# ArcNews

## Briefly Noted

### ArcGIS Desktop (ArcMap) Is Retiring

ArcGIS Desktop (ArcMap) retires in 2026, so now is the time for organizations to step into a modern geospatial platform by migrating to updated user types with access to ArcGIS Pro—the most secure, advanced version of ArcGIS. Esri has prepared resources to help users make the change, including the instructor-led courses Migrating from ArcMap to ArcGIS Pro (go. esri.com/migration-course) and ArcGIS Pro: Essential Workflows (go.esri.com/workflows-course), as well as the Migrate to ArcGIS Pro learning plan (links.esri. com/migrateLP). For more information—and to talk to someone about your organization's unique needs—go to esri.com/ desktopmigration.

### New NAIP Imagery Available in ArcGIS Living Atlas

The National Agriculture Imagery Program (NAIP) 2023 imagery is now available in ArcGIS Living Atlas of the World. NAIP, which is administered through the US Department of Agriculture's (USDA) Farm Production and Conservation Business Center, produces high-quality aerial photography imagery of the continental United States during the agricultural growing seasons. With this latest update, Esri's NAIP time series includes annual coverage from 2010 through 2023.

### System Health Notifications in Esri Support App

With the Esri Support App, ArcGIS Online administrators can get proactive insight into the status of their ArcGIS Online systems with health notifications. ArcGIS Online Health Dashboard notifications let administrators know when the status of their dashboard changes. Administrators can then ask the Esri Support AI chatbot for more information on their implementation's status and get immediate answers. For more information, go to links. esri.com/notifications.

## As Wildfires Raged, Satellite Imagery and GIS Helped Fill In Information Gaps

By the end of January, 2025 had already reportedly become the second-most destructive year for fires in California's history. The Palisades Fire and the Eaton Fire—both of which broke out in Los Angeles County on January 7 and burned for weeks, fueled by powerful Santa Ana winds and extended drought conditions—destroyed or damaged more than 16,000 homes and other structures, according to nonprofit news organization CalMatters.

As the fires burned out of control, agencies on the ground were getting help from GIS and satellite imagery to allocate resources as effectively as possible, prioritize areas in need, and expedite relief to affected communities. In particular, Esri partner ICEYE, which operates the world's largest synthetic aperture radar (SAR) satellite constellation, quickly delivered radar-based building-damage analysis to federal, state, and local organizations fighting the fires and providing emergency services. This allowed those organizations to understand how the fires were evolving and begin early damage assessments.

"With the fires in Los Angeles, there was a massive data gap. Agencies couldn't fly because of the persistent high winds, and they couldn't see through the smoke or as the fires burned during the night," said Andy Read, ICEYE's vice president of government solutions. "That's where our technology stands out. Our satellites use radar imaging that can see

| Damaged or Destroyed | Undamaged | Total Structures |
|---|---|---|
| 4,001 | 3,167 | 7,168 |

← While the Palisades Fire was actively burning, Esri worked with ICEYE to develop damage assessment dashboards with 2D and 3D perspectives.

## Tennessee Pioneers GeoAI-Based Wetland Screening Tool

Wetlands, ranging from bogs and marshes to wooded swamps, are distinct ecosystems that define the natural landscape of Tennessee. They are vital to the state's ecological well-being and scenic charm—and they yield crucial benefits to society, including filtering pollutants, recharging aquifers and streams, and providing flood storage capacity.

"Our state has a very special geology and ecology that my agency believes is worthy of protecting," shared April Grippo, director of the Division of Water Resources at the Tennessee Department of Environment and Conservation (TDEC).

Protecting and managing wetlands falls on TDEC, and this mission is carried out by the Division of Water Resources. In response to recent changes in federal wetland protection laws, TDEC staff now have access to an innovative tool that uses GIS technology to solve an old problem: locating all the potential wetlands in the state.
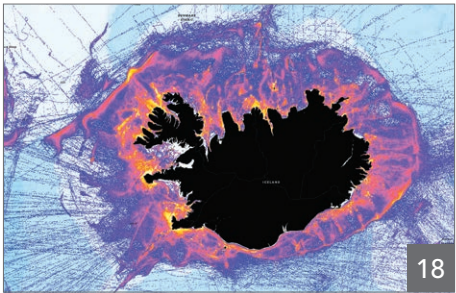
→ Using deep learning models, including Esri's Wetland Identification Model, Esri partner Skytec developed a wetlands predictive model that located 800,000 additional acres of wetlands in Tennessee.

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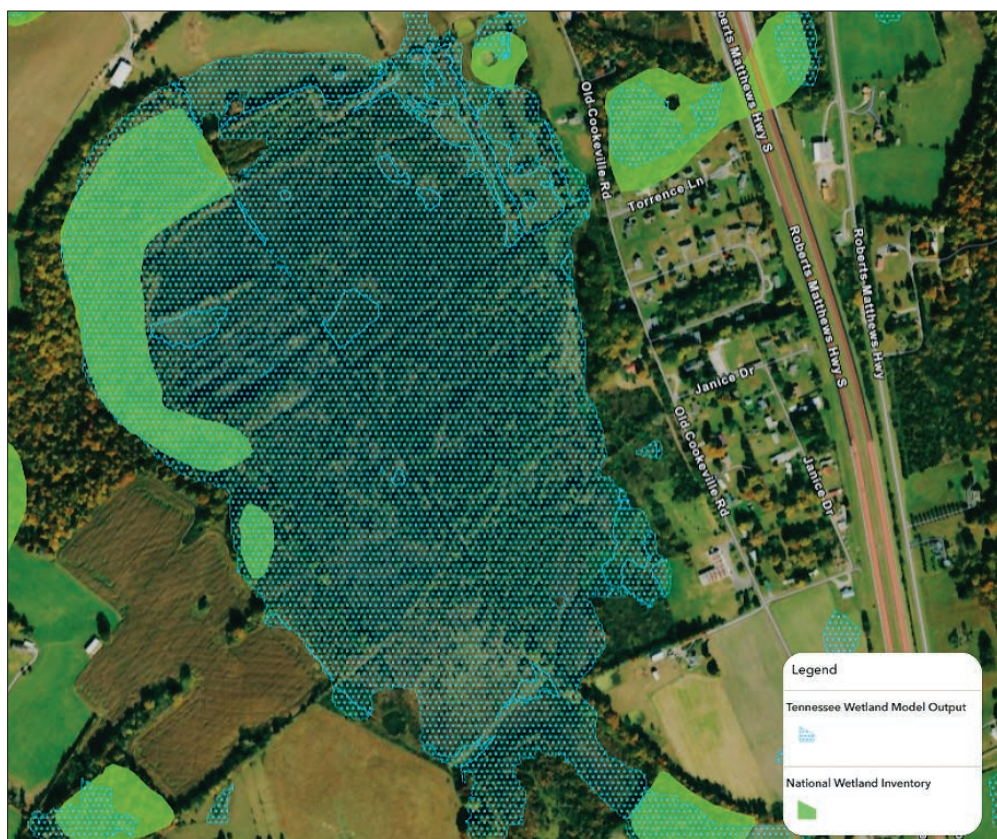
Puerto Rico suffered more than 6,000 dengue cases in 2024, prompting the government to declare a public health emergency. To find mosquitoes transmitting the disease, the Puerto Rico Vector Control Unit (PRVCU) developed a comprehensive dengue tracking and suppression program that uses an array of Esri products, from ArcGIS Pro to ArcGIS Field Maps.

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# How Microsoft Users Can Seamlessly Unlock the *Where* in Data

For more than 25 years, Esri and Microsoft have partnered to deliver innovative technology that empowers customers with location-based insight. This long-standing relationship has enhanced product integrations via ArcGIS for Microsoft, which brings ArcGIS capabilities and data directly into the secure and familiar Microsoft environment.

New to the suite of integrations available for Microsoft users is **ArcGIS GeoAnalytics for Microsoft Fabric**. Releasing this spring, GeoAnalytics for Fabric allows data scientists and data engineers to conduct spatial data integration, transformation, enrichment, and analysis at scale using Apache Spark, a distributed computing framework for processing large amounts of data.

Users can seamlessly access Esri's advanced spatial analytics tools within Microsoft Fabric to detect patterns, perform predictive analytics, or produce business intelligence-ready data for exploration and strategy development. This results in powerful spatial insight that can easily be shared across organizational tools such as Microsoft Fabric, Microsoft 365, Microsoft Power BI, and Esri's ArcGIS environment.

## Together, Microsoft and Esri Offer Unmatched Value

ArcGIS for Microsoft seamlessly integrates ArcGIS capabilities and data with Microsoft productivity apps, intelligence services, and data platforms. It allows users to access and leverage geospatial information within Microsoft products such as Microsoft 365, Microsoft Fabric, and Microsoft Power Platform. This lets users across an organization—from data analysts performing complex spatial analyses to executives using spatial insight to make operational decisions—easily share location data and collaborate on important projects.

With ArcGIS for Microsoft, data analysts and data scientists can visualize and analyze data at scale and gain a deeper understanding of spatial relationships and underlying patterns. Users can uncover hidden trends and correlations that might not be apparent in traditional data analysis, leading to more informed and effective decision-making.

Because teams can work with ArcGIS geospatial data and apps directly in the Microsoft environment instead of switching between platforms, users are more productive and can collaborate more easily and efficiently. Additionally, sensitive information remains protected with Esri and Microsoft's robust identity and access management solutions, as well as role enforcement. These safeguards—which comply with data privacy regulations and organizational policies—ensure that only authorized users can access an organization's ArcGIS data.

One notable integration is that ArcGIS capabilities work in Microsoft's Power Automate, an end-to-end cloud automation platform that helps users automate business processes through self-service configuration, without significant or costly involvement from IT. This integration can handle complex geospatial tasks, reducing manual effort and the potential for errors. And for developers, ArcGIS Maps SDK for .NET offers tools to build robust geospatial and location intelligence apps for both desktop and mobile platforms. This SDK enables developers to create custom apps that work seamlessly with existing Microsoft tools, enhancing the functionality and usability of geospatial data.

## Add the Geospatial Perspective to Data Analysis

One of the most exciting new releases in the Microsoft-Esri ecosystem is ArcGIS GeoAnalytics for Microsoft Fabric. This new Spark-native library is packed with geospatial analytics tools to help users discover where things are occurring, how they relate, and which actions to pursue. It integrates directly into Fabric's data science and data engineering workloads, allowing users to work with geospatial data—from integration and transformation to enrichment and analysis—within Microsoft Fabric's Spark-based notebooks.

With GeoAnalytics for Fabric, users can do the following:

- **Automate spatial data engineering and transformation:** This allows users to streamline the process of managing and transforming geospatial data so they can increase efficiency and accuracy in their projects.
- **Enrich data with location context:** Users can enhance individual data points and big data analytic workflows by bringing in contextual datasets.
- **Analyze events geographically:** By incorporating geospatial analytics into Microsoft Fabric, users can discern patterns and trends in their data to gain a better understanding of where—and why—events are occurring.
- **Visualize spatial relationships:** Users can explore how different locations influence and relate to each other.
- **Identify strategic locations:** Organizations can improve their operations by finding the most strategic locations with ideal situational characteristics.
- **Integrate with Microsoft Power BI:** Users can deliver the results of their analyses in Microsoft Power BI or take their exploration further by leveraging the powerful interactive mapping capabilities of ArcGIS Online and ArcGIS Enterprise.

## A Continued Commitment to Innovation

The ArcGIS for Microsoft team continues to enhance integrations between the two platforms and develop new products to provide Microsoft users with the spatial capabilities of ArcGIS technology. This ongoing commitment to innovation and integration ensures that organizations can harness the full power of geospatial data to drive business outcomes.

To learn more about ArcGIS for Microsoft, visit go.esri.com/arcgis-microsoft. To submit feedback or ideas about other uses for ArcGIS GeoAnalytics for Microsoft Fabric, post in Esri Community at links.esri.com/fabric-community.

ArcGIS for Microsoft is designed for business leaders, data analysts, data engineers, data scientists, developers, and GIS professionals. The full capability suite provides users with the tools they need to perform advanced geospatial data processing, modeling, and spatial analysis, as well as automate spatial workflows. In turn, ArcGIS for Microsoft enables executives to make informed strategic decisions that leverage geospatial insight. Key integrations include the following:

### ArcGIS GeoAnalytics for Microsoft Fabric
GeoAnalytics for Fabric integrates mapping capabilities and geospatial analysis tools directly in the Microsoft Fabric environment. This interface for Apache Spark provides a collection of spatial SQL functions, track functions, and analysis tools to help data scientists and engineers detect patterns in their data. Users can employ ArcGIS for Power BI as well to seamlessly incorporate the insight garnered in GeoAnalytics for Fabric into business reporting and further analysis, helping to uncover the *where* and *why* of the data.

### ArcGIS for Microsoft 365
ArcGIS for Microsoft 365 integrates location analytics and provides access to spatially enabled apps and data in familiar Microsoft 365 apps. Everyone in an organization can create, edit, and analyze maps in Microsoft Excel; augment Microsoft SharePoint sites with interactive maps and location-enriched content; and collaborate on geographic content in real time during Microsoft Teams meetings.

### ArcGIS for Power Platform
ArcGIS for Power Platform offers low- to no-code development tools that enable users to build geospatial apps and set up automated workflows. ArcGIS Connectors for Power Automate offer geospatial triggers and actions that can be set up with little to no coding, allowing users to automate repetitive geospatial and data management tasks directly within Power Automate.

### ArcGIS Maps SDK for .NET
ArcGIS Maps SDK for .NET lets developers build 2D and 3D location-based mapping apps that work online and offline. Using .NET Multi-platform App UI (.NET MAUI), Windows UI Library (WinUI), and Windows Presentation Foundation (WPF), developers can create apps for Windows, iOS, and Android platforms that include capabilities such as geocoding, geofencing, routing, and navigation, as well as data collection and editing.

### ArcGIS Enterprise on Microsoft Azure
ArcGIS Enterprise on Microsoft Azure leverages the full power of self-hosted infrastructure within a scalable, secure, and reliable cloud environment. Deploying ArcGIS Enterprise on Microsoft Azure enables organizations to improve their efficiency and scale resources to meet evolving needs.

### ArcGIS Pro with Microsoft Azure Virtual Desktop (AVD)
ArcGIS Pro with Microsoft Azure Virtual Desktop (AVD) delivers a powerful, flexible GIS solution by leveraging Azure's scalable resources. With support for Windows 11 multisession virtual machines, it provides a seamless user experience and maximizes the value of cloud technology.
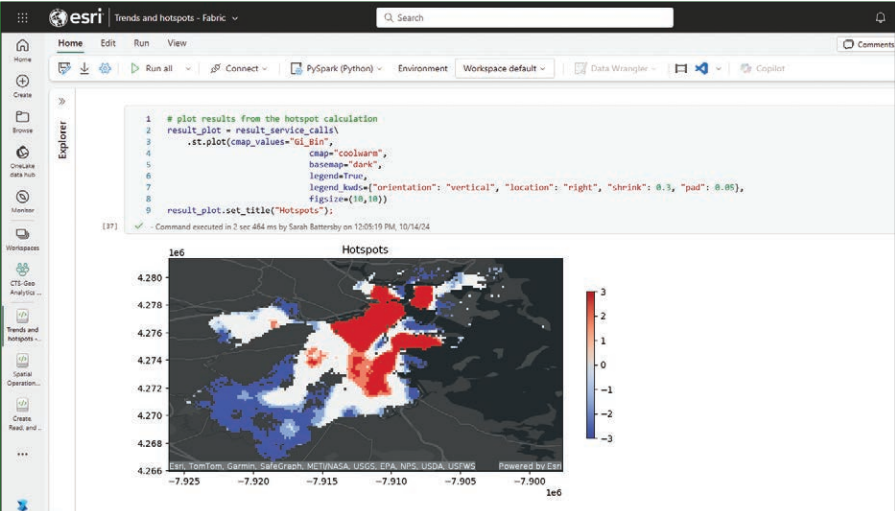


↑ With ArcGIS GeoAnalytics for Microsoft Fabric, data scientists and data engineers can conduct geospatial analysis using Apache Spark to uncover patterns and trends in their data.
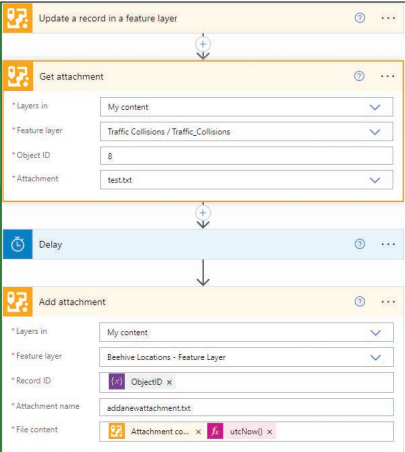


↑ ArcGIS Connectors for Power Automate helps users automate repetitive tasks directly in Power Automate.

→ Users can add interactive maps and location-enriched content to Microsoft SharePoint sites.

# As Wildfires Raged, Satellite Imagery and GIS Helped Fill In Information Gaps



| Damaged or Destroyed | Undamaged | Total Structures |
|---|---|---|
| 6,473 | 3,579 | 10,052 |
| Palisades Fire  Eaton Fire | Palisades Fire  Eaton Fire | Palisades Fire  Eaton Fire |

↑ During the recent fires in Los Angeles, California, ICEYE rapidly acquired high-resolution imagery from its constellation of synthetic aperture radar (SAR) satellites. (Image courtesy of ICEYE.)

← The ICEYE team provided continual imagery and analysis for the Eaton Fire, which Esri presented in a dashboard.

through smoke, clouds, and at night. Our analysis team then delivers GIS-ready insights that help government agencies understand the damage at a structural level in near real time."

## How Radar Helps Determine Destruction

ICEYE builds its own satellites, and because it has so many in orbit, the satellites can revisit the same areas frequently. This ensures reliable data collection during and immediately after natural disasters such as wildfires, floods, and hurricanes.

Satellites that record optical imagery require sunlight, good weather, and no visual obstructions. But radar-based satellites like the ones ICEYE produces send radio waves down to Earth that bounce off objects, such as buildings and vegetation, and return pulses to the satellite. By measuring the time it takes for the pulses to return to the satellite, ICEYE can determine the locations of those objects and their distance from the satellite.

"This means that ICEYE can deliver insight day or night, through clouds and smoke, and regardless of high winds that ground the planes and drones that record traditional aerial imagery," said Read.

For the recent fires in Los Angeles, the company deployed its Wildfire Insights service, which leverages a machine learning model to analyze rapidly acquired high-resolution imagery. The model, trained on historical wildfire events, picks up on the differences in return pulses for buildings that have been destroyed versus those that haven't been impacted.

## Actionable Datasets Ready for Analysis

The imagery that ICEYE produces isn't delivered to its customers in a raw format. Rather, the imagery is packaged in ready-to-use geosp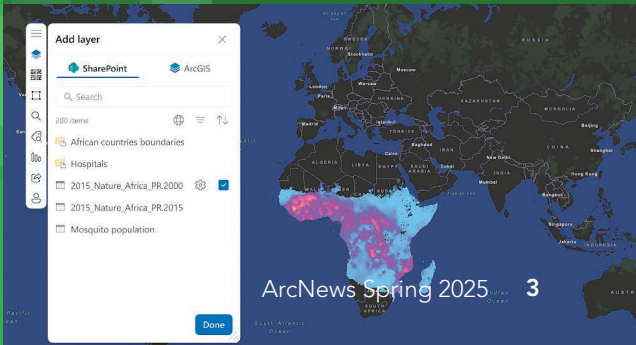atial datasets via Wildfire Insights, an always-on service that's part of ICEYE's portfolio of natural disaster analytical products. Agencies

on the ground can then put these datasets directly into ArcGIS Online or ArcGIS Pro to create the geospatial products they need.

The way the service works is that at ICEYE, a team of meteorologists and geospatial and remote sensing experts continually monitor and analyze SAR imagery of wildfire events. Public safety agencies don't have to delineate areas of interest or request imagery acquisition timelines; ICEYE just has those ready to go as actionable geospatial datasets that are compatible with ArcGIS technology.

"After we collect the images, we instantly start to analyze them and build that geospatial dataset," Read explained. "Then we deliver it seamlessly to the customer."

Agencies can take the datasets, plug them into whichever ArcGIS products they're using, and create maps, dashboards, and other visualizations of the events they're managing.

"Every one of the end users is probably doing something a little different with the datasets, whether they're using ArcGIS Pro to do some additional analysis or building dashboards to use internally," said Read.

During Southern California's recent fires, federal, state, and local agencies used ICEYE's datasets to fill in data gaps and get baseline damage assessments for impacted neighborhoods, despite the challenging conditions. For the Palisades Fire, ICEYE acquired and delivered its first image within 24 hours of the first signs of smoke on the ground. The ICEYE team continued to provide updated results of impacted buildings for that fire twice daily while also imaging and analyzing the nearby Eaton and Hurst fires—the latter of which was a smaller fire that broke out in northern Los Angeles County on January 7 as well.

One state-level organization that responded to the fires used the SAR data to quickly analyze burn scars and determine the extent and geographic distribution of impacted areas. The resultant

damage assessments were then efficiently shared with local, state, and federal partners through ArcGIS Online and a dedicated collaboration hub. This streamlined approach ensured a common operational picture, enabling agencies across all levels of government to effectively coordinate resources and accelerate recovery efforts.

## Getting Ahead on Damage Assessments

Being able to start on damage assessments early is one powerful use case for ICEYE's imagery.

To conduct traditional damage assessments, public safety agency staff members typically go door-to-door gathering data about damaged and destroyed buildings. These surveys are time-consuming to perform and difficult, if not impossible, to do while wildfires are still burning in the vicinity.

In the case of the recent fires in California, high winds persisted for several days at a time, only to pick up again after brief reprieves. This impacted firefighting efforts and grounded traditional airborne assets, creating blind spots for first responders and damage assessors. Integrating ready-to-use SAR imagery datasets helped these agencies fill in some gaps while the fires still raged, significantly enhancing both speed and accuracy.

"We were able to tell the story of what happened on the ground before they could get in to do assessments," said Read. "With Wildfire Insights, an agency's GIS team doesn't have to spend time analyzing the imagery to get answers. We're delivering actionable information through our geospatial datasets. This means agencies can respond decisively as the event is unfolding."

This is true for wildfires as well as other natural disasters such as floods and hurricanes. ICEYE's Flood Insights solution is used extensively to provide situational awareness during flood events and heavy storms.

# Seven New Ways to Tell a Story in ArcGIS StoryMaps

The ArcGIS StoryMaps team continually improves the product to enable users to tell visually pleasing, compelling stories as easily as possible. Over the last six months, the team has added templates, the ability to create interactive charts, advanced embedding capabilities, and more. Read on to discover seven ways to construct more creative and intuitive ArcGIS StoryMaps content.

## 1 Use Templates for Storytelling

Story templates offer a great way to create a story structure that others can easily build on. They are useful for a variety of reasons. Maybe an organization needs to quickly make similar, consistent stories, or perhaps a teacher wants to provide a framework that students can use to complete digital coursework.

Users can create a template from the Stories page within the ArcGIS StoryMaps builder and build it out the same way they would a story—except they can also include instruction blocks that let anyone building on that template know what kinds of content they should be adding. When others duplicate that template, they'll be able to modify their copy while viewing the instruction blocks (which won't show up in the published version of the story).

## 2 Display Collection Items on a Map

Collections group related content together, and now users can organize that content geographically by turning on Show map in the collection's Design panel. Users can assign a location to as many items in a collection as they wish. Those items will then be represented by points on the map, which readers can use to interact with and navigate through the collection.

## 3 Use Media as the Base of an Express Map

When media layers were added to Map Viewer in ArcGIS Online, it allowed users to pull an image into a web map—not as part of a pop-up, but into the map itself as its own layer. A similar capability was also added to express maps, the simple reference maps that can be created within ArcGIS StoryMaps.

It gives storytellers the option to use an image as the base layer for an express map instead of a map. This enables users to draw on, add features to, and annotate an image as they would a map. It also lets users employ other storytelling features, such as media actions, to apply interactivity to maps.

## 4 Preserve the Extent or Scale of Maps

Stories are intended to be viewed across a wide variety of screen sizes. So it's important to consider how the various elements of a story—especially media such as a map—will appear on different devices.

A new Map view option helps users ensure the optimal viewing experience for their maps by choosing whether a map will maintain the desired extent when viewed across different screen sizes, or maintain its scale instead.

## 5 Show Data Trends with Charts

Charts can carry a lot of narrative weight, add context, and incorporate a different way to visualize concepts. Users can now create interactive charts directly in ArcGIS StoryMaps. They simply plug in data and choose from a handful of chart types, including bar, column, line, and donut.

## 6 Seamlessly Embed a Story on a Web Page

The new script embed capability offers an alternative way to embed a story, freeing users from the limitations of using an inline frame. After enabling advanced embedding in the story settings and designating the domains where that story can be embedded, users have full access to the story interface through their web page's CSS and JavaScript. This means more control; advanced customization; and a smooth, integrated user experience. Once script embed is activated, the story and web page content live together and can interact more seamlessly.

## 7 Categorize Map Tour Items

As one of the first major features added to ArcGIS StoryMaps, map tour has long been a go-to block for immersing readers in place-based content and information. Now, map tours have a new dimension: the ability to categorize the items in the tour by breaking them down into thematic groups.

This helps readers easily navigate larger datasets by focusing on specific points of interest such as historical landmarks, dining spots, or nature trails, resulting in a more personalized and interactive experience. The option to categorize map tour items is currently available when creating a map tour using a feature service—though in the future, users will be able to create a categorized tour from scratch as well.

