Esri News

for State & Local Government

Keeping Local Waterways Clean Begins in the Streets

The City of Hillsboro Public Works Operations Division partnered with the information services geographic information (GIS) team to demonstrate municipal separate storm sewer system (MS4) compliance and track street sweeper vehicle location data in real time.

In Hillsboro, Oregon, street sweeping is provided by the city's Public Works Operations Division, which is responsible for cleaning over 460 curb miles of paved streets. Its primary objective is reducing the amount of particulate matter, leaves, and debris that enters the stormwater system and local waterways such as the nearby Tualatin River.

To safely discharge water runoff into surrounding environments, the city must maintain MS4 compliance, which includes sweeping all roads at least

> GIS is key to your community's ability to build lasting infrastructure using available federal funding opportunities. See pages 18–23 to see how your peers are using a geographic approach to build the future.

12 times a year. To fulfill this requirement, the city had to export vehicle path data from each street sweeper's automatic vehicle location (AVL) system, a computer-based vehicle location tracking system. However, visualizing this data

↓ One of the City of Hillsboro's street sweepers is pictured below.

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Keeping Local Waterways Clean Begins in the Streets

from a disparate system and turning it into a static PDF was a time-consuming manual process.

In addition, staff could not instantly know which streets or areas had not been cleaned. If a community member had questions related to sweeping or if drivers wanted to retrace their steps, staff couldn't immediately address those concerns.

The information services GIS team used ArcGIS GeoEvent Server, a capability within ArcGIS that captures real-time data streams, to pull vehicle data directly from the AVL system into the city's ArcGIS Enterprise portal as a data layer for future use.

The team also ensured that every time it receives data, it includes other critical vehicle path details besides location, such as speed, the orientation of the vehicle, mileage, and whether the vehicle was sweeping at that exact moment.

Once the data was hosted on the city's portal site using ArcGIS GeoEvent Server, Layne LeBleu, a GIS and asset management technician for the Public Works Operations Division, developed user-friendly web apps. Using ArcGIS Web AppBuilder, a web-app-building tool, LeBleu published live AVL data to the Public Works Sweeping app and the Public Works Sweeping Dashboard to meet stakeholder needs.

"Gone are the days where I have to spend five hours at a time to extract information for staff and reporting purposes," said LeBleu. "Now I just make changes to the apps as needed. Staff can look at the app and instantly know where to sweep next."

