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for State & Local Government
Spring 2025

Communicating Capital Investments to Decision-Makers Through ArcGIS® StoryMaps

The Port of Beaumont in Texas is engaged in a major capital expansion to enlarge and improve its operations. The port has benefited from public and private investment totaling nearly $7 billion since 2013, and work is ongoing to build marine and rail facilities, add dock infrastructure, and increase overall capacity in a capital investment program that amounts to hundreds of millions of dollars each year. More recently, the port has been using a geographic information system (GIS) technology-based application to tell decision-makers and the public about numerous and complex changes needed for the port to remain safe and efficient. The port leveraged ArcGIS StoryMaps (included with ArcGIS Enterprise) to combine maps, 3D scenes, embedded content, multimedia, and more into dynamic and interactive narratives.

Deepwater Asset

The Port of Beaumont is the seventh-largest port in the US by tonnage. The deepwater facility also ranks first in the world in terms of the amount of US military equipment handled, being the headquarters of the US Army's 842nd Transportation Battalion.

Located in southeast Texas, the port is connected to the Gulf of America by a 42-mile stretch of the Sabine-Neches Waterway—itself the nation's third-busiest waterway in terms of tonnage—which is currently the subject of a $1.1 billion deepening project. Begun in 2017, this work is expected to take 12–15 years to complete.

Among the port's facilities are a roll-on/roll-off dock; 118 acres of open storage; 574,710 square feet of covered storage; rail storage; and a 1,100-foot-diameter turning basin. It is also home to one of the largest mobile harbor cranes in the Gulf of America region. With three general cargo terminals, a liquid bulk terminal, and a dry bulk terminal, the port generates annual revenues in excess of $40 million. Direct employment amounts to nearly 7,000 people, plus over 19,000 involved in port-related activities.

Capital Programming

Brandon Bergeron, director of engineering, holds responsibility for

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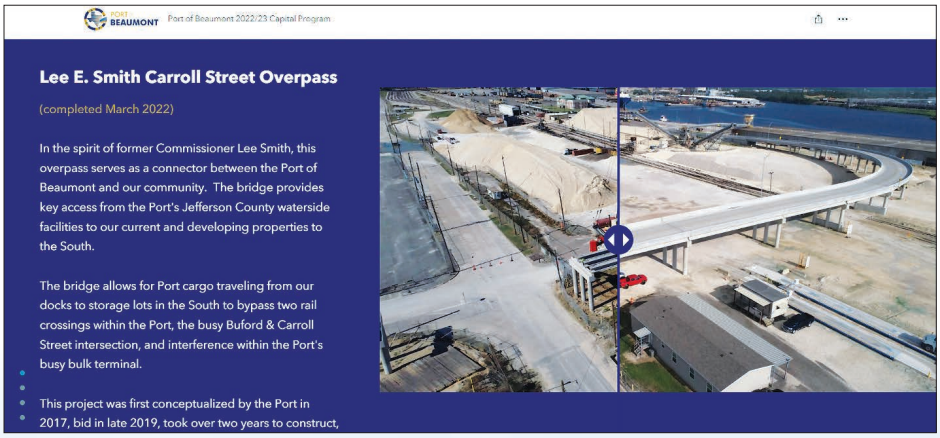

↑ The port's ArcGIS StoryMaps story highlights specific projects, including an overpass constructed to connect the port to the community.

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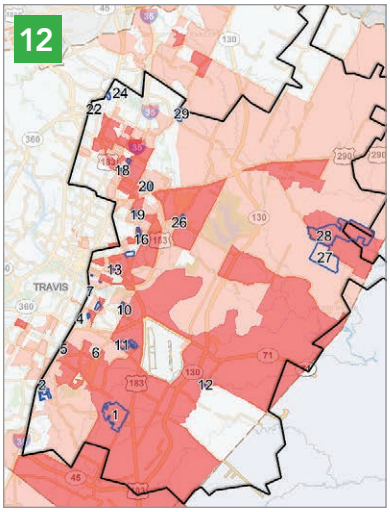

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Communicating Capital Investments to Decision-Makers Through ArcGIS StoryMaps continued from cover

↑ An ArcGIS StoryMaps story showcases an overview of the port's capital improvement projects.

↑ The port used GIS to map its utility networks and infrastructure.

the capital improvement program and various major maintenance activities. He describes how, upon joining the port, one of his first tasks was to present the next year's capital improvement program to the board of commissioners.

At each annual workshop, various actions—including proposed capital improvements—are discussed. During his first outing, Bergeron laid out proposed changes using PowerPoint. This, he says, amounted to "a few drawings on slides accompanied by printed handouts." He continued to use PowerPoint slides for the next couple of years until port leaders decided to engage with Esri, gain product licenses, and start teaching themselves about what GIS could offer.

"[Using ArcGIS] StoryMaps just seemed like a clever way to present things and I really wanted to capitalize on that," Bergeron continued.

"Our board of commissioners is a diverse group consisting of a bank president, the general manager of a rice mill, a nonprofit leader and entrepreneur, a retired local educator, a Harvard graduate and current dean of students at a local private school, and a successful business professional . . . all intelligent and accomplished in their own right," said Bergeron. "Due to their many responsibilities, our commissioners have a limited time in which they can process the intricacies of each port project, all filled with port nomenclature and jargon. To ensure the best use of their time, we saw the development of a capital improvement plan story [in ArcGIS StoryMaps] as an opportunity to present a lot of technical information in a relatively short window of time, in an easy-to-follow format. [ArcGIS StoryMaps] was a game changer in the way projects are presented to the board."

The result is engaging and educational. It enables the port to better inform decision-makers and meet its infrastructure development and rehabilitation needs.

"The best thing I can do is put [the information] on a map—show them the scale of the project, what it will look like, and add some descriptions alongside the budget and schedule," Bergeron added. "Being able to share these details while they're looking at things in the real world as part of a virtual port tour is an incredibly valuable tool to me."

The Process of Building a GIS Tool

Lean staffing dictated that the ArcGIS StoryMaps story would be largely built by employees themselves, using Esri's online tutorials and other educational assets. This approach meant that those with knowledge of the port could create something that precisely reflected their knowledge and needs. It has taken around three years to get the ArcGIS StoryMaps story to its current state, and a major factor in its current level of maturity was the pandemic lockdown: The economic slowdown meant that staff could focus on learning GIS.

Researching the information that went into the ArcGIS StoryMaps solution was complicated and took time. Port staff met externally with the City of Beaumont, which has infrastructure, such as stormwater drain lines, that passes through the port to the Neches River. In some instances, the effort involved calling long-retired maintenance superintendents for help to locate the necessary drawings. The Port of Beaumont is old, dating back to the early 1900s, and some original drawings were little more than back-of-a-napkin sketches done by engineers in the 1960s that had later been redrawn several times.

With so much often-redundant infrastructure sitting underground, a primary set of drawings needed to be compiled that, once completed, could be perpetually updated. The port retained a consultant for the data-gathering process. Bergeron needed to receive information in a standardized form, so instead of creating a GIS map from scratch, the consultant produced shapefiles that could then be added into ArcGIS Enterprise.

Reception

Gaining additional licenses in an organization with little previous experience of GIS required a multistep approach, and introduction to the technology's capabilities required gradual training to help build staff's confidence and provide support. This included, for instance, creating maps that showed the sizes of docks, storage shed capacities, and so on that were easily clickable and usable by individuals during meetings and discussions.

The board of commissioners responded very favorably to the ArcGIS StoryMaps

↑ The port's ArcGIS StoryMaps story showcases the various capital improvement projects.

story, and there have been several requests to use it elsewhere—as members are often asked to explain recent and proposed developments, it affords them the same insights and ease of use enjoyed by Bergeron. He sees this enthusiasm as potentially opening the door for significantly increased use of GIS to support many different activities. Examples include operations dashboards and projects supporting future applications for the US Department of Transportation Maritime Administration's Port Infrastructure Development Program (PIDP) and Department of Homeland Security funding.

The ArcGIS StoryMaps story has brought greater buy-in as people can see better what is happening or is going to happen. Bergeron explained, "We can show them the results of the funding that they've provided and we can also show them what will happen even before the first shovel is turned—'Here's where it is in the real world; let's zoom in and out; let's look at some details and scroll through some photos so you can see why this project is needed.'"

Management's enthusiasm matched and even surpassed that of the board. With the direct support of the port's director of trade development, a new ArcGIS StoryMaps story is already being developed to showcase and market the port's facilities and terminals.

With so many foreign trade zones—which can shift and morph over the course of different projects and usages—within the port, lease management is another area that is being considered. Bergeron notes that information sharing with the US Department of Homeland Security and US Immigration and Customs Enforcement would be greatly enhanced.

Other benefits of the ArcGIS StoryMaps story include time savings and faster response to outside requests. Bergeron must deal with nearly constant calls from contractors and consultants, and the ArcGIS StoryMaps story enables him to handle them in greater numbers. The information on it is public, so queries on infrastructure locations and statuses can be dealt with simply by sharing an online link, effectively enabling self-guided port tours.

Using the GIS has also saved time and frustration for contractors called on-site to deal with maintenance issues. In addition to the ArcGIS StoryMaps story, the Port of Beaumont has also created a utility map. Using ArcGIS Field Maps, a mobile data collection app, on-site contractors can immediately know just what infrastructure is beneath them, which gives them a better idea of exactly where every asset is and how best to deal with it.

Wider Appeal

In terms of the novelty of the application, Bergeron is modest about the Port of Beaumont's achievements. Other ports have used ArcGIS StoryMaps to illustrate and market their strategic planning, and some of those efforts inspired him. He therefore refuses to take sole credit.

Where he does differentiate is in the self-taught element of his port's creation of its ArcGIS StoryMaps story. As nonexperts when the project commenced, he and his team approached things differently from how they might have had they been fully versed in GIS from the start. Anecdotal comments from peers in other ports have highlighted how, on occasion, using specialists can result in overly complex, difficult-to-use solutions with unnecessary capabilities.

