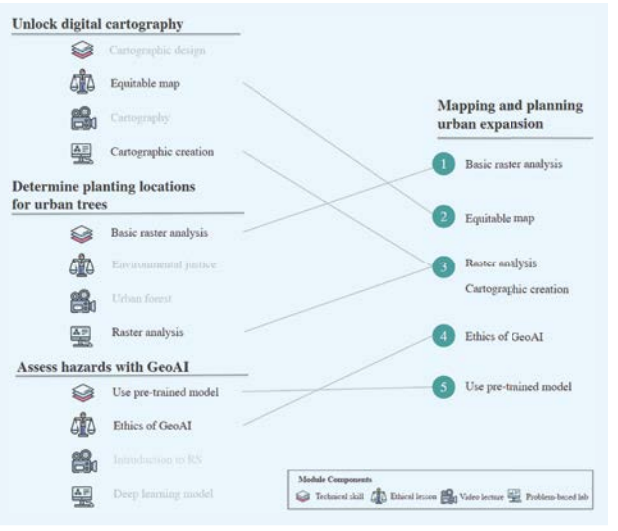
Faculty instructors and teaching assistants will gain the following four benefits, if not more, from using the modules in the guide:

- They will save valuable preparation and class time by having ready-to-use courseware, complete with data, that can fit into existing courses and curriculum.
- They can trust the modules—which are prepared by experienced academics—to cover the latest GIS concepts and techniques, including web mapping, geospatial artificial intelligence, enterprise GIS, big data, and ethics.
- The modules are easy to customize using provided templates, and they can be used in their entirety or deconstructed into component parts.
- The modules are openly and freely available, continually updated by a network of universities in collaboration with Esri, and open for additional participants and contributions.

The guide is meant to be used in at least three distinct ways. First, instructors can insert modules into their existing GIS courses as complete lessons. For example, if a professor wants to update their cartography lessons to emphasize interactive web mapping, they could use the Unlock Digital Cartography module to complement existing materials. If they want to add lessons on recent developments in mobile mapping, GeoAI, and the use of computational notebooks, they can slot modules on each of these topics into their GIS courses.

Second, modules can be used to complement and enrich thematic courses across the university curriculum. Because the modules do not require extensive prior knowledge of GIS, instructors can quickly introduce students to key concepts and skills using the supplemental materials that accompany each module. For example, a business professor interested in introducing students to market analysis and site selection could use the Expanding a Business Using Location Analytics module to teach students different market screening and segmentation techniques while also emphasizing nondiscrimination in business decision-making. A professor of environmental and conservation science might use the Conservation Decision-Making with GIS module to train students to identify sites suitable for conservation and then expand those skills by using the Forecast Future Habitat Suitability Under Climate Change module to imagine how those sites might change over time.