↓ In a map tour, users can categorize items by theme.
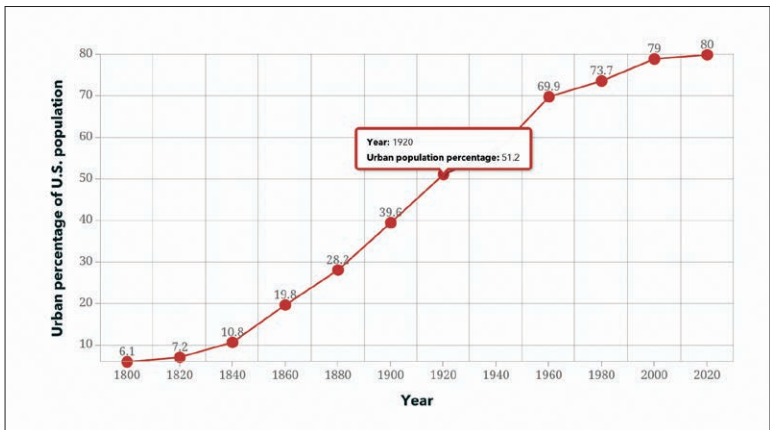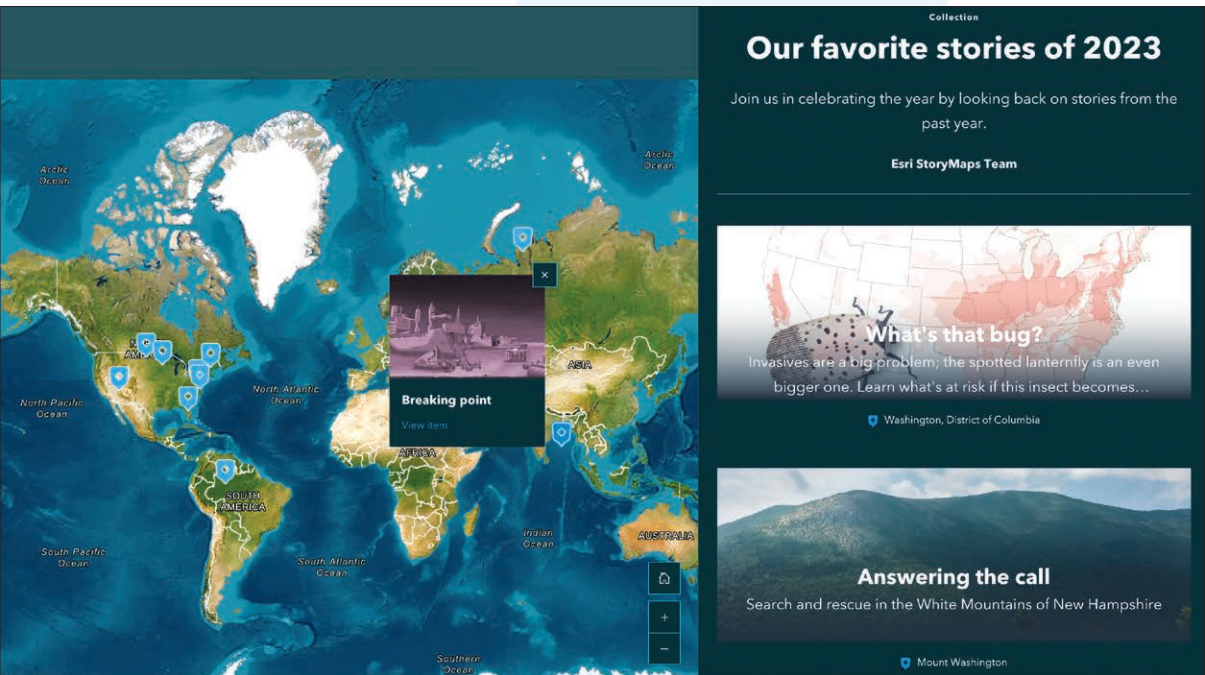


↑ Users can now create interactive charts in ArcGIS StoryMaps.

← A map view of a collection allows readers to navigate the collection via a map.

# Tennessee Pioneers GeoAI-Based Wetland Screening Tool

To address this challenge, TDEC staff, in collaboration with Esri partner Skytec, leveraged the Esri Wetland Identification Model (WIM), ArcGIS Online, and ArcGIS Experience Builder to develop a predictive model of the locations and extents of existing and potential wetlands throughout the state. The resultant Tennessee Wetland Screening tool allows anyone—from state agencies and policymakers to farmers, landowners, and developers—to visualize wetlands across the state, enabling informed decision-making.

## Understanding Tennessee's Wetland Landscape

State agencies have traditionally relied on the National Wetlands Inventory (NWI) dataset, which is maintained by the US Fish and Wildlife Service, for wetland mapping and regulatory needs. The NWI data within Tennessee was mostly generated via imagery from the 1980s, and only pockets of it have been updated since. This led to outdated and coarse-scale wetland data.

Since US states were recently granted autonomy to define and regulate nonfederal wetlands within their borders, it has become paramount for state agencies to find ways to update their wetland data. Access to accurate and up-to-date wetland data proved particularly crucial in Tennessee as state lawmakers considered new policies regarding wetlands and the extent of the state's regulatory authority over them in 2024 and 2025.

"Legislators, nonprofits, and members of the public were calling us, and they all wanted to know how many wetlands were in the state and where did we get that number from," Grippo recalled. "We knew we needed better data; a statewide number; and, importantly, [to be] able to predict where they are."

Grippo explained that to certify the existence of wetlands, a TDEC representative or qualified consultant must conduct on-site inspections. In the past, TDEC's reliance on the NWI has led to inaccuracies in identifying potential wetlands, causing some to be undocumented. This often resulted in property developers or owners being unaware that jurisdictional wetlands were present on their property, potentially causing delays and additional costs when they later needed to mitigate for these wetlands.

This is where the statewide mapping project came in: It aimed to provide a comprehensive, up-to-date resource for policymakers and landowners alike.

TDEC approached Skytec, which specializes in developing solutions using remote sensing and geospatial artificial intelligence (GeoAI), to model wetlands and provide a better idea of their extents and locations across the state.

## Developing an Accurate and Transparent Tool

For TDEC, it was crucial that the wetlands data model incorporate a wide array of perspectives for various end users. The information needed to be equally valuable to lawmakers deciding on wetland legislation, regulatory agencies tasked with wetlands protection, and stakeholders such as residential and commercial developers, farmers, and conservation organizations.

The tool needed to help developers assess potential environmental impacts and avoid having to engage in wetland mitigation—the process of compensating for wetland loss by creating new wetlands or enhancing existing ones. For farmers, it needed to aid them in avoiding waterlogged areas and making strategic planning decisions. For conservationists, the model needed to support flood management and identify areas suitable for ecological restoration or the preservation of rare species, as well as locations with high biodiversity.

For stakeholders across the board, the tool needed to quickly identify and eliminate unsuitable sites, reducing the need for extensive field assessments.

"There are a lot of finances that go into purchasing property, and stakeholders want to know what their constraints are. So for this project, the goal was for more informed decision-making no matter who you were," said Chris Fleming, a senior solutions engineer at Skytec.

Creating the model—a monumental task—required the seamless integration of technologies for which Skytec is renowned, including processing lidar data, integrating high-resolution satellite imagery, and developing advanced deep learning algorithms. Key to the model's success was the training data. Fleming meticulously downloaded ground-truthed wetland delineations from regulatory reports dating back to 2011 and digitized them into a usable format. Subsequently, he incorporated Natural Heritage Network data on rare, threatened, or endangered element occurrences or habitat, as well as data from conservation groups, regional scientists, and remotely verified NWI data and delineation data.

"There's a lot of people with a lot of information in their heads that's not on a map," explained Fleming. "That was the focus of our effort: We wanted the best possible training data."

Additionally, because of Tennessee's naturally diverse landscape, the model was broken into six broadly defined ecoregions, each with its own training data and separate model.

Andy Carroll, the chief technology officer at Skytec, said the timing of the project was ideal because the team had recently deployed a high-performance computing environment in the Microsoft Azure cloud. Skytec used the preconfigured ArcGIS for Microsoft Planetary Computer and deep learning models, including Esri's Wetland Identification Model, along with a high-resolution imagery land-cover classification model, to analyze each of Tennessee's ecological regions.

The wetland and land-cover models ran nearly nonstop for a little more than eight weeks. The result was a predicted wetlands
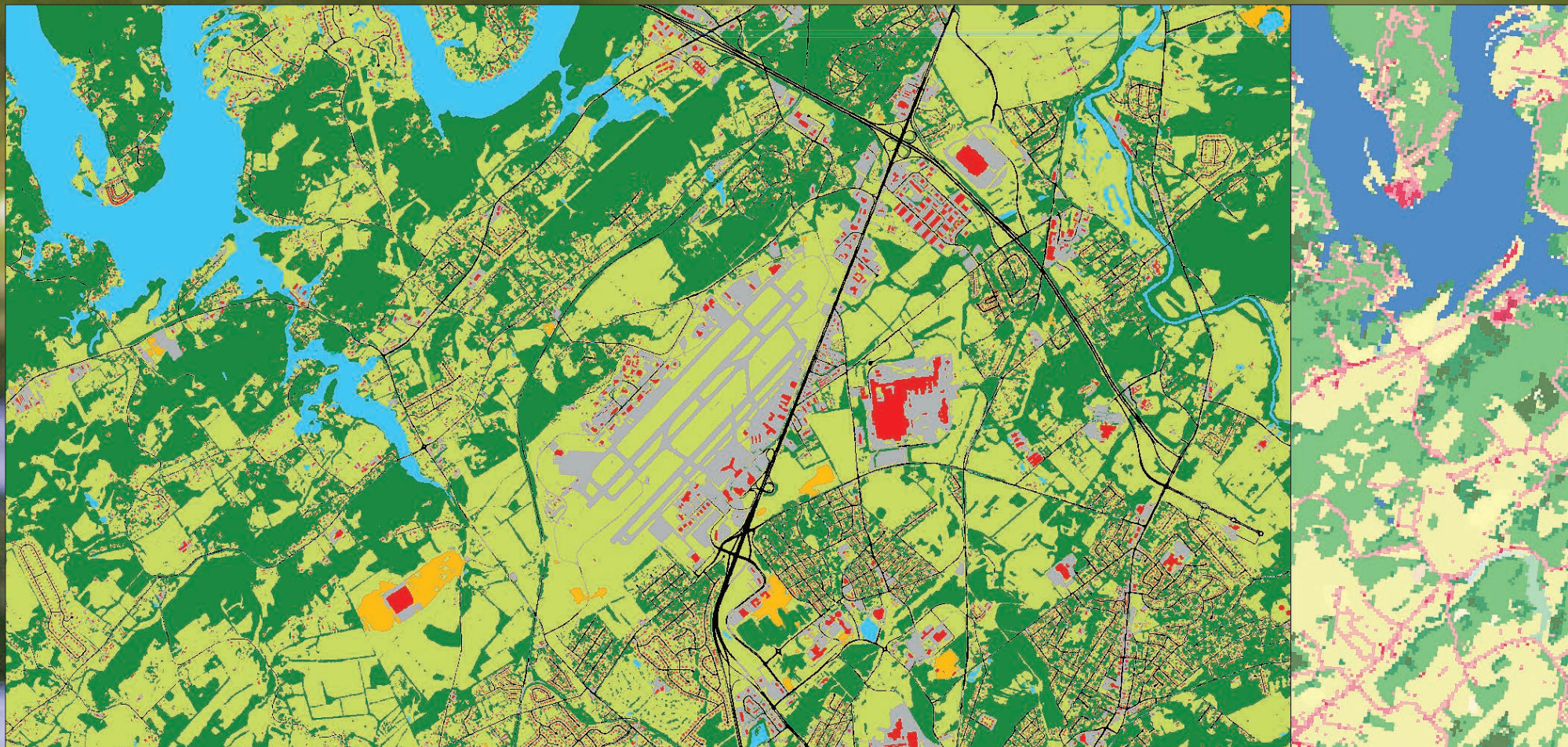


↑ Using the deep learning model (left) helped the Tennessee Department of Environment and Conservation (TDEC) create higher-resolution land-cover images of the entire state—including Knoxville, shown here—than was possible with the 30-meter land-cover imagery (right) from the National Land Cover Database (NLDC).

layer and a land-cover dataset at one-meter resolution that assisted in the filtering and basic classification of wetlands across the state.

This intensive process was crucial to meeting the tight eight-week deadline set by the State of Tennessee to get this information ahead of its next legislative committee meeting.

### An Encompassing Model with Many Uses

While Tennessee is the first state to create a model of this magnitude, Fleming and Carroll are confident that this process can be replicated not only for wetlands but also for other natural resources, from city canopy covers to intact riparian buffers.

"This kind of project would not have been possible just a few years ago," Carroll said. "It was just the right time, right compute, convergence of software, and training data."

After finishing the model, the team presented it to the public through a viewing tool built using ArcGIS Experience Builder. Skytec collaborated with Esri cartographers to create the maps and symbols used in the app. The completed tool is available for viewing and use at links.esri.com/TNwetlands.

Tennessee encompasses 26.9 million acres, and the NWI had estimated 1,065,661 acres of wetlands in the state. The model has since predicted nearly 800,000 more acres of wetlands for a total of 1,802,495 acres. Looking ahead, Grippo and her team are poised to use the model to validate their discoveries in the field and craft narratives around publicly accessible wetlands, like those within state parks.

The team's next steps include integrating the data as a mapping layer into other TDEC workflows and addressing questions such as the number of permits issued in areas under wetland mitigation proposals. Moreover, the team aims to support the growing restoration market by identifying land with the potential for restoration that can benefit both agricultural needs and natural ecosystems.
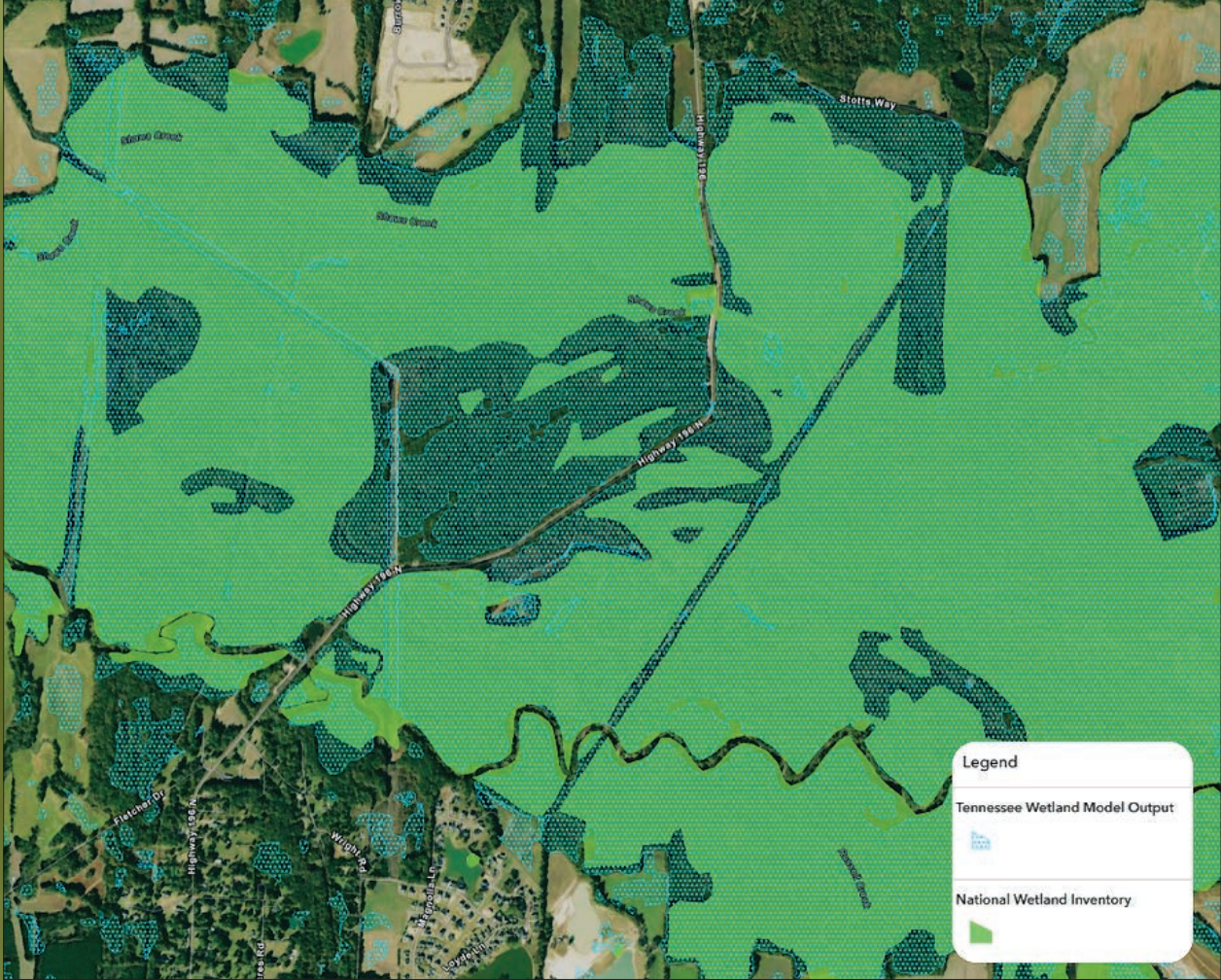
"One agency can't alone say something is important. We need to be able to demonstrate it, and this tool helps us tell the story about our state's wetlands," Grippo shared. "People are passionate about protecting these resources, but they need that knowledge, and I hope this tool becomes the first place they go [to learn]."

↑ The tool can help a range of users—from policymakers and developers to farmers and landowners—visualize wetlands across the state.
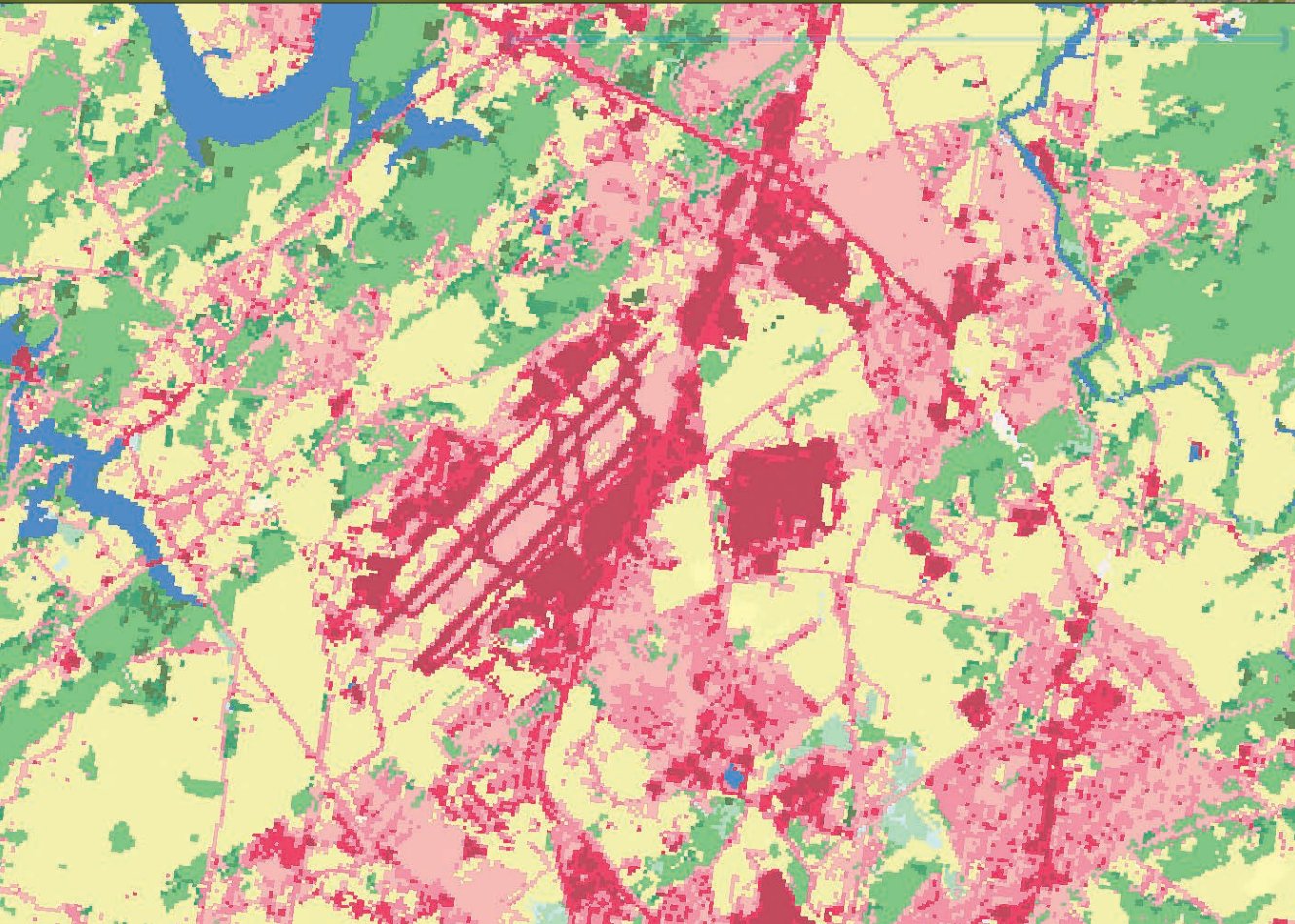
# Puerto Rico Tackles Dengue with Help from GIS

Dengue is a dangerous disease that mosquitoes transmit to humans. Occurring more often in tropical and subtropical climates, dengue infects approximately 400 million people each year, making it one of the most common mosquito-borne diseases worldwide. In mild cases, it can cause fever and flu-like symptoms, and in more serious cases, bleeding and even death.

Puerto Rico suffered more than 6,000 dengue cases in 2024, exceeding historical figures for the area, according to Puerto Rico health secretary Carlos Mellado López. This outbreak prompted health officials to declare a public health emergency in March 2024, joining other Latin American nations such as Brazil and Peru that are coping with their own outbreaks.

To find mosquitoes transmitting the disease throughout Puerto Rico, the Puerto Rico Vector Control Unit (PRVCU) developed a comprehensive dengue tracking and suppression program. Staff from the PRVCU installed an extensive network of mosquito traps—thousands of them—across the island to help locate the invasive pests. Mosquitoes trapped in this network are tested for dengue's genetic markers, and those that test positive are traced back to specific traps. This georeferencing establishes where and when active dengue transmission has occurred and has proved to be an invaluable tool for targeting interventions to those specific areas.

ArcGIS provides the technological foundation for Puerto Rico's mosquito suppression program. By using an array of Esri products, including ArcGIS Pro, ArcGIS Workforce, ArcGIS Field Maps, and ArcGIS Online, PRVCU collects critical data in the field to track this invasive pest. Control crews can then gather the affected traps and kill the vector mosquitoes—the ones capable of causing harm—that are reproducing and transmitting pathogens in that location.

## A Difficult Disease to Track

The data collected from each person infected with dengue can provide some details about when the person was bitten but not precisely where they were infected. A human can be bitten and infected by mosquitoes in any one of several locations, making it difficult to discern the infection point.

Additionally, the time lag between when a person is infected and when the infection is confirmed and reported may be too long to help fight an outbreak. Once a person is bitten by an infected mosquito, there is a one-week incubation period before they begin to exhibit symptoms. When symptoms appear and the person goes to the doctor, the doctor takes a blood sample and sends it to the territorial health laboratory for testing. If the person tests positive, this is relayed to Puerto Rico's vector control team about a week later.

By the time someone's blood sample is tested, the mosquito that originally caused the infection has likely infected other people. These individuals may become viremic, meaning the virus is present in the blood, which can, in turn, infect a new generation of mosquitoes. As this cycle repeats, a vector control team that relies on human case data for guiding control efforts may not have up-to-date information. Moreover, most infected people never go to the doctor. It is estimated that 75 percent of all infections are never medically attended.

## A Targeted Approach to Finding Mosquitoes

To target dengue-carrying mosquitoes, authorities need information about the mosquitoes themselves. Puerto Rico's mosquito suppression program consists of three steps to find and exterminate infected mosquitoes: surveillance intervention, Autocidal Gravid Ovitraps (AGOs), and Wide Area Larvicide Spray (WALS). AGOs are sticky, pesticide-free traps that attract and kill female mosquitoes that lay eggs to help control and monitor mosquito populations. WALS is an approach to larvae control that uses naturally occurring bacterium to kill the mosquito larvae in water sources.

"Surveillance intervention involves setting traps for seven days and examining the collected mosquitoes," explained César Piovanetti Fiol, chief information officer of the Puerto Rico Science, Technology & Research Trust, the private nonprofit organization that oversees the PRVCU initiative. "[AGO] traps are low-maintenance, environmentally safe traps for mosquito eradication. The WALS method involves dispersing larvicides on vegetation and buildings to control mosquito populations."

For the island-wide network of traps, staff from the PRVCU maintain a detailed chain of custody that documents who handles each collected trap. Each trap has a unique identification code, so it can be tracked from the field to the processing station, the molecular laboratory, and finally the mapping center. This is where the trust's GIS team produces treatment maps for the organization's vector control teams, which visit and service the traps on a weekly basis. In addition, a quality management system ensures that no traps are missed or lost and that all standard operating procedures are followed.

## ArcGIS Enhances a Complicated Process

As established Esri technology users, the PRVCU has deployed several solutions to aid the mosquito abatement program. Vector control unit staff use ArcGIS API for Python with geoprocessing tools in ArcGIS Pro to generate potential locations for surveillance and intervention traps.

Staff geocode the locations of the traps, and those that require maintenance are automatically loaded each day into assignments in ArcGIS Workforce thanks to the Python API. This ensures that each vector management technician knows the area and the number of traps that need to be installed. The Python script has several variables that dictate what the team will do with the traps, such as perform maintenance.
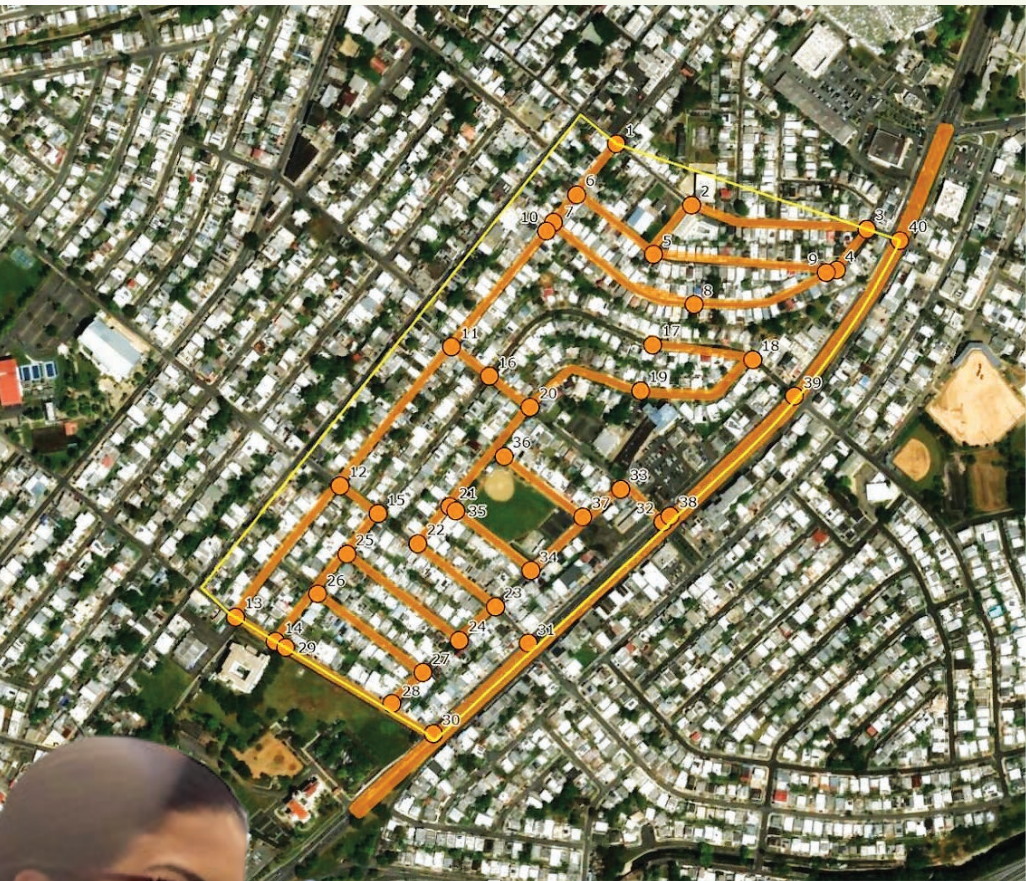


↑→ During Wide Area Larvicide Spray (WALS) operations, technicians use ArcGIS Navigator to find the most efficient route for covering vast areas.