The Port of Beaumont's ArcGIS StoryMaps story and its features have, by contrast, attracted interest and positive reviews from peers.

"My counterparts in other ports have reached out via the American Association of Port Authorities Port Professional Manager program," said Bergeron. "They see the value in [ArcGIS] StoryMaps because they face many of the same dilemmas. It's hard for many people to understand engineering drawings, but when you put a rendering next to a photo on a map, it suddenly all makes sense."

To explore how ports can gain a competitive advantage using GIS, please visit go.esri.com/GISinPorts.

> **"The best thing I can do is put [the information] on a map—show them the scale of the project, what it will look like, and add some descriptions alongside the budget and schedule. Being able to share these details while they're looking at things in the real world as part of a virtual port tour is an incredibly valuable tool to me."**
>
> **Brandon Bergeron**
> Director of Engineering at the Port of Beaumont

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Solid Waste Authority of Palm Beach County Runs Smart Mini City with ArcGIS

The Solid Waste Authority (SWA) of Palm Beach County, Florida, serves as a leader in solid waste management. Within its integrated solid waste management system, staff are responsible for maintaining thousands of utility and facility assets that annually process over 1.75 million tons of solid waste. SWA oversees the unincorporated areas of the county and is responsible for the management of solid waste and the permittance of solid waste disposal throughout the county.

Within the main campus, hundreds of people and simultaneous activities converge to reduce, recycle, and dispose of the waste as well as to create renewable energy from it. SWA does this work while keeping the local community safe, maintaining regulatory compliance, and being fiscally sound and environmentally responsible.

What once was a daily operation that lacked real-time situational awareness and had disparate systems of record is now built on a geographic information system that is based on software as a service (SaaS) and supports an enterprise-wide modernization.

The GIS team at SWA consists of two people: Josephine Rudd, GIS manager, and Susan Fox, GIS specialist, are solely responsible for working with all departments at SWA to see how GIS can support their respective workflows. ArcGIS Online is their SaaS-based GIS and is a crucial component for the team's effort to expand GIS across the authority. Having over 160 end users, the team needed a real-time solution to create a collaborative work environment with a more efficient system of record.

"We started with a one-stop shop and have been trying to expand to more of an authority-wide solution with the resources that we have," said Rudd.

The goal for the team is to expand GIS throughout the whole enterprise, with each department managing its own data and updating it to create a smart mini city within the authority.

Location Intelligence for Corporate Social Responsibility

As part of its integrated solid waste management system, the landfill is required to be swept every quarter for any methane emissions that exceed state and national standards. Previously, sweeps were completed using a GPS unit—staff would manually write down the location coordinates for exceedances and then map the coordinates on paper. The paper

continued on page 8

↑ The color-coded data points on the map help the team identify and visualize areas that may have methane or hydrogen sulfide (H_2S) exceedances. The colors vary based on the severity of the area, with green representing the lowest level of concern for workers at the Solid Waste Authority.

map was the only means for field staff to identify potentially hazardous zones, and the process lacked real-time updates for management and overall data accuracy.

The GIS team believed that there had to be a way to simplify this process, so Rudd and Fox set up and implemented a real-time data collection workflow. They mapped precise locations in ArcGIS Online so that staff in the field would know exactly where to record each reading. Field crews now utilize ArcGIS Field Maps, an all-in-one app that uses data-driven maps and mobile forms to help workers record emission levels.

Once the reading is recorded, a value is returned immediately, color-coded to convey the level of urgency to management, who monitor the data in real time using ArcGIS Dashboards. The impact this workflow modernization has had on operations is significant. What used to take 10 days is now completed in a single day. Each time a workflow is integrated with ArcGIS Dashboards, SWA staff create a layer for the data collection effort, which serves as a far better system of record than handwritten notes.

"We went from paper and pencil [documentation] that took days and days to get mapped and sent out to everybody. But now, from upper management down to the guys in the field, real-time repair helped us cut down on an unquantifiable amount of cost and time for a given job," said Rudd.

Streamlining the cumbersome task of tracking methane-level history created more efficiencies for the authority. Using real-time GIS has also been a success for SWA; because of the size of the landfill project, field staff did not know where each point was, nor did managers know what work was still needed. A readily accessible map creates a cohesive work environment and eliminates any delays between upper management and the individuals doing the work in the field, resulting in significant time savings.

"Using GIS applications has had a positive effect when it comes to maintaining environmental compliance. Air regulations require routine monitoring of methane surface emissions from the landfill," said Mary Beth Morrison, director of environmental programs at SWA. "Using GIS tools allows us to obtain accurate geospatial information instantly. This helps multiple departments address corrective action measures efficiently and expeditiously, which is essential for meeting regulatory time frames."

↓ The SWA hub site, created using ArcGIS Hub, is for internal and external users. External users may have no idea what GIS is, so having a simple map provides positive benefits for identifying work tasks.

A Geospatial Approach to Asset Management

The first step in launching the plan to expand GIS throughout the authority started with a needs assessment. GIS staff met with every single department to identify and address its needs, and it became very apparent to the team that a work order and asset management system would be extremely beneficial. Some departments had their work showcased in stacks of paper that were two to three feet high. When staff used the paper in

the field, they had no way of communicating updates with each other.

Using GIS as a digital system of record was the way to go for the authority because all its assets have a location. The authority chose Esri partner Cityworks as its work order and asset management system. Since staff had already been converting their computer-aided drafting (CAD) data into GIS data, they had all their aboveground assets in the system ready to go, which shortened the implementation schedule.

Utilities staff now use the Cityworks mobile app on a tablet to visualize where all the preventative maintenance tasks are while in the field. Instead of constantly moving from one side of the property to the other, visualizing clusters of preventative maintenance tasks on the map allows workers to do their tasks in one area before moving to the next, increasing efficiency.

The authority is also using GIS for facility management. It realized the benefit of making digital facility asset information available to staff, such as the location, number, and status of elevators, garage doors, and HVAC units, as well as providing a way for employees to report structural issues such as problems with lights, carpets, and asset integrity.

Having all these assets available in the map apps and ArcGIS Dashboards shows the staff everything that is going on within the facilities—who has done what and when, and what repairs and inspections still need to be done. Warranty information is also included in the system, allowing managers to monitor preventative maintenance tasks' status, and when assets are due for replacement.

Transforming Waste Management System Results in a Smart Mini City

This modernization of the legacy workflows, powered by ArcGIS, has aided in the authority's overarching goal to eliminate data silos and collaborate in real time on work orders and asset and facility management, creating an integrated team across the authority. Anyone can view the live system status on any device.

The consistent methodology behind the use of ArcGIS technologies allowed the GIS team to successfully roll out powerful geospatial tools for each department, leading to coordinated strategic decision-making in real time while also delivering operational efficiencies. The result of the team's work is the evolution of SWA's integrated solid waste management system into a smart mini city.

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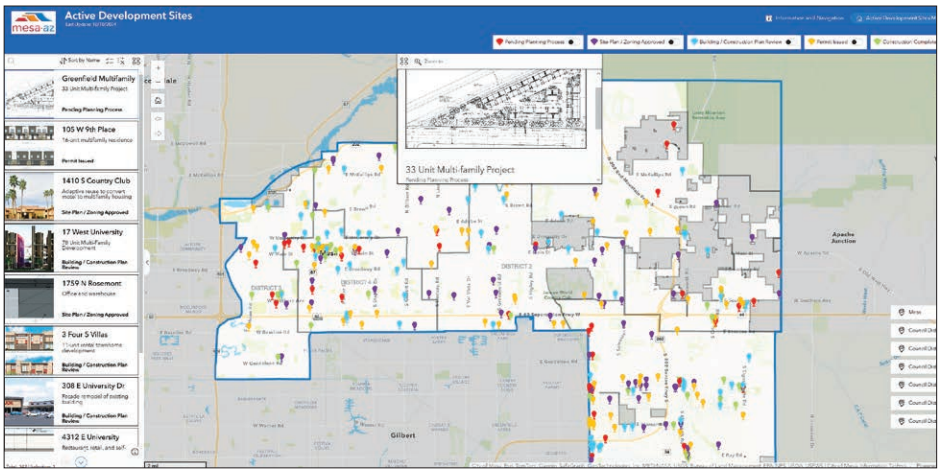
City of Mesa Revolutionizes Urban Planning Projects with ArcGIS

The planning division of the City of Mesa, Arizona, serves the third-largest municipality in the state. Planners within the division have taken significant steps to integrate a geographic approach into urban planning processes through ArcGIS Online. These efforts have focused on three key initiatives: enhancing internal and public communication about active development sites, fostering much-needed transit-oriented development, and improving stakeholder engagement in city planning. By leveraging technologies such as ArcGIS Experience Builder, ArcGIS Urban, and ArcGIS CityEngine, Mesa's planners are modernizing their approach to internal operations and community outreach.



↑ The City of Mesa's Active Development Sites map features the city's development projects.

Developing the City's Most Used Interactive Map

One of the city's most notable and widely used applications on the city's website is the interactive Active Development Sites. This public-facing application, generated with ArcGIS Experience Builder, was designed to provide easy access to information about developments within Mesa. The recently updated application allows residents, developers, and the city's administration to stay informed about projects. These projects are sorted by status: pending planning, approved planning, ongoing review of building or construction plans, permits issued, and construction completed. For each project, the user can choose to view it in 3D, which opens an instance of ArcGIS Urban to view the project in greater detail, as well as in the context of the surrounding community. For stakeholders in one of the fastest-growing cities in the Southwest, this is crucial, authoritative information.

Since its deployment, the Active Development Sites map has garnered positive feedback from the public and the development community. It has also been well-received by internal stakeholders—transportation department staff use it to track roadwork permits and infrastructure improvements, and city staff and officials use it to monitor development projects.

"By providing the city's residents, applicants, and city officials with current project information on the Active Development Sites map, we offer an opportunity to follow any project status," said Mary Kopaskie-Brown, planning director at City of Mesa. "This improves our communication with stakeholders and keeps them informed as we continue to build a collaborative and open process in Mesa."