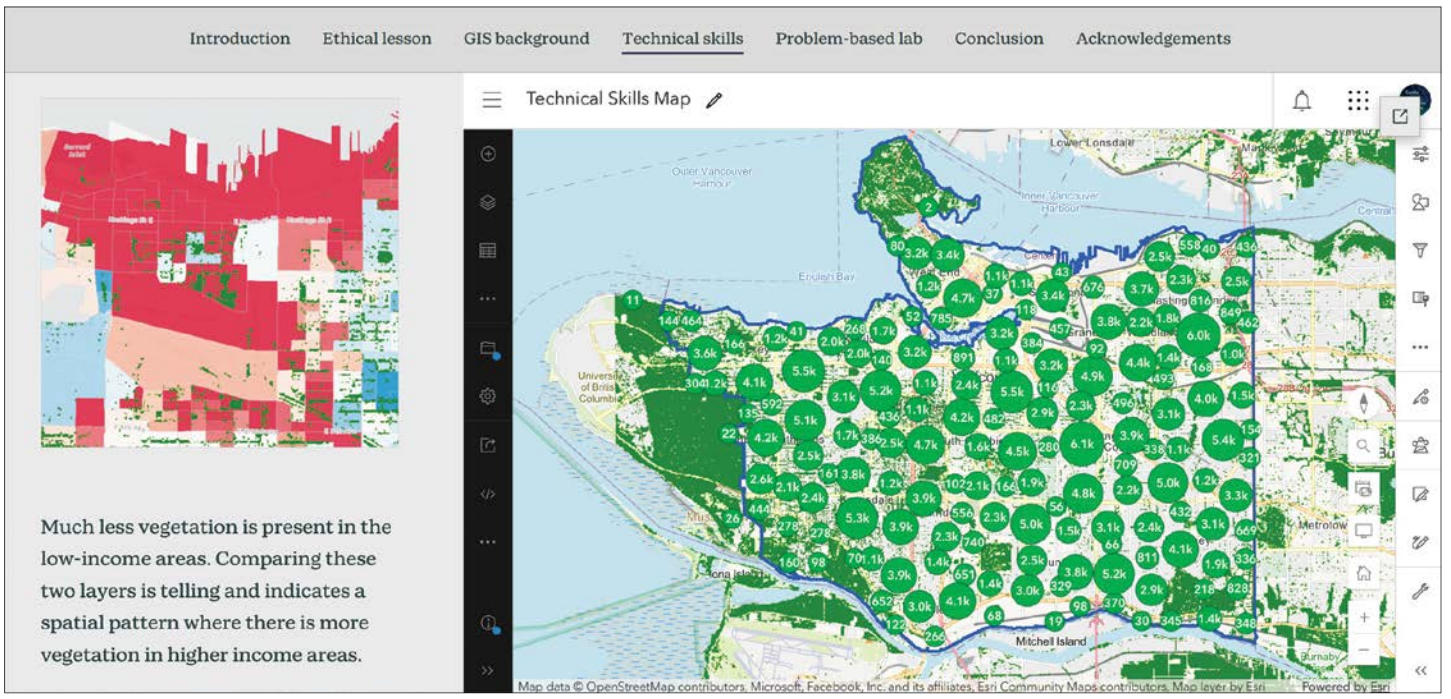
Third, instructors can break up modules into their component parts and use them to create or remix course content. For example, an urban planning professor who wants to create a lesson on mapping and planning urban expansion could augment their existing course materials by combining web mapping training exercises and the ethical lessons and lab from the Unlock Digital Cartography module, the raster analysis technical lessons and lab from the Determine Planting Locations for Urban Trees module, and the GeoAI technical training and ethical lesson from the Assess Hazards with GeoAI module. Combined into a new lesson, the professor could use these materials to teach students how to acquire and analyze Earth observation data using GeoAI tools while considering the ethical implications of their urban planning decisions.



↑ Instructors can access, edit, and combine the modules' individual components to make new course content appropriate for their classroom settings.

If you're a university-level instructor—whether you teach GIS courses directly or incorporate geospatial thinking into other disciplines—explore the guide. See the available modules, experiment with integrating them into your courses, and share your experiences with colleagues.

The guide is a collaborative effort, and its continued growth depends on input and feedback from educators. Visit GuidetotheGeographicApproach.com to view the introductory community webinars, browse the module library, and contribute your own ideas or case studies. New materials on using GeoAI and working with AI assistants to solve real-world problems are currently in development, so stay tuned for those updates.



↑ The Determine Planting Locations for Urban Trees module uses a dynamic web-mapping interface to teach students about data and map literacy, spatial thinking, and ethical reasoning.



About the Authors

Dr. Peter Kedron is an associate professor of geography at the University of California, Santa Barbara (UCSB), and the associate director of its Center for Spatial Studies and Data Science. Dr. Sarigai (Rose) Sarigai is an academic coordinator for the Guide to the Geographic Approach project at UCSB's Center for Spatial Studies and Data Science. Dr. Dawn Wright, a specialist in marine geology, is Esri's chief scientist, who aids in strengthening the scientific foundation for Esri software and services while also representing Esri to the scientific community.

Embedding Geospatial Thinking in International Relations

By Dr. Marcia Moreno-Báez, Tufts University

When graduates of the Fletcher School of Law and Diplomacy at Tufts University in Massachusetts join organizations such as the United Nations, the World Bank Group, or the International Committee of the Red Cross, they arrive with a skill those organizations desperately need: GIS expertise. Founded in 1933, Fletcher is known for innovation in international education and reflects a mission to educate leaders who deliver solutions to global problems.

Since 2009, more than 600 Fletcher students have completed geospatial training using ArcGIS technology, learning to map refugee settlements, track disease outbreaks, analyze climate impacts, support crisis responses, and more. At Fletcher, GIS represents a spatial literacy that can transform international relations students into global leaders.