←↓ Staff from the Puerto Rico Vector Control Unit (PRVCU) are using ArcGIS technology to locate and suppress dengue-carrying mosquitoes across the island.
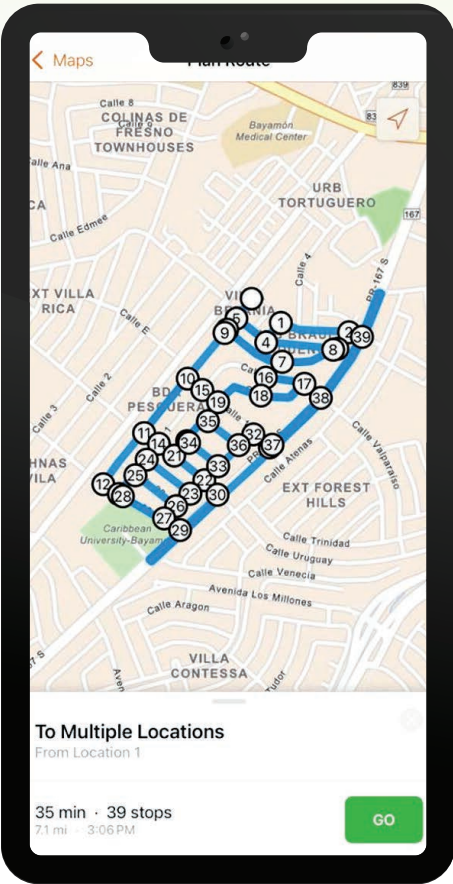
"ArcGIS Workforce is integral to the program's success by providing a structured and efficient way to manage field operations, ensuring that tasks are completed accurately and on time," said Piovanetti Fiol.

Once the team locates dengue-infected mosquitoes, mobile workers use ArcGIS Field Maps to identify where to install the AGO traps. A map in Field Maps is configured to integrate with an ArcGIS Survey123 questionnaire to help mobile crews document trap installation on residential premises. The team also developed an ArcGIS Arcade script to identify any AGO traps that require maintenance, which is needed every eight weeks following installation.

To kill mosquito larvae in water sources using the WALS approach, a truck sprays larvicide over vast areas, including on buildings and vegetation. ArcGIS Navigator determines the most efficient route for the truck to take. After spraying, field technicians complete a Survey123 form that provides details on the location of the operation, the wind direction and temperature at the time of spraying, and the time the larvicide spray was applied. This information gets put into a report for the Puerto Rico Department of Health.

"Our sophisticated Esri-based trap information management system is practical, reliable, and the centerpiece of operations," said Piovanetti Fiol.

## Success Shows in Low-Income Housing Developments

The success of this program is especially evident in Puerto Rico's low-income housing projects, called *residenciales*. Residents of these neighborhoods contract dengue at a rate four times higher than people who reside in other housing types,

according to Dr. Grayson Brown, executive director of the PRVCU. It's not uncommon for 2–3 percent of residents in these complexes to require medical attention for dengue each week.

In residenciales where vector control hasn't taken place, up to 90 percent of the traps may contain mosquitoes that test positive for dengue. However, the PRVCU's geospatial dengue tracking program enables staff to respond quickly and target the residenciales that have dengue-transmitting mosquitoes.

The desired result is for the number of dengue-positive mosquitoes to drop to zero within several weeks of targeted interventions, and for human cases to also fall to near zero within several weeks of the last dengue-positive mosquito being detected. Having the ability to target the mosquitoes themselves, rather than pursue human cases reported weeks later, goes a long way toward achieving these goals.

## Centralizing All Geospatial Data

The Puerto Rico Science, Technology & Research Trust has used Esri products since the inception of its island-wide vector control project eight years ago. The organization's enterprise geodatabase stores approximately 500,000 records related to surveillance interventions.

"We employ ArcGIS Enterprise to centralize geospatial information for all interventions, ensuring data integrity, facilitating access, and enabling users to manage large volumes of data efficiently," said Alberto Millan Melendez, GIS manager for the Puerto Rico Science, Technology & Research Trust.

The project is in direct collaboration with the US Centers for Disease Control and Prevention (CDC). This means that the PRVCU and the

CDC Dengue Branch jointly evaluate all protocols and criteria for the installation, management, and maintenance of mosquito traps and larvicide spraying procedures.

Sharing implemented solutions with the CDC and other stakeholders is a requirement for all projects. The trust uses ArcGIS Online to easily share data, maps, and web apps with external agencies. The PRVCU also employs ArcGIS Dashboards extensively to collect and visualize data for various agency projects. This allows the data to be displayed in an easy-to-understand format that technical support staff,

decision-makers, and others can readily understand and update.

The successful application of ArcGIS technology to find and destroy dengue-carrying mosquitoes has led the PRVCU to expand its use of GIS. PRVCU's next step is upgrading its ArcGIS Enterprise deployment to expand web editing workflows and incorporate ArcGIS Knowledge, according to Millan Melendez. The PRVCU will also provide ArcGIS access to all programs within the Puerto Rico Science, Technology & Research Trust to integrate GIS data and capabilities into future projects.



↑ The team uses ArcGIS Field Maps in conjunction with ArcGIS Survey123 to help mobile crews with trap installation and document spraying operations.



↑ The PRVCU uses dashboards—like this one that consolidates information about all response interventions across different communities—to share project data with other agencies.

# ArcGIS Online Now Includes Premium Imagery and Simplifies Data Integration

Data connects individuals, businesses, and societies in unprecedented ways. It is the raw material from which insight, innovation, and progress are woven. When used effectively, data becomes a powerful tool for fostering understanding, making decisions, and shaping the future.

Geospatial data provides the *where* that gives context to other data, enabling people and organizations to identify patterns and trends; address complex, place-based challenges; optimize resources; and develop more effective strategies. ArcGIS allows users to integrate multiple types of geospatial data from various sources as layers of information that seamlessly integrate within the context of a map, providing a holistic view of virtually any place on Earth—from an office park to a city to an entire country.

Imagery is an increasingly important part of the data ecosystem available to ArcGIS users. And now, the new Content Store for ArcGIS, an integrated web app for ArcGIS Online and

ArcGIS Enterprise, provides a single access point to high-quality, current imagery from multiple leading commercial providers.

## Data Enables the Geographic Approach

In the past, data was often collected and stored without fully understanding its value or how to maximize its potential, making it more of an overhead than an asset. Today, however, data is a mainstay of modern enterprise operations. With the exponential growth in data availability and advancements in technology, organizations are discovering innovative ways to leverage data at scale, such as using predictive analytics to forecast market trends, implementing real-time monitoring to optimize supply chains, and enhancing customer experiences through personalized marketing.

In any enterprise—whether educational, governmental, or private—it is important to see how things are related through the lens of location. This is called the geographic approach, and it is essential for solving problems, making informed decisions, and planning for the future. GIS, of course,

enables the geographic approach by allowing organizations to link information to physical locations. With GIS and the right data, organizations can create detailed maps and visualizations that offer a comprehensive view, going beyond traditional data analysis.

To fully leverage the power of the geographic approach, it is crucial to integrate various types of data, including imagery. Imagery from satellites, airplanes, balloons, drones, and even tablets and phones adds visual richness and unique insight that can't be derived from other data types. When this data is woven together with other data, it creates a multifaceted understanding of an area of interest, enabling organizations to make well-rounded and informed decisions.

## Seamless Access to Geospatial Data

The robust data integration that is core to ArcGIS technology is indispensable for many organizations. But before integration can occur, users need access to relevant data to build their projects. GIS-ready content is crucial for both the users who are

building the GIS and the stakeholders who rely on it to make decisions. Having easy access to the data they need, when they need it, not only boosts efficiency for GIS users but also equips decision-makers with relevant and trustworthy information, leading to more effective strategies and improved outcomes.

To meet this critical need, ArcGIS Online lets users seamlessly access geospatial data from a variety of sources to build data layers for their maps. They can start by bringing their own data into ArcGIS. Esri also aggregates and curates high-quality data in ArcGIS Living Atlas of the World. This comprehensive library includes maps, apps, and data layers that cover the entire globe and address various topics, from current weather to population characteristics derived from the US Census Bureau.

Additionally, Esri has a wide network of partners that provide valuable apps and data and imagery services on ArcGIS Marketplace. These services expose specific data types, such as social media and point-of-interest data. In many cases they're designed to support the needs of various industries like banking and real estate. Furthermore, ArcGIS simplifies the process of incorporating data from public repositories managed by government agencies and commercial data providers.

By leveraging these diverse and authoritative data sources, ArcGIS enables users to build and maintain a robust and reliable GIS.

## Imagery Stimulates Deeper Insight

Imagery is rapidly becoming a vital data asset. It provides unique and detailed insight into geographic areas of interest, revealing a wealth of information that was previously untapped. Sourced from a variety of platforms—including cell phones, tablets, traffic cameras, drones, planes, and satellites—imagery is now a critical component of many organizations' data resources.

In ArcGIS, imagery is treated with the same importance as other data types. It can range from high-resolution satellite imagery to other types of remotely sensed data, such as synthetic aperture radar (SAR) and lidar. Each type of imagery data offers specific advantages—for example, SAR can penetrate cloud cover and lidar provides 3D awareness.

By integrating imagery data into GIS, users can uncover deeper insight, create more accurate and dynamic visualizations of areas of interest, and make more informed and strategic decisions.

## An Easier Way to Get Imagery

While many organizations find value in open imagery datasets, commercial imagery providers offer several additional advantages. Commercial imagery provides superior data coverage, higher resolution, and more up-to-date imagery because satellites can revisit the same areas more frequently. It also delivers a wide range of options—such as multiple band combinations, depending on the need—and more opportunities for targeted data collection.

Image courtesy of Esri partner Maxar.

esri.com/arcnews

Integrating commercial imagery data with open imagery and other data is ideal, but getting there has been challenging in the past. The market is crowded with providers that offer seemingly similar products, making it difficult to know which data to select. The process of purchasing commercial imagery can be complex as well, involving multiple providers and contracts, which slows down projects.

Content Store for ArcGIS—jointly created by teams from ArcGIS Living Atlas and Esri partner SkyWatch—features imagery from Esri's cornerstone partner, Maxar, as well as many other providers, including Esri partners Airbus and Planet. For organizations, Content Store simplifies the process of purchasing premium commercial satellite imagery, and for users, it enables them to quickly discover, integrate, and apply imagery to their projects. Users can search Content Store for satellite images based on an area of interest, purchase them, and immediately add them directly to ArcGIS projects.

By combining commercial imagery with data from other repositories, users can leverage a diverse range of sources to enhance their spatial analysis.

### The Benefits of Combining Diverse Data Sources

The ability to access, integrate, and analyze diverse data sources is essential in GIS. Whether through the extensive datasets in ArcGIS Living Atlas or the seamless integration of commercial imagery via Content Store for ArcGIS, users of ArcGIS technology can access the data they need to make
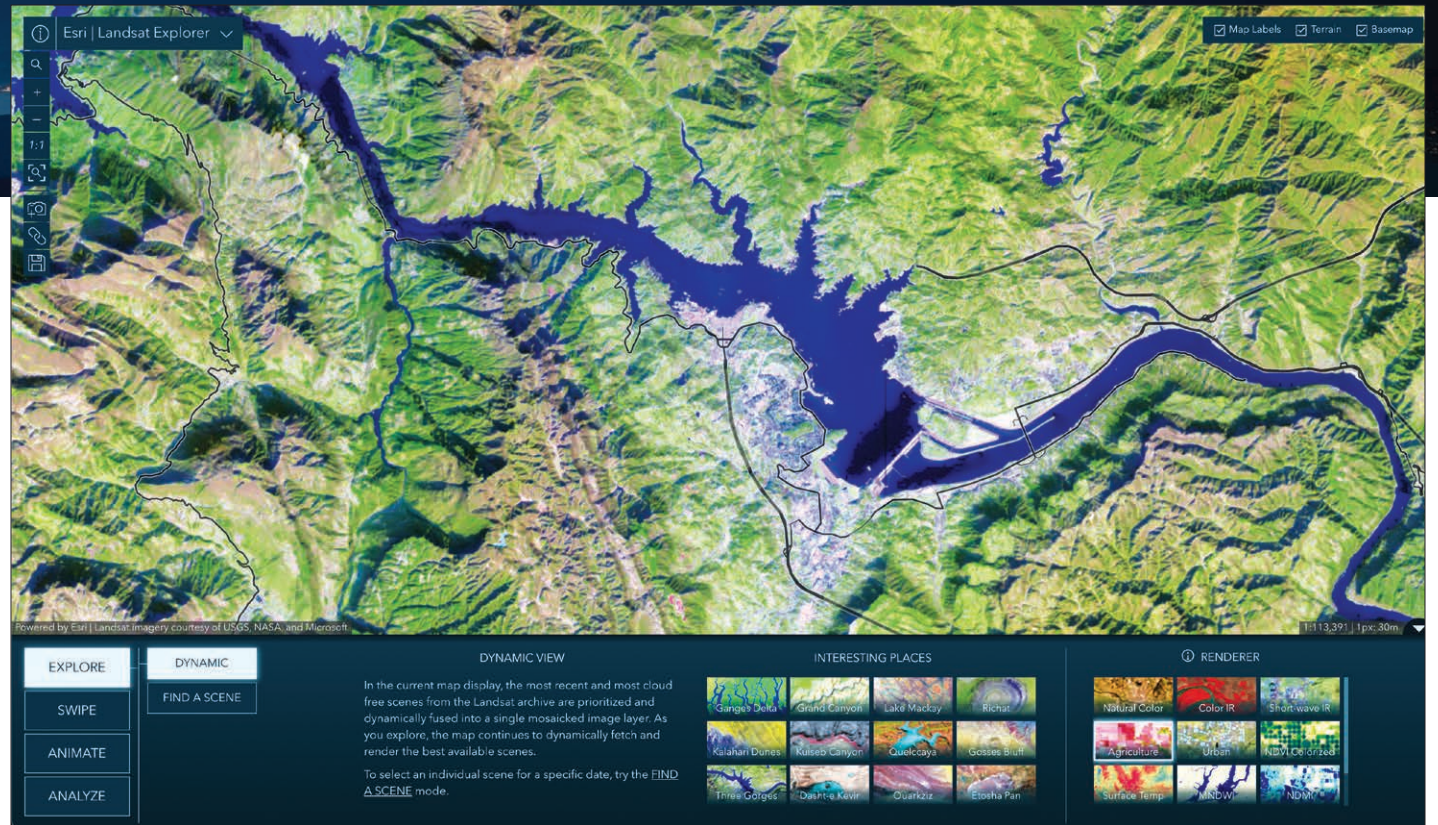
↑ The Landsat Explorer, available in ArcGIS Living Atlas of the World, provides easy access to more than 40 years of multispectral imagery from the Landsat satellite missions.

→ ArcGIS Online lets users access geospatial data from a variety of sources, including ArcGIS Living Atlas, which aggregates and curates high-quality, authoritative data.

informative maps and perform comprehensive analyses. This integration enhances the accuracy and relevance of GIS apps, driving innovation and progress across various industries.

As data generation grows, the ability to combine these diverse data sources into a cohesive and insightful geographic view will continue to be key for informed decision-making.
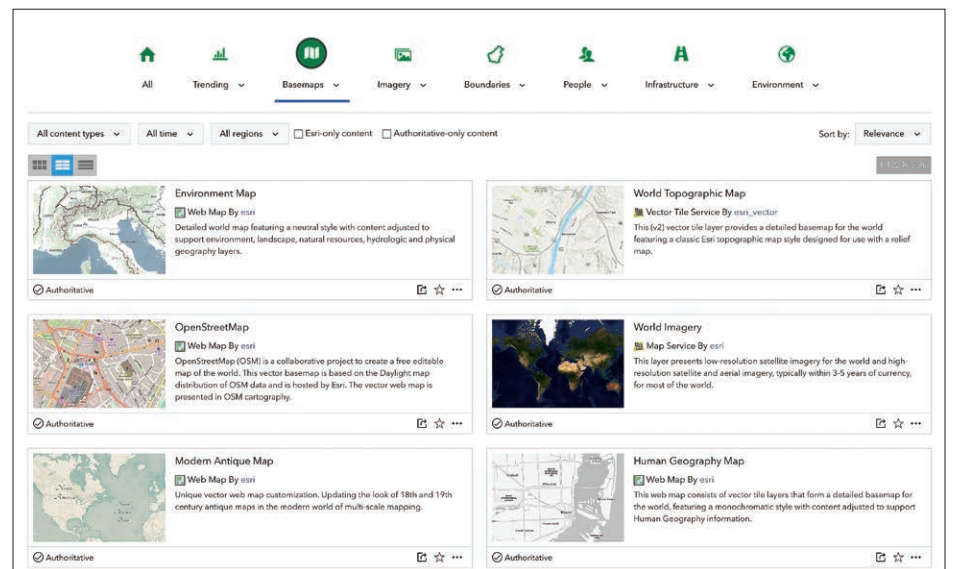
# Modern GIS Apps Let Public Engage in Planning Major Greenway Initiative

From the 1800s to the first half of the 20th century, passenger and freight trains along the New York, Ontario, and Western Railway (O&W) served as a great regional connector, linking New York's Hudson Valley cities of Port Jervis and Kingston and countless communities along the way. Originally established as an industrial route to transport coal, this line traversed the region's open fields, dense woods, and mountainous terrain, bringing people and goods to areas including the region's famous Catskills resorts before it was discontinued in the late 1950s.

The Delaware and Hudson (D&H) Canal—spanning 108 miles, much of it alongside the O&W line—was hand-dug by workers in the 1820s to ship coal from Pennsylvania to markets along the Hudson River and in New York City. The D&H Canal was decommissioned when the O&W line was constructed, and as transportation infrastructure in the United States evolved toward more efficient railroads and trucking, the O&W rail line was also decommissioned. It ultimately fell into disrepair, leaving a fragmented footprint through the heart of the western Hudson Valley.

In recent years, however, the Open Space Institute (OSI), a national conservation nonprofit organization, and its partners have breathed new life into the lands that were once crossed by the O&W and the D&H Canal. OSI's Growing Greenways plan aims to create, revitalize, and link over 250 miles of greenways, trails, and abandoned rail lines to form an interconnected network of public-use, off-road recreational trails. This trail system will connect cities and people, conserve local landscapes, and create new access to green space. The former O&W and D&H corridor, which extends through three counties and dozens of towns, will serve as the backbone of the entire Growing Greenways network.

"This is an exciting project for OSI and for the entire region. We heard from the majority of people that trails are something that the community really wants to have," said Annie Bergelin, design and capital projects manager at OSI. "But for this project to succeed and truly benefit the region, it was critical to engage the community from the beginning and allow their input to inform the process."

About half of the corridor is already in recreational use, but there are gaps spanning many municipalities. With a desire to involve local residents and groups in the planning process, OSI knew they could not solely rely on traditional methods of community engagement such as distributing flyers, hosting open houses, and attending events like fairs and festivals.

Instead, OSI used ArcGIS Experience Builder, ArcGIS Instant Apps, and ArcGIS Survey123 to modernize its outreach efforts to connect with as many people as possible. Staff at the organization created maps and surveys to coordinate with residents, local communities, businesses, government agencies, and environmental experts across the Hudson Valley.

## Using GIS to Modernize Community Engagement Efforts

"At the start of this [project], we knew there was going to be a public survey, we knew there would be direct community input on the routing alternatives, and all of it would need to be put on a map," said Julia Feller, senior GIS associate at OSI. "We wanted something easy to build, maintain, and update."

With Esri partner Greenman-Pedersen, Inc. (GPI), an engineering consulting firm, OSI staff initiated a feasibility study, known as the O&W Rail Trail Corridor Study. Their aim was to fully involve local communities in developing a plan for the entire trail corridor, including ways to improve existing trail conditions, site access routes and trailheads, and connect to amenities like restaurants, museums, farmer's markets, and historical locations.

OSI's GIS staff started with ArcGIS Experience Builder—a no-code, customizable app builder—to create a website featuring details about open houses and community events, frequently asked questions, information about the trails, and project resources. The site also contains interactive maps that show historical trail conditions and encourage public input.

"Experience Builder was a central part of this project," said Feller. "We wanted something simple and user-friendly for people accessing this at home or on their phone."

As the project progressed, OSI and GPI staff developed trail routing alternatives as shapefiles, which the OSI team then integrated into ArcGIS Instant Apps. This intuitive mapping app—which has easy-to-use templates and configuration options for web app development—makes it easier for audiences to engage with interactive maps and data and provide input by reading about trail alternatives and entering a thumbs-up or thumbs-down.



### O&W Rail Trail Survey

SELECT THE WORLD LANGUAGE ICON ABOVE TO CHANGE THE SURVEY TO SPANISH.

SELECCIONA EL ICONO DE IDIOMA MUNDIAL DE ARRIBA PARA CAMBIAR LA ENCUESTA A ESPAÑOL.

Thank you for participating in this survey for the O&W Rail Trail Corridor. OSI is spearheading this effort to create a vision to transform and connect the 57-mile former O&W/D&H corridor into a continuous trail from Kingston to Port Jervis. The future trail will serve communities throughout Ulster, Sullivan, and Orange Counties, providing access to scenery and nature. This survey aims to gather input on the vision for the trail, including trail uses, access, design, and amenities.

All responses will remain confidential. At the end of this survey, you will have the option to provide your contact information to receive future updates about the project.

**Questions with a red asterisk are required. The survey is open through June 30th.**

↑ The Open Space Institute's (OSI) community survey, built in ArcGIS Survey123, was live for three months during summer 2024 and was completed by more than 1,100 respondents.
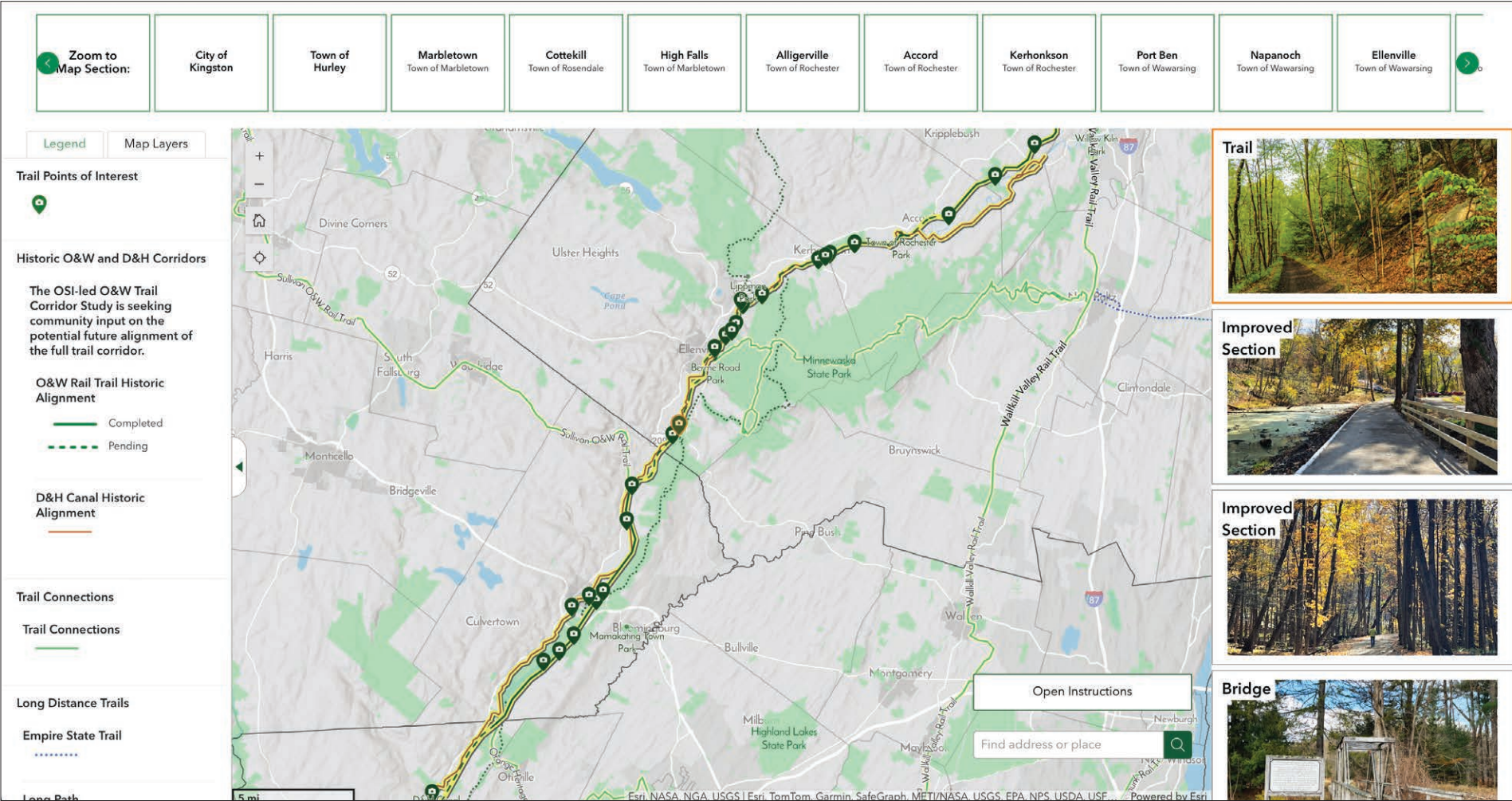


↑ The website created with ArcGIS Experience Builder contains interactive maps that show key locations.

"We have something that is living and breathing," continued Feller. "We were able to split [the map] up by where people live, because people know their own neighborhood and are able to provide feedback on their own community."

**Mapping Apps Will Help Shape a Connected Trail System**

The first phase of the community engagement process used ArcGIS Survey123 to build and circulate a survey regarding the trail corridor. During OSI's community survey, the app let residents and other stakeholders answer questions about how they use the current trail system and what they would like to see from a potential connected trail.

"Our team members were able to go in and look at the survey results as they came in," said Feller. "We also translated the whole survey into Spanish using the beta translation feature, which saved a lot of time and made the survey accessible to a wider range of people."

The OSI team found success in leveraging GIS to modernize its approach to community engagement. The online survey was live for three months during summer 2024 and was completed by more than 1,100 respondents. Happily, OSI learned that more than 98 percent of survey takers supported the O&W trail revitalization.

OSI knows that the trail build-out won't happen quickly; a greenway corridor conversion is a multiyear project. But with GIS, staff have the tools in place to gather input and provide updates to the community.

"Experience Builder allows us to gather, maintain, and share data—both spatial and nonspatial—in a single, easily accessible online space," said Neil Jordan, director of geospatial strategy at OSI. "We've found this to be an effective tool for efficiently communicating a significant amount of information, both internally and externally."

In the future, OSI staff plan to use GIS to support their efforts in maintaining a strong network of community leaders along the O&W corridor and to generate donations for greenway projects. Feller emphasized the value of the organization's new website as a powerful tool for building engagement and educating people about the work they are doing.

"We will continue to share the website in our communities so that people can see active projects and stay up to date as the Growing Greenways initiative progresses," she said.

For more information on OSI's Growing Greenways plan, read the "Growing Greenways: Connecting the Western Hudson Valley" ArcGIS StoryMaps story at openspaceinstitute.com/growinggreenways.



↑ The home page of the O&W Rail Trail Corridor Study was created using ArcGIS Experience Builder.



↑ A public input map, built in ArcGIS Instant Apps and integrated directly into Experience Builder, allows audiences to engage with trail routing alternatives by entering a thumbs-up or thumbs-down.



← The 57-mile New York, Ontario, and Western Railway (O&W) rail and Delaware and Hudson (D&H) Canal corridor includes some sections of public-use, off-road trail.