GIS Guides MesaCONNECTED TOD Plan

The planning division is also leading a major initiative to develop the MesaCONNECTED Transit-Oriented Development (TOD) Plan, which is being funded in part by a Federal Transit Administration (FTA) grant. This plan focuses on land-use planning along a five-mile streetcar route that will extend into Mesa, connect with the city's existing light-rail system, and enhance regional connectivity.

The plan aims to promote compact mixed-use, pedestrian-friendly environments, particularly around the 11 planned transit stations. Mesa planners are using both ArcGIS Urban and ArcGIS CityEngine to facilitate meaningful community engagement, cross-sector collaboration, and informed decision-making.

The analytical and visualization capabilities of ArcGIS Urban have been instrumental in enabling planners to explore various TOD Plan development scenarios, assess associated impacts, and ensure alignment with the city's long-term goals. Although in the early stages, Mesa staff are effectively leveraging the interoperability of ArcGIS Urban and ArcGIS CityEngine.

ArcGIS CityEngine is being used to develop virtual 3D models that will illustrate the recommended zoning and design strategies of the MesaCONNECTED TOD Plan. The models will eventually be integrated into ArcGIS Urban and made publicly accessible through ArcGIS Online. The models will serve as a central repository for information related to the plan and its future implementation.

"ArcGIS Urban and ArcGIS CityEngine allow us to transform abstract design and planning ideas into a graphic format that is engaging and easily understood," explained Rachel Nettles, assistant planning director for the City of Mesa. "We are excited that these tools help us bring projects to life so [that] they resonate with our community."

Immersive Content Drives Resident Engagement in Mesa's 2050 Plan

The third and final initiative focuses on public engagement in Mesa's 2050 General Plan update, a process that outlines the city's strategies for future growth and development. City staff knew they needed new ways to involve the community. They worked with consultant Logan Simpson and the Resilient Visions Collaboratory (RV CoLab) in the Media and Immersive eXperience (MIX) Center at Arizona State University (ASU). This partnership led to the first immersive event experience of its kind for city planning. This effort used Unreal Engine and leveraged content developed in ArcGIS Urban, SketchUp, and ArcGIS CityEngine.

The event included over 350 high school students from across the city to engage with proposed future land-use designations (e.g., place types) in a 3,200-square-foot, 300-degree cylindrical, interactive mixed-reality installation. This space enabled entire groups to fully immerse themselves in the urban environments imagined within the General Plan draft. Survey feedback from participating students confirmed that providing an immersive, interactive experience of the changes described in the plan was successful: It bridged the gap between complex planning documents and people's understanding of their city's future vision.

The stakeholder engagement initiative was recognized with two prestigious awards: the American Planning Association (APA) Arizona Chapter's Best Planning Excellence Award for the initiative's innovative approach, and the ASU President's Medal for Social Embeddedness. The collaborative effort brought new ideas and technical expertise to the project, ensuring that the final product was both user-friendly and impactful.

"This was an amazing use of technology," said John Giles, mayor of the City of Mesa. "When you hand a high school student some two-dimensional papers and say, 'Hey, will you help us plan the city?,' you can imagine the reaction you are going to get to that. Everybody in the room was engaged and paying attention and had feedback. I don't know the last time I was in a room with 60 high school students where that was the case."

The City of Mesa's planning division has embraced the potential of spatial technology through its innovative use of ArcGIS tools. By developing the Experience Builder app for public engagement, designing transit-oriented developments with ArcGIS Urban and ArcGIS CityEngine, and enhancing public participation in the General Plan update, the city is setting a strong foundation for its future growth.

These initiatives are helping create a more sustainable, connected, and transparent planning process, ensuring that Mesa evolves in a way that benefits both its residents and the broader region. By using cutting-edge tools and collaborative efforts, the city is leading the way in a modern approach to urban planning, demonstrating how technology can transform both internal review processes and stakeholder engagement.

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> "ArcGIS Urban and ArcGIS CityEngine allow us to transform abstract design and planning ideas into a graphic format that is engaging and easily understood. We are excited that these tools help us bring projects to life so that they resonate with our community."
>
> **Rachel Nettles**
> Assistant Planning Director, City of Mesa

↑ A 3D rendering of the MesaCONNECTED Transit-Oriented Development Plan was made using ArcGIS Urban and ArcGIS CityEngine.

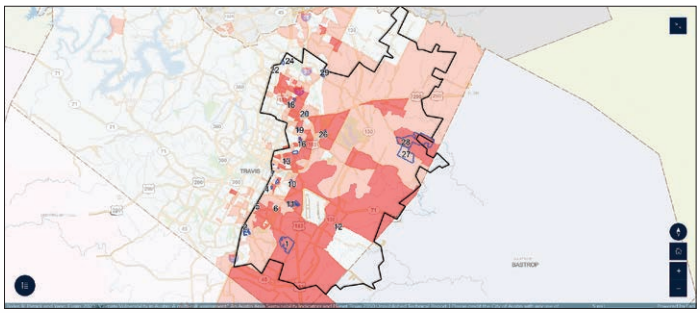
- Planners in Mesa, Arizona, are using ArcGIS technologies to integrate geography into urban planning.
- The planners concentrated on three crucial initiatives: enhancing both internal and public communication about active development sites, promoting essential transit-oriented development, and improving stakeholder involvement in city planning.
- By leveraging ArcGIS technologies and interactive maps, Mesa's planners are modernizing their approach to internal operations and community outreach.

Austin Public Health Enhances CASPER Surveys with GIS Technology

Assessing the community's needs in a time of emergency is a key part of any public health organization's responsibilities. Often, the best method to assess the needs of the community following an emergency is by conducting a Community Assessment for Public Health Emergency Response (CASPER). The CASPER is a relatively cost-effective option that can provide invaluable, accurate, and timely data at the household level to create a real-time picture for decision-makers, public health leaders, and emergency managers. Data collected provides insight about community awareness, opinions, needs, and concerns for any possible topic, including climate change, health, community services, and emergency preparedness.

With these benefits in mind, when the City of Austin's Office of Resilience approached Austin Public Health, the official health department of the City of Austin and Travis County, Texas, about a CASPER, it was an easy decision to use GIS technology and solutions to conduct and streamline the assessment. The GIS tools used allowed employees to

- Identify populations at increased risk of harm due to a disaster.
- Quickly prepare staff and volunteers for conducting the survey.
- Visualize the results for easy data-driven decision-making in times of emergency.
- Share the data and visualize results for the community.

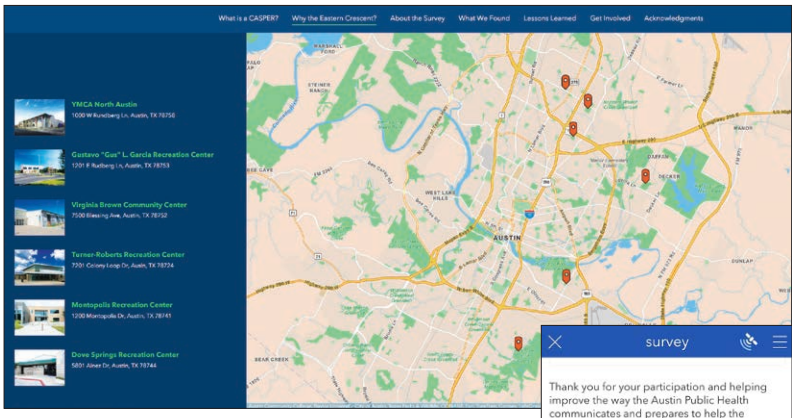


↑ Climate Vulnerability in Travis County: Areas on the map that are red indicate higher levels of vulnerability and exposure.

From the Beginning: Where to Survey?

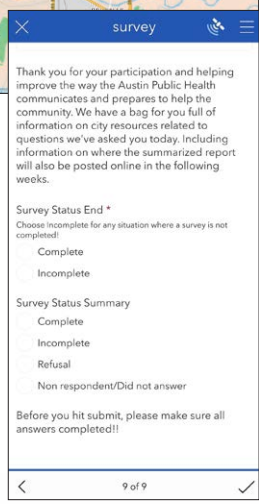
Early in the planning process, the CASPER's objectives were to understand the experiences and needs of residents with respect to severe weather, inform and improve resiliency hubs, ensure emergency preparedness, and develop resources to enhance community resiliency.

This led to the Resilience Hub Network—a series of community-focused physical facilities that offer day-to-day services and support the community before, during, and after a disaster. Based on community meetings and resident feedback, six facilities were picked to be the pilot locations for the Resilience Hub Network. All these facilities are located within one particular area, with the goal of expanding to the entire city.



↑ Pilot locations are spread throughout the Eastern Crescent.

The City of Austin's Office of Equity explained that the area, informally known as the "Eastern Crescent," is most vulnerable to displacement. It is shaped like a backward C and is loosely defined by three highways: I-35 on the west (especially north of the Colorado River), on the south US 183 on the north and east, and US 71 on the south. Generations of people who have lived in the Eastern Crescent have suffered forced displacement into the area, followed by segregation, discriminatory lending practices, and disinvestment. More recently, the Eastern Crescent has suffered gentrification and new cycles of displacement out of the area.



↑ ArcGIS Survey123 automatically records and uploads survey results.

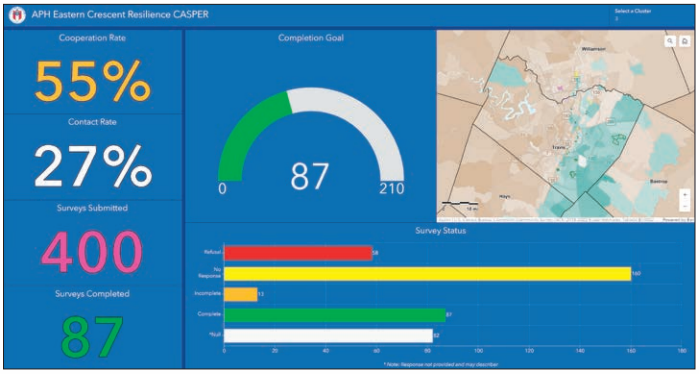
GIS Tools Optimize CASPER Execution

Typically, organizations conduct CASPER surveys using pen and paper, as outlined in the methodology. However, it was important for Austin Public Health to exercise new GIS tools on blue-sky days and test the methods to identify and track which areas to survey.