GIS and International Relations

The field of international relations is about understanding how the world connects beyond borders. It examines how countries, organizations, and individuals interact via diplomacy, trade, security, human rights, and global challenges. Knowing where and why events occur has become fundamental to shaping better policy, responding to crises, and leading across borders.

In 2009, GIS experts at Tufts partnered with Fletcher faculty to rethink how geospatial education could prepare students for data-driven careers and a rapidly changing technological landscape around the world. This partnership created an emerging commitment to geospatial innovation that would soon prove its value.

Proof of Concept: The Haiti Response

One early example came during the 2010 Haiti earthquake, when a Fletcher student used crisis mapping to help guide humanitarian response. Working with a global volunteer network, he created a live crisis map integrating geolocated reports from text messages, social media, and local radio. It enabled aid agencies to locate survivors and direct resources with unprecedented speed.

What began in a donated Fletcher space grew into a large-scale demonstration of digital humanitarianism, showing how geospatial skills could directly impact global crises.

Growing the Program

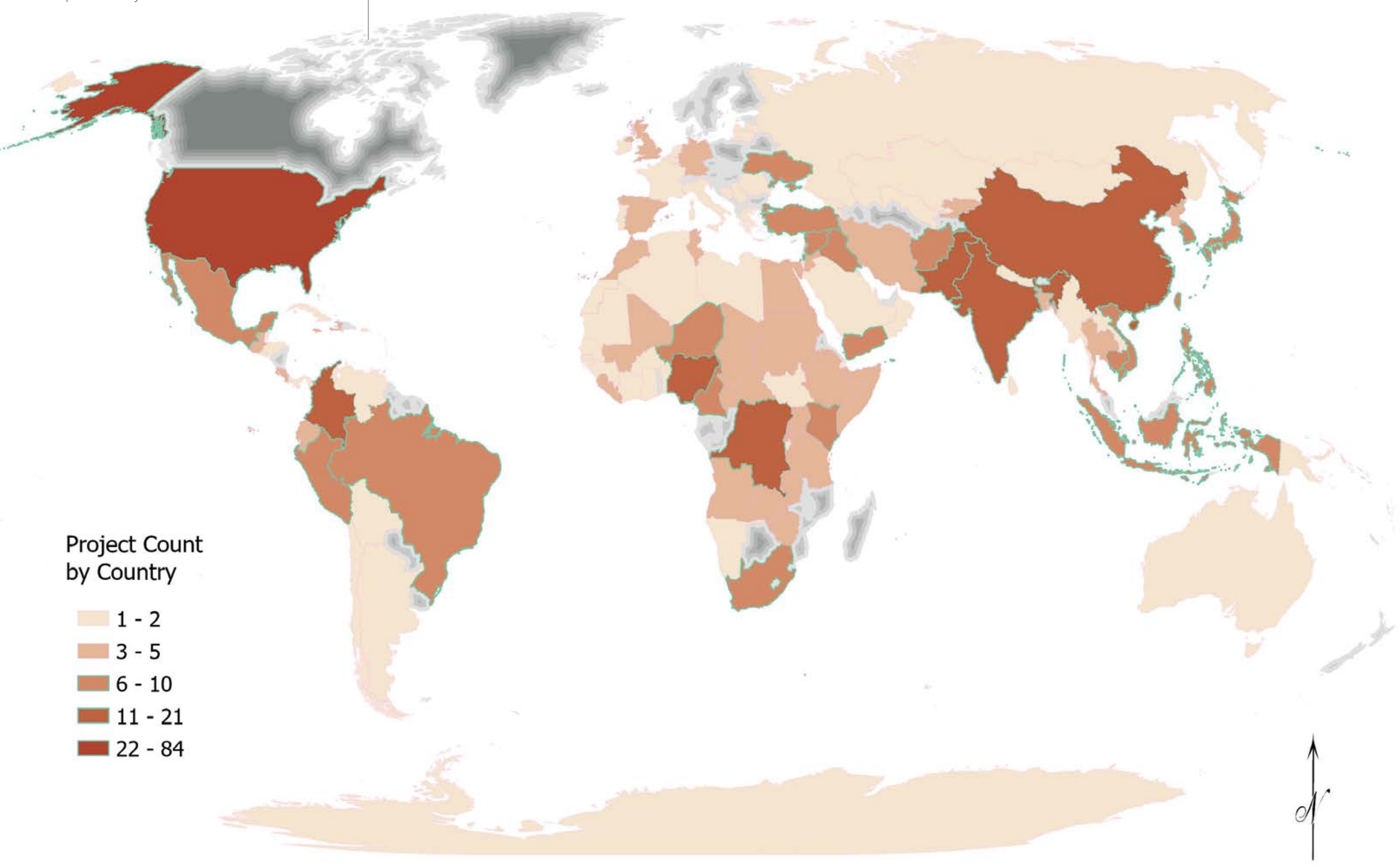
Building on early successes like the Haiti response, GIS is now fully integrated into Fletcher's interdisciplinary curriculum. An introductory course called GIS for International Applications is organized into three modules: core concepts and skills, spatial analysis, and project development. Other courses focus on data management and geoprocessing; geospatial modeling, including spatial statistics and multivariate analysis; and visualization. Instruction centers on ArcGIS Pro, with applied training in tools such as ArcGIS StoryMaps, ArcGIS Dashboards, and ArcGIS Survey123.