The street sweeping workflow is also a 24/7 MS4-compliance reporting system. Operations are archived to track street sweeping information over any custom time frame. The Public Works Sweeping Dashboard complements this aspect, since the Public Works Operations Division can filter down to specific areas,
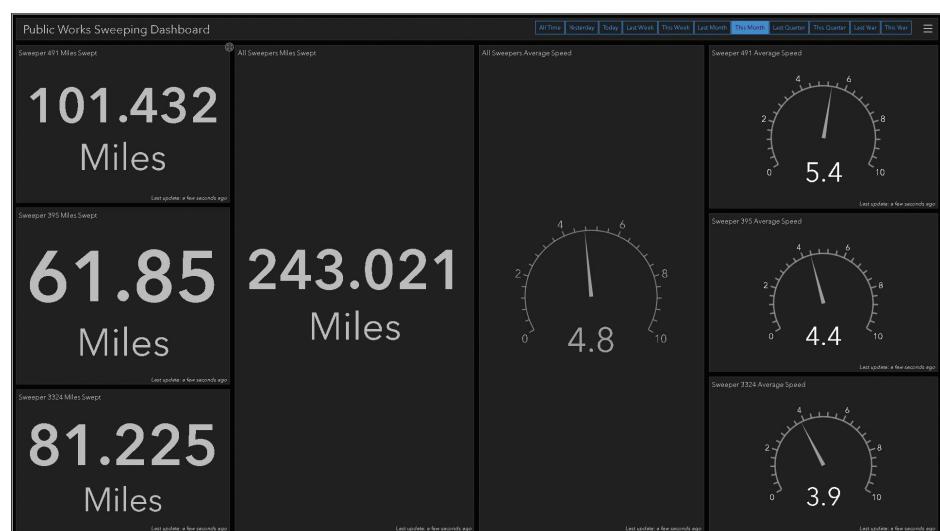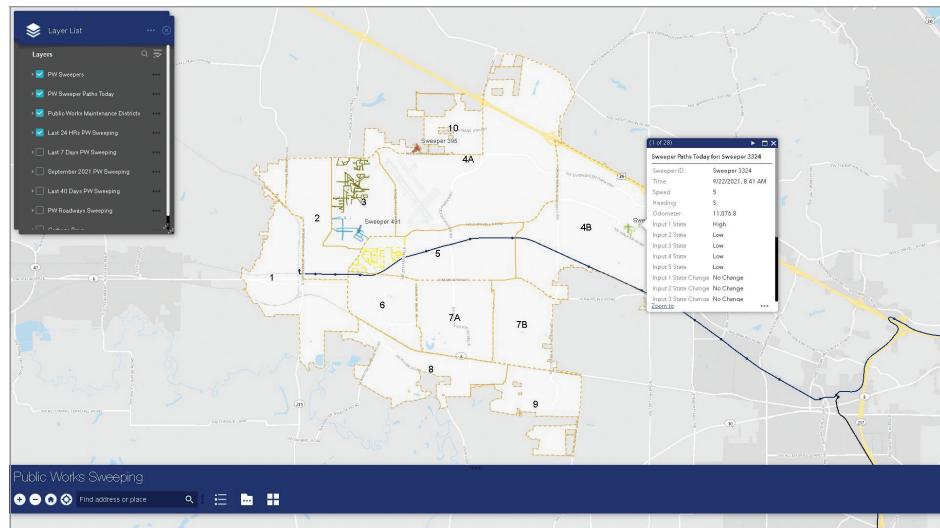
↑ The real-time sweeping app and dashboard make it easy for staff to visualize progress and street sweeping metrics.

routes, and dates and determine if the city is in compliance.

Out of this effort, staff also created a winter weather application that uses the same methodology for the city's snow-plowing and deicing efforts in the winter months.

"As we [the City of Hillsboro's information services GIS and Public Works GIS teams] integrate the AVL data into GIS, the public works team [members] can begin to see where else t hey can use this workflow," said Kristin Judy,

information services GIS analyst. "We're now waiting for the first major snow event to arrive this year to test our winter weather applications."

For more information on how agencies can use GIS to streamline field and fleet management, visit go.esri.com/hillsboro.

El Jebel, Colorado, Saves Thousands Using Augmented Reality and GIS

Crawford Properties, LLC, owns and manages a residential and commercial mobile home community in El Jebel, Colorado. The company is responsible for El Jebel's 5.4 square miles of underground assets, including water, sewer, gas, and electrical infrastructure, which are needed to support this growing community just outside Aspen, Colorado.

The Colorado 811 organization divides facility owners like Crawford into tier one, tier two, and home rule cities to improve safety and prevent damage to valuable underground assets in Colorado communities. Crawford is a tier one member which means it must respond to all 8-1-1 phone calls with utility location requests on its property. Colorado subsurface utility engineering regulations require tier one members to document when areas have been marked before roadwork, development, or other digging projects can begin. Crawford's staff needed a faster, more accurate way to record assets and their responses to 8-1-1 requests, reduce clerical errors, and mitigate any financial exposure due to inaccurate or slow response. Using the latest in GIS and augmented reality (AR) technology, staff simplified how they locate assets and saved thousands of dollars in labor costs alone.

Crawford also faced the retirement of an essential employee. For almost 60 years, the comapny's supervisor, Noel, had gathered an almost encyclopedic knowledge of the underground pipelines and utilities that support life and business for El Jebel's 1,600 residents. The city's sewer infrastructure consists of plastic piping with no tracer wires, so it wasn't easy for others to access what Noel had mentally cataloged through his years of work. With this in mind, Crawford began to look at possible solutions to better support knowledge transfer and improve the locating team's access to geospatial information.