With a clear goal in mind, GIS professionals at Austin Public Health decided to deploy the Community Health Assessment Planner solution from ArcGIS Solutions through ArcGIS Pro. This solution delivers a set of capabilities that help plan community health surveys, collect survey responses, and monitor key indicators as the assessment occurs. ArcGIS Solutions is a collection of preconfigured GIS tools tailored to meet an organization's specific needs, making them easy to deploy and get started.

From helping develop the plan for the surveys to easily enabling epidemiologists and executives to monitor key indicators as the assessment occurs, the Community Health Assessment Planner is an out-of-the-box solution to better manage a CASPER. Once the solution was deployed, the GIS team was able to set up a cluster selection and a random selection of households to survey. Then the GIS team deployed ArcGIS Survey123, which removes the pen-and-paper process and implements a user-friendly interface for CASPER volunteers to conduct surveys in the community.

Finally, using ArcGIS Dashboards, the completed survey data was instantly uploaded and available for public health officials to understand progress and make informed decisions.



↑ Survey results stream into the dashboard in real time. A blue dashboard shows completion rates at 54.2 percent and contact rates at 25.4 percent with a map of Austin to the right.

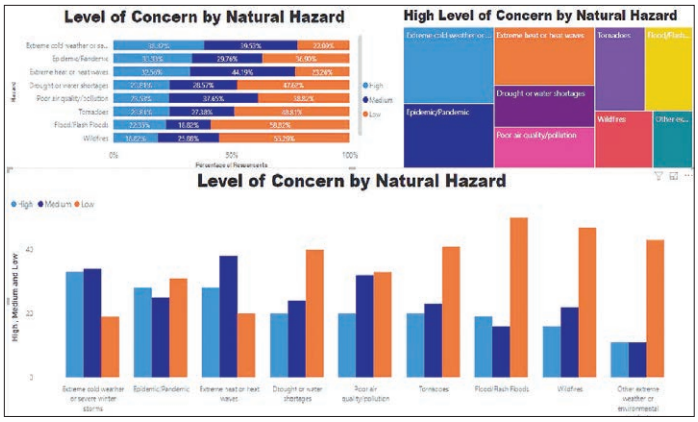
GIS-Based CASPER Results Reveal Community Health Needs

The results of the CASPER assessment provided valuable information for Austin Public Health and the Office of Resilience. Staff found that of the households surveyed, a large percentage were vulnerable to heat or had a history of heat-related illness. Many households also did not feel prepared for a disaster. Further, they shared that text messages were the most effective way to communicate in times of emergency.

To inform the community about these results and illustrate their process, the team shared the results using ArcGIS StoryMaps. This provides an easy-to-understand, dynamic viewing experience for the public and showcases the collected data in a way that promotes action and can influence policy and prevention response.

Using GIS to aid Austin Public Health's CASPER survey has provided a more accurate representation of community needs and trained the entire CASPER team with essential practice to deploy the tools during an emergency. With the Community Health Assessment Planner solution, planning, managing, and administering the survey reduced staff time and streamlined workflows that followed the survey. Spatial analysis ensured a meticulous deployment of the survey, providing staff with a better understanding of their community's preparedness and needs.

To learn how to streamline your workflows with ArcGIS Solutions, please visit go.esri.com/HealthSolutions.



↑ Results from Austin Public Health Community Assessment for Public Health Emergency (CASPER) leverage data visualization tools.

Navigating Parcel Migration amid Maui's Wildfire Aftermath

Maui County embarked on the migration of its tax parcels from ArcGIS Parcel Fabric in ArcMap to ArcGIS Pro. Then wildfire devastated the island. Here's how county staff overcame the ultimate obstacle while serving their community and exemplifying the intrinsic value of property records.

Since 2014, Maui County staff had used ArcMap to manage parcels in ArcGIS Parcel Fabric. With ArcMap nearing its retirement, county employees initiated a transition plan to ArcGIS Pro. This plan provided sufficient time for both migration and training. County staff were also keen to take advantage of the customization capabilities of Parcel Fabric in ArcGIS Pro.

"As long-term Parcel Fabric users, we knew we needed to get ahead of the curve," said Elisse Deleissegues, GIS analyst in the Real Property Assessment Division of Maui County's Department of Finance. "Our Real Property Assessment Division has a track record of technical proficiency, and we understood the level of effort involved. We were ready to migrate!"

Maui County staff worked with Pro-West & Associates, an Esri partner, to identify how they could leverage Parcel Fabric in ArcGIS Pro to manage data and workflows more efficiently.

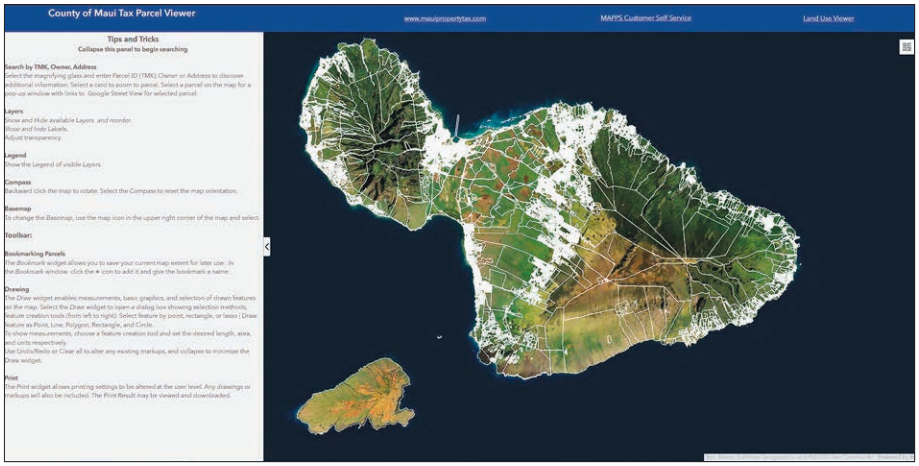
"We needed to minimize the potential for human error during [data] entry and hold onto many of the unique ways in which we used the fabric for our own geography and unique needs, while going beyond the limitations of ArcMap," continued Deleissegues.

Maui County's goals included

- Automating input and reducing manual entry by leveraging attribute rules.
- Adding more domains for consistent data entry by modifying the current schema.
- Representing features such as plats by adding new parcel types to the schema.
- Enhancing history preservation.
- Tying parcels to each instrument of record and generate a parcel lineage.
- Employing ArcGIS Pro tools for efficient and flexible editing.
- Improving label expressions in ArcGIS Pro to show multiple values in unique situations.

Maui County's geography is atypical because it consists of four islands—totaling 1,161.5 square miles—resulting in a lack of contiguous data. Additionally, Maui County does not have a Public Land Survey System (PLSS) base for defining land. The county uses a base of control points from which to develop and maintain its data. Maui County uses a state plane coordinate system with south azimuth direction units. In preparation for migrating to ArcGIS Pro, county employees upgraded to ArcGIS Enterprise. This allowed them to update the data to the correct version needed to implement ArcGIS Parcel Fabric in ArcGIS Pro. The time had come to perform the migration.

Then, disaster struck.



→ The County of Maui's tax parcel viewer displays all mapped parcels for the entire island.

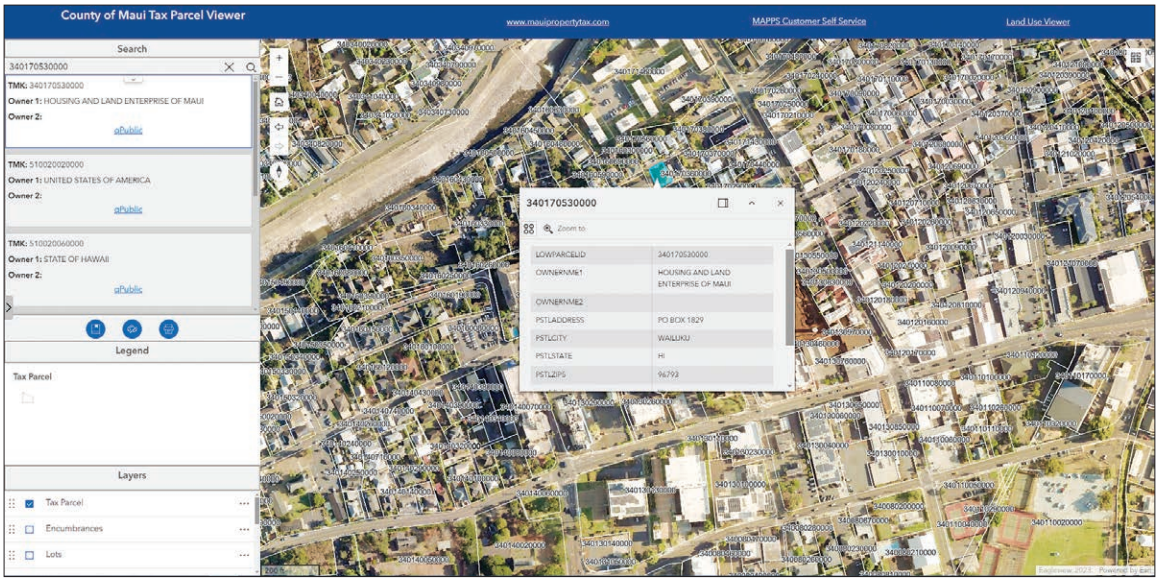
Wildfire Devastation Increased Demand for Parcel Data

Beginning August 8, 2023, wildfires took hold. The historic and culturally important town of Lahaina was reduced to ruins. The lives of 101 individuals were tragically lost, making the outbreak one of the deadliest wildfires in US history.

In the aftermath, all projects in Maui County were immediately halted. This included the parcel migration and ArcGIS Enterprise upgrade projects. Staff pivoted to focus entirely on serving the community.