# GIS-Based Large Language Model Answers City Planning Questions
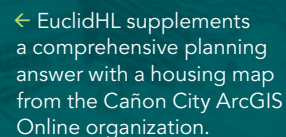


← EuclidHL supplements a comprehensive planning answer with a housing map from the Cañon City ArcGIS Online organization.



→ Zoning regulates the use, development, and activities allowed on a parcel. By fusing zoning text with GIS data, EuclidHL helps residents understand these regulations.



← EuclidHL helps clarify zoning questions with an ArcGIS Urban web scene that shows zoning districts and planning projects.

**People,** properties, and businesses around the world are affected by city planning and zoning. But planning documents and zoning ordinances can be several hundred pages long. They often contain countless maps, graphics, charts, illustrations, technical diagrams, and reference images. This makes them difficult to use and understand.

To help property and business owners navigate planning and zoning information, Esri partner Houseal Lavigne created EuclidHL, an AI-powered planning and zoning assistant that is always available, focuses on accuracy, is community specific, and interfaces with ArcGIS technology. Leveraging GIS, generative AI, and large language models (LLMs), EuclidHL simplifies access to and understanding of a community's planning and zoning information by answering users' questions in clear and concise language with supporting graphics and maps.

### City Plans and Zoning Ordinances Hold Answers

All cities, from small towns to large metropolitan areas, want to be vibrant and allow residents and businesses to thrive. To achieve this, cities develop comprehensive plans that establish a vision, along with the goals and strategies needed to see that vision become reality. Throughout the United States and in some other countries, these plans are legally recognized as the city's official policy document for growth, land use, and development.

Going hand in hand with planning is zoning, one of the most powerful implementation tools available to cities. Zoning regulates the use and development of all land, ideally in a manner that is consistent with the city's plan.

Every day, city staff get peppered with questions. "What is the city's approach to affordable housing?" "Where can I open a restaurant?" "Can I have chickens in my backyard?" "What growth areas are targeted for annexation?" "What are the city's sustainability initiatives?" "What is the process for getting a mixed-use development approved?"

The answers to these questions can be found in the city's plans and zoning ordinances. This information is important to everyone, from city staff to the public, yet it is difficult to find. It needs to be accessible, accurate, and easily understood.

### The Challenges of Finding City Information

While municipalities post their zoning codes and planning documents online, the sheer size and complexity of these resources is difficult to mine for answers. Voluminous text, charts, and tables—along with countless maps, diagrams, and illustrations—comprise a city's policies and regulations. Even for trained city staff and officials, finding the right answer to a question is often challenging.

What's more, municipal planning staff are not available 24 hours a day, seven days a week. Even during normal business hours, they have other

In Cañon City, the Planned Development District (PD) and Planned Development Overlay (PDO) are designed to accommodate innovative approaches to development.

1. PD – Planned Development: This district is intended for sites that are twenty (20) acres or more in size. It allows for development that aligns with the City's Comprehensive Plan but does not necessarily conform to the requirements of the City's Basic and Riverfront districts.

2. PDO – Planned Development Overlay: This district is for sites less than twenty (20) acres in size. It accommodates innovative development approaches that align with the City's Comprehensive Plan and generally conform to the requirements of the underlying district, but may require deviations to achieve a higher level of design and amenity.

What would you like help with?

EuclidHL can make mistakes. Check important info.

← Residents and business owners can use EuclidHL to better understand concepts such as planned development districts and annexation.

responsibilities, tasks, and projects that demand their attention. But what if someone gets inspired over the weekend to open a business? What if a developer or contractor needs information after hours? What if a city council member is looking into a constituent's concerns after the evening's city council meeting? These issues crop up all the time, not just on weekdays between the hours of 9:00 a.m. and 5:00 p.m.

So the team at Houseal Lavigne took on a challenge: how to make a city's planning and zoning information available all the time in a way that is user-friendly, easy to understand, accurate, and community specific—and that fully leverages a city's commitment to GIS. Essentially, the team wanted to develop a city planning and zoning expert that is always available.

### GIS as a Central Component of the Solution

EuclidHL is a GIS-enabled, AI-based planning and zoning assistant that answers community-specific questions in easy-to-understand language, graphics, and maps. To create this tool, the team at Houseal Lavigne leveraged its extensive GIS, visualization, and technology expertise, along with the company's experience working with hundreds of cities across the United Sates on planning and zoning projects. GIS data delivers a clear picture of where the effects of planning and zoning take place, so the team made it a central component of the assistant.

Members of the team realized that they could put a city's planning policies, vision, and priorities together with zoning and development regulations and use that to build the instruction set for an LLM. This would limit the LLM's responses to the adopted regulations and policies detailed in specific planning and zoning documents.

Since planning and zoning text is geospatial in nature, the team also realized that an LLM could use the text from planning and zoning documents to query and access GIS data. The team decided to call this combination of generative AI, planning documents, zoning ordinances, and GIS "EuclidHL"—a nod to the 1926 Supreme Court case, Village of Euclid v. Ambler Realty Co., that legitimized the use of zoning as a tool to regulate land use and development.

### An Agent-Based LLM Delivers Specific Answers

EuclidHL works by using an agentic framework, an AI system that makes decisions and takes actions on its own. EuclidHL's agent can adapt its responses to different questions without human oversight. It may request clarification, however, during a dialogue.

The agent knows to limit the sources of its information to a specific set of planning and zoning documents, GIS data, maps, 3D scenes, and an engagement platform such as ArcGIS Hub. EuclidHL can also interact with ArcGIS Urban planning projects, enabling it to respond with information about urban development scenarios and zoning capacities. The agent allows the LLM to fetch, reformat, and display information while greatly reducing the likelihood that it will invent, or hallucinate, information when it is uncertain of its response.

The agent also employs a series of defensive tools to prevent unsuitable questions or responses. EuclidHL users cannot use the tool to inquire about subjects that are not related to getting a city's planning or zoning information. Unsuitable questions are politely declined. Moreover, all conversations are logged and can be reviewed by an administrator and flagged for further analysis by Houseal Lavigne staff.

### How EuclidHL Works

When a resident, developer, city leader, or anyone else submits a question to EuclidHL, the question is forwarded to the EuclidHL agent, which determines how to respond. A response can include text and graphics from zoning and planning documents; references to ArcGIS web maps, scenes, and feature layers; and links to supporting documentation such as building permits and variances. Included in the response is a set of instructions. These instructions are passed to ArcGIS API for JavaScript, which renders the maps, scenes, feature layers, and graphics, and displays text within the chat box.

EuclidHL is currently in use in Cañon City, Colorado, and select other cities in the United States. It provides users with reliable, defensible, and locally specific answers to questions about home additions, fences, acceptable use

of property, locations for businesses, municipal plans for growth, plans for new housing, open spaces, annexation, transportation, mobility improvements, and more.

Users can ask EuclidHL common questions, such as "Can I raise chickens in my backyard?" or "What are the restrictions on building accessory dwelling units (ADUs)?" Whenever EuclidHL answers a question, it responds with a text-based answer and displays supporting GIS data on a map or in a 3D scene.

In addition to presenting web maps and scenes that automatically change, pan, and zoom depending on the conversation, EuclidHL will return graphics from legal codes, ordinances, and plans when asked specific planning and zoning inquiries. The graphics include diagrams that help explain required yard setbacks, minimum distances to structures, design guidelines, landscape standards, sign types and requirements, and other property and development regulations.

### Community Support in the Age of Generative AI

For a city's residents, business owners, and civic leaders, generative AI—especially AI assistants—offers an easier way for them to get answers to planning and zoning questions. But the responses must contain more than just text, especially since every planning and zoning inquiry is anchored in geography. EuclidHL fuses text responses with maps, 3D scenes, planning and zoning support documentation, and graphics, providing answers to community members when they need them.

## Scientific Currents

By **Dr. Camrin Braun**, Woods Hole Oceanographic Institution,
and **Dr. Rebecca Lewison**, San Diego State University

# As Oceans Change, Dynamic Data and Technology Pave the Way Forward

It is no secret that the world's oceans are undergoing sweeping changes. The signs are apparent in shifting ocean currents, changing distributions of marine species, and anomalies in once-predictable weather patterns.

As ocean temperatures rise, marine organisms large and small are increasingly on the move. Marine megafauna—such as tunas, sharks, billfishes, marine mammals, seabirds, and sea turtles—now roam into cooler waters or alter their migrations to align with new ocean conditions.

These variations are just the beginning of a cascade of impacts that a changing climate will continue to impose on marine megafauna and marine ecosystems. As species relocate to keep pace with shifting habitats, entire food webs may be reshaped, fish populations may collapse, and the human communities that depend on these resources may find themselves grappling with unprecedented challenges.

The stakes for natural resource and conservation management in the ocean are higher than ever. Climate-driven changes amplify conflicting management objectives, such as how to ensure the sustainable use of resources while conserving marine biodiversity. Commercial fishers, for instance, may find that it's harder to catch the most valuable species, so they fish at different times, or in different locations, or with different gear. Recently, there's been an increase in the number of whales getting entangled in fishing gear along the Atlantic and Pacific coasts in the United States, highlighting emerging conflicts in how humans and marine megafauna interact with changing ocean environments. Protected area managers are also concerned that the species for which these areas were established will shift their habitats, limiting how effective protected areas are as refuges.

As marine ecosystems and ocean users continue to adapt to unpredictable oceanographic conditions, the future presents significant economic, ecological, and cultural challenges. Addressing these changes requires new tools and approaches to navigate an uncertain future. The Fisheries and Climate Toolkit (FaCeT) takes a dynamic approach to ocean management by bringing together various data sources and employing ArcGIS Hub to foster collaboration among disparate stakeholders.

## A Toolkit for Flexible, Proactive Ocean Management

Available at fisheriesclimatetoolkit.sdsu.edu, FaCeT seeks to equip fisheries, marine spatial planning specialists, and conservationists with critical tools for managing and protecting changing oceans. Researchers from San Diego State University (SDSU) and Woods Hole Oceanographic Institution—with support from the National Aeronautics and Space Administration's (NASA) Ecological Conservation program—built FaCeT to help resource and conservation managers, policymakers, and communities adapt to changes taking place in the ocean.

FaCeT does this by integrating multiple streams of information, including satellite-based data and ocean climate models that capture important oceanographic variables, such as historical, present, and future sea surface temperatures and chlorophyll concentrations. Other information streams include various fishery-independent and fishery-dependent biological data, as well as ecological forecasting tools that predict changing species distributions. Together, the teams use these data streams to develop a wide range of products designed to support climate readiness and ocean resilience across multiple ocean management sectors.

At the heart of FaCeT's approach is the idea that ocean management must be dynamic and flexible to respond to changing ocean conditions. Dynamic ocean management encourages developing proactive frameworks that allow practitioners to adjust their actions so they reflect changing ocean conditions across timescales, from near real time to the end of the century.

When warm-water predators move into regions where they were previously rare, for example, local managers using dynamic ocean management approaches can respond swiftly by changing allowable catch levels, modifying what gear can be used to reduce bycatch, or shifting fishing operations to areas more likely to yield high catch counts. To continue conserving protected species, local managers can make dynamic changes to what activities are permitted in certain areas. This is climate-informed management.

## Harnessing Cutting-Edge Data and Technology

The data integration that FaCeT provides facilitates the agility and flexibility that dynamic management requires. Remotely sensed data—including from NASA satellites—delivers updated snapshots of ocean conditions, while forecast models project how factors such as temperature, salinity, and primary productivity will change over weeks, seasons, and decades. By overlaying this environmental data with dynamic species distribution models—and then identifying both current and future hot spots for marine megafauna—FaCeT helps managers and stakeholders see what will likely change in the ocean over the next season, decade, and century.

Esri products are instrumental to FaCeT's ability to harness data and technology. Using a site made with ArcGIS Hub, SDSU and Woods Hole researchers are working with partners such as the Northeast Regional Ocean Council to develop state-of-the-art tools—including the Northeast Ocean Data Portal, available at northeastoceandata.org/data-explorer. These tools serve data visualizations, projections, models, and maps to resource managers and users.



**NORTHEAST OCEAN DATA**
DATA EXPLORER

**LEGEND**

Stellwagen Bank National Marine Sanctuary

Northeast Canyons and Seamounts Marine National Monument

Habitat Suitability
Value

1: Good

0: Poor
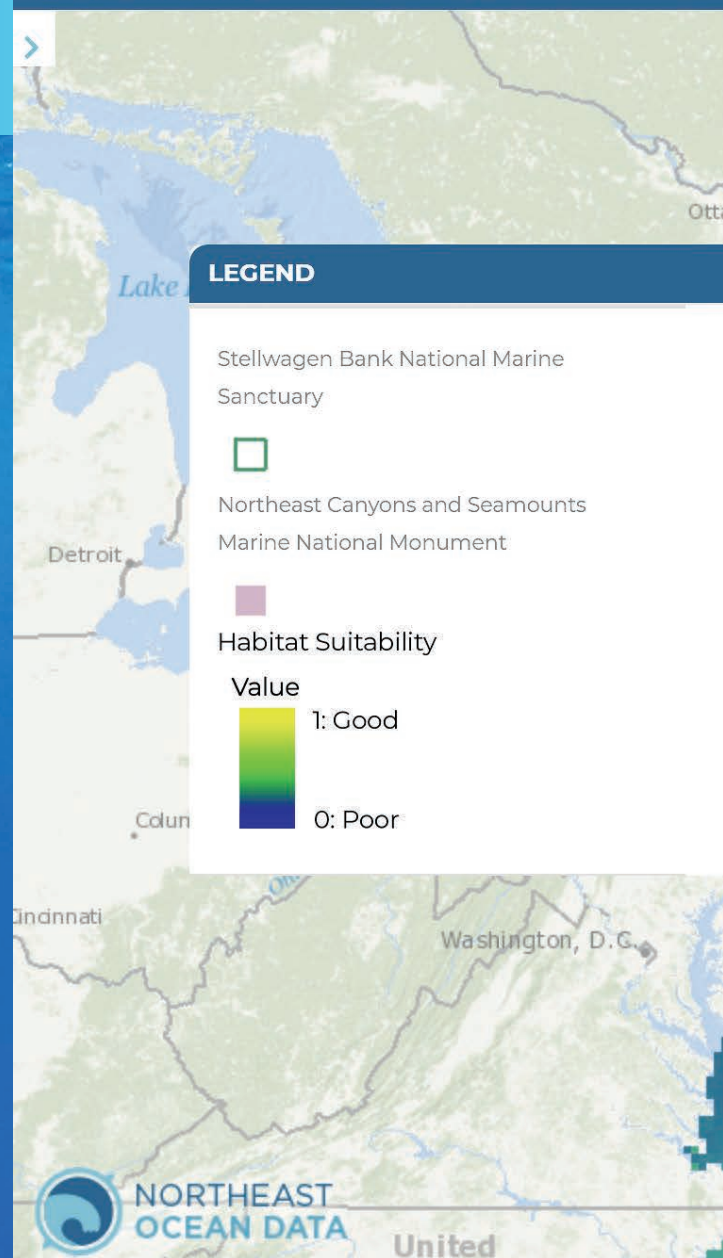
These data-driven products are made in direct collaboration with users. While the science and technology behind FaCeT can seem complex, the research team has prioritized the development of accessible and needs-based products. For example, FaCeT provides visualizations of how key Northwest Atlantic species distributions are projected to change in upcoming decades. Rather than releasing jargon-filled technical reports, the FaCeT team creates interactive dashboards based on in-depth surveys and collaborations with users, bridging the gap between research and management.

With accessible maps, figures, and charts, FaCeT supports data-driven, climate-smart applications. The result is a toolkit that can transform raw data into knowledge and, ultimately, action.

## Science Must Inform Practice

As the FaCeT initiative illustrates, building a climate-resilient future for marine ecosystems is possible. By using cutting-edge Esri technology, robust data streams, and accessible data visualizations, FaCeT offers a model for how science can inform practice.

Although no single toolkit can solve all the problems arising from climate change, FaCeT's integrative and adaptive approach represents an essential step toward proactively governing the world's oceans. This approach acknowledges the ever-changing nature of the oceans and the communities that depend on them.

As climate change pushes species to new frontiers, and as once-predictable patterns give way to novel conditions,
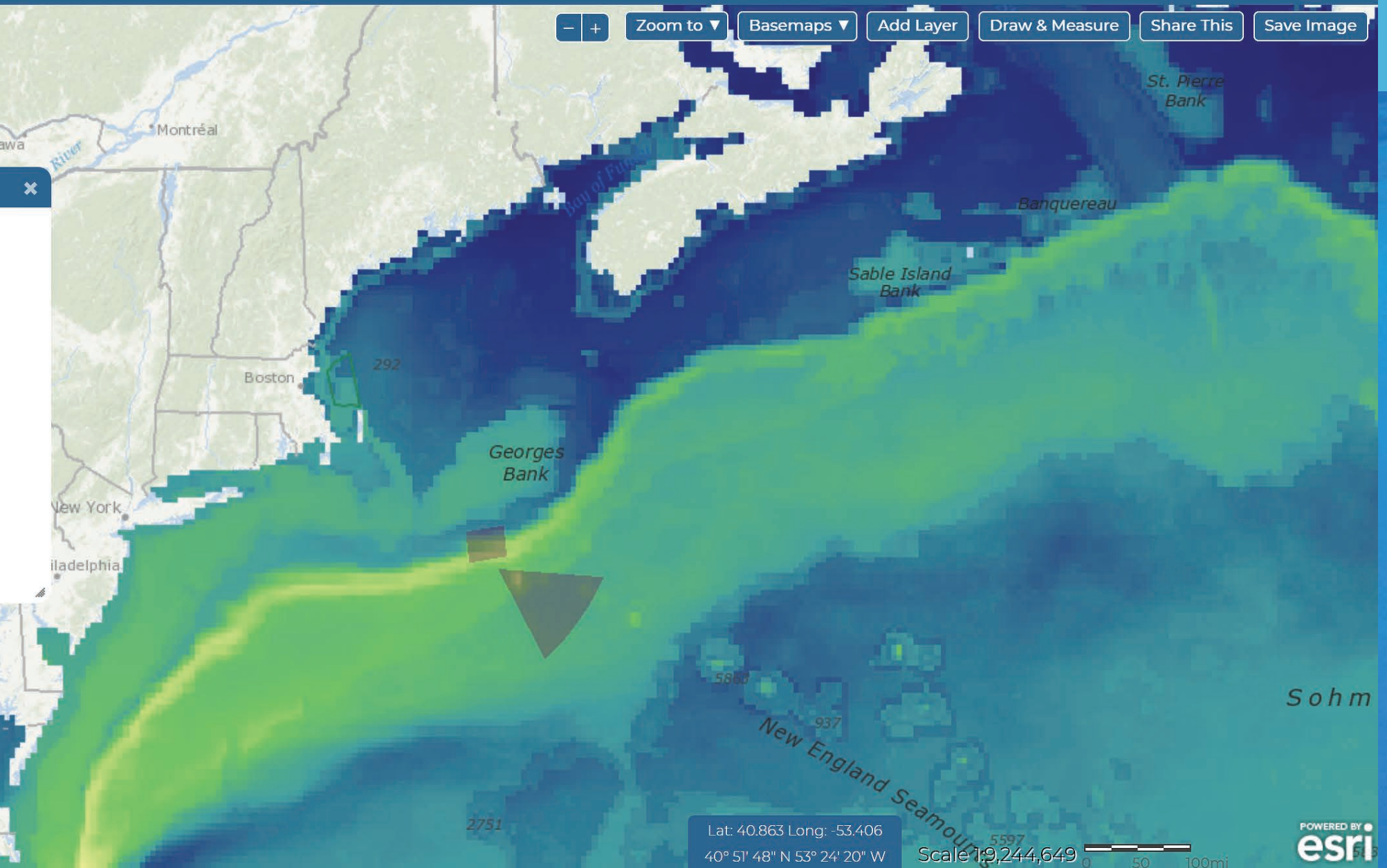
↑ The Northeast Ocean Data Portal from the Northeast Regional Ocean Council uses an ArcGIS framework to serve Fisheries and Climate Toolkit (FaCeT) products to stakeholders working in multiple ocean management sectors.

the pressing task is to ensure that resource and conservation management keep pace. Nimble tools like FaCeT will help communities cope with today's challenges and anticipate tomorrow's opportunities, encouraging a shift from reactive measures and rigid management structures to proactive strategies and flexible, resilient frameworks.

The future of the world's oceans hinges on humans' capacity to think creatively, collaborate widely, and make decisions informed by sound science. By learning from initiatives like FaCeT, and the researchers and communities that shape them, people can better navigate the turbulent waters that lie ahead. The alternative—watching as marine ecosystems falter under the strain of warming ocean temperatures and changing weather patterns—is not an option for a society that relies on oceans for food, livelihoods, and biodiversity. Instead, the path forward requires harnessing the best-available knowledge; embracing adaptive strategies; and forging partnerships that span disciplines, sectors, and borders.

Oceanic and societal resilience will depend on people's collective ability to read the changing signals, respond flexibly, and work together to help create a more sustainable future.

**About the Authors**

Dr. Camrin Braun is a marine ecologist and principal investigator at Woods Hole Oceanographic Institution. His research unites physical-biological interactions with the challenges of managing living marine resources in a dynamic ocean. Dr. Rebecca Lewison is a conservation ecologist and professor at SDSU. Her research focuses on translational and actionable science. Lewison also serves as the director for SDSU's Institute for Ecological Monitoring and Management. The authors wish to acknowledge and thank Dr. Laura McDonnell and Dr. Nima Farchadi for their contributions and collaboration.

# Illuminate Fishing Activity on the Open Ocean

## New Layers in ArcGIS Living Atlas of the World Show Where Consumers' Fish Comes From



↑ Employing hexbin summaries with the monthly fishing intensity service, this map displays where fishing activity takes place for a specified number of months throughout the year. Here, 1 month of fishing activity is shown in dark blue and 12 months of fishing activity is shown in bright yellow.

Fish is a significant source of protein for more than 3 billion people around the world, according to the World Wildlife Fund. And fish consumption has increased by roughly 3 percent annually over the last 60 years—almost double the population growth of 1.6 percent—according to the Food and Agriculture Organization of the United Nations. This demands a global industrial fishing effort that spans the farthest reaches of the oceans and, in many places, applies unrelenting pressure to fish stocks, sovereign waters, and sensitive ecosystems.

It is estimated that only 25 percent of global fishing activity is actively tracked or monitored, according to a recent article published in *Nature*. This allows fleets of so-called dark vessels, many of them small, to contribute to humans' growing appetite for fish. Except that lots of these vessels skirt regulations, disregard sovereign state territorial boundaries, and apply increasing pressure on the ocean's resources and fragile ecosystems.
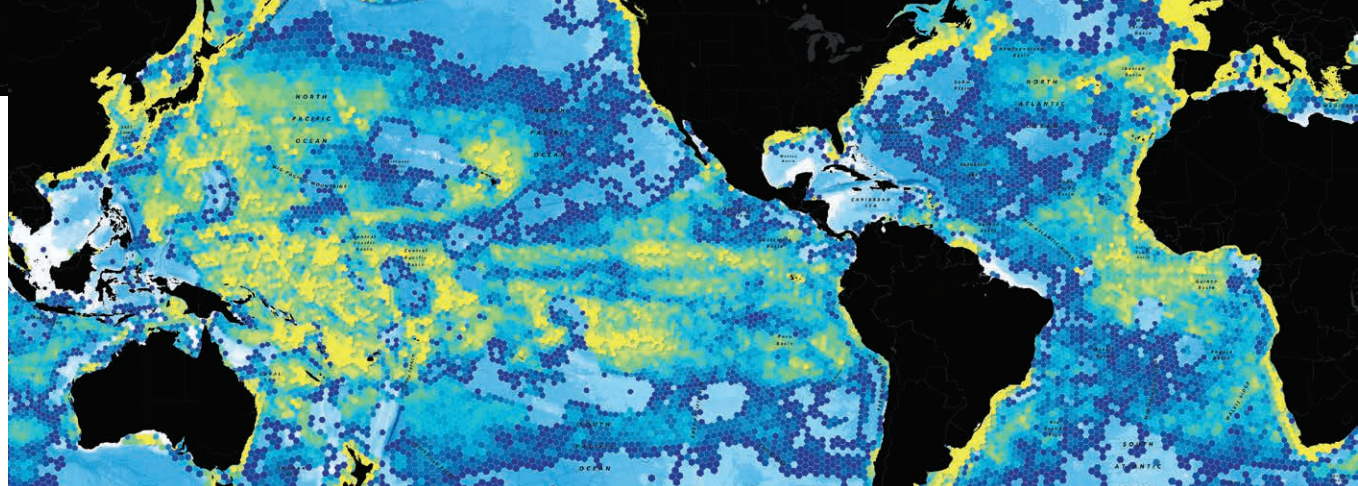
To take action to protect vital marine resources for future generations, people need a better understanding of where fishing activities are taking place throughout the world. But the global fishing footprint hasn't ever been quantified—until now.

With new fishing layers in ArcGIS Living Atlas of the World, users can gauge fishing intensity around the globe by locating fishing vessels and illuminating their activity on a map.

### New Layers Show Intensity of Fishing Activity

Esri recently added new global fishing intensity layers to ArcGIS Living Atlas. These one-kilometer-resolution, multidimensional datasets are the product of Global Fishing Watch, an independent international nonprofit that provides a global, real-time view of fishing. Global Fishing Watch makes human activity at sea publicly accessible.

One of the layers—Global Fishing Intensity (Year 2020)—provides a global summary of fishing vessel activity throughout the world's oceans. The data comes from the Automatic Identification System (AIS), a network of terrestrial receivers that monitors the movement and location of equipped vessels. It is represented as the total hours that all known fishing vessels are operating within each one-kilometer cell for the year 2020. This snapshot consists of two multidimensional variables: vessel hours and fishing hours. Vessel hours displays any fishing vessel activity within that cell, including transit to and from port, while fishing hours shows only apparent fishing activity as detected by Global Fishing Watch.

The other layer, called Global Fishing Intensity – Monthly Time Series (Year 2020), provides a more granular look at fishing intensity with monthly summaries for 2020. As with the yearly service, both vessel hours and fishing hours are available for visualization and analysis in ArcGIS Pro and ArcGIS Online. This layer can show the change in monthly fishing intensity in the waters around, say, Iceland—the country with the highest per capita fish consumption in the world, according to the World Economic Forum.

### Deep Learning Ascertains Important Unknowns

Since fishing vessels don't actively broadcast when they switch between transit or fishing activity—and dark vessels circumvent tracking—Global Fishing Watch employs innovative techniques to classify vessel activity. In addition to using satellite-based positioning technology and the AIS, the nonprofit employs machine learning to make educated guesses about whether a vessel is fishing based on the speed, direction, and shape of its track in the water.

If a vessel is taking a direct route to or from a port, it is probably in transit. If it is creating figure-eight shapes, following bathymetric features or contours, or steering around regulatory or sovereign boundaries, it is probably fishing. Using 22 billion AIS vessel positions collected from 2012 to 2016, while employing convolutional neural networks (CNNs)—a type of deep learning network—Global Fishing Watch modeled what fishing activity looks like. The model, which is part of both Global Fishing Intensity layers, is currently 90 percent accurate.

### Combine Layers to Dive Deeper

What can users do with these layers? A lot, actually.