Course tutorials and student projects address pressing issues in foreign affairs and diplomacy, including conflict analysis, governance, environmental sustainability, energy and climate policy, economic development, and infrastructure planning. These efforts are showcased in an ArcGIS StoryMaps collection called Mapping the World Through Student Stories (links.esri.com/tufts-mapping), where Fletcher students present spatial analyses of real-world global challenges. By combining rigorous analytical methods with modern GIS technology, these stories translate geographic insight into compelling narratives and actionable policy solutions.

From Discovery to Diplomacy

For many Fletcher students with nontechnical backgrounds, GIS begins as just another line in a course description. But it quickly turns into a practical tool for humanitarian aid, peacekeeping, and sustainable development.

↓ A global map shows the number of projects completed by Fletcher students on a per-country basis.



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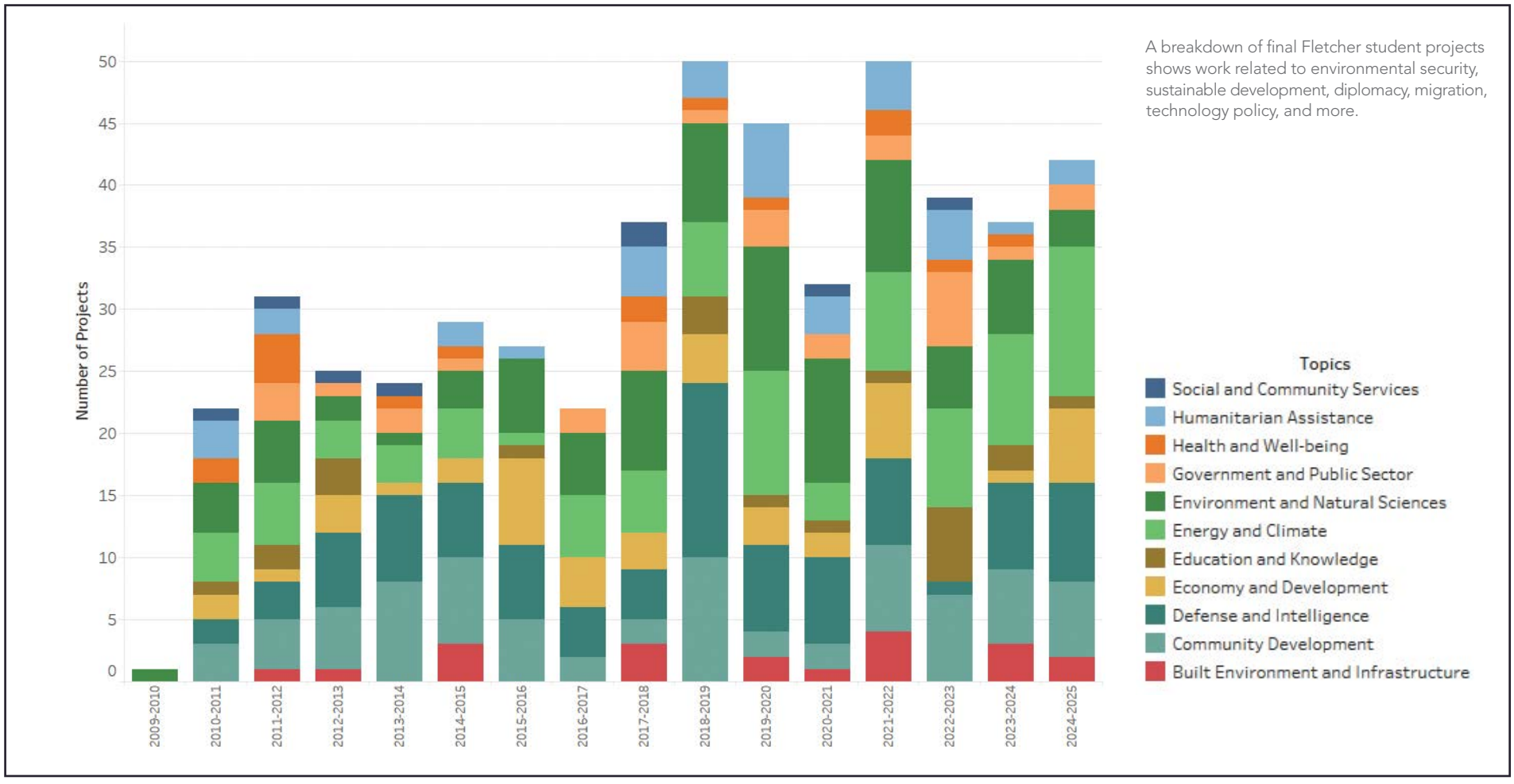