At this time, the true value of parcel data came to the fore. Lacking the infrastructure to monitor and manage wildfire damage—wildfires of this magnitude were unprecedented in Hawaii—county staff faced an extraordinary volume of requests for information. Many duplicate requests were received, and inquiries poured in from property owners, other counties, the state, and relevant entities.

Information about property boundaries, zoning, and more was in higher demand than ever. A small team worked tirelessly to respond—with the added pressure of the personal impact of the fire on staff



← The County of Maui public tax parcel viewer highlighting a single parcel and its corresponding records.

members, including the loss of homes, loved ones, and community.

Ten months after the fire, two out of the five Maui County enterprise management team members were still working full time to help with recovery and reconstruction efforts. With numerous lawsuits and discovery underway in relation to the fire, information remains in high demand.

"When the wildfires hit, the critical nature of parcel data immediately became clear. Recovery would be impossible without it," said Deleissegues.

Maui Parcel Migration Moves Forward

After the county started to recover from the wildfire, staff restarted the ArcGIS Enterprise upgrade and parcel migration project. Maui's parcel data was moved into ArcGIS Parcel Fabric in ArcGIS Pro, leveraging its newly created schema customized to match the county's needs.

With the migration complete, the enterprise management team focused on maintaining their data in ArcGIS Pro. Team members were equipped to be self-efficient in editing data in ArcGIS Pro, having taken training focusing on the county's unique workflows and schema as well as staff roles across offices involved in the parcel management workflow.

ArcGIS Pro brings new capabilities and advantages to Maui County, including:

- Reducing opportunities for human error and increasing data accuracy
- Enhancing editing efficiency
- Simplifying the QA/QC process
- Improving attribute visualization
- Automating unique scenarios using attribute rules
- Understanding the source documentation, including deeds, plats, and surveys
- Displaying parcel lineage visually and in tables, showing which documents created and retired the feature

"As a technically astute team, we were ready to embrace the most up-to-date tools to keep our authoritative data up-to-date and deliver value. We're excited about building on our capabilities," said Deleissegues.

Maui County Leverages Data with Self-Service Apps

Maui County's enterprise management team is focused on taking full advantage of accurate data and modern GIS capabilities from the upgrade. The team is using its Parcel Fabric data in ArcGIS Pro to support and share valuable data through self-service GIS apps and county initiatives. These apps and initiatives include the Real Property Assessment Division Parcel Viewer, which tracks parcel changes, ownership changes, and value changes; conducts compliance checks through agricultural inspections; manages an appeals tracking dashboard; and uses post-wildfire imagery for assessment purposes. Additionally, the team utilizes the Public Parcel Viewer for real-time tax map updates, the Maui Automated Planning and Permitting System (MAPPS), and the Equitable Property Value Hub.

"While the impact of the wildfires will stay with us forever, we are able to move forward with a clearer focus than ever on the value of the land records information and land records professionals," said Deleissegues.

To discover how to migrate to ArcGIS Pro, please visit go.esri.com/LRParcel.

> **"While the impact of the wildfires will stay with us forever, we are able to move forward with a clearer focus than ever on the value of the land records information and land records professionals."**
>
> **Elisse Deleissegues**
> GIS Analyst, Real Property Assessment Division, Department of Finance, Maui County

Managing Pennsylvania's Wildlife for Hunters and Healthy Habitats

By Sunny Fleming, Industry Manager at Esri

The Pennsylvania Game Commission has undergone a digital transformation, embracing enterprise GIS to power statewide dashboards for hunters and better management of game species.

Key Takeaways

- Pennsylvania uses GIS to map and manage species' health and to conduct wildlife management projects.
- A GIS-based app informs hunters of changing conditions.
- Maps of wildlife management units guide the practices of multiple departments as well as residents.

In Pennsylvania, where roughly 1.5 million white-tailed deer roam, the hunting seasons running from September to January are based on firearm type.

Hunting is big in Pennsylvania. In fact, every Pennsylvanian has state game lands within a 20-minute drive of their home. The Pennsylvania Game Commission (PGC) manages the state's 1.6 million acres open to the sport. Hunters can view interactive maps and dashboards on the PGC's app or website to see when and where to hunt, state regulations, and how to report their harvests.

Staff at PGC keep this information accurate and widely available using GIS technology. With GIS as part of the PGC's larger IT enterprise, data flows easily from apps to maps to dashboards.

"We used to just have a list of Wildlife Management Units and a black-and-white map," said James Whitacre, GIS Services Division chief at PGC. "Now we have harvest dashboards for the four big game animals of deer, turkey, elk, and bear to keep track of what hunters are taking. We have a hunter notification map they can use to stay in touch with changes and plan their hunting and recreating."

The PGC runs public awareness campaigns to educate both hunters and nonhunters about safe hunting practices, the importance of respecting wildlife, and the rules and regulations governing hunting.

Determining Zones to Manage Wildlife

In addition to big game, the agency uses GIS to manage hunting zones and habitats for a long list of small game, furbearers, and migratory birds. It regulates different seasons for hunters using rifles, bows, traps, falcons, and muzzleloaders—a throwback to pilgrim times.

Hunters have a significant impact on the state's economy with purchases of guns, ammunition, clothing, and other equipment. Hunting license fees and wildlife restoration grants fund the maintenance of healthy forests.

To keep wildlife and human activities in balance, PGC biologists analyze species numbers, hunting impacts, and disease mortality using GIS. The PGC also uses GIS to identify areas critical for conservation and to implement conservation plans and policies.

The PGC modernized its maps in the mid-2000s, examining research and statistics using GIS. Staff determined large-scale WMUs based on habitat and human-related land characteristics. Other considerations included human population density, public/private landownership; recognizable physical features such as major roads and rivers; and land-use practices such as agriculture, timber, and development.

The Pennsylvania Game Commission modernized its Wildlife Management Unit (WMU) map as part of a larger

← The Pennsylvania Game Commission runs public awareness campaigns to educate both hunters and nonhunters about safe hunting practices, the importance of respecting wildlife, and the rules and regulations governing hunting.

digital transformation from paper maps to enhance usability, accessibility, and interactivity. By integrating GIS technology, the commission created dynamic maps that are layered with various datasets, such as topography, landownership, roads, and hunting boundaries to provide a detailed view of WMUs.

The management units largely line up with habitat and species variability. The new system simplified areas to be monitored from as many as 67 units down to 21. This made it easier for hunters to access information and collect and analyze data for management recommendations. A constant flow of data helps the PGC guide periodic reviews of WMUs.

The PGC creates species-specific maps to guide where to hunt depending on what the agency is managing. For instance, hunters have 23 WMUs to choose from for deer—delineated based on the deer population and the capacity of the land to support it. Deer thrive in Pennsylvania, and the state has the highest deer hunter density of any state, according to the National Deer Association.

Making Changes Based on the Latest Data and Science

PGC teams adjust management practices inside each WMU based on the latest knowledge about how animals behave, their life cycles, and habitat conditions. As part of the modernization effort, they focused on creating one authoritative GIS dataset across the state so that each region can edit in a central place.

"One of the reasons we always struggled with central data is that we're a distributed workforce," said Daniel Jones, GIS project manager at PGC. "We have six regional offices, 40 habitat crew offices across the state, lots of home offices, and biologists that are working in remote locations. So being able to tie all that data together

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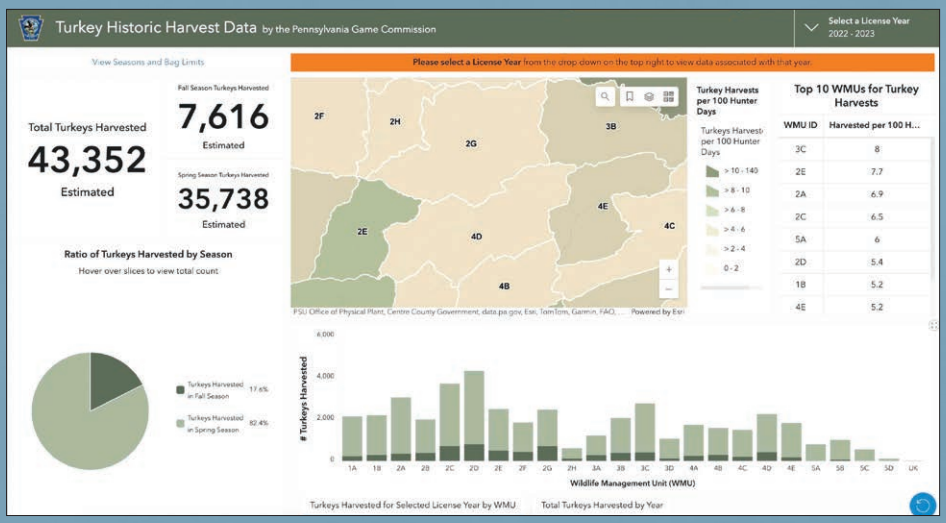
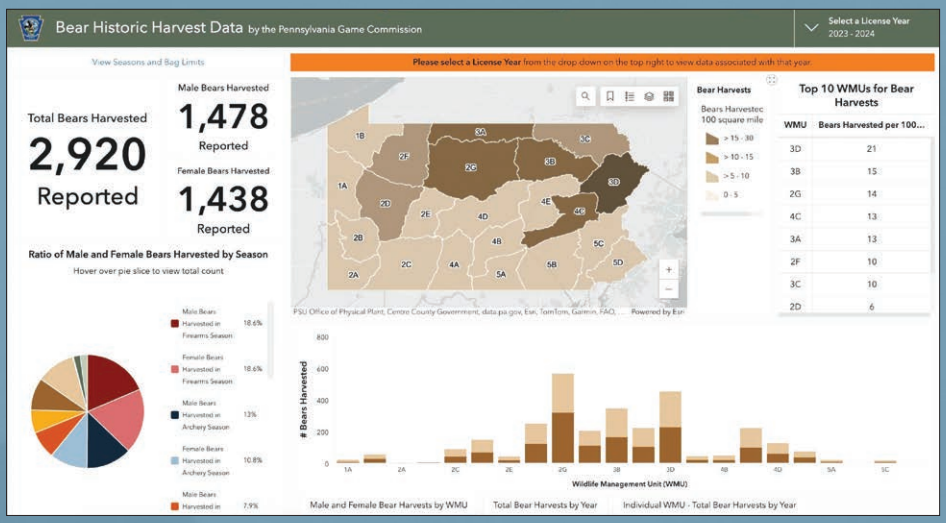
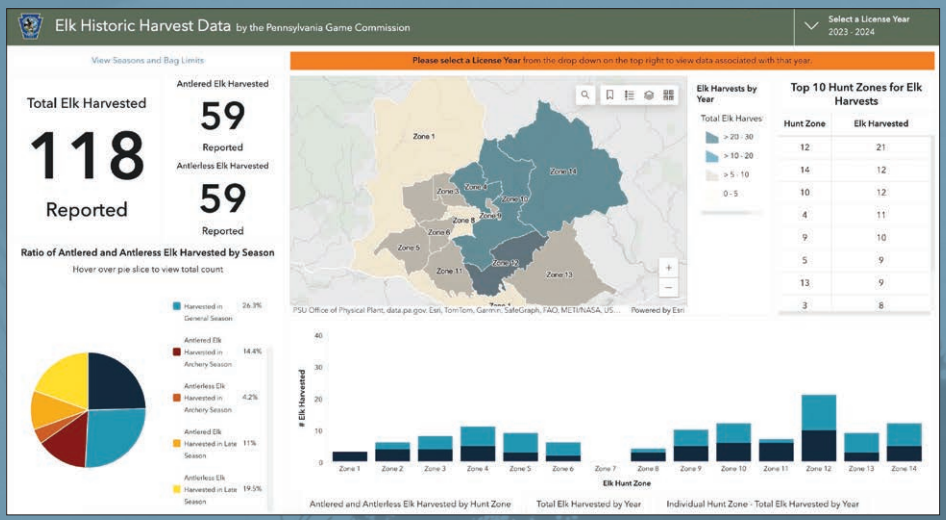