Exploring global patterns of fishing intensity shows that certain waters are heavily fished while others aren't. But why? Combining the fishing intensity layers with other layers in ArcGIS Living Atlas—such as bathymetry, marine protected areas, and sovereign boundaries—users can begin to answer these questions. Taken together, these layers can highlight sharp changes in fishing activity over time, in certain spaces, and at various depths.

For example, users can employ equal area hexbin summaries in combination with the monthly fishing intensity service to determine regions where fishing activity takes place 1, 2, 3, or all 12 months of the year. Looking at sovereign offshore boundaries, known as Exclusive Economic Zones (EEZs), together with the data from the World Database on Protected Areas and the National Oceanic and Atmospheric Administration's (NOAA) Marine Protected Areas, reveals why fishing activity is so heavily concentrated in seemingly random wedges of open ocean: because of fishing restrictions. These layers can also be helpful for monitoring possibly illegal fishing activity in the world's most sensitive "no-take" zones—marine protected areas that don't allow extractive activities, including fishing, mining, and drilling.

To go even deeper, users can combine Global Fishing Watch layers with AIS-provided vessel track lines from the U.S. Vessel Tracking app (links.esri.com/AIS-traffic) in ArcGIS Living Atlas to get details about individual fishing vessels and track their journeys to and from ports of call in the United States.

### Transform Understanding into Action

The data that Global Fishing Watch has aggregated has the potential to transform how humans protect and manage the ocean by illuminating activity that was previously hidden. Used in combination with other authoritative layers in ArcGIS Living Atlas, this insight can help transform understanding into action, driving local initiatives and partnerships that reduce overfishing and habitat destruction.

For more detailed information on the new global fishing intensity layers in ArcGIS Living Atlas, explore the "Global Fishing Watch" ArcGIS StoryMaps story at links.esri.com/global-fishing.
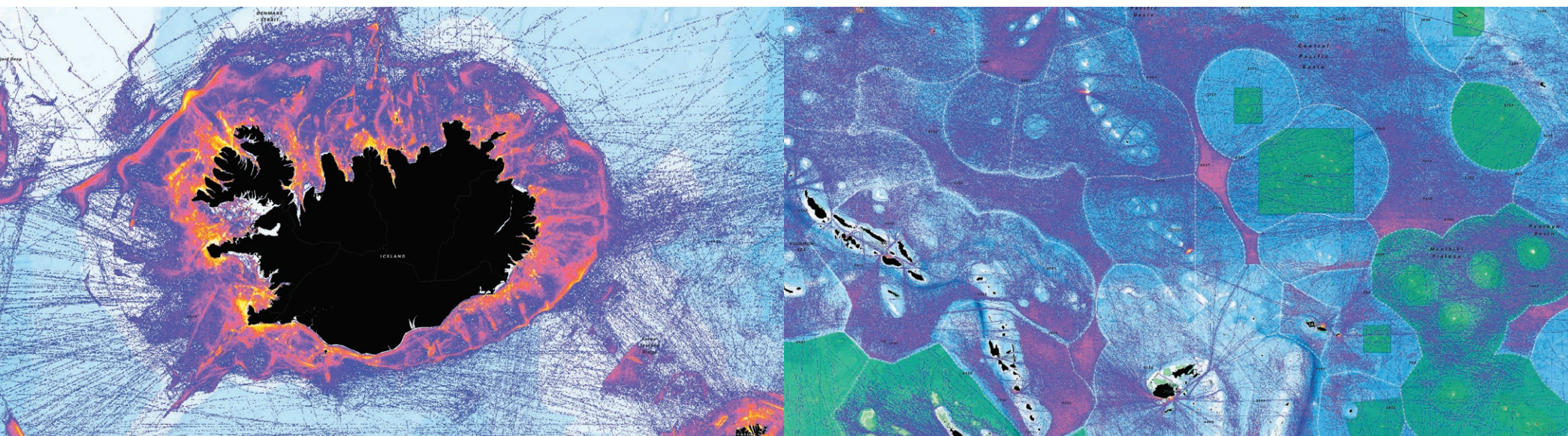


↑ The Global Fishing Intensity (Year 2020) layer shows the presence of fishing vessels over one year in the shallow waters around Iceland.



↑ Combining the fishing intensity layers with a marine protected areas layer reveals where illegal fishing activity may be happening in some of the world's most sensitive places.

# The Future of GIS Is Here

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# Real-Time Data Feeds of Bighorn Sheep Locations Protect Motorists and Animals

In the United States, about one in every 128 drivers each year will collide with a wild animal, causing more than $8 billion in damages, according to the US Department of Transportation.

Safeguarding people and wildlife along transportation corridors is crucial, but it requires having precise information about wildlife crossing locations. This is why the Nebraska Game and Parks Commission, in collaboration with the Nebraska Department of Transportation (NDOT), joined forces with industry leader and Esri partner VECTRONIC Aerospace for an innovative wildlife study. The project team used VECTRONIC Aerospace's solar-powered GPS collars in conjunction with ArcGIS Online and ArcGIS Velocity to create a real-time 3D monitoring system that tracked where bighorn sheep were—and weren't—crossing roads.

## Protecting Bighorn Sheep and Motorists

To help reduce vehicle collisions with wildlife, NDOT received a federal grant from the US Department of Transportation's Federal Highway Administration to engage in construction and nonconstruction projects (such as fixing fencing) that would protect both motorists and wildlife. The funding is part of an initiative led by the US Department of the Interior to improve habitat quality and migration corridors for big game in Western states, especially in winter.

The grant enabled NDOT to conduct hot spot analyses of wildlife-vehicle collisions and engage in planning and research to aid wildlife management. It allowed the department to monitor wildlife movements and migrations relative to the location of renewable energy infrastructure, such as wind and solar farms. Additionally, it funded efforts to mitigate disease transmission between domesticated and wild animals.

The Nebraska Game and Parks Commission has been instrumental in bighorn sheep restoration efforts since 1981. The state has successfully returned Rocky Mountain bighorn sheep to the Wildcat Hills and Pine Ridge regions of western Nebraska. But the number of vehicle collisions with the animals grew. Between 2009 and 2023, most vehicle collisions in the state involving bighorn sheep occurred in the Wildcat Hills State Recreation Area along Nebraska Highway 71.

An initiative to expand the Heartland Expressway—which, in part, comprises Highway 71 and traverses Nebraska, linking Rapid City, South Dakota, to Denver, Colorado—was being planned. The area seemed to be a natural crossing for bighorn sheep, though. So NDOT and Nebraska Game and Parks began collaborating on a study about the dangers to bighorn sheep and motorists and the best ways to mitigate those hazards.

The study was designed to provide the comprehensive data needed to make informed decisions about the necessity, location, and costs of building wildlife crossing structures—such as underpass tunnels, viaducts, or overpasses—along with other potential mitigation strategies, according to Nebraska Game and Parks.

## Quick Data Analysis Has a Range of Uses

For the team, it was crucial that the study pinpoint current wildlife crossing areas to guide the construction of new crossing structures. Central to this effort was monitoring bighorn sheep movements and visualizing the data using ArcGIS technology.

Working with VECTRONIC Aerospace, NDOT and Nebraska Game and Parks obtained solar-powered GPS collars equipped with remote satellite communication and attached them to seven bighorn sheep. This enabled real-time monitoring of the animals in the study area.

Research team members then employed ArcGIS Online to store and facilitate real-time analysis of the resultant data. The team also leveraged ArcGIS Online to create maps of the bighorn sheep's movements, including 3D maps that showed, for example, when sheep were on a mountain overlooking the highway. The team used ArcGIS Dashboards as well to create dashboards that revealed the movements of bighorn sheep, displaying how many were in the vicinity of roads and how often this occurred. Taken together, these tools provided a more accessible and comprehensive view of the GPS collar data, simplifying information sharing and collaboration across the organizations.

The team also used ArcGIS Velocity to conduct real-time analysis of the incoming GPS collar data. The analysis process included enriching the data with motion statistics, direction of travel, and proximity to road features, as well as calculating distances to known locations to generate near real-time notifications for wildlife managers. Additionally, Velocity offered big data analytic capabilities for long-term analysis. This greatly streamlined



↑ A 3D map of a highway segment shows where collared bighorn sheep are and reveals where they often cross roads, indicating prime areas for developing wildlife crossings.

the analysis process, which traditionally was done by downloading static spreadsheets and geoenabling them before any kind of analysis could even begin.

VECTRONIC Aerospace's solar-powered SOLEX Collar sends information about its position every 15 minutes. Velocity took that information and processed it right away, finishing location analysis in 40 seconds. The system notified Nebraska Game and Parks wildlife managers when bighorn sheep were 50–250 meters from a highway. The wildlife managers could then call the sheriff or other wildlife officers out to that area to help reduce the chance of vehicles colliding with the bighorn sheep.

Real-time data is not only crucial for preventing wildlife-vehicle collisions, but it can also serve as an early warning system for researchers when radio-collared, wild bighorn sheep interact with other species. This capability could prove pivotal in containing the transmission of diseases between bighorn sheep and other animals, which can result in dramatic population decreases and necessitate the costly culling of herds.

"This collaborative effort utilizing new, innovative technology will contribute greatly to species, like bighorn sheep, in need of conservation and will serve us well in developing a variety of mitigation strategies addressing future challenges," said Todd Nordeen, manager of big game and disease research for the Nebraska Game and Parks Commission.

## Current Insight Informs Future Research

As a result of integrating the GPS collar data with ArcGIS Online and ArcGIS Velocity, wildlife managers were able to proactively monitor bighorn sheep movements in real time to prevent possible wildlife-vehicle collisions and strategically prepare for future wildlife crossings. Being able to view the data derived from the GPS collars in dashboards gave wildlife managers insight into past trends and highway activity.

NDOT staff expect the bighorn sheep collar data "to be an asset in our feasibility study as we seek to improve our understanding of movement patterns and potential mitigation strategies to enhance the safety of both the traveling public and wildlife in the Wildcat Hills region along [Nebraska Highway] 71," said Jarrod Walker, highway planning manager for NDOT.

The Wildcat Hills pilot study, which began in 2024, has already provided valuable data that will inform the planning of secure and sustainable wildlife corridors in Nebraska. The insight gained from this study will also guide future research on monitoring wildlife movements, mitigations, and potential disease transmission.

→ VECTRONIC Aerospace's solar-powered collars send information about each bighorn sheep's position every 15 minutes.

The use of this technology greatly expands the opportunities to safeguard both humans and wildlife, such as by triggering DOT alerts when animals are in the area so motorists are reminded to stay alert and slow down.

"We look forward to developing solutions for big GPS datasets generated by our wildlife collars to make it easier for our clients in Nebraska and around the world to streamline the data analysis in Esri's ArcGIS platform," said Chris Kochanny, CEO and president of VECTRONIC Aerospace.

↓ A data visualization dashboard tracks the movements of bighorn sheep in Nebraska, displaying how many are in the vicinity of roads and how often this occurs.
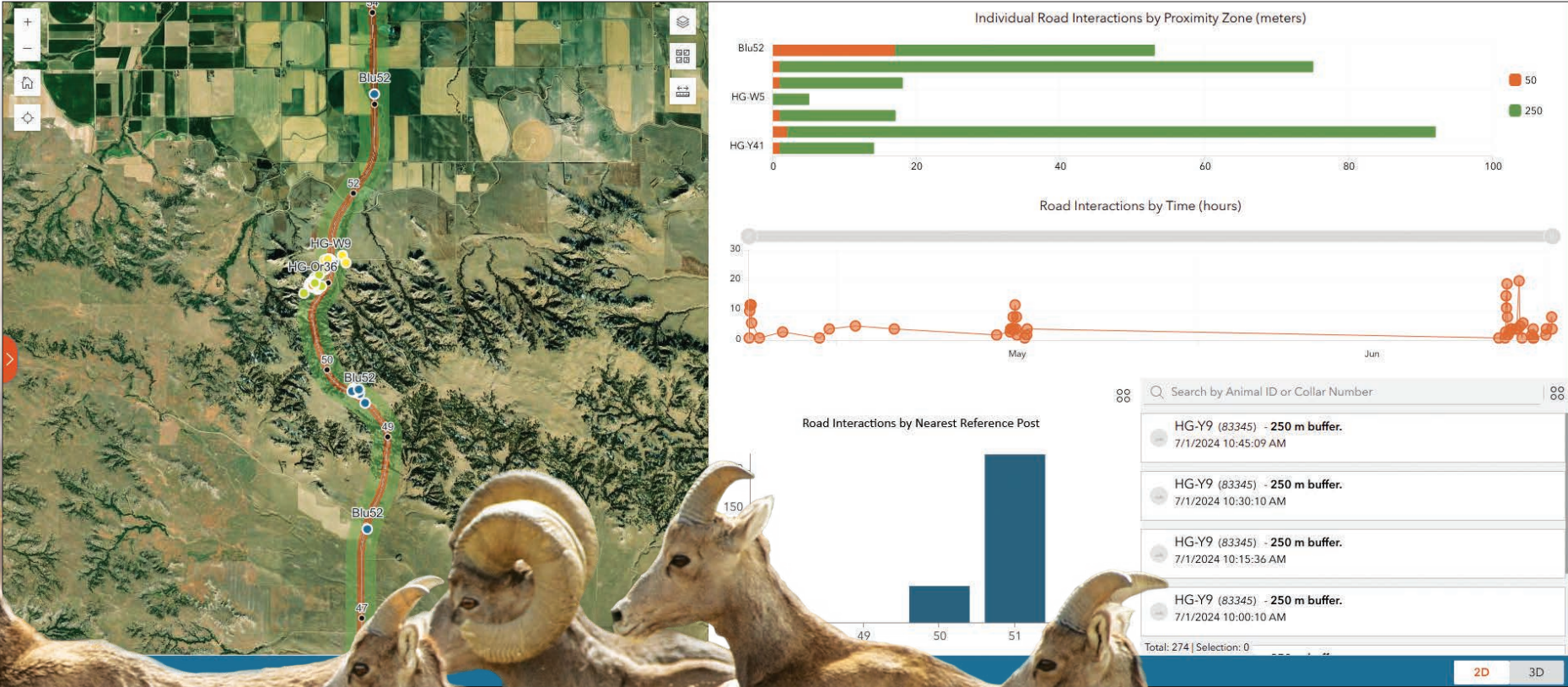
# DESIGNING FOR GOOD TO SAVE LIVES IN LOUISVILLE

The power of location has fascinated Claire Yates for years. Now the driving force behind Vision Zero Louisville, the Kentucky city's safety initiative that envisions zero roadway fatalities by 2050, Yates has built her career around what she calls "designing for good."

"I became very interested in the built environment and how infrastructure and developers shape the communities that people live in," she said. "I really enjoy this kind of marriage of real estate, the built environment, and human nature."

In her current roles as transportation planner for Louisville Metro Government and its Vision Zero program manager, GIS is central to Yates's work. She meticulously records and maps every crash in Louisville that results in death or serious injury and shares this data with the public. She also creates and maintains datasets that support her work. These include roads that have been or are planned to be rightsized to make driving on them safer, as well as uncontrolled, midblock crossings to help determine where new pedestrian crossing infrastructure is needed.

"We use GIS to determine where we should invest our limited time and resources," she said.

Yates has also employed GIS to bring in more than $29 million in federal funding to improve Louisville's roadways for motorists, pedestrians, and bicyclists.

"Claire figured out how GIS can support Louisville's efforts to improve road safety, and she has continued to use the technology to bring in more funding," said Oscar Loza, senior marketing manager for industry solutions at Esri. "Her efforts—and successes—are inspiring."

## Flares of Geospatial Brilliance

Fresh out of college, Yates was working as a paralegal for a real estate development company, trying to decide if she wanted to become a lawyer. She concluded that practicing law wasn't her calling, and she wasn't enthusiastic about the big-box-store-anchored strip malls that the company tended to develop. But Yates did find urban planning fascinating. So she enrolled in the urban studies master's degree program at the University of Louisville. That's where she first encountered GIS.

Yates took an introductory GIS course and found the instructor, Bob Forbes, "absolutely wonderful," she said. "He was just very methodical...about getting us acquainted with new programs and a new concept like GIS."

She was hooked, so she took several more GIS classes.

"That really opened my eyes to the kind of power that GIS has and what you can do with it using different datasets," she recalled.

Since learning ArcGIS technology, Yates has brought her own flare of geospatial brilliance to all the roles she's held. After graduate school, as an analyst at a commercial real estate appraisal company, Yates used GIS to enhance her market research by, for example, mapping lease rates for different submarkets of Louisville. It wasn't common to bring GIS into this type of work.

"I brought it in because I knew how to do it and it was kind of a value-add for me," she said. "It was also a way for me to keep my GIS skills sharp."

When she joined Louisville Metro as an urban planner, she used ArcGIS StoryMaps to create compelling geospatial narratives and ArcGIS Dashboards to build informative dashboards.

"I created a story map of the public art collection in Louisville. I also created dashboards for initiatives like our Cool Roof Incentive Program," she said, referring to the Office of Sustainability's efforts to encourage building owners to install roofs made of cooling materials, such as asphalt shingles, to offset rising urban temperatures.



↓ The roads marked in blue have been converted from four-lane roadways to three-lane roads with designated turn lanes. The streets marked in yellow are proposed for reconfiguration.

Claire Yates

GIS Hero

**Filter by Date Range** No date selected  **Filter by Travel Mode** No category selected  **Filter by Road Type** No category selected

### Information

This dashboard is provided for informational purposes only. Minor crash data discrepancies often occur due to the nature and complexity of the data.

Crash data is obtained from the public Kentucky State Police crash database, which is populated by reports submitted by law enforcement officers throughout Kentucky. Additional data and formatting is then conducted by Vision Zero Louisville.

**Crash data included in this dashboard includes crashes within Jefferson County, Kentucky, inclusive of all public safety jurisdictions.**

**Crash data included in this dashboard has been disaggregated by Vision Zero Louisville to identify the travel mode (such as a pedestrian or motorcyclist) and injury severity of each victim involved in a fatal or suspected serious injury crash.**

- Note 1: Vision Zero Louisville metrics exclude interstates, expressways, and freeways (I-64, I-65, I-71, I-264, I-265, KY-841 Gene Snyder Freeway), but are shown here for convenience unless noted otherwise.
- TIP: To exclude interstates, expressways, and freeways from your search, use "Filter by Road Type" and select all types except for interstate and freeway.
- Note 2: Vision Zero Louisville metrics exclude parking lots and pedestrian/train collisions outside of public right-of-way.
- Note 3: Data is categorized by injury severity and travel mode. Therefore, a single crash event may be represented more than once.
- Note 4: The Motor Scooter travel mode classification includes mopeds, motor scooters, and motorbikes.

**1k** ♥ Fatalities on Public Roadways

**4,605** ✳ Suspected Serious Injuries on Public Roadways

#### By Year

| Year | FATALITY | SUSPECTED SERIOUS INJURY |
|------|----------|--------------------------|
| 2016 | 99 | 660 |
| 2017 | 108 | 569 |
| 2018 | 76 | 478 |
| 2019 | 98 | 482 |
| 2020 | 124 | 472 |
| 2021 | 124 | 509 |
| 2022 | 128 | 523 |
| 2023 | 135 | 453 |
| 2024 | 113 | 459 |

#### Fatalities and Suspected Serious Injuries

LOJIC | Kentucky State Police; Louisville Metro Public Works and A... Powered by Esri

Severity Type  Heat Map

#### Lives Lost

- KEAYLAND ██████ 14
- DALLAS █████ 49
- DANH █████ 56
- TINA ████ 61
- JANIYAH ██████ 20
- SANDRA ██████ 81
- MYRTLE ██████ 77
- JESSICA ██████ 44
- CHRISTOPHER ██████ 61
- MARK ██████ 61
- LAYNE ████ 39
- STEPHEN ██████ 25
- MICHAEL ██████ 50
- CRYSTAL █████ 45
- COLTON ██████ 25
- JONATHAN ██████ 29
- DENNIS ██████ 61
- ELIZABETH ██████ 32
- TYLER ██████ 33
- ERIC J ██████

*This list serves to remember those who have lost their lives on Louisville's public roadways. To request the name of a loved one be removed, please contact our Vision Zero Louisville Program Manager.*

↑ The Vision Zero Louisville Dashboard offers a snapshot of roadway fatalities and suspected serious injuries, along with a map of where crashes occurred and, if publicly available, the names of those killed.

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At Louisville Metro, Yates engaged in long-range and neighborhood-level planning, transportation planning, and streetscape design. Then, in the summer of 2022, the Louisville Metro Council passed its ordinance calling for zero roadway deaths by 2050. The Department of Public Works began looking for a planner to lead that initiative.

"I jumped at the chance and was hired to do that," Yates said.

#### Safer Roads Demand Maps

Yates quickly modeled the Vision Zero initiative around the Safe System Approach. It consists of five overlapping strategies: safer roads, safer speeds, safer people, safer vehicles, and post-crash care.

To guide Vision Zero Louisville's Safer Roads strategy, Yates partnered with the Kentucky Transportation Cabinet and consulting firm Palmer Engineering to develop Louisville's first High Injury Network. This data-driven approach identifies non-interstate roadway segments that account for a disproportionate amount of a community's fatal and serious-injury crashes. Louisville's High Injury Network represents 5 percent of non-interstate miles but 55 percent of fatal and serious-injury crashes over a five-year period. The High Injury Network allows Louisville to direct limited resources toward improving safety on high-priority corridors.

One of the first tasks Yates undertook in her new job was to create the Vision Zero Louisville Dashboard. Once a month, she pulls public data on traffic collisions and maps the locations of roadway fatalities and suspected serious injuries. She also set up news alerts for searches such as "Louisville pedestrian," "motorcycle crash Louisville," and "fatal crash Louisville." She reviews these every day and catalogs them in her web browser. She then disaggregates the crash data to the individual level and, if possible, attaches any related news stories to the crash information on the map.

In the publicly available dashboard, users—including city leaders and elected officials—can click on a collision and find out more about the people involved. Yates's goal is to show that these crash statistics aren't just numbers; they represent real people whose lives have been altered and, in many cases, ended on Louisville's roads.

"Humans make mistakes," she said. "Maybe they misjudged the amount of time that they had to make a left turn. But that mistake shouldn't be a death sentence."

#### Open, Transparent GIS Data Gets Results

Three years in a row, Louisville's Vision Zero initiative has received federal funding to support its road safety projects—in large part because of GIS analysis. This work also won Yates and the department a 2023 Special Achievement in GIS Award from Esri.

In 2022, Louisville Metro Public Works secured more than $21 million in Safe Streets and Roads for All (SS4A) grant funding to convert several four-lane roadways into three-lane roads with designated turn lanes. The grant application featured maps and analysis revealing that fatal and serious-injury crashes occurred more frequently in disadvantaged areas.

In 2023, Louisville Metro Public Works was awarded $7.5 million through SS4A to make safety improvements to a pair of one-way streets that connect downtown with the University of Louisville. And in 2024, the city was awarded a partial SS4A grant of $800,000 to hire two new staff members to support Vision Zero.

"Because GIS was central to why Louisville received this grant money, the city now makes GIS analysis a big part of its grant applications," said Loza. He credits Yates with elevating GIS to that pivotal role and making geospatial data useful, open, and fully transparent.

"I often remind myself and my colleagues to 'share and share alike,'" Yates said. "All of our work is owned by the community, and so therefore, the community should have access to the data and the work that they are paying for."

Yates said that anything she would tell her boss, she'd tell the public. So she posts all her publicly available data to Louisville's open data portal. There, the public can see that the number of people killed on surface streets in Louisville in 2024 was the lowest since 2019.

"But I do not rest on that," Yates said. "That is still entirely too many people losing their lives."

# With New Enterprise GIS, Arbor Day Foundation Strengthens Partnerships

By Michael Blair and Laura Cates, Innovate! Inc.

For more than 50 years, the Arbor Day Foundation has developed relationships with organizations around the world to maximize the impact of planting trees. Focused on global reforestation efforts, urban forest management, and education about the importance of trees, the Arbor Day Foundation boasts over 1 million members, donors, and partners.

To effectively run the business of planting the right trees in the right places, the Arbor Day Foundation now relies on a robust ArcGIS Enterprise implementation to provide near real-time, accurate data for enhanced decision-making. Over the course of about a year, Esri partner Innovate! Inc. worked with the Arbor Day Foundation—exploring staff needs and organizational priorities—to develop a strategic plan for how to better deploy GIS. With its new, more robust GIS implementation, the foundation continually keeps staff and donors up to date on projects and priorities while showing concrete returns on investment for tree-planting endeavors.

## Needs Assessments Inform Strategy

When the team at Innovate began collaborating with the Arbor Day Foundation, the organization was using ArcGIS technology on a limited basis, but it didn't have an enterprise-wide GIS setup. Staff at the foundation were unsure where to begin or how to implement a fully developed geospatial solution to maximize their return on investment in Esri technology. The team from Innovate began by developing a strategic plan for how to deploy GIS within the organization, complete with short- and long-term goals.

Leaning on their deep experience in supporting nonprofits, Innovate staff designed transformative, cost-effective GIS solutions that enabled the Arbor Day Foundation to maximize donor engagement, streamline operations, and measure impact in near real time. These tailored solutions addressed the foundation's unique needs, optimizing decision-making and project management.

By conducting a thorough needs assessment and engaging stakeholders from key departments such as business intelligence, corporate partnerships, IT, marketing, reforestation, and web development, Innovate ensured that every aspect of the Arbor Day Foundation's diverse requirements was captured. The team translated this insight into actionable user stories and use cases; performed a data gap analysis; and developed a tailored product road map centered on geospatial data stored in the foundation's ArcGIS Enterprise implementation, which is hosted in Microsoft Azure.

In close collaboration with foundation staff, the Innovate team integrated data from more than 20 systems across the organization, creating the basis for simplifying workflows and optimizing strategic decision-making. Innovate implemented ArcGIS technology and custom tools, delivered a robust system architecture, configured enterprise geodatabases, and modernized the organization's reforestation processes. The Innovate team created dynamic dashboards and interactive widgets, enabling staff and donors to engage with impactful data visualizations.

With deep client engagement, expertise in ArcGIS products, and a commitment to fully understanding the Arbor Day Foundation's vision, the Innovate team unveiled a wide range of previously untapped opportunities to integrate ArcGIS technology into workflows and processes.

## A Dashboard Shows Impact

Corporate stakeholders increasingly prioritize environmental, social, and governance (ESG) goals. Yet aligning these objectives with impactful initiatives remains a challenge. For the Arbor Day Foundation, this means ensuring that reforestation projects meet ecological and social priorities while delivering tangible returns on investment for corporate donors.

To this end, the Innovate team used ArcGIS API for JavaScript to create the Impact Dashboard, which displays accessible, visually compelling, and vetted scientific data on tree planting. Users can easily view transparent, near real-time data on the number of trees planted and any relevant environmental offsets—including the amount of carbon that gets sequestered and the number of pollutants removed from the air—and view the information on maps and in photos and stories.

For nonprofits, maximizing resource efficiency is a constant priority, and adopting digital tools is a crucial step toward achieving that goal. The Arbor Day Foundation recognized the need to modernize its manual processes, particularly those tied to donor reporting. These processes were labor-intensive and required significant staff time to gather, compile, and present data to corporate partners.