Crawford selected Argis Solutions to help solve this multilayered problem. Argis is a Denver, Colorado-based Esri partner focused on integrating GIS with augmented reality and mixed reality. Argis's mobile app, the Argis Lens, translates ArcGIS feature services into augmented reality in real time. The Argis Lens offered Crawford a cost-effective method for cataloging and communicating the valuable information that was currently only accessible through Noel. It
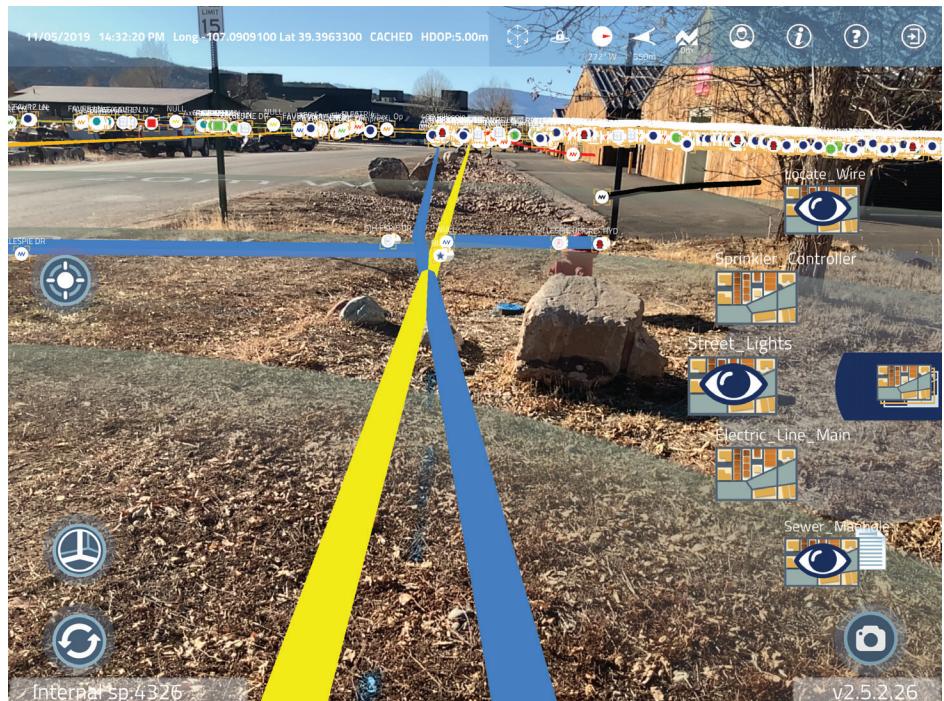
↑ This screen capture shows Crawford's ArcGIS data in the Argis Lens.
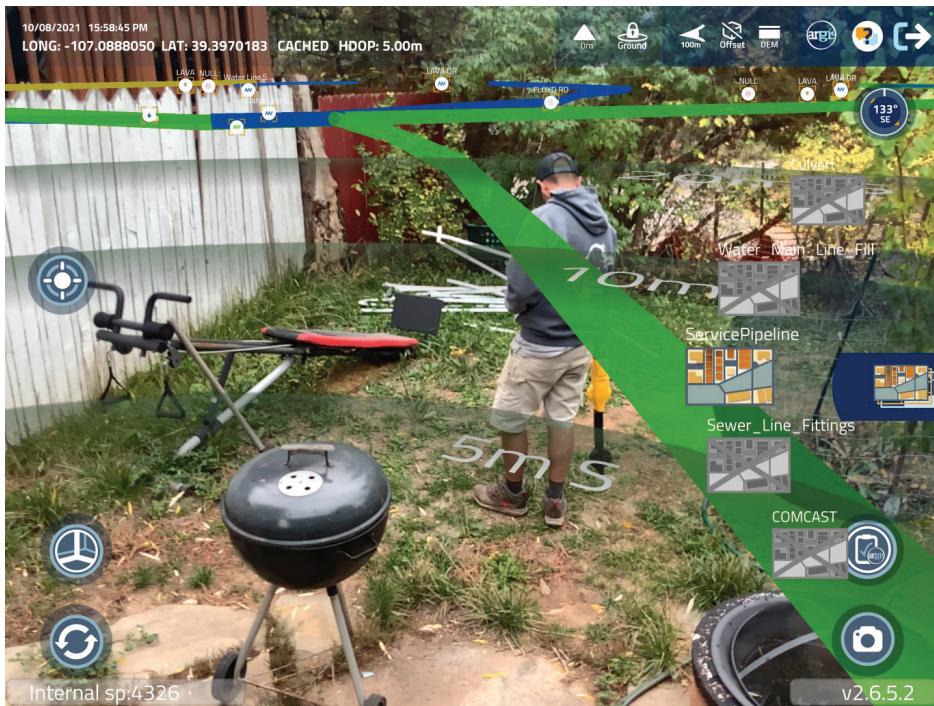
↑ A Crawford crew member measures with a magnetic wand while another crew member takes a screen capture in AR to document the location of service pipeline.