↑ The Pennsylvania Game Commission's turkey dashboard provides a comprehensive overview of wild turkey populations and hunting-related data within the state.



↑ Hunting is used as a management tool to control bear numbers, prevent overpopulation, and minimize human-bear conflicts. By maintaining a balanced population, the Pennsylvania Game Commission helps ensure the overall health of the bear population and the ecosystem.



↑ Elk hunting in Pennsylvania is highly regulated, with limited seasons and a lottery system for permits. In 2001, Pennsylvania held its first modern elk hunt since the species' reintroduction.

into a central data source was always really a challenge for us, and it impacted data quality for decision-making."

The shift to mobile devices and apps has helped accelerate data access and knowledge sharing. Statewide GIS services have consolidated local data to ensure transparency and awareness of trends.

For instance, the PGC combats invasive species and improves forest health with prescribed fires on nearly 20,000 acres of state game lands each year. GIS is integral to the planning and implementation phases. Because this data originates in GIS, it can be easily transferred to apps for those conducting each burn and for the public.

Bird nest boxes provide another work-in-progress example. The PGC manages a network of more than a thousand across the state, placed in sites suitable for foraging by different species. Field crews added each box to the map to help ensure they are maintained and cleaned after each nesting season.

Nest boxes also act as a data collection point to monitor species' health or improve distribution. The PGC added nest boxes for barn owls to reintroduce them to their natural range, and for American kestrels to monitor their health and declining population.

An app-based approach guides each foray into the field and informs an ecosystem-level awareness of how each species is faring.

"Getting tools into the hands of our field staff who know and can share the boots-on-the-ground information is critical," Whitacre said. "It also aids researchers who are going out to make observations and do any sort of monitoring."

Deer hunting in Pennsylvania is a major recreational activity with a substantial economic impact and a rich cultural tradition, and it plays a critical role in wildlife management and conservation.

Projects to Make Improvements

While the PGC focuses primarily on bird and mammal species, staff work closely with other state agencies that also focus on conservation and the environment. The Pennsylvania Fish and Boat Commission manages fish, reptiles, and amphibians. The Department of Environmental Protection manages water quality. The Pennsylvania Department of Conservation and Natural Resources oversees habitats, with forest and parks divisions tasked with managing one of the largest public forestland expanses in the eastern US and more than 100 state parks.

The PGC takes on projects to support these other agencies. A recent project, the Aquatic Organism Passage program, converts a large number of culverts into bridges. Culverts work well to divert stormwater and keep roadways clear, but they cut off the movement of aquatic species. Bridges restore streams to their natural state and improve connectivity for fish and other aquatic animals.

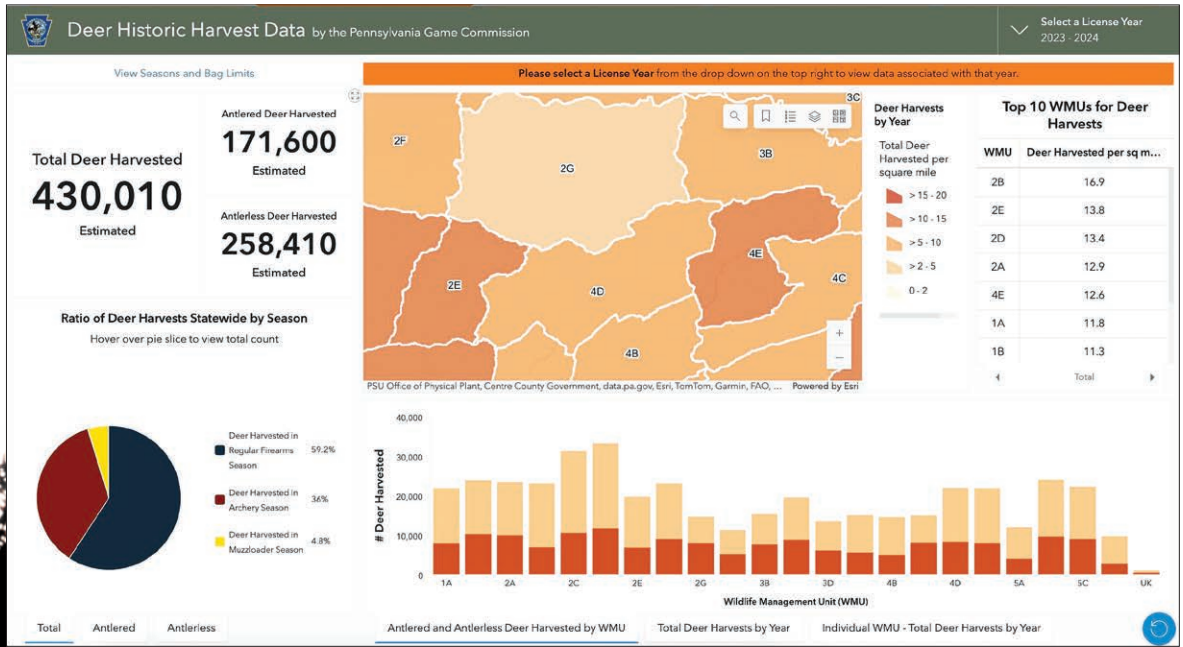
"We put a lot of funding into that, even though fishing is outside of our realm, because it increases the overall value of that recreational space for hunting and fishing," Whitacre said.

The PGC's habitat crews are also involved in restoring lands reclaimed from old strip mines and other industrial activities.

"We use GIS to plan how to properly restore habitat," Whitacre said. "We determine whether to rebuild a forest or create a grassland."

Encouraging Hunters to Manage Wildlife Sustainably

When a deer population grows too large, they can overgraze an area and disrupt ecosystems. This happened in Scotland to the point where fences were needed, and



→ Deer hunting in Pennsylvania is a major recreational activity with a substantial economic impact and a rich cultural tradition, and it plays a critical role in wildlife management and conservation.

trees and plants had to be reintroduced to the landscape. Hunting can prevent such problems.

"Hunting is a sustainable practice if it's done correctly and managed well," Whitacre said. "There are plenty of people in Pennsylvania who rely on a yearly harvest, and we rely on hunters to manage species numbers and their impacts."

To encourage potential hunters and ensure the sport continues, organizations such as Backcountry Hunters & Anglers and the Ruffed Grouse Society have invested in marketing efforts.

"It's a priority for us too to recruit the next generation of hunters," Jones said. "Not only a younger generation, but a more diverse population of hunters, including women and others who historically weren't involved in hunting. We have different mentored programs, going into the inner cities to get people involved in hunting."

The state's GIS app is helping, particularly for those who didn't grow up hunting. On dashboards, hunters can see trends and learn where other hunters are succeeding. The app sends alerts to hunters about what to be on the lookout for and places to avoid—such as areas scheduled for prescribed burns.

"When the snow melts and the trees haven't greened out yet is when we have an opportunity to burn. But that happens at the same time of year when hunters are trying to get out in the woods after being cabined up all winter," Jones said. "With the hunter notification app, we can share where we're going to burn so they can plan accordingly."

To learn how conservation organizations use GIS to streamline natural resources management, please visit go.esri.com/NatResources.

Addressing Chronic Wasting Disease in Deer

Post-pandemic, people are increasingly concerned about diseases being spread by animals. The deer population, for instance, has contributed to an increase in Lyme disease because deer transport ticks that carry the disease.

The PGC works with researchers looking at disease trends, with such things as white-nose syndrome in bats and a new, troubling issue of rabbit hemorrhagic disease that could impact the state's abundant snowshoe hare population. This research relies on location data to understand the conditions and how diseases are spread.

One of the big wildlife health issues in Pennsylvania and other Eastern states is chronic wasting disease (CWD), which attacks the spine and brain of deer. CWD is a prion disease, like bovine spongiform encephalopathy (also known as mad cow disease) in cattle. Prions create a chain reaction that makes spongelike holes in the brain. CWD prions can live in the environment and stay valid for years or decades. They can travel through waterways and be transferred through saliva or urine. As the deer population increases, so does the likelihood that CWD will be transmitted.