Previously, the Arbor Day Foundation took as many as 80 hours per donor to produce end-of-year reports, especially for large corporate donors such as Fortune 500 companies. Transitioning to a system that allows corporate partners to see up-to-date impact data through the Impact Dashboard reduced the Arbor Day Foundation's administrative burden, enabling staff to focus on mission-critical tasks. These advancements also improved transparency and engagement, providing corporate partners with immediate access to visually compelling, data-driven insight without foundation staff having to manually generate reports. At any time, donors can see exactly what they've spent their money on, resulting in a feeling of tangible effect.

The Impact Dashboard proved impactful indeed. In addition to saving time and resources, the dashboard enabled the Arbor Day Foundation to put more money into its tree-planting initiatives. Conservative estimates indicate that the GIS integration and Impact Dashboard save the Arbor Day Foundation hundreds of hours of work and hundreds of thousands of dollars per year. With one tree costing $1 to plant, these savings directly affect and further the foundation's mission.

## The Initial Investment Pays Off

Innovate's advanced integration of IT and GIS services provided the Arbor Day Foundation with powerful tools to elevate its mission to the next level. The organization's initial $500,000 investment in updating its GIS has yielded savings that far exceed this expenditure, underscoring the transformative effects of engaging in strategic geospatial planning.

The data-driven donor reporting presented via the Impact Dashboard gives donors—including some of the most well-known telecommunications, beverage, car rental, and retail companies in the world—instant access to customized reports. Near real-time dashboards and storytelling tools such as ArcGIS StoryMaps have helped the foundation build more trust with its corporate donors and increase participation. This has enhanced transparency and reduced administrative overhead, saving the Arbor Day Foundation close to $500,000 annually on this process alone.

Moreover, by fully integrating GIS, the Arbor Day Foundation strategically expanded its efforts, leveraging data to identify and prioritize regions with the highest ecological and social return on investment across more than 60 countries.

## Continued Collaboration as Technology Evolves

In support of the Arbor Day Foundation's ongoing mission, Innovate continues to provide the organization with comprehensive services built on a foundation of high-level strategic planning, client engagement, and collaboration. This approach allows the Innovate team to deliver a full spectrum of enterprise GIS services, including traditional IT infrastructure support; the development of database systems; extract, transform, and load (ETL) processing; app modernization; the creation of custom widgets; and support for data analytics, data science, reporting, and training.

As Esri technology evolves, Innovate plans to leverage the ArcGIS ecosystem—including AI, machine learning, and 3D visualization—to develop even more customized solutions. Implementing software and apps such as ArcGIS Pro and ArcGIS Survey123 will help the Arbor Day Foundation engage in predictive modeling and mapping to prioritize reforestation efforts in areas of greatest need.

By integrating Esri's technology with Innovate's holistic approach to IT and GIS, the Arbor Day Foundation has enhanced its mission by delivering impactful environmental solutions while strengthening corporate partnerships. This collaboration underscores the power of GIS to drive meaningful, measurable change for nonprofits worldwide.



↑ Dashboard users can view information about their projects on maps and in photos.

### About the Authors

Michael Blair is the senior IT/GIS strategist and architect at Innovate. A Certified ScrumMaster and Amazon Web Services (AWS) Certified Solutions Architect, he has more than 30 years of experience managing and supporting IT and geospatial app development projects, including on cloud platforms. Laura Cates is a seasoned writing professional working at Innovate. She delights in exploring the intersection of science, ingenuity, and strategy that is GIS.

# Hot Spot Analysis Helps Protect Howler Monkeys from Electrical Power Lines

By Corrie Presland-Byrne, Hammerhead Technology

One of the most biodiverse countries in the world, Costa Rica is home to about half a million species, including four types of monkeys. One of these is the howler monkey, known for its exceptionally loud howl and its long tail that's capable of grasping.

Howler monkeys use their tails to swing between trees and other objects. But when a howler monkey touches more than one electrical power line—such as when moving from one to another—it creates an electrical circuit that can injure or kill the monkey and cause a power outage.

This is one of many issues faced by the Costa Rican nonprofit Wild Sun Rescue Center, which rescues, rehabilitates, and releases local wildlife that are sick, injured, or orphaned. From August 2018 to January 2019, more than half of the monkeys taken in by the center were victims of electrocution. Over 75 percent of these 47 monkeys died. Of the survivors, few could be released back into the wild due to age or the severity of their injuries.

To come up with a targeted plan to reduce these deaths, injuries, and financial costs, Esri partner Hammerhead Technology used GIS to compare power line locations with places where howler monkey electrocutions had occurred.

## Costs and Potential Solutions

In addition to injuries and loss of life, wildlife electrocutions can represent significant financial costs to two stakeholder groups: conservation organizations and electric companies.

Rescue and treatment efforts often cost about $1,500 per monkey—and they sometimes fail to save the creature. Electric companies may face customer complaints and repair expenses that cost $250–$100,000 per incident.

Potential solutions to this issue include tree trimming, building wildlife bridges such as heavy-duty ropes, insulating power lines and other electrified equipment, and moving power lines underground. While insulation and tree trimming are generally the most cost-effective, even these approaches would be prohibitively expensive if implemented across an entire regional electrical network.

## Using GIS to Identify Electrocution Hot Spots

Hammerhead researchers employed ArcGIS Pro to explore, analyze, and display key location data for electric poles, power lines, transformers, and howler monkey electrocutions. Once the data was collected and organized, these researchers created separate layers for each element and selected a basemap to show the results in the Costa Rican town of Nosara—known for its thriving howler monkey population—and the Guanacaste province, where Nosara is located.

Once these electrocution hot spots had been identified, another Costa Rican nonprofit organization, the Sloth Conservation Foundation, estimated costs to insulate electrical infrastructure in these places. According to Hammerhead, replacing exposed power lines with insulated lines in hot spots could have prevented up to 70 percent of the electrocutions during the study period in the researched area.

Including the lines—as well as damaged poles and transformers—the total estimated cost for insulating power infrastructure in electrocution hot spots was $17,900–$29,850. In comparison, researchers estimated, the total combined repair costs for these locations could easily have reached hundreds of thousands or even millions of dollars.

Staff at Hammerhead and several Costa Rican conservation organizations hope to collaborate with local electric companies to implement targeted mitigations based on the GIS data. This hope was further fueled by a 2024 decree issued by the Costa Rican government that requires power companies to take responsibility for wildlife electrocutions.

## Applying the Technology Elsewhere

Hammerhead is also using this technology in Florida to evaluate a variety of data layers, including ones that show speeding and poaching incidents, wildlife injuries and deaths, protected areas, traffic volume, and property development. With these layers, GIS can help government agencies track wildlife and criminal incidents and identify places for potential preventive action, such as installing additional police presence.

Hammerhead staff view these efforts in Florida and Costa Rica as key steps in combining GIS technology and conservation to make the world a better place.

For more information on this work, explore the ArcGIS StoryMaps story "The Coexistence Between Wildlife and Utility Networks" in English at links.esri.com/monkeys or in Spanish at links.esri.com/monos, or contact Hammerhead at info@hammerheadtechnology.com.

### About the Author

Corrie Presland-Byrne is a dedicated conservationist with expertise in wildlife rehabilitation, marine conservation, and using technology to help solve ecological issues. She holds a bachelor's degree in biology and chemistry from the University of Mary Washington and a master's degree in conservation technology from the Florida Institute of Technology. Presland-Byrne lived in Costa Rica for three years and now resides in eastern Florida. She is the head of conservation technology and a GIS and web developer for Hammerhead Technology, which integrates technology with conservation efforts.



**Electrocution Locations**

**Electrocutions Hot Spots**
◄ High
◄ Low

**Power Lines**

Esri, © OpenStreetMap contributors, TomTom, Garmin, Foursquare, METI/NASA, USGS

↑ Created with ArcGIS Pro and electrical company data, this map shows three areas with high numbers of howler monkey electrocutions.

→ Known for their loud howls and long tails, Costa Rica's howler monkeys can be injured or killed when they swing from electrical power lines—a problem that can be reduced by using GIS technology.

# ExxonMobil Leverages ArcGIS Monitor to Manage Its Global Enterprise GIS

Managing IT infrastructure can pose many challenges, such as dealing with unplanned outages, handling security breaches, and overseeing software updates. A skilled and knowledgeable IT team can help an organization streamline operations and keep business moving.

The Enterprise Geospatial Solutions (EGS) team at ExxonMobil—one of the largest integrated fuels, lubricants, and chemical companies—is the IT group that manages the global organization's ArcGIS infrastructure. The team also enhances system performance and resolves technical issues for ExxonMobil's thousands of employees, who range from scientists and engineers to researchers.

Given that ExxonMobil operates in more than 60 countries, the EGS team is responsible for managing a large global enterprise system. Over the years, there's been steady growth in the company's organizational usage of the ArcGIS Enterprise system, but this led to increased downtime and latency problems. The team wanted help with monitoring system performance to stay ahead of any technical issues. So in 2023, the EGS team partnered with Esri to configure ArcGIS Monitor, which offers tools to monitor the health of an enterprise GIS deployment.

Using ArcGIS Monitor has helped the EGS team more proactively address technical problems. It has also provided EGS employees with more insight into the system, helping them deliver the critical GIS services that ExxonMobil staff rely on.

## Technical Issues Without Notice

ExxonMobil's comprehensive GIS includes ArcGIS Enterprise (Portal for ArcGIS and more than 40 ArcGIS Server sites), multiple ArcGIS Online subscriptions to support field operations, and ArcGIS Pro.

The main ArcGIS Enterprise portal is in ExxonMobil's headquarters in Houston, Texas. This is what staff members primarily utilize, along with two smaller Enterprise portals in Qatar and Papua New Guinea. Within the past year, between 5,000 and 8,000 staff members have actively used a portal, according to Nicholas Chase, GIS system architect for the EGS team at ExxonMobil.

Over the last 10 years, the EGS team has expanded its use of Web GIS, but it didn't have the tools to track the growing system and monitor its performance.

"As [the system] grew and more people were using it across the entire organization, it became really [disconcerting], as the central support team, to find out about a server outage from our users," said Chase.

ExxonMobil staff were largely using ArcMap. But then more users began to transition to Web GIS, and there was an uptick in the use of more simplified web apps and solutions. That's when the system started experiencing technical issues.

In 2018, for example, around 500 services were running on ArcGIS Server. The GIS server kept crashing, and the EGS team wasn't aware of the technical issues until users brought it to their attention. A similar instance occurred in 2023 when a GIS server was overwhelmed with a large number of services. The EGS team had to manually shut things down and reset the maximum number of services allowed to run to prevent any further issues.

In the fall of 2020, the main GIS server in Houston became unstable, and services were crashing without notice for more than a month. EGS personnel spent time after hours reducing the minimum and maximum service instances that could be running for 350 or more services.

In 2023, technical issues continued, with Qatar portal users reporting severe latency—long delays in the time it takes for data to transfer across a network. A hosting server in Houston also became overloaded. This can result in performance issues or server failure.

The EGS team wanted a solution that would help improve performance and get staff the data they needed to troubleshoot faster. They also wanted to be able to display metrics visually and collect and retain performance data for an extended period of time.

## Assistance with Implementation

Although the EGS team originally deployed ArcGIS Monitor in 2020, using version 10.8.1, staff did not have the time or resources to properly optimize the deployment, according to Chase and Paul Sanders, product owner for the EGS team at ExxonMobil.

"We've been using some version of Monitor in limited capacity going back 10 years maybe," said Chase. In 2018 or 2019, the team "tried to install Monitor and throw resources at it," he added. But they needed some assistance.

Traditional monitoring tools for server environments allow users to monitor things like storage capacity and focus primarily on infrastructure, but Monitor works specifically with ArcGIS technology.

"The real benefit of Monitor is the integration of the different components of the ArcGIS infrastructure…specifically the services and being able to look at your services, what's running, and see down to the individual service level," said Sanders. "That's a huge positive."

The EGS team connected with Andrew Sakowicz, an associate director with Esri Professional Services, who helped configure version 2023.3.1 of Monitor during a three-day on-site workshop in 2023. The team also received valuable post-engagement support when making necessary tweaks to the implementation.

"If I were to try to do these visualizations myself individually…it would take forever. But with the Esri support, we were able to just kind of drop these into the back-end PostgreSQL database and just have them available for us to copy right to our different servers and our different sets



↓ The Enterprise Geospatial Solutions (EGS) team uses dashboards to monitor ExxonMobil's enterprise GIS implementation.
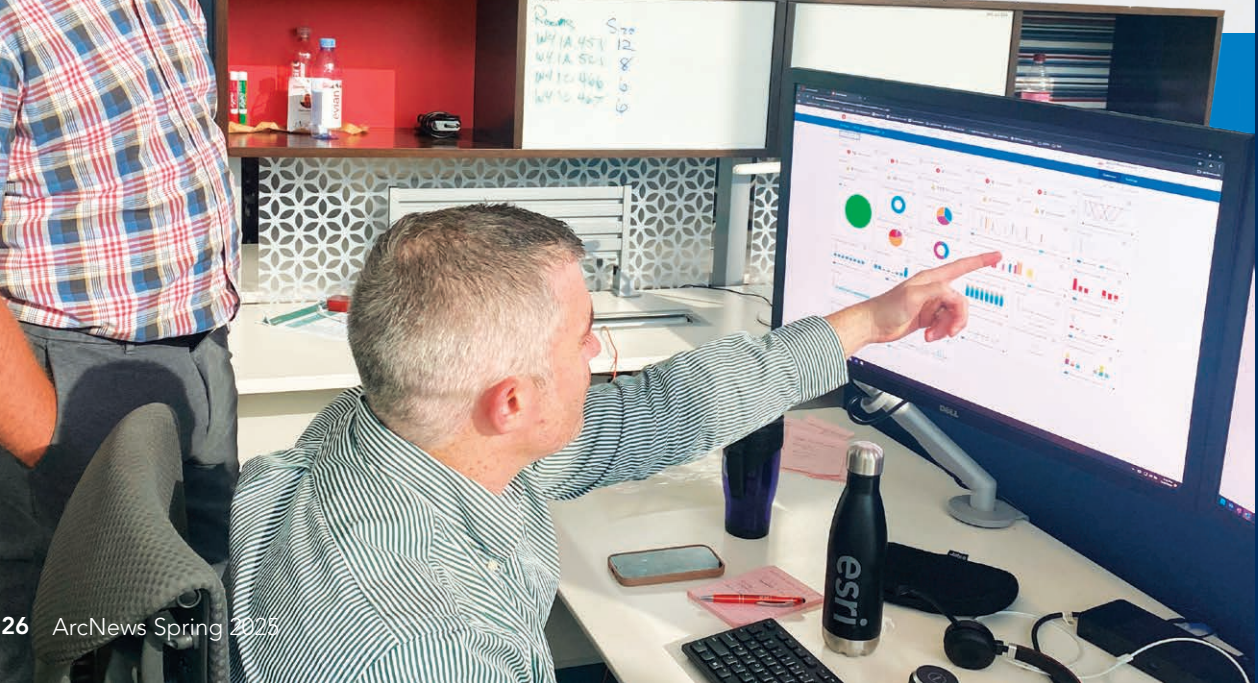
← Nicholas Chase (left) and Paul Sanders (right) investigate the availability pattern of an ArcGIS Server machine.
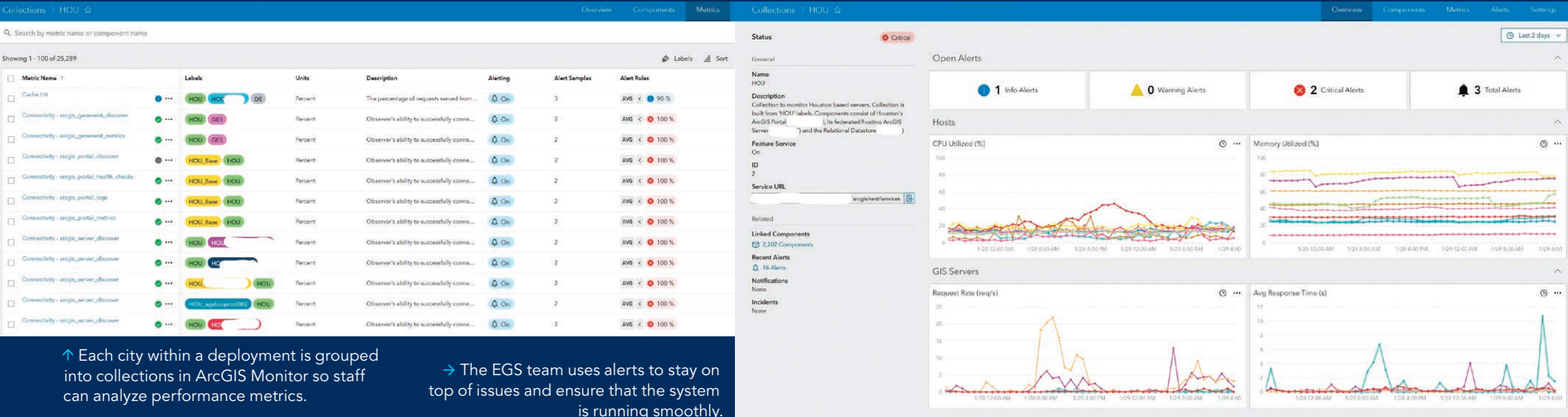
↑ Each city within a deployment is grouped into collections in ArcGIS Monitor so staff can analyze performance metrics.

→ The EGS team uses alerts to stay on top of issues and ensure that the system is running smoothly.

of services," said Sanders. "So that was a huge benefit there…having the knowledge and know-how."

Sakowicz helped the EGS team organize within Monitor using features such as labels, notifications, and collections. As Sanders explained, each city within a deployment is grouped into collections for monitoring, with Houston being the largest. Collections are groups of components that serve as the foundation for their analysis views in ArcGIS Monitor.

Sakowicz also helped EGS team members customize their analysis views so they offer detailed metrics and can help identify trends in data. The team uses alerts in Monitor to ensure that the system is running smoothly. Team members now receive email notifications when possible performance issues are detected.

## Faster Troubleshooting and Problem-Solving

The EGS team now employs Monitor to survey ExxonMobil's entire enterprise GIS system, and this has helped identify the company's most used GIS resources. The team monitors storage capacity, server connectivity, request response time, and CPU utilization. These metrics have made it easier for team members to understand ExxonMobil's system and manage its GIS servers more effectively.

"When you think about traditional IT responses, it's reactive. And [Monitor] allows us to be a little bit more proactive," said Sanders. "We've gotten to the point now where the support team, if they get a ticket in…the first thing they're checking is Monitor. It just helps us be a more effective support team for ArcGIS."

Monitor also helps team members pinpoint the underlying symptoms of a problem. And being able to visualize key metrics enables them to troubleshoot faster. The visualizations give team members quick system details like server availability, and the additional information helps them ensure the business is operating efficiently.

Sanders and Chase also appreciate the alerts, which they configured to create visibility on potential issues. The pair can now identify what the support team deems critical and change the alerts to reflect that.

"The alerts are a hugely positive piece of it because not everybody on the team is going to log in to Monitor…on a daily basis, but they can get an email on a daily basis and see what's going on in the system," Sanders explained.

The metrics provided by Monitor also give EGS team members the data they need to justify requests or prove the need for resources. For example, when the server

operations team recently wanted to take back cores and reduce memory due to low utilization, the EGS team was able to show that average utilization was between 60 and 80 percent during business hours.

For the Infosys part of the EGS team at ExxonMobil, Monitor is a valuable tool that helps team members administer their environment better and often leads to faster response time. The group can now address issues from staff more quickly, according to Chase, because when something is reported, team members have usually already seen the alerts and are working on a solution.

The successful deployment of Monitor has led the EGS team to make it a key component of migrating the company's on-premises infrastructure to the cloud while redesigning its overall system. Understanding how users are employing that infrastructure and its capacity capabilities will be essential as the team designs the new system.

"When you're building a new infrastructure and you… don't know how the cloud infrastructure is going to work with your deployment today, Monitor is going to be really important to that because we'll have insight into it and data behind it," said Chase. "We'll be able to make more proactive decisions."

# The 1974 FOIA Amendments Set the Foundation for Open Data

By Ralph Nader

The 50th anniversary of the strengthened Freedom of Information Act (FOIA), vetoed by US president Gerald Ford and overridden by Congress, was in November 2024. It came and went without much mention, though many have benefitted from this important open government law. That inattention did not, however, deter some advocates who played a pivotal role in the passage of the 1974 FOIA amendments from organizing a 50th Anniversary Celebration at the National Press Club in Washington, DC, on December 19, 2024.

On April 12, 1973, in a prepared statement made before the US Senate's Subcommittee on Intergovernmental Relations of the Committee on Government Operations and the Subcommittees on Separation of Powers and Administrative Practice and Procedure of the Committee on the Judiciary, I outlined how freedom of information should work at the government level:

*[W]e see the problems of public access revolving around substantive and procedural barriers to information. The Freedom of Information Act can conceivably be a useful tool to inform the public about just how the government is protecting the public interest if those barriers are removed. We urge these committees to pass what changes are necessary and then to provide the constant oversight on the executive to make sure that branch is complying with the letter and spirit of the law. We also reassert that the Freedom of Information Act must apply to all governmental processes, executive as well as legislative. The Congress must be open to public scrutiny if the people's right to know is to be secure.*

The strengthened FOIA was the foundation of the open data movement. In many ways, it impacted GIS data sharing. This has evolved into people and organizations sharing geographic map services, and it has even shaped the vision of the Federal Geographic Data Committee, which promotes the coordinated development, use, and dissemination of geospatial data at the national level in the United States.

I opened the 50th Anniversary Celebration with remarks on the critical importance of FOIA, which is designed to implement the principle that information is the currency of democracy. It is a unique law: The people are its enforcers through their petitions for specific files, reports, inspections, procurement contracts, grants, and subsidies among a multitude of material that the public has a right to know. What's more, petitioners—be they regular people, academics, the press, corporations, unions, co-ops, or anyone in the world—who are denied after their internal appeals can take the government to federal court.

Government agencies are the administrators of FOIA, processing requests and deciding what to release, redact, and decline. While responding to FOIA requests has often been seen as a burden by staff members of many agencies, since it creates more work with no additional staff or funding, the act has led indirectly to a kind of open data philosophy that has impacted the sharing of maps and related tabular data across government organizations.

In the years leading up to 1974, however, opposition to this legislation from the federal bureaucracy and corporations was furious. Government officials from nearly every department or agency—including the Department of Defense, the Department of the Interior, the Department of the Treasury, the Department of State, and the Department of Agriculture, along with regulatory agencies—were demanding categories of exemptions and dilutions. They dreamt up endless excuses for keeping government information secret, inundating the champions of the FOIA legislation—California Representative John E. Moss and Massachusetts Senator Ted Kennedy—with written objections. But they and other members of that Congress held strong and enacted the most robust freedom of information law in the world.

The 1974 FOIA law carried exemptions that were in the original 1966 FOIA law. But it still provided requestors with the leverage to produce huge amounts of material that was turned into stronger civic action, groundbreaking media exposés, and more fortified academic research, and helped create a climate for the emergence of ethical whistleblowers revealing wrongdoing. With supportive liberal and conservative legislators in Congress, whistleblower protection laws were passed that have saved taxpayers tens of billions of dollars and generated some deterrence to government abuses as well.

Government disclosures have infused judicial actions, sparked health and safety regulations, and inspired new laws. In my remarks at the 50th Anniversary Celebration, I encouraged greater usage of FOIA by the American people—including high school students who can learn about and use state and local freedom of information laws as part of their civic training. Many high schools participate in GIS Day and benefit from the culture of openness fostered by this historic Freedom of Information law. Information is also the currency of mapping.

For more information, see the Center for Study of Responsive Law's report on the history of the 1974 FOIA Amendments at csrl.org.

## About the Author

Ralph Nader is a consumer advocate, lawyer, and author. His most recent book, published by Seven Stories Press, is *Civic Self-Respect*. Learn more at links.esri.com/nader-book.

## From the Meridian

By Dr. Patricia Ehrkamp
American Association of Geographers

# Geography Should Be a Global Gathering Place

Last summer, I attended the 35th International Geographical Congress in Dublin, Ireland. Bringing together more than 3,000 delegates and organized by the International Geographical Union and the Geographical Society of Ireland, the congress met under the theme of Celebrating a World of Difference.

It was a delight to see so many geographers from around the globe exchanging knowledge, collaborating across borders and language barriers, and building new networks of friendship along the way. Several sessions, for example, highlighted experts from the Global South on topics such as urbanization and environmental management. These sessions also made clear that so many current and pressing issues in the world—such as climate change, food security, and geopolitics—do not stop at national borders and cannot be understood in isolation.

This wonderful global and collaborative spirit stands in stark contrast to expressions of nationalism, populism, and xenophobia that have emerged in the public arena in an alarming number of countries over the past few years. These are well-known tropes of national politics around the world, and they have been part of US immigration policy in particular for decades. But I will never get used to the ways in which such anti-immigrant rhetoric and hostility instills discomfort or even fear in people who hail from other parts of the world.

I have deep concern for how this rhetoric affects international students in undergraduate and graduate programs, as well as international colleagues. Many members of the American Association of Geographers (AAG), where I serve this year as president, are immigrant faculty members, practitioners, and international students. Research shows that racism, discrimination, and anti-immigrant policies lead to stress and anxiety and adversely affect the health and mental health of immigrants and minoritized populations.

Yet there is evidence that making a commitment to internationalism in education and research has many benefits—and this is a long-established practice in the field of geography. Producing and exchanging knowledge and insight across national borders can help cultivate understanding and promote collaboration as people collectively address the significant challenges that are affecting people not only in neighboring countries but also around the world.

We have experienced this at AAG, where just over a decade ago, AAG past president Eric Sheppard noted that efforts to change the organization's name from the Association of American Geographers to the American Association of Geographers were prompted by the realization that "the AAG has become far more than a community of American geographers," as he stated in his April 2013 President's Column on AAG's website. Sheppard continued: "Many of our members, even among those working in the United States, are not (only) American citizens. Many more attend our annual meetings from outside the United States as our national meetings have become the gathering place for geographers from across the world."

Today, one in four of AAG's members is located outside the United States, representing about 100 countries. These proportions are also reflected in AAG's annual meeting, where between 26 and 30 percent of attendees come from other countries.

The number of international students studying in the United States has been growing, and international faculty contribute so much to universities and their individual departments. But there are challenges as well. In addition to hostile policies, international faculty and students may also struggle with visa issues, language barriers, microaggressions, and other unspoken hindrances.

In response to some of these challenges, AAG has been supporting an initiative called the Geospatial sciences Alliance for International women faculty Advancement (GAIA). With funding from the National Science Foundation (under grant award numbers 2404263 and 2404264), GAIA fosters equity and inclusion for international women faculty members in geography and geospatial science. The initiative includes assistance in data collection, training, and technology to help institutions transform their approach to supporting international women scholars. Led by Dr. Jieun Lee of the University of Northern Colorado, this partnership is a collaboration among her university; AAG; the University Consortium for Geographic Information Science; and the City University of New York, College of Staten Island. (For more information on GAIA, see AAG's *ArcNews* column from the spring 2023 issue, "Groundbreaking Support for Trailblazing Women," at links.esri.com/GAIA.)

In addition, universities in the United States keep recruiting international students, in part because tuition dollars matter in the world of higher education. In recent years, visa holders accounted for a significant percentage of all members of geography master's and doctoral programs in the United States. (See AAG's *The State of Geography* report from 2022 at links.esri.com/aag-geo-2022.) Along with a growing number of students from historically excluded groups, international students in geography programs enrich their classrooms and learning environments with their experiences and insights. In seminars and research, for example, international students' ideas help foster global consciousness and understanding. These students also bring significant regional expertise to tackling problems in different parts of the world—and these viewpoints are critical for geographers to consider.