Students learn to map refugee settlements; identify disaster risks; and analyze opportunities for conflict prevention, environmental protection, and disaster response. For many alumni, this experience has opened doors to internships, careers, and leadership roles where geospatial analysis is a strategic asset.

Expanding Global Reach

Fletcher's commitment to GIS education continues to evolve. A new course on drone technology and geospatial intelligence gives students insight into how unmanned systems are reshaping security and humanitarian operations. Fletcher has also begun exploring geospatial AI, recognizing that AI and large language models are creating new opportunities and challenges for geospatial analysis in international contexts.

GIS now runs through Fletcher coursework across nearly every field—from international development and environmental policy to human security, humanitarian affairs, technology, regional studies, gender and intersectional analysis, business, negotiation, conflict resolution, and security studies. Beyond traditional analysis, it serves as both a research tool and a medium for storytelling, helping students communicate complex global challenges through spatial narratives.

This geographic literacy enhances Fletcher graduates' career prospects as demand for spatial thinking grows across sectors. Fletcher remains committed to equipping future leaders with the tools needed to expand their global reach.

About the Author

Dr. Marcia Moreno Báez is a research professor at the Fletcher School of Law and Diplomacy at Tufts University. She holds a PhD from the University of Arizona and completed a postdoctoral fellowship at the Scripps Institution of Oceanography at the University of California, San Diego. She teaches courses on geospatial technology, focusing on the development and application of spatial methods for territorial and marine planning, fisheries management, and natural resource governance. For more information on GIS studies at Fletcher, contact Báez at marcia.morenobaez@tufts.edu.

See the Forest for the Trees: Why Maps and Cartography Matter More than Ever

The Relevance of Cartography

A Cartographer's Perspective

By Dr. Georg Gartner
International Cartographic Association

In an era defined by digitalization, humanity has unprecedented access to information. Satellites orbit Earth; sensors track movements and changes in real time; and vast databases collect, store, and analyze nearly every measurable aspect of the world. Yet, paradoxically, this abundance of data often makes it more difficult, not easier, to gain understanding.

Humans have more details than ever before, but we increasingly struggle to grasp the bigger picture. In this context, maps and cartography—understood not merely as geographic tools but also as methods of structuring and visualizing complexity—have become more important than at any time in history. They help us see the forest rather than getting lost among the trees.

Cartography has always been about more than drawing coastlines and borders. At its core, it is a way of transforming overwhelming reality into a meaningful representation. A good map does not show everything—it shows what matters. This principle is crucial in the digital age, where the problem is no longer a lack of information but an excess of it. Without careful selection, hierarchy, and abstraction, data becomes noise. Maps, by necessity, impose order. They determine what's included and omitted and how relationships should be displayed. By doing this, they turn raw data into knowledge.

Digitalization has radically expanded the scope of cartography. Today's maps are dynamic, interactive, and multilayered. GIS, real-time dashboards, and spatial data visualizations allow users to explore phenomena ranging from changing migration patterns and climates to supply chains and social inequalities. But this power also brings risk. When every variable can be mapped, layered, and animated, this can lead to visual overload. Users may focus on individual data points, zoom endlessly in to details, or mistake precision for understanding. The role of cartography, therefore, is to not just display data but also guide interpretation.