"Right now, the method we use is to reduce deer numbers in areas where they're affected," said Daniel Jones, GIS project manager at the Pennsylvania Game Commission (PGC). "We allocate more licenses and tags for antlerless deer in those areas."

CWD threatens hunting in Pennsylvania and across the United States.

"One of the interesting things about CWD that I find just crazy is that it has an incubation period of one to two years before the deer even show any symptoms. Then when they show symptoms, they're dead within weeks," said James Whitacre, GIS services division chief at PGC. "That presents a particular problem because it is spread and goes undetected for so long. That infected deer has already been a vector, spreading the disease, long before it passes away."

The PGC has GIS-driven workflows to map and analyze CWD, and shares information with the public using a map-based story created with ArcGIS StoryMaps. Hunters can test the deer they've taken, and deer found on roadways are tested. The results of the tests are posted on a public CWD dashboard.

"It's a transparency thing," Whitacre said. "We have a heat map of where the positive deer have been found. And we have a whole system of disease management areas that we manage."

Families for Safe Streets: Turning Faceless Numbers into Stories with GIS Tools

Every day, 120 people are killed and over 14,000 suffer life-altering injuries on US roadways. Families for Safe Streets (FSS), a nonprofit organization that advocates for lifesaving legislative and policy changes, believes that every life-altering crash is a policy failure. To support its advocacy work and present compelling data to drive change, the organization has adopted GIS technology.

FSS is composed of people who have lost loved ones, been injured, or cared for someone who was injured in traffic violence. Across the US, individuals affected by traffic violence have established chapters to fight for change in their local communities, while hundreds more are advocating for change in communities that do not yet have a chapter. With GIS, FSS chapters can memorialize loved ones, visualize the magnitude of traffic violence, and provide precise data to the media as they cover these tragic events, ultimately driving awareness and policy change.

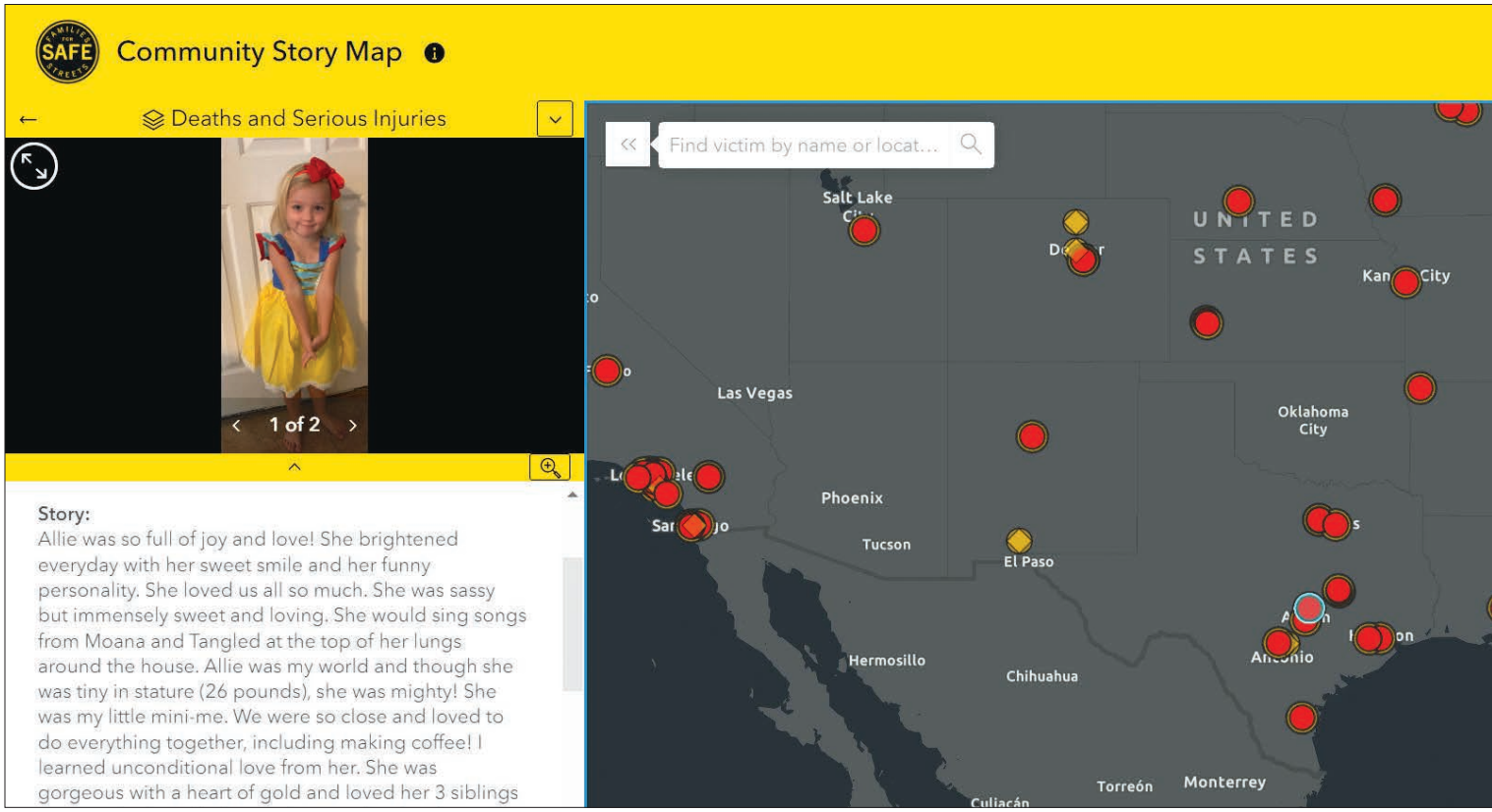
Memorializing Lost Loved Ones

Although more than 44,000 people are killed on US roadways annually, few people recognize the scale of the crisis.

FSS members recognized the need to raise awareness about the numerous lives lost and affected by traffic violence. Previously, they only held in-person memorials and vigils to honor those who lost their lives on the road. But there was a need to memorialize those impacted at a larger scale. So when FSS members attended a National Safety Council meeting and came across the *Celebrating Lost Loved Ones* GIS-based map, they felt inspired to do something similar. The map aims to reduce the stigma around addiction by having families and friends add pictures to the map of loved ones lost to opioids and substance use disorder.

"We work closely with the National Safety Council and came across the opioid map and thought, 'Wow, we need this too; I wonder how they developed that,'" said Amy Cohen, cofounder of FSS. "We truthfully thought it would be a fortune, but we reached out [to Esri] and were thrilled to be able to launch our own map so easily."

FSS members used tools such as Attachment Viewer in ArcGIS Instant Apps to build the Families for Safe Streets Community, an interactive map that serves as an online memorial space, providing a way for those affected to share stories and build community. By showing the faces, stories, and life-changing consequences behind the



statistics, the map helps humanize a public health epidemic—one of the most effective ways to move decision-makers to change.

The FSS's community map has been a great tool to identify new advocates and connect them with a local FSS chapter or even, in some cases, create new chapters depending on need.

Leveraging Data Visualization for Policy Change

Data visualization tools are powerful when communicating a cause, building a community, or making critical decisions such as policy change. Unlike spreadsheets that make it hard to comprehend and digest large datasets, imagery such as infographics or maps allow a viewer to easily understand what is being communicated.

"This map is becoming instrumental for local and statewide advocacy, as we are able to regularly share the map with legislators and media groups," said Cohen.

After witnessing the map's strong impact in bringing advocates from all over the nation together, the Philadelphia FSS chapter was inspired to use the map as a tool for promoting the expansion of speed safety camera programs within the city. Successfully expanding the program, FSS members continue to see how powerful data visualization tools are for advocacy efforts.

Maps Lead to Increased Community Engagement

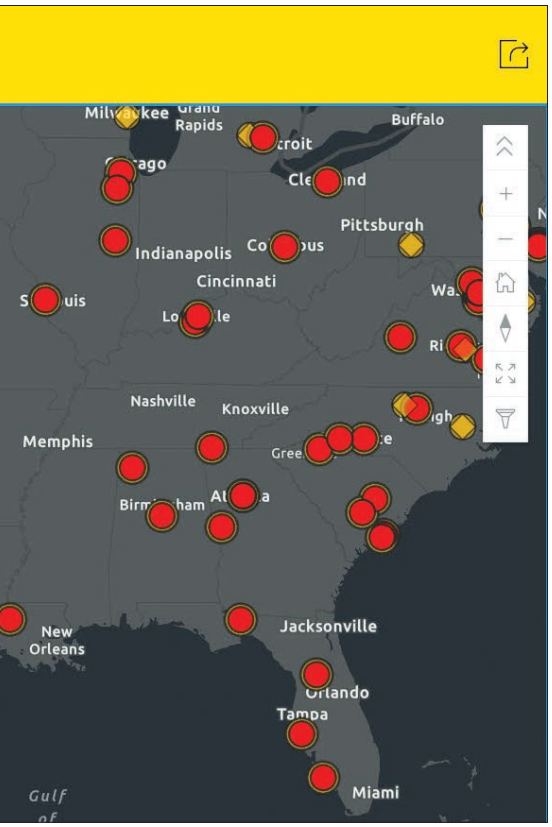
A huge part of the role of civic nonprofits is to educate the public on the issues they support. This allows them to find new advocates and volunteers as well as opportunities for media coverage. However, without data visualization, organizations struggle to communicate their causes to audiences who may not be directly impacted by them.

"By collecting community stories as we are now, on the map, the public is able to easily understand our cause, which has resulted in a lot more media coverage," said Cohen.