Student applications from abroad for the 2024 academic year continued to grow, meaning that geography programs based in the United States are attractive to international students. This is a fact that geospatial professionals should celebrate. Those of us in positions to do so should also check in locally with our international colleagues and students to make sure they feel supported in the current, challenging political climates present in so many countries. After all, developing a global geographic consciousness must include our home places.

My hope is that gatherings such as the International Geographical Congress and AAG's annual meeting—being held this year in Detroit, Michigan, a city near the US-Canada border that has a long history of immigration—will spark conversations about immigration, borders, and differences, and continue to foster intellectual engagement that enriches geographic knowledge and geographers themselves. As we continue to build global consciousness and understanding, AAG remains committed to being a gathering place for *all* geographers.

## About the Author

Dr. Patricia Ehrkamp is the current president of AAG and an Arts & Sciences Distinguished Professor in the Department of Geography at the University of Kentucky. She is a political and feminist geographer with research interests in immigration, borders, refugee geopolitics, citizenship, and migrant transnationalism.

From the Meridian is a regular column from AAG, a nonprofit scientific and educational society whose members from nearly 100 countries share interests in the theory, methods, and practice of geography. Find out more about AAG's programs and membership at aag.org.

# Esri Partners Implement Creative Solutions to Overcome Challenges

Esri partners can help customers implement GIS for a range of needs, from streamlining operations and asset management, to monitoring and being proactive about network management. Take a look at how Esri partners Clearion, Schneider Electric, ITpipes, and Eos Positioning Systems assisted utilities and cities in making the most of their GIS implementations and improving performance.

## Routing Tree Cuttings Toward Eco-Friendly Causes

For most utilities, it is a continual challenge to keep vegetation away from power lines and manage the resultant debris. In Georgia—which has heavy tree coverage even in the metropolitan capital of Atlanta—this challenge became an opportunity for the state's largest utility to help feed local zoo animals and support nearby farmers.

Georgia Power, an investor-owned electric utility that provides reliable service to more than 2.7 million customers, partnered with **Clearion** (clearion.com) to find eco-friendly ways to manage freshly cut vegetation and wood chips. Clearion developed two specialized workflows that enable Georgia Power's tree pruning contractors to pinpoint where trimmed branches from certain tree species are located so they can be routed to two partners. The first, Zoo Atlanta—a leader in conservation and one of the oldest continuously operating zoological institutions in the United States—takes the tree branches, known as "browse," for elephants, zebras, giraffes, and other browsing species to enjoy as part of their diet. The second, the Grassroots Growers Alliance (GGA), takes the tree cuttings and distributes them as wood chips to local Atlanta farms.

To allocate these resources efficiently, Georgia Power tapped into Clearion's vegetation management platform, which is built on ArcGIS Maps SDK for JavaScript and ArcGIS Maps SDKs for Native Apps. By leveraging this platform along with ArcGIS Field Maps and ArcGIS Dashboards, the utility found innovative ways to repurpose tree branch cuttings that would otherwise go to waste.

Horticulturists at Zoo Atlanta use Field Maps to navigate to places where tree trimmings are available for collection, and within minutes they have a hefty supply of browse for hungry zoo animals. The GGA employs Field Maps to update the status of its wood chip delivery points to ensure that farmers receive the wood chips they need. Both partners, along with Georgia Power, use the dashboards to get a high-level look at the locations of available tree trimmings and, in the GGA's case, the status of wood chip drop-off sites.

As a result of this initiative, Georgia Power has significantly reduced disposal costs by avoiding unnecessary travel to distant dumping locations. Contractors can now rely on Clearion's platform to locate tree trimmings and wood chip delivery points, lowering fuel expenses and mitigating their environmental impact. Zoo animals benefit from locally sourced, nutrient-rich browse that enriches their diets, while zookeepers and horticulturists have a simplified workload thanks to a reliable, streamlined process. Additionally, local farmers that feed 130 families on a biweekly basis receive a steady supply of wood chips that enhance soil quality and crop yields for the entire community.

Georgia Power's motto is to be "A Citizen Wherever We Serve." This effort spotlights the utility's strong commitment to sustainability and support of environmentally focused nonprofits. And its collaboration with Clearion stands as a model for creative resource management, demonstrating how technology-driven solutions can benefit business operations, local communities, and the environment.
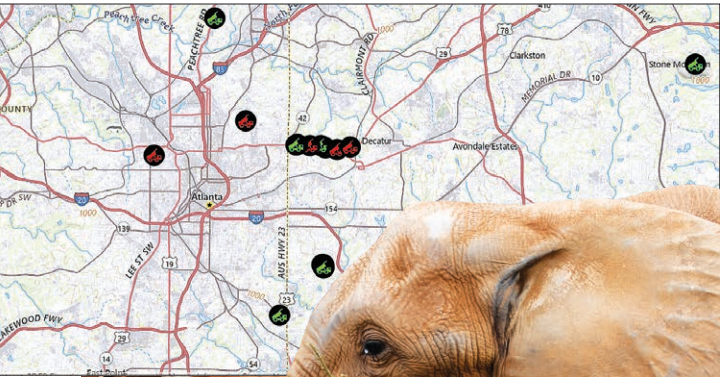


← Clearion's platform helps contractors deliver wood chips to local farmers.



## Bringing Network Management Up to Date

Connexus Energy, Minnesota's largest customer-owned electric cooperative, serves more than 145,000 customers with reliable and sustainable electricity. Known for its innovative energy solutions, including solar and battery storage, Connexus prioritizes community service and environmentally friendly practices.

In 2019, leaders at Connexus decided that the company needed to modernize how it manages its network. They wanted to introduce an integrated outage management system and a supervisory control and data acquisition system to streamline operations and improve reliability. Leadership recognized the importance of having a modern network management system to advance the company's distribution goals and aimed to upgrade the design-build workflow to incorporate real-time data.

Connexus previously used ArcFM Classic from **Schneider Electric** (se.com) for outage management and GIS editing. For this transition, Connexus implemented Esri's ArcGIS Utility Network for a unified model to manage its connected network, Schneider's ArcFM Solution XI Series to streamline design and construction workflows, and Schneider's EcoStruxure ADMS to get real-time forecasts and historical views of the distribution network. This new system supported the company's immediate design-build and GIS needs, reducing design backlogs and enhancing productivity.

The project, which began in late 2019, was phased, with Connexus issuing a request for proposals to integrate various systems. The GIS team played a crucial role in data migration, ensuring minimal duplication and seamless operations. By early 2023, Connexus had a robust data model and had finalized its software vendor selection. Utility Network went live in mid-December 2024, with the ADMS set to go live in early 2025.

Connexus has already experienced benefits from the new system, including improved data management and optimized processes. The Utility Network data model enhances data quality and simplifies management, aligning closely with systems such as the ADMS. Business and validation rules ensure data accuracy, and the company has seen performance improvements. The project has also optimized processes by reducing overhead and cutting down on unnecessary data capture.

The new digital environment at Connexus supports efficient workflows. Having tools that are designed for specific roles enhances training and operations. Moreover, the system incorporates ArcFM Feeder Services, which provides an out-of-the-box bidirectional integration between ADMS and ArcFM Solution XI Series, ensuring an up-to-date operational network. This simplifies processes and troubleshooting.

↓ The new distribution network management system at Connexus streamlines operations and improves reliability.



← At Zoo Atlanta, elephants, giraffes, and other browsing species eat tree cuttings from Georgia Power as part of their diet.

## Video- and GIS-Based Inspections Enable Proactive Asset Maintenance

The City of Tuscaloosa, Alabama, faced significant challenges managing its extensive sewer infrastructure, which includes 507 miles of sanitary sewer lines and 252 miles of storm drains. Frequent sewer overflows, environmental hazards, and costly emergency repairs highlighted the need for the city to take a more proactive and efficient approach to maintenance.



So the city partnered with **ITpipes** (itpipes.com) and Esri to integrate video inspection technology with advanced GIS. ITpipes's inspection software seamlessly connects with ArcGIS Pro 3.2 and an asset management system from another Esri partner, CentralSquare Technologies (formerly Lucity). This enables teams across the city to engage in comprehensive data sharing. Mobile crews and office workers, for example, can access asset data in real time, meaning they can prioritize maintenance based on accurate pipeline condition assessments.

The city deployed ITpipes Mobile, allowing city staff to conduct pipe inspections using closed-circuit television (CCTV) feeds. Since ITpipes Mobile integrates with ArcGIS Pro, crews receive cached, location-based visualizations and detailed information about each asset. Using mobile inspection PCs, crews can view GIS-based maps preloaded with pipeline attribute data, select assets for inspection, and record findings in the system.

Each night, inspection data and videos that are collected in the field using ITpipes Mobile are automatically synced with ITpipes Web. This process updates ITpipes Web and ArcGIS Pro with newly gathered inspection data while simultaneously downloading fresh work orders to ITpipes Mobile. This ensures that mobile crews have the most up-to-date assignments the following day.

← Using ITpipes Mobile, which integrates with ArcGIS Pro, mobile crews can conduct pipe inspections using closed-circuit television (CCTV) feeds and view the results on a map.

Within three years of implementing this solution, the City of Tuscaloosa achieved a 50 percent reduction in sewer overflows and significantly decreased emergency repairs. By inspecting and assessing more than 400,000 feet of its system annually, the city shifted from performing reactive maintenance to doing predictive maintenance, optimizing resource allocation and reducing downtime.

According to Tuscaloosa asset management quality control specialist Joy Cowart, the new system has strengthened operational efficiency and supports data-driven decision-making, contributing to a cleaner, safer community.

"ITpipes [provides] a very versatile tool that helps efficiency in all processes through the City of Tuscaloosa, including [not only] repairs and maintenance of sewer assets but also billing and capital improvement projects," Cowart said. "Its seamless integration with Esri's GIS platform enhances data accessibility and decision-making. It is very user-friendly, and the tech support team is amazing!"

Through this partnership, the City of Tuscaloosa has shown how cutting-edge technology can elevate sustainability in municipal infrastructure management.

## Accurate GIS Data Is Key for a Growing City

The City of Seguin serves over 30,000 residents with water, wastewater, and electric utilities. The Utility Services Department, led by smart grid solutions manager John Saldana, supports internal utility infrastructure teams with an enterprise GIS.

"We are the middleman between utilities and the city," said Saldana.

Rapid expansion in Seguin has increased demand for utilities. As surrounding farmland gets developed, staff at the city wanted to accurately map existing assets prior to construction to help builders avoid accidents. They also wanted to map new infrastructure to streamline future asset management.

To begin this project, Saldana equipped mobile crews with ArcGIS Field Maps and Arrow Gold GNSS receivers from **Eos Positioning Systems** (eos-gnss.com). The Arrow Gold receiver connects to an Arrow Gold base station, helping the city achieve centimeter-level location accuracy during data collection.

As crews gather information, Seguin data analyst Felicia Helms checks the quality before integrating the data into the city's enterprise GIS. In doing so, Saldana and Helms have prepared the city for two big projects.

First, Seguin has leveraged smart-meter upgrades to help comply with the Environmental Protection Agency's Lead and Copper Rule Improvements, which aim to get lead pipes replaced in communities across the United States

over the next decade. As technicians upgrade meters, they capture photos and location data for each water meter pit. Saldana is now prototyping an AI model to analyze these photos to identify lead service lines.

Second, Seguin is migrating its electric utility data to ArcGIS Utility Network. Helms leads this effort, which will streamline management of the city's electricity infrastructure and support its outage management system. A similar process will follow for the water utility network.

Having accurate GIS data is imperative for utility management, Saldana emphasized.

"Data does not exist in a silo," he said. "It's designed to be shared, expanded upon, integrated, and consumed upstream and downstream. We keep this in mind as we're building and capturing something as simple as a point. This is where it all starts."
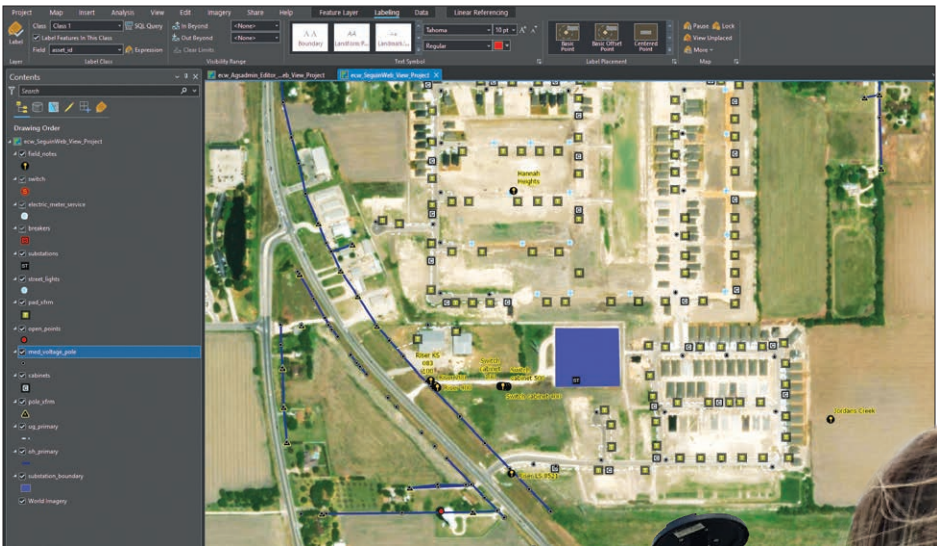


↑ The City of Seguin is mapping utility assets as new neighborhoods get developed.



→ Using ArcGIS Field Maps on an iPad connected to an Arrow Gold GNSS receiver, data analyst Felicia Helms maps utility assets.

# Startup Partner Improves Sidewalk Accessibility with iPhone Lidar and ArcGIS

By Abi Kavanagh, DeepWalk

Accessible sidewalks are essential for inclusive and livable communities. They ensure urban mobility; improve overall safety; and foster a healthier, more vibrant environment—especially for people with mobility issues. Yet many cities have sidewalks that are uneven, poorly maintained, or absent altogether.

To address this critical issue, the Americans with Disabilities Act (ADA), passed in 1990, requires that every public entity with 50 or more employees maintain an ADA transition plan. The plan details how a given organization will remove physical barriers to accessibility in their facilities and services. When the ADA transition plan is applied to sidewalks, ensuring accessibility is a necessary yet intricate task. It requires evaluating hundreds of miles of sidewalk spaces.

When the Town of Erie, Colorado, began preparing to address sidewalk accessibility as part of its mission to empower more than 33,000 residents through community access and inclusion, staff began working with the WT Group—an engineering, design, and consulting firm—to develop a robust transition plan. To streamline and simplify sidewalk evaluations in Erie, the accessibility team at the WT Group turned to Esri Startup partner DeepWalk (deepwalk.com) for help incorporating geospatial technology.

## Paving the Way for More Accessible Cities

Headquartered in Chicago, Illinois, DeepWalk Research, Inc., was founded in 2018 by Anshul Shah and Brandon Yates to provide sidewalk inspection solutions that help public entities improve accessibility. DeepWalk's automated inspection software uses lidar scanners on iPhones to assess the accessibility of sidewalk systems, providing municipalities, universities, and other organizations with

data for the creation, implementation, and maintenance of ADA transition plans.

With more than 250 sidewalk miles, Erie needed an automated and scalable solution that could scan sidewalks and determine whether or not they met accessibility standards. DeepWalk's ArcGIS technology-integrated software provided the tools and mapping solutions required.

In the past, data collectors inspected every individual sidewalk panel with a tape measure and a level—a demanding and time-consuming process for municipalities with hundreds of sidewalk miles. With DeepWalk's iPhone-based lidar scanning app, data collectors scan sidewalks as they walk them. These scans generate photorealistic 3D models of the sidewalks that are then processed with DeepWalk's automated measurement system and delivered on its web app.

For Erie's self-evaluation, a team of three data collectors from the WT Group gathered 56.5 miles of Erie's sidewalk and curb ramp data in only five days. Once uploaded from their mobile phones, Erie and the WT Group continuously received the data as it was processed and could easily track the progression of the project in DeepWalk's web app.

"We were very happy with the efficiency of the DeepWalk tool," said Tatum Storey, accessibility practice principal for operations at the WT Group. "Every municipality we work with uses GIS, so this system could be replicated in every city across the country with a public sidewalk system."

For customers like Erie, DeepWalk automatically measures and identifies access barriers within the sidewalk network. Checking for measurements like sidewalk panel widths, slopes, and detectable warning surfaces, the data extracted from the scans provides essential information
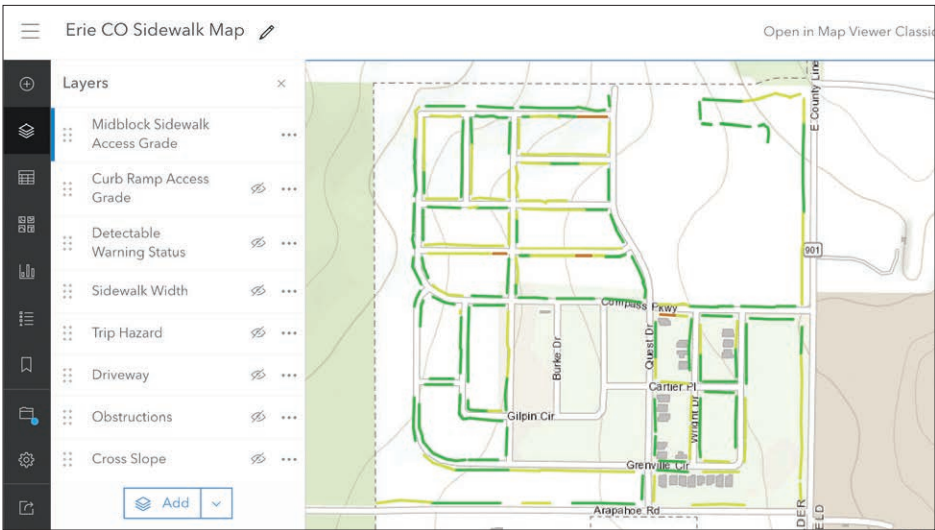


↑ Using ArcGIS, staff from the Town of Erie and the WT Group can locate obstructions within the sidewalk network that need to be remediated.

for the development of ADA transition plans and other sidewalk improvement programs.

To meet the specific needs of these projects, DeepWalk users have a customizable experience in which tags are created for specific data points to track within their sidewalk network. For Erie, manual tags were set by the WT Group to collect location information about trip hazards and driveways within the sidewalk network. Once processed, the data point type is extracted into its individual mapping layer to be integrated into ArcGIS Online.

## Integrating DeepWalk and ArcGIS

ArcGIS Online enables DeepWalk users to complete advanced analyses of their sidewalk data. In just a couple of clicks, DeepWalk's ArcGIS integration delivers preformatted mapping layers with 58 precomputed fields. The time spent on styling and formatting these layers gets reduced by up to 15 hours, allowing GIS teams to allocate more resources to creating project-specific customizations, advanced mapping solutions, and informative dashboards that aid the development and maintenance of their transition plans. In addition, being able to visualize this data in ArcGIS helps communicate accessibility needs clearly to stakeholders.

In minutes, Erie's processed data seamlessly integrated into ArcGIS Online, featuring layers for sidewalk and curb ramp access grades, the tags for trip hazards and driveways, and measurements.

Using DeepWalk's sidewalk grading algorithm, access grades are assigned to each scan on a zero-to-five scale. Sidewalks with severe barriers to accessibility are considered noncompliant. They are assigned a score of zero and represented in red on the map. Compliant sidewalks with no discernible barriers to accessibility are assigned a score of five and represented in green on the map. The combination of data visualization in ArcGIS and DeepWalk's scoring system is significant for sidewalk improvement efforts because it is easy to identify priority areas across a region.

Beyond ranking based on access barrier type, Erie's sidewalk layers can be combined with existing datasets to prioritize areas that are within proximity to important public facilities, that experience high levels of foot traffic, or that are densely populated. Advanced mapping analysis in ArcGIS transforms sidewalk and curb-ramp data into actionable insight, and facilitates the creation of sidewalk improvement programs such as eliminating trip hazards or removing vegetation.

As Erie continues to develop its ADA transition plan, DeepWalk's manageable mapping solution—which outputs downloadable files for planning programs in the region—makes it easier to prioritize and implement remediation efforts. Additionally, as Erie completes various sidewalk enhancement programs, the town's data can be updated in ArcGIS to reflect the improved conditions. This allows Erie to keep its ADA transition plan current and ensures that all improvements meet compliance standards and are recorded and represented accurately.
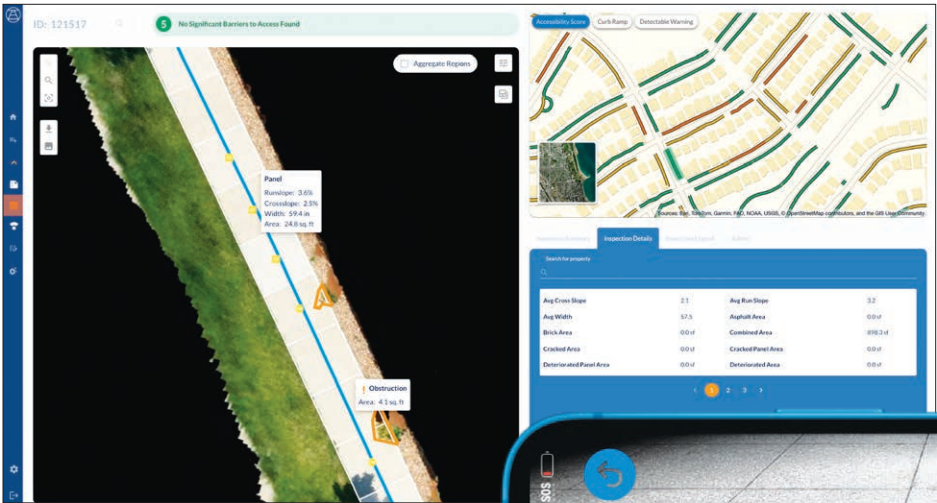


↑→ DeepWalk users upload sidewalk scans and receive processed data on the web app, where they can view inspection results and integrate with ArcGIS.
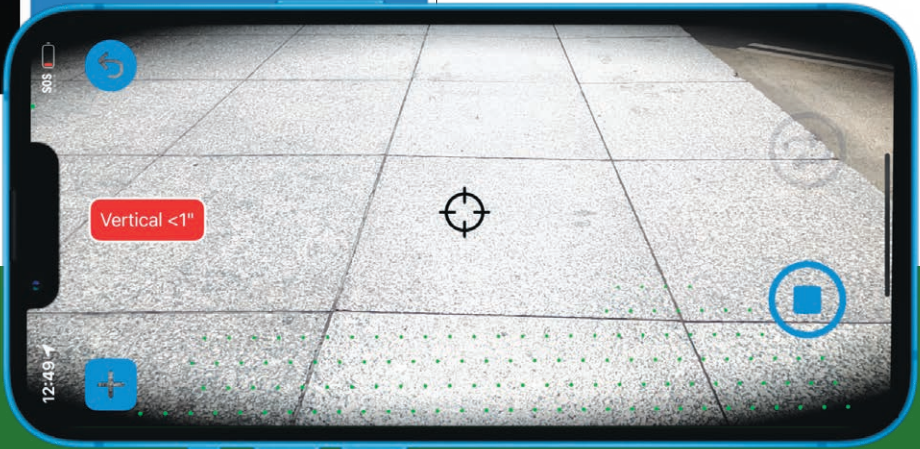
For more information on the Esri Startup program, go to links.esri.com/startup.

### About the Author

Abi Kavanagh is the vice president of marketing at DeepWalk. Since joining DeepWalk in 2023, she has grown the company's partnership with Esri by becoming an ArcGIS Marketplace provider and listing DeepWalk's iPhone lidar solution on the Esri Partner and ArcGIS Marketplace directories.

## The Relevance of Cartography
### A Cartographer's Perspective

By Dr. Georg Gartner
International Cartographic Association

# A Plea for More Cartography in Curricula

Cartography—the art and science of mapmaking—has long been a cornerstone of human civilization. It shapes how people perceive the world, navigate their environments, and communicate complex spatial information.

In the digital age, cartography has undergone a seismic transformation, integrating advanced technologies such as GIS, remote sensing, and machine learning. Despite this evolution, the educational frameworks that support cartography have not kept pace. In many regions, cartographic education remains fragmented, outdated, or undervalued.

But there are ways to modernize cartographic curricula and ensure that students are well prepared to practice cartography in today's digital world. The International Cartographic Association (ICA) and several universities are charting a new way forward.

### The Challenges of Cartographic Education

Cartography lies at the intersection of art, science, and technology, making it inherently interdisciplinary. This complexity, however, has often been a double-edged sword.

Many educational institutions struggle to position cartography within their academic frameworks. As a result, cartography is frequently subsumed under broader disciplines like geography, computer science, or environmental studies. While this integration can be beneficial, it often dilutes the specialized focus that modern cartography demands.

One significant challenge is the lack of standardization in cartographic education. Programs vary widely in their scope and depth, with some emphasizing traditional methods while others focus on cutting-edge technologies. This inconsistency leaves students and professionals ill-prepared to meet the demands of a rapidly evolving field.

Another pressing issue is the limited availability of specialized cartographic programs. In many countries, formal education in cartography is restricted to a handful of universities or technical institutions. This scarcity exacerbates regional disparities, leaving many aspiring cartographers with limited access to high-quality training.

Additionally, cartography is persistently underappreciated as a distinct discipline. Maps are ubiquitous in daily life, but how they are created and interpreted often go unexamined. This invisibility contributes to a lack of investment in cartographic education and research, perpetuating a cycle of neglect.

Finally, the rapid pace of technological advancements has outstripped many educational institutions' ability to update their curricula. Emerging technologies like AI, augmented reality (AR), and real-time geospatial data processing are reshaping cartography. Yet these innovations are often absent from traditional cartographic education, leaving many graduates unable to leverage these tools effectively in their careers.

In this context, the ICA is playing a critical role. Its Commission on Education and Training, for example, facilitates the exchange of knowledge, develops educational resources, and organizes workshops and conferences to bridge gaps in cartographic curricula. By promoting best practices and fostering collaboration among educators, researchers, and practitioners, the ICA is contributing to the modernization and standardization of cartographic education. These efforts help the discipline remain robust and responsive to global issues.

### A Model Educational Program

Amid these challenges, the International Master of Cartography program stands out as a model of innovation and excellence. This joint initiative offered by four leading European universities—Technische Universität München in Germany, Technische Universität Wien in Austria, Technische Universität Dresden in Germany, and the University of Twente in the Netherlands—addresses many of the shortcomings in traditional cartographic education.

The program is explicitly designed to provide a comprehensive and modern education in cartography. Its curriculum combines theoretical foundations with practical applications, ensuring that students develop both a conceptual understanding of cartography and the technical skills to create maps. Core courses cover topics such as geovisualization, spatial data science, cartographic design, and web mapping. Additionally, students are exposed to emerging technologies such as 3D mapping, big data analytics, and interactive cartography.

One of the program's distinguishing features is its emphasis on international collaboration and cultural exchange. Students from around the world come together to learn from a diverse faculty, fostering a global perspective on cartography. This international approach is particularly valuable in a field that operates across geographic and cultural boundaries.