would also help Crawford's mobile workers document data directly at the work site, keeping all stakeholders involved in the excavation process better protected from potential damages.

Crawford moved all its GIS data to ArcGIS Online—a cloud-based mapping system for creating, analyzing, and sharing maps—to consolidate information into one dynamic system of record. Whenever new assets are placed, a Crawford locating team visits the site and records the asset's coordinates using ArcGIS Collector, a mobile data collection app, with a Global Navigation Satellite System (GNSS) receiver via a tablet. This data is then fed directly into ArcGIS Online onto a feature layer where it is maintained.

Using a tablet, mobile workers view the collected data, which ranges from sprinkler heads to electrical wires or sewer pipes. The Argis Lens allows them to verify the data's accuracy and record images near known points and landmarks. When location requests are submitted, the location team uses the Argis Lens and ARTMS, Argis's augmented reality 8-1-1 response system, to manage the entire location request on-site in one stop. ARTMS ingests Colorado 811 marking requests and shows 8-1-1 responses directly from the field within the application. Because ARTMS is an extension of ArcGIS Workforce, team managers can also use it to track workers and tickets. Combining ARTMS with the Argis Lens keeps mobile workers safer. They are armed with visual situational awareness of surrounding systems made visible on the AR map. If the ArcGIS data requires updating, the mobile worker uses the tablet and GNSS receiver to update the data directly at the work site.

This new workflow focuses on mobile worker empowerment. It allows all GIS locating and documentation to occur at the work site. Crawford Properties is reducing postprocessing activities by two hours a day, saving $7,500 yearly in labor alone in 2021. Data quality has improved, and data is more functional and accessible. With ARTMS, Crawford has excellent documentation for 8-11- location response requests, verifying the full record of information provided. Better documentation minimizes Crawford's loss exposure and protects the El Jebel community, allowing it to operate as seamlessly as possible. Crawford is also beginning to use ArcGIS to measure each mobile home lot to meet state requirements. As it looks to the future, Crawford will be transitioning to ArcGIS Field Maps, an all-in-one app that uses data-driven maps to help mobile workers perform data collection and editing.

"What I love about Argis Solutions' software is that I don't need to change my data model. Its system just uses the data I have in the condition I have. It just extends our current data's power," said Prentice Hubbell, property manager/owner of Crawford Properties. As this affordable-housing community continues to grow and thrive using a geographic approach, the dynamic continuity offered by the ArcGIS system, combined with the ARTMS extension, makes it simple for Crawford's staff to find specialized solutions that make their work faster, easier, and safer.

For more information on how agencies can use GIS to maintain their infrastructure and increase operational awareness, visit go.esri.com/eljebel.

St. Louis County, Minnesota, Saves over $200,000 in Keeping Roads Clean

A GIS-Based Application Streamlines a Program That Turns Community Involvement into Cleaner Roadsides

Adopt-a-highway programs have revolutionized the way America cares for its roadways. Despite the programs' incredible success, each state's program itself can be daunting for local governments to manage. St. Louis County, in northern Minnesota, manages an estimated 2,000 miles of roadways within its limits and relies on volunteer organizations to assist in the roadways' maintenance. What was once a system based on paper maps has now become a web-based GIS solution that saves the county over $200,000 in

↑ Adopt a Highway Signage in St. Louis County

annual labor costs.