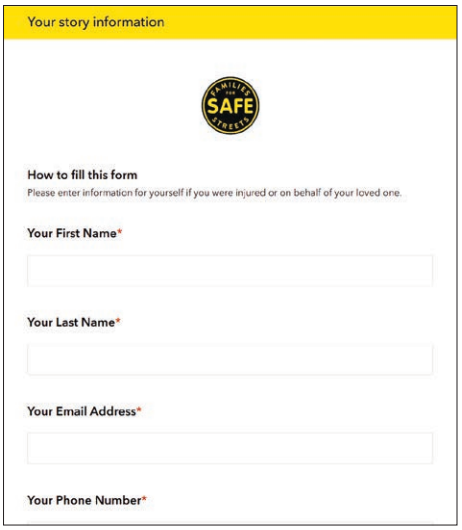
The Families for Safe Streets community map has turned statistics into people, giving names to them and sharing their stories for all to access. It provides an opportunity to unite a country around a cause and allows the grieving to attach photographs and stories to what was once a faceless statistic.

The Road Ahead

Setting up a digital memorial is only the first step for FSS. Moving forward, organization members aspire to leverage GIS technology to analyze demographic data around traffic deaths and identify any commonalities in the communities most impacted. This will provide greater insight into what sort of legislation the organization should support. The FSS's digital map honors and remembers those lost to crashes and those who have suffered life-altering injuries. GIS tools allow FSS to expand its reach and continue to advocate for safer traffic safety measures.



← The Families for Safe Streets' interactive community map plots out traffic deaths and serious injuries throughout the US while also memorializing those impacted by traffic violence.



↑ The FSS's map directly links folks to ArcGIS Survey123, where they fill out a survey with information about their affected loved ones. The survey then directly adds this information to the map.

To learn more about the Esri Nonprofit Organization Program, please visit go.esri.com/NPOGov.

GIS Helps Hampton Shaler Water Authority Streamline Efficiencies

Hampton Shaler Water Authority (HSWA) is a midsize water authority located in western Pennsylvania serving the Townships of Hampton and Shaler; the Boroughs of Etna and Sharpsburg; and portions of the Townships of O'Hara, Indiana, Richland, West Deer, Ross, and McCandless, and the Borough of Millvale. HSWA's water source is 12 groundwater wells, and it distributes between five and six million gallons of water per day to approximately 26,000 water customers. The water is metered for residential, commercial, industrial, and institutional uses, as well as bulk sales to commercial/municipal customers. It is unmetered for internal use, including flushing and testing purposes.

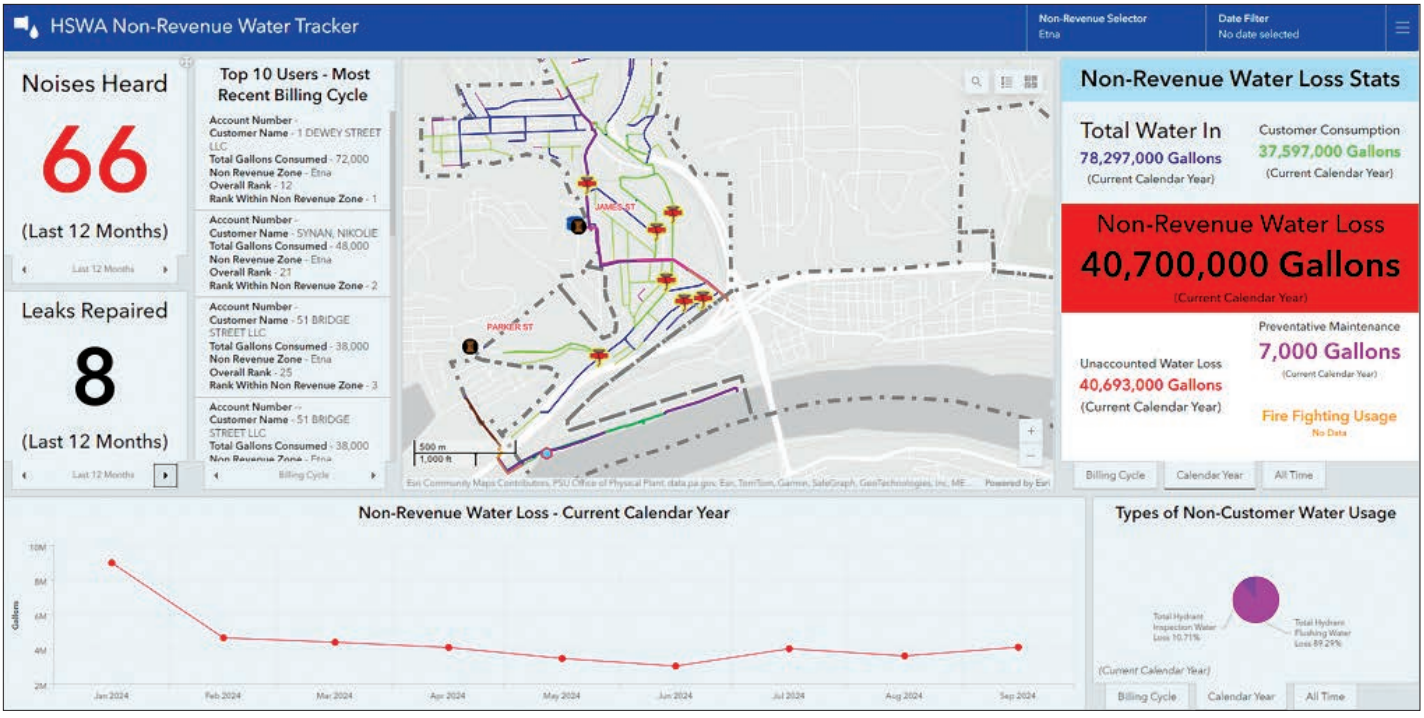
Accounting for Nonrevenue Water

HSWA knew over 35 percent of the water sent out into the system was unaccounted for. This nonrevenue water includes anything that isn't billed to the customer (e.g., billing errors or stopped meters), doesn't make it to the customer (e.g., leaks), or is used to ensure the quality of the water (e.g., flushing operations), as well as the occasional firefighting/training uses. HSWA needed a way to find where its water was missing or unaccounted for so staff could improve the services they were providing and save money. Accounting for nonrevenue water would also help HSWA improve datasets needed for better-informed management decisions (e.g., line replacements/leak detection efforts) and for annual reporting to state agencies.

With recent investments in GIS technology, HSWA has been able to capture flushing data (both automated and manual) and leak information in real time. The next step was using GIS to help find where the unaccounted-for water was going by utilizing existing regional master-meter data and individual account meter reads in the corresponding region. This would help identify leaks, address billing issues, and reduce water losses.

Partnering for Success

Esri partner geographIT, a division of EBA Engineering, Inc., is headquartered in Laurel, Maryland. The firm has 15 GIS staff members who provide comprehensive GIS and application development services. These services include cloud and on-premises enterprise GIS deployments, water/wastewater data and processes, ArcGIS Utility Network implementation, system integrations, tool migrations from ArcMap



↑ An ArcGIS Dashboard keeps all stakeholders accountable and informed.

↑ An HSWA staff member uses geophone equipment to listen for noises to help identify leaks in the area.

to ArcGIS Pro, emergency management support services, Next-Generation 911 support, and local municipality support. The team includes EBA's project manager Joe DeLuca, GISP; HSWA's executive director April Winklmann; and HSWA's distribution manager Jacob Casile.

Esri Apps Turn Data into Understanding

The team set up tables in the HSWA water geodatabase to record regional/zone master-meter readings and customer meter readings captured in HSWA's billing database. They also configured an on-demand ModelBuilder process to auto-import the hydrant and flushing data into the GIS database. EBA worked with HSWA to identify regional locations in their service area that had meters on all incoming water sources. Filters were created on the data to track both the date and location of the activity/reading. Meter readings for both billing and the associated regional master-meter data are captured per monthly meter reading cycle, as are the leak and flushing data. An ArcGIS Arcade expression was used along with ModelBuilder to calculate water usage from automated flushers by both day and month. This information was combined in an ArcGIS technology-based dashboard that includes filters for both the date and regional areas being tracked. There are currently five regional areas that are being tracked and have been added to the dashboard. As seen in the image, the dashboard displays the count of noises heard; the number of leaks repaired by month and year; the top 10 customers (calculated by usage) by billing cycle and year; flushing data by month/billing cycle, year, and all data captured to date broken out by flushing type; and a chart showing nonrevenue water by month. The dashboard also includes a calculation of total regional metered water; water consumed by customers; unaccounted water loss; and accounted-for flushing water usage by month, year, and all time. Another ArcGIS Arcade expression was used along with ModelBuilder to calculate the nonrevenue water loss stats, including total water in and out to customers, unaccounted-for water, and combined nonrevenue water usage. Future plans include adding firefighting/training water usage and expanding to other service areas.

Saving Water

HSWA was losing more than nine million gallons of water per month in the Etna area before starting nonrevenue water loss data tracking. Over nine months, eight leaks were found in this area, and the repaired leaks resulted in six million fewer gallons of water lost every month. The authority also conducted a detailed search for leaks in the Sharpsburg area, which was losing five million gallons of water each month. Thanks in part to the information shown on the dashboard, staff found and repaired a leak, which stopped almost all the nonrevenue water loss in that area. The Sharpsburg leak was buried nine feet underground, beneath an abandoned railroad. The leak was in an area with sand and gravel alluvial materials, meaning there were no apparent signs of a leak above ground. The leak likely would not have been found if the losses weren't identified in this area.

This data has proven to be in sync with what crews are finding on the ground. Water usage trends going up are often quickly followed by field crews hearing noises in the associated area while checking for leaks. As leaks are repaired, water usage trends drop, identifying the approximate amount of water that was being lost through each repaired leak. When shared with the management team, this data helps plan both short-term leak detection/repair work and long-term line replacement priorities. Overall, this GIS-aided process helps streamline and solidify decision-making. HSWA, using this new data system, has saved millions of gallons of the precious resource of water.

To learn more about GIS for water utilities, please visit go.esri.com/WaterResourcesSLG.

> **"Having these processes in place helps us to identify leaks that have been an issue for months or years. Thanks to this success, we are looking to invest in additional regional meters and expand the program throughout our service area as appropriate."**
>
> **Jake Casile**
> HSWA Distribution Manager

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