This guiding function is especially critical in times of crisis. During natural disasters such as floods, wildfires, or earthquakes, decision-makers rely on maps to assess risk, allocate resources, and communicate with the public. A flood map, for example, is not valuable because it contains every possible measurement; it is valuable because it clearly communicates where danger lies, who is affected, and what actions are needed. Poorly designed maps can mislead, create false confidence, or cause panic. Well-designed cartographic representations, on the other hand, can save lives by making complex situations immediately understandable.

Beyond emergencies, maps play a central role in navigating long-term global challenges. Climate change is a prime example. The phenomenon is vast, abstract, and unfolds across different scales of time and space. Individual data points—temperature readings, CO_2 concentrations, and sea-level measurements—are meaningful only when seen in relation to one another. Cartographic representations allow us to connect these details into patterns: warming trends, vulnerable regions, and projected futures. Without maps, climate data risks remaining a collection of isolated facts rather than a coherent narrative that can inform policy and public action.

The importance of cartography extends far beyond physical geography. In the digital world, the word "map" increasingly functions as a metaphor for structured knowledge. Network diagrams, information architectures, conceptual maps, and data visualizations all follow cartographic principles. They reduce complexity by establishing orientation: What is central? What is peripheral? How are elements connected? In this sense, cartography becomes a general cognitive tool for understanding systems—economic, social, and technological—that are otherwise too complex to grasp.

Having the power to map also raises ethical questions. Every map reflects someone's choices and perspectives. What is shown prominently and what is hidden can reinforce power structures, biases, or political agendas. In the age of big data, these issues are amplified. Automated mapping systems may appear neutral, but they are built on assumptions embedded in data collection, classification, and visualization. Responsible cartography, therefore, requires transparency; critical reflection; and an awareness that maps shape how people see the world, not just how they navigate it.

Education plays a crucial role in ensuring that maps fulfill their potential rather than becoming sources of confusion or manipulation. Map literacy—understanding how maps are constructed, what they can and cannot show, and how to interpret them critically—is an essential skill in the digital age. Just as reading and writing were foundational skills in earlier eras, the ability to decipher visual and spatial representations is becoming increasingly important. Without this literacy, users risk mistaking detailed maps for truthful ones or confusing complexity with insight.

At the same time, advances in digital tools have democratized cartography. What once required specialized training and expensive equipment can now be done with widely available software and open data. This democratization allows communities to map their own realities, highlight local knowledge, and challenge official narratives. Participatory mapping projects, for instance, have been used to document informal settlements, environmental damage, and social inequalities that were previously invisible on official maps. In this way, cartography can empower voices that might otherwise remain unheard.

Yet democratization does not eliminate the need for expertise. On the contrary, as more people create and consume maps, the demand for thoughtful design and methodological rigor increases. The challenge is not simply to produce more maps but better ones—maps that clarify rather than obscure, connect details to context, and help users orient themselves in a complex world. This requires a deep understanding of both data and human perception.

Ultimately, the enduring importance of maps and cartography lies in their ability to reconcile detail with meaning. In a world flooded with data, it is easy to become lost among numbers, metrics, and isolated facts. Cartography reminds us that understanding depends on structure, perspective, and synthesis—that seeing everything is not the same as understanding anything. By helping people step back, identify patterns, and grasp relationships, maps allow them to see the forest even when surrounded by individual trees.

As digitalization continues to accelerate, the question is not whether there will be enough data but whether humans will have the tools and wisdom to make sense of it. Maps—broadly understood as cartographic representations of complexity—will remain indispensable. They are not relics of a pre-digital past but are essential instruments for navigating the present and shaping the future. In learning to see the forest for the trees, we rediscover why cartography matters now more than ever.

About the Author

Dr. Georg Gartner is a full professor of cartography at Vienna University of Technology in Austria. He is currently serving his second term as president of the International Cartographic Association.