The program also integrates real-world projects and internships, bridging the gap between academia and industry. Students get to work with leading organizations, gaining hands-on experience and building professional networks. This practical orientation ensures that graduates are well equipped to meet the demands of the modern workforce.

The International Master of Cartography is a testament to the importance of interdisciplinary education. By drawing on expertise from multiple universities and disciplines, the program reflects the multifaceted nature of cartography. It serves as a reminder that no single institution or field alone can address the complexities of modern cartography. (More information about the program is available at cartographymaster.eu.)

### A Sample Modern Curriculum

To address the challenges facing cartographic education and build on successful models such as the International Master of Cartography, a concerted effort is needed to modernize curricula worldwide. A modern curriculum should be based on a triangle of competencies, balancing three essential skill areas: design knowledge, data management skills, and technological expertise. This approach ensures that students are not only adept at creating visually compelling maps but that they can also handle complex datasets and leverage state-of-the-art technologies. If programs can achieve this balance, graduates will be equipped to address the multifaceted challenges of modern cartography.

A sample curriculum could look like this:

- Foundations of Cartography would introduce the principles, history, and theory of cartography. There would be an emphasis on map design, communication, and user-centered approaches.
- Geovisualization and Data Representation would demonstrate techniques for visualizing spatial data, including thematic and interactive mapping. This course would integrate storytelling with data visualization.
- Spatial Data Science would teach the fundamentals of spatial statistics, geospatial data processing, and machine learning. Students would get hands-on practice with tools like Python, R, and GIS platforms.
- Web and Mobile Cartography would teach students how to develop interactive maps and web apps. It would cover web mapping libraries and responsive design.
- Cartographic Design Studio would demonstrate advanced map design principles and let students create diverse map types. It would focus on aesthetics, usability, and audience-specific design.
- Geospatial Big Data Analytics would illustrate the best techniques for handling and analyzing large geospatial datasets and have students apply these to urban planning, disaster management, and transportation.
- 3D and Multimedia Cartography would emphasize the principles of 3D visualization, multimedia, and virtual reality (VR) and AR in cartography. Students would apply these principles to urban modeling and immersive mapping.
- Ethics and Social Implications in Cartography would examine the ethical considerations that arise when using and representing data and making it accessible. The course would focus on diversity, inclusivity, and social responsibility.
- Geopolitical and Cultural Dimensions of Cartography would use historical and contemporary examples to explore how maps influence political decisions, cultural narratives, and social perceptions.
- Professional Practice and Industry Collaboration would allow students to complete internships, case studies, and collaborative projects with industry partners. This course would help students develop professional skills in project management and client communication.
- A Capstone Project and Thesis would integrate theoretical knowledge and practical skills in an independent research project that addresses a real-world cartographic challenge.

### Setting Up the Future

The need to modernize cartographic education has never been greater. As the world becomes increasingly interconnected and data-driven, the ability to create, interpret, and communicate spatial information is essential. However, the challenges facing cartographic education—from outdated curricula to limited access—threaten to undermine the field's potential.

The International Master of Cartography offers a powerful example of how to address these challenges. By encouraging interdisciplinary collaboration, the use of cutting-edge technology, and a global perspective, it provides a blueprint for the future of cartographic education.

To build on this success, educators, policymakers, and industry leaders must work together to modernize cartographic curricula—like the ICA commissions are doing. By embracing standardization, technology, accessibility, ethics, and lifelong learning, the cartographic community can ensure that its trade remains a vibrant and vital discipline in the 21st century.

### About the Author

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

## Spatial Foundations

By Dr. Trisalyn Nelson, Dr. Amy Frazier, and Dr. Peter Kedron,
University of California, Santa Barbara

# How to Apply the Geographic Approach to Conservation

Confronted by the effects of a changing climate, there is renewed interest in boosting conservation and biodiversity efforts. Global endeavors, such as the 30x30 target of the Kunming-Montreal Global Biodiversity Framework to protect 30 percent of the planet by 2030, are part of this.

While targets like 30x30 receive widespread support, many countries fail to achieve their goals. This is, in part, because there is insufficient support for GIS and spatial planning at local levels. There is also often a disconnect between the geographic data that scientists produce and the information that is required to make on-the-ground decisions about conservation.

Compounding these challenges is that fragmented administrative agencies are trying to achieve multiple planning goals simultaneously, such as improving biodiversity, reducing carbon emissions, and restoring habitats.

Over the past year, the Center for Spatial Studies and Data Science at the University of California, Santa Barbara (UCSB), has been collaborating with conservation organizations around the world to identify how the geographic approach can better support conservation goals. Based on these discussions, the center invited experts in conservation science and geographic information science (GIScience) to a two-day workshop in December in Santa Barbara, California, to identify research priorities and develop new programs.

During the workshop, a key theme emerged: Academics, conservationists, and GIS practitioners have a strong desire to expand partnerships and collaboration. This will decrease gaps in data and improve on-the-ground decision-making. But building sustainable relationships can be difficult, so the group came up with some ideas for how to foster more cooperation across disciplines.

## Priorities for Building Strong Partnerships

On the one hand, GIScientists continually create the spatial data and methods that conservation organizations need to fill information gaps and support on-the-ground decision-making. On the other hand, conservationists have the nuanced, field-based understanding of human-environment interactions that GIScientists need to create beneficial technical innovations.

While the benefits of collaboration may be apparent, creating and sustaining partnerships requires resources and a shared understanding of problems. The GIS community has an established history of leading and supporting such collaborative efforts and is well positioned to serve as the catalyst for change.

Many GIS practitioners are already familiar with conservation issues because they work in fields that are deeply tied to environmental resource management, land-use planning, and marine science. This familiarity lowers barriers to collaboration. Similarly, many of the organizations that GIS professionals work for have the financial, computational, and human resources needed to overcome cost barriers. The longevity of these partnerships and, ultimately, the success of conservation efforts will also depend on training the next generation of GIScientists and conservationists in collaborative science.

Working together, participants at the two-day workshop identified the following three priorities for building strong partnerships that encourage collaboration in conservation science:

### Teach Co-Design Principles Within GIScience Curriculum

For experts at the meeting, intentionally building co-design principles into GIScience is a top priority. Co-design is the process of collaboratively identifying research questions, data, methods, and solutions for addressing problems. In this context, co-design can ensure that the information and knowledge that academic work generates is both useful and usable by conservation decision-makers.

### About the Authors

Dr. Trisalyn Nelson is a professor and holder of the Jack and Laura Dangermond Endowed Chair of Geography at UCSB. She is also a Public Voices fellow of the OpEd Project, which seeks to elevate underrepresented expert voices. Dr. Amy Frazier is a professor and holder of the Jack and Laura Dangermond Endowed Chair of Conservation Science at UCSB. Dr. Peter Kedron is an associate professor of geography at UCSB and the associate director of the Center for Spatial Studies and Data Science.

Successfully implementing co-design requires that all groups involved are intentionally engaged and that the project is iterative to facilitate feedback. Co-design is also typically best practiced when facilitated by someone trained in co-design. Unfortunately, all these requirements are often beyond the scope of traditional GIS curricula. The principles of co-design should not be taught as an additional skill; rather, they should be infused into the learning aims of GIS classes.

Capstone courses, for example, could have students partner with community groups to implement a co-design process to solve a real-world problem—iteratively defining questions and interpreting results. This type of integration would align GIScience curricula with modern problem-based pedagogies. It could also bring ethics into the foreground by giving students a chance to hear from the people and communities that are affected by the analysis and decisions made based on their findings.

### Build Standard Protocols
### for Sharing Models and Data

Meeting participants said that a key barrier to knowledge exchange between the GIS and conservation communities is the lack of shared platforms. Conservationists don't know where to look for accessible information about recent advances in geographic data collection, analytical techniques, and spatial modeling. Similarly, GIS

practitioners and researchers have a hard time identifying meaningful advances in conservation practice and don't know how to find partner organizations for collaborative work.

A top priority, then, needs to be establishing widely known platforms where GIScientists and conservationists can match up on project needs, exchange ideas, and share recent advances. Critically, these platforms will need to set up protocols for data and models. Standard protocols make models more transparent and comparable and can help inform decision-making on what methodologies to employ and how to use them appropriately. Meeting participants also stressed the need to develop dynamic decision-support models that can reliably predict how conservation decisions will impact outcomes.

### Create a GIS Conservation Corps

In the Center for Spatial Studies and Data Science's ongoing discussions with conservation organizations, every group has said that GIS staffing shortages have made it harder to meet and evaluate conservation goals. Shortages occur in spatial data collection, management, analysis, and visualization, as well as in local or organizational geospatial training. This usually happens because of limited funding—particularly when there is only funding for one GIS position. Lack of GIS staff is particularly acute in low-income areas, where smaller organizations often conduct

important conservation work despite limited staffing, budgets, and access to GIS software or expertise. That said, even large conservation organizations need more support.

GIS companies and higher education institutions can address this problem. In colleges and universities around the world, students are eager to use their growing GIS skill sets to solve real-world problems and impact global issues. Working with conservation organizations, students can gain skills in co-design and GIS-based communication. Similarly, GIS companies are filled with technical and subject matter experts who are capable of supporting conservation efforts. The challenge is connecting and mobilizing these individuals. A programmatic effort to link these groups—with conservationists and community members working together to solve pressing problems—is needed.

## What Can You Offer?

To make this exchange happen, partnerships and programs must be created to develop and implement co-design curriculum, build conservation-based protocols for GIS data and models, and produce programs that connect students and interns with conservation organizations.

While our team at UCSB is already working on this, now is a great time to think about what you and your organization can offer—and whether there are programs in your purview that could help apply the geographic approach to conservation. For more information or to share ideas, email spatial-admin@ucsb.edu.

Conservationists and geospatial information scientists (GIScientists) tour the Jack and Laura Dangermond Preserve together at Point Conception in California.



Workshop participants included 31 experts from around the globe, including the United Kingdom, Germany, Canada, Colombia, and the United States.

They hailed from a wide range of organizations, with roughly half coming from conservation groups such as:

• American Prairie
• Conservation International
• Esri
• Frankfurt Zoological Society
• Kew Gardens
• The Nature Conservancy
• Wildlife Conservation Society

Other participants represented research and academic institutions, including the following:

• California State University, San Bernardino
• Carleton University
• Clark University
• Conservation Biology Institute
• Institute Humboldt
• North Carolina State University
• San Diego State University
• Texas A&M University
• University of California, Santa Barbara
• University of Iowa
• University of Tennessee, Knoxville
• University of Texas at Austin
• University of Washington

# URISA Becomes the Geospatial Professional Network

By Wendy Nelson, Geospatial Professional Network

To better serve the global geospatial community, the Urban and Regional Information Systems Association (URISA) has officially rebranded as the Geospatial Professional Network (GPN)—a move aimed at broadening the organization's mission.

The rebranding marks a significant shift from URISA's original focus on urban and regional GIS and reflects the evolving needs of GIS professionals across diverse sectors and regions. GPN offers enhanced career development, networking, and educational opportunities.

The decision to adopt a new name was driven by research and feedback from URISA members indicating that the organization needed an identity that represents a wider range of geospatial professionals. This rebrand positions GPN as an inclusive network for everyone working in GIS, whether in urban planning, nonprofit sectors, or other industries. The new logo symbolizes global connectivity, with a central circle that represents the worldwide reach of GIS and surrounding dots that signify data and people. It reflects the organization's commitment to professional growth and collaboration.

Along with the rebrand, the organization developed the following new value proposition statement:

*The Geospatial Professional Network is a vibrant community uniting emerging and experienced GIS professionals through top-tier education, networking, and career development. We are committed to upholding ethical standards, empowering you to support your organization, advance your career, and shape the future of the geospatial profession.*

URISA is a nonprofit 501(c)3 association incorporated in 1966. Moving forward, URISA will be doing business as the Geospatial Professional Network.

### About the Author

Wendy Nelson is the executive director of GPN, formerly URISA. She has held this position since 2005.

Members and allied organizations have had positive reactions to the rebranding. Professionals from various sectors—including water utilities, nonprofit GIS organizations, and local government agencies—expressed excitement about the more inclusive and approachable name. Additionally, the new identity aims to simplify communication about the value GPN provides, making it easier for members to speak to the advantages of being in the organization.

Here's what community members are sharing about GPN's new brand and mission:

> It will be a lot easier to explain the benefits of this organization now. Nice work by all involved on having a finger on the pulse of the needs and desires of its members.

**Andrew Bishop**, Current Agricultural Use Value (CAUV) Administrator, Weights and Measures Official, and GIS Assistant for the Union County Ohio Auditor's Office in Marysville, Ohio

> I love it. I stand with the GPN all the way!!!

**Dr. Demetrio Zourarakis**, GISP and CMS (GIS/LIS, RS, Lidar), Independent GIS and Remote Sensing Analyst in Versailles, Kentucky

> L●VE, L●VE, L●VE! Looking forward to renewing my membership with the GPN😎

**Annette Ginocchetti**, GISP, GIS Services Manager and Federal Aviation Administration-Certified Remote Small Unpiloted Aircraft System (sUAS) Pilot for the Northeastern Pennsylvania Alliance in Pittston, Pennsylvania

> I love the new name and logo so much!!!!!! Thank you to all those who are working on the rebrand. This is going to help us immensely. I can personally see how this new name will help me at work.

**Kevin Haynes**, Geospatial Information Officer at the University of South Carolina in Columbia, South Carolina

> Geospatial Professional Network—I love it! Definitely a more approachable group name than the Urban and Regional Information Systems Association. The name was honestly a barrier for me when I first started getting into the GIS community. I wasn't sure they were talking about me.

**Pamela Bond**, GISP, Principal GIS Consultant at Go West Geospatial Services, LLC, in Boise, Idaho

> Love it…long overdue!

**David Alford**, GISP, GIS Manager/Specialist and Certified Louisiana Deputy Assessor (CLDA) for the Livingston Parish Assessors Office in Livingston, Louisiana; Owner of iGeo Consulting

As GPN moves forward, the organization will continue to offer renowned programs such as the GIS Leadership Academy and the Advanced GIS Leadership Academy, in addition to workshops, webinars, and conferences like GIS-Pro in the Rockies 2025 in Denver, Colorado. The rebrand also serves to unify and strengthen regional chapters in the United States and around the world and help them build their membership and networks.

GPN is a central hub for geospatial professionals worldwide, fostering innovation and leadership in the field of GIS. For more information, visit theGPN.org.

# Esri Press

## A to Z GIS: An Illustrated Dictionary of Geographic Information Systems
### By Esri

As GIS has evolved and grown, so has the language of this powerful technology. With more than 1,400 new terms and nearly 400 high-quality illustrations, the third edition of *A to Z GIS: An Illustrated Dictionary of Geographic Information Systems* helps readers elevate their understanding of GIS. Written, developed, and reviewed by more than 200 subject matter experts, this comprehensive, fully cross-referenced dictionary—with nearly 3,000 terms in total—is essential for managers, programmers, users, writers, editors, and students discovering the interdisciplinary nature of GIS. March 2025, 354 pp. Ebook ISBN: 9781589488120 and paperback ISBN: 9781589488113.
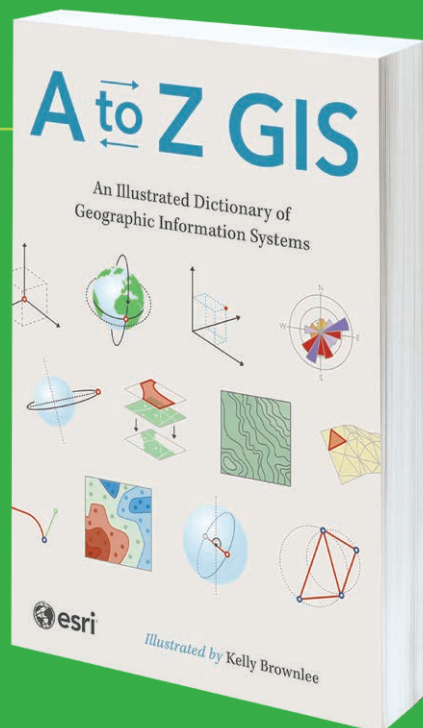
## Getting to Know Mobile GIS
### By Dr. Pinde Fu

"Mobile first" and the "post-PC era" aren't just buzzwords; they represent today's reality. Within the GIS industry, the mobile internet has profoundly transformed how people acquire, visualize, analyze, and disseminate geospatial information. *Getting to Know Mobile GIS* helps GIS professionals and students grasp the opportunities presented by Mobile GIS across business operations in a variety of organizations. Using a low- to no-code approach, the book includes detailed tutorials that make the principles of Mobile GIS fun and easy to learn. It helps readers become immediately productive in creating enterprise GIS solutions for online and offline spatial data visualizations, data collection, location sharing, and workforce coordination. February 2025, 286 pp. Ebook ISBN: 9781589488083 and paperback ISBN: 9781589488076.
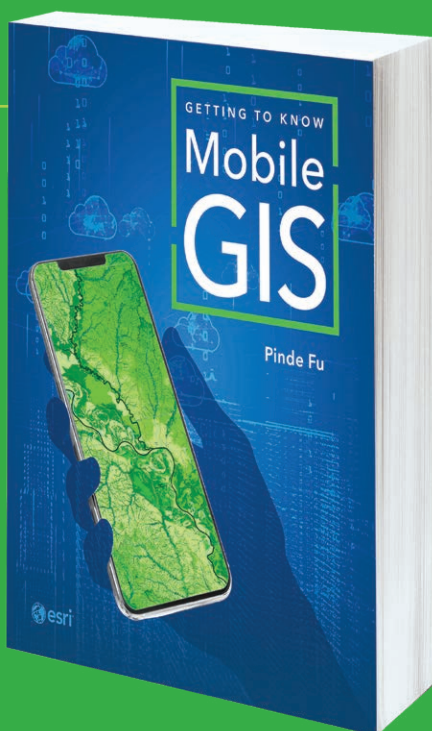
For more information on all Esri Press publications, visit **esri.com/esripress**.

The Geographic Information Systems Professional (GISP) certification from the GIS Certification Institute (GISCI) is widely recognized as a benchmark of excellence in the geospatial profession. It allows GIS practitioners to showcase their expertise, knowledge, and dedication to the field of GIS.

To earn this certification, candidates must pass a comprehensive exam and submit a portfolio that highlights their educational achievements, professional experience, contributions to the GIS community, and any relevant extracurricular activities. Participation in a professional organization can enhance a GISP candidate's portfolio, according to GISCI.

The Esri Young Professionals Network (YPN) offers three ways to earn contribution points toward gaining a GISP certification: becoming a YPN Ambassador, a YPN Content Ambassador, or a YPN Event Ambassador.

### YPN Ambassador

YPN Ambassadors are active participants in Esri YPN. They interact with contributed blog posts on Esri Community, introduce themselves to their peers, engage with YPN on social media platforms, and promote their own YPN memberships.

To become a YPN Ambassador, GIS practitioners need to join Esri YPN, follow Esri YPN on X (if applicable), join the YPN LinkedIn Group, and subscribe to the Esri Young Professionals Network on Esri Community. From there, they need to interact in several ways with other YPN members and content on these platforms.

Once all the requirements have been completed, participants can apply to receive a YPN Ambassador badge and certificate. This serves as proof of being an active member of an organization and earns participants one to three contribution points in GISCI's Other GIS Contributions category.

### YPN Content Ambassador

Another way to gain contribution points toward earning a GISP certification is to publish articles. Esri YPN allows participants to do this by becoming a YPN Content Ambassador.

Anyone who wants to be a YPN Content Ambassador must follow the same initial steps of becoming a YPN Ambassador, and then publish and promote a blog post on the Esri Young Professionals Network Blog on Esri Community. Once a person publishes their post and promotes it via the YPN LinkedIn Group—and posts to another space on Esri Community—they can apply to get their YPN Content Ambassador badge and certificate as proof of completion.

### YPN Event Ambassador

GISP candidates can also earn points in the Other GIS Contributions category by becoming a YPN Event Ambassador. After following the first few steps for becoming a YPN Ambassador, aspiring YPN Event Ambassadors must attend a virtual or in-person event hosted by Esri YPN, and either host their own event where Esri YPN is included as a talking point or speak at a YPN event.

When a person has completed the criteria to become a YPN Event Ambassador, they can apply to get a badge and certificate as proof of completion to earn GISP certification points.

## Make an Impact in the GIS Field

A bonus of becoming a YPN Ambassador, YPN Content Ambassador, and/or YPN Event Ambassador is that, in addition to enhancing their GISP portfolios, participants get to expand their professional networks and deepen their understanding of the GIS field.

For more specifics on becoming any of these three YPN ambassadors, see the list of requirements at links.esri.com/YPN-Ambassador. For information on GISCI's Contributions to the Profession point schedule, visit links.esri.com/GISCI-Points. Pay particular attention to Section VIII: Other GIS Contributions.

# New Training and Certification Offerings

## Training

### Speed Up Productivity with ArcGIS

Developed and delivered by in-house experts, instructor-led trainings provide demonstrations and hands-on software exercises, problem-solving scenarios, and interactive discussions with learners who contribute their own real-world experience. Participants learn technical skills that can be applied immediately on the job. The following new and updated courses are available now:

- **Creating Stories with ArcGIS:** This course teaches participants the concepts, best practices, and decisions that need to be made when using ArcGIS StoryMaps. Explore course details at go.esri.com/creating-stories.
- **Introduction to GIS Using ArcGIS:** Attendees gain experience using GIS maps to visualize and explore real-world features, analyze data, and share maps and other resources. Find out more at go.esri.com/gis-intro.
- **Introduction to Indoor Mapping Using ArcGIS Indoors:** Anyone looking to get started with ArcGIS Indoors can learn how to prepare building data, load floorplan data, create an indoor network, and more. Check out the course at go.esri.com/indoor-class.

Instructor-led classes are taught in person, online, and as private training events for groups. Attendees of private training events can also add a day of instructor coaching to reinforce the knowledge and skills they gained through the training. Instructor coaching consists of in-depth discussions and demonstrations that are tied directly to an organization's workflows, environment, and data. Learn more at go.esri.com/coaching-day. An Esri Training Pass can streamline access to the courses above and all of Esri's instructor-led training options. Find out more at go.esri.com/trpass2025.

### Make a Bigger Impact with GIS

Adoption strategy workshops can help organizations elevate the impact of their GIS programs and increase user adoption. These one-day interactive trainings prepare leaders, project stakeholders, and change influencers to communicate more effectively, enhance resilience to change, and align GIS adoption with an organization's strategic goals.

- **Communicating and Collaborating for ArcGIS Success:** Participants learn about behavioral preferences and how to foster trust, collaboration, and productivity. Explore more at go.esri.com/collaborate.
- **Building Organizational Agility and Enabling Change in a Geospatial World:** Attendees discover new ways to think, act, and react when implementing geospatial strategies. Find out more at go.esri.com/build-agility.
- **Creating Organizational and Geospatial Resiliency**: Participants learn how to apply robust strategies to implement new ideas effectively. Find out more at go.esri.com/geo-resiliency.

### Stay Up-to-Date—the Easy Way

Live training seminars from Esri Academy are an easy way to get tips and learn from experts in real time. These one-hour, no-cost seminars teach best practices and highlight what is possible with GIS and ArcGIS technology. Each live seminar is presented twice (on a Thursday), recorded, and made available for free. Recent recordings include the following:

- Python 101 for ArcGIS
- Discover Express Mode in ArcGIS Experience Builder
- Power Data-Driven Decisions with ArcGIS Dashboards
  Find upcoming training seminars at esri.com/lts. View all recorded seminars at go.esri.com/recordings.

### A Massively Popular Way to Learn

To gain experience with ArcGIS and understand how trending topics can apply to anyone's workflows, take one of Esri's free massive open online courses (MOOCs). They offer videos, guided exercises, discussion forums, and a certificate for course completion. Esri provides all the ArcGIS software needed to participate. Registration is currently open for the following MOOCs:

- Running April 9–May 7, **Make an Impact with Modern Geo Apps** teaches participants how to fuse location data, Web GIS capabilities, and narratives into immersive app experiences for desktop, web, and mobile users. Register by April 16 at go.esri.com/geo-apps-2025.
- In session again September 17–October 29, **Spatial Data Science: The New Frontier in Analytics** focuses on data-engineering workflows and helping users gain insight from data by leveraging spatial methods and algorithms, regression analysis, deep learning models, space-time cubes, and more. Sign up at go.esri.com/sds-2025.

## Certification

### New Certification Exams

The Esri Technical Certification Program helps individuals gain confidence and establish credibility that fuels personal, professional, and business growth. The following new exams are available now:

- **ArcGIS Pro Foundation 2025:** Qualified candidates have less than two years of applied experience using ArcGIS. Learn more at go.esri.com/2025-eapf.
- **ArcGIS Pro Associate 2025:** Candidates must have two to four years of experience using ArcGIS. Explore exam details at go.esri.com/2025-eapa.
- **ArcGIS Pro Professional 2025**: Candidates need at least four years of experience using ArcGIS. Learn more at go.esri.com/2025-eapp.

Go to **esri.com/training** for more information. Find courses at **esri.com/training/catalog**. Keep up with Esri training news by subscribing to the newsletter (**go.esri.com/training-news**), reading the *Esri Training Blog* (**go.esri.com/trainingblog**), connecting with the Esri Training community on Esri Community (**go.esri.com/training-community**), and following **@EsriTraining** on X.

# UNIVERSITY OF REDLANDS
# INSTITUTE FOR GEOSPATIAL IMPACT

In continued partnership with geospatial industry leader Esri,® the Institute for Geospatial Impact (IGI) at University of Redlands is driven through cutting-edge application of Esri's contemporary technologies for higher education. Our students are guided by expert faculty in GIS who provide one-on-one mentoring and collaborative hands-on, real-life learning opportunities that prepare them to make meaningful impact in their organizations and communities.

Through interdisciplinary instruction and community-based internship projects, students are equipped for diverse careers that employ geospatial insights to improve organizational strategy, streamline government services, optimize non-profit operations, and more. The IGI at University of Redlands is eager to continue mentoring current and aspiring GIS professionals for this innovative and competitive field.

## Graduate Degrees

- Master of Science in GIS  (MSGIS)
- Master of GIS  (MGIS)
- Executive Master of GIS  (EMGIS)
- MBA with Location Analytics Concentration
- Master of Science in Business Analytics  (MSBA)

## Undergraduate Degrees*

- Bachelor of Arts in GIS  (BAGIS)
- Bachelor of Science in GIS  (BSGIS)

*Offered in-person

## Certificates

- Certificates in multiple GIS focus areas

*Certificates and graduate degrees are available through in-person, online, and hybrid modalities.*

**UNIVERSITY OF Redlands**

**www.redlands.edu/igi**

### 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.

As a student in the School of Business & Society Master of Science in Business Analytics (MSBA) program, Owen Giron built lasting connections with his Redlands Professors —James Pick and Avijit Sarkar—who have become "incredible mentors." Now the trio are working together on a research project using GIS (geographic information systems) to study the global digital divide and artificial intelligence (AI) readiness in 137 countries.

Through this research, Owen has gathered global perspectives to discern how other countries view AI, how the technology impacts company ethics, and if leaders are ready to align the innovative software with the mission, vision, and values of an organization. The research goal is to illustrate how AI is shaping the future of education and the workplace.

"Professors like Avijit Sarkar and James Pick are the reasons why I am excited to learn and why I strive to help others in my journey both academically and professionally. Prospective students can expect mentorship while at the University of Redlands."

— **Owen Giron '23 MSBA**

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