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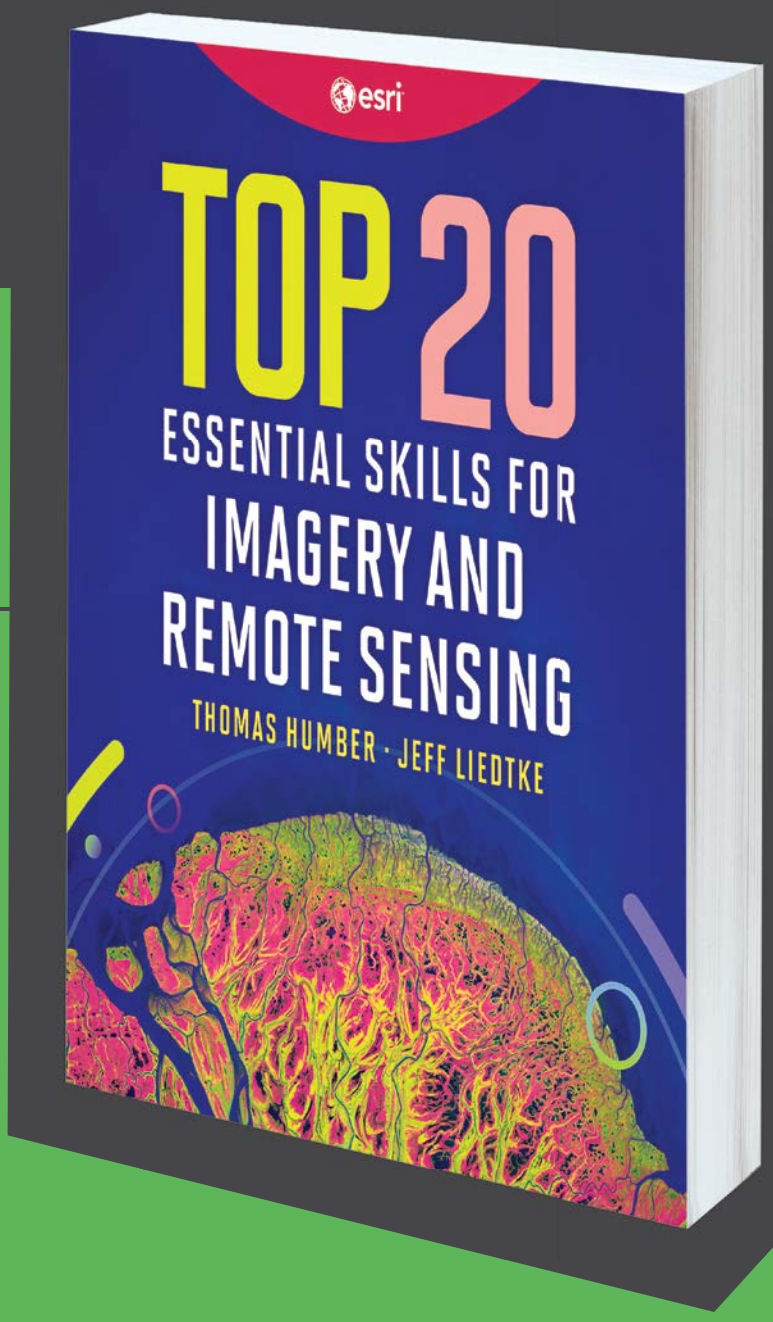
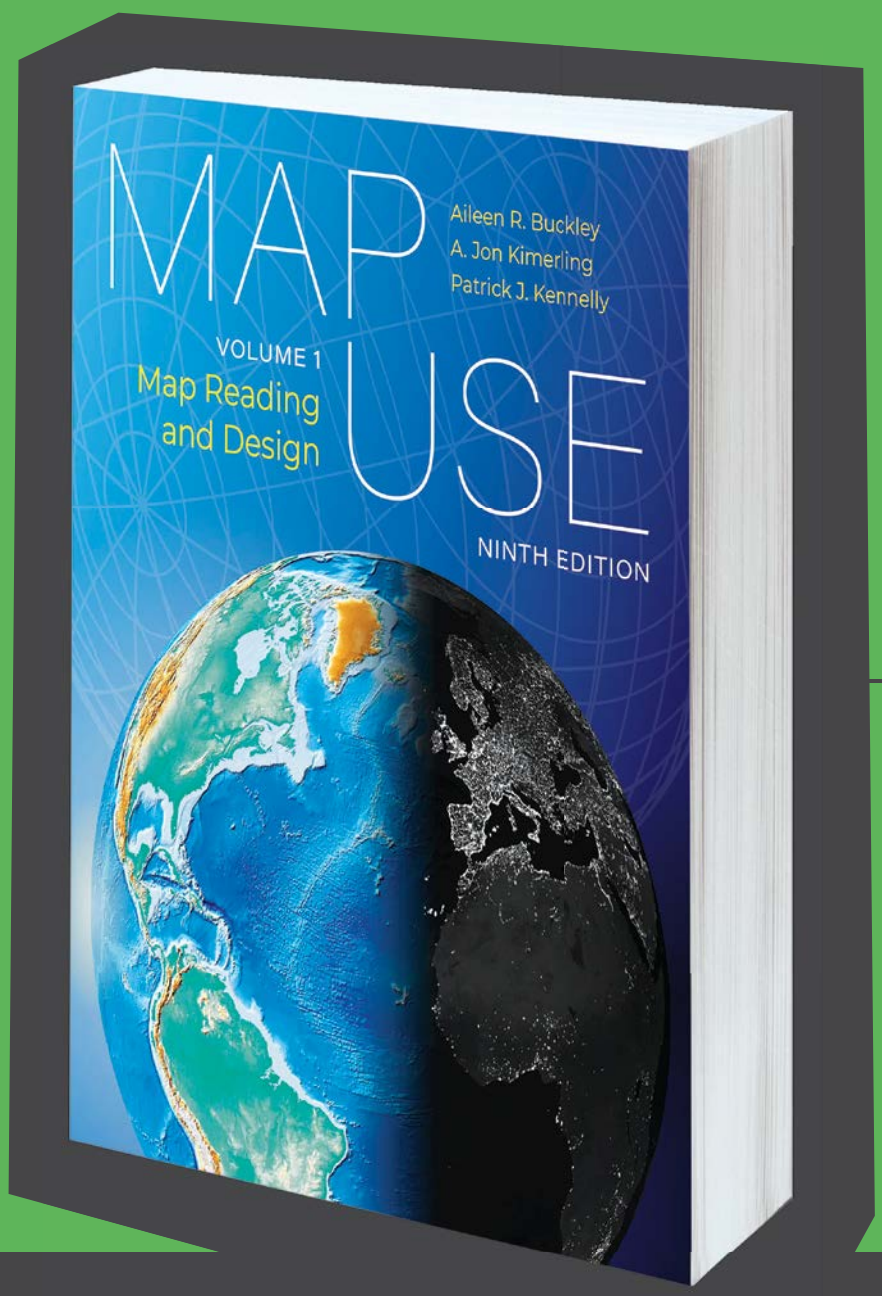


Top 20 Essential Skills for Imagery and Remote Sensing

By Thomas Humber and Jeff Liedtke

Top 20 Essential Skills for Imagery and Remote Sensing guides readers step-by-step through the key techniques needed to visualize, process, analyze, and manage imagery and raster products. The book contains concise chapters—each of which takes about 45 minutes to complete—with easy-to-follow tutorials and practical examples. This is an approachable resource for users of all skill levels, from GIS professionals who want to deepen their understanding of imagery to students who are eager to learn about remote sensing. March 2026, 330 pp. Ebook ISBN: 9781589488229, paperback ISBN: 9781589488212, and hardcover ISBN: 9781589488731.



Map Use: Map Reading and Design

Volume 1, Ninth Edition

By Dr. Aileen R. Buckley, Dr. A. Jon Kimerling, and Dr. Patrick J. Kennelly

Maps are sophisticated conceptual creations. They convey as much about how people think and communicate as they do about the mapped environment. *Map Use: Map Reading and Design*, Volume 1, ninth edition, is a comprehensive primer on how to read and understand maps, design and make maps, and recognize the limitations and inaccuracies of maps. Combining authoritative text with hundreds of stunning visuals, the book describes foundational cartographic concepts in the context of the industry's latest innovations. Changes for the ninth edition include reindexing; revised datums, maps, and images; an updated map projection guide; a new state plane coordinate system; and updated text to reflect new concepts, practices, and technology. An online glossary is also available. March 2026, 340 pp. Ebook ISBN: 9781589487765, paperback ISBN: 9781589487758, and hardcover ISBN: 9781589488816.

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View the full MOOC calendar at esri.com/training/mooc.

Get Clarity on AI in ArcGIS

Technology providers are releasing new AI tools and apps at dizzying speeds. Sifting through the hype to identify practical AI use cases and potential impacts is a challenge that many organizations face. A new web course at Esri Academy can help.

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