Victor Lund is the traffic engineer for St. Louis County and oversees the adopt-a-highway program locally. The county had previously managed the program through an outdated management system. It was functional but not robust. The inability to map and track which volunteer organization was maintaining each road segment, or to see the cleanup status of each adopted roadway in real time, was a real concern.

"With more than three people trying to manage the paper map system, we realized we needed an automated system," said Lund.

The county was in search of a web-based GIS solution that not only could improve productivity and efficiency but also would encourage more community engagement by having a user-friendly public-facing interface. With this vision in mind, the county contracted with North Point Geographic Solutions (NPGS), an Esri partner, to make this application a reality.

Stephanie Boyum, a GIS specialist for St. Louis County, leverages ArcGIS Online—a cloud-based software

that creates and shares interactive web maps—and ArcGIS API for JavaScript, in conjunction with custom code developed by NPGS, to build a user-friendly web application that manages all the adopt-a-highway workflows.

There are two main components to the web application. The front-end component is a map where county employees and the public can view which highway segments are available or unavailable. Public users can create a profile and select a segment they wish to adopt, or be put on a waiting list. They can also ensure that their organization or individual information is entered correctly for their adopt-a-highway sign. This information is then stored in ArcGIS Online, where the data is updated in real time.

The administrator component of the dashboard allows county staff to approve new highway adoptions, verify information, and contact highway adopters. It also allows staff to track when a cleanup was reported and how many bags of trash were collected. A reported cleanup triggers an automated notification to the closest maintenance department garage to send a truck to collect
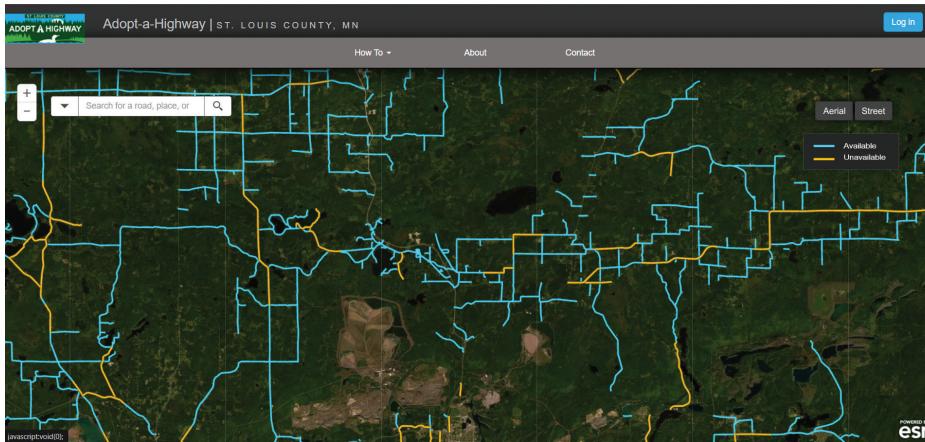
↑ Local adopted and not-adopted segments of highway are shown in St. Louis County's Adopt-a-Highway application.

↑ Staff members from North Point Geographic Solutions are joined by their family members to help clean up the Northeast MN GIS User Group's portion of a highway.

the trash bags. The system automatically generates reminder emails to groups that have not reported the required number of annual cleanups. With over 360 active segments, the application has led to a significant reduction in both the number of phone calls and the amount of administrative hassle.

Another key feature of the application is the public user's dashboard, where cleanup organizers can see all relevant information regarding their segment. The application also automatically sends reminders for scheduled cleanup events. County staff reported that before the application, groups would need to call the county to report cleanups, and the effort to pick up trash bags was uncoordinated. Not only has this application made the workflow easier for both St. Louis County staff and highway adopters, it has also encouraged more organizations to participate in the program. Now they can simply look at the interactive map to see what road segments are available. Before the application, the county had approximately 250 active segments. Now it has over 360, an increase of 44 percent.

Having an efficient and effective GIS-based system to manage the adopt-a-highway program has proved to be cost-effective and have a powerful environmental impact. In 2021, the county had 888 hours of reported group volunteer time. Assuming an average of five volunteers in each group, there

↑ Once an internal (government agency) administrator approves a highway cleanup group (inset), the cleanup group administrator has access to a dashboard for managing the group's members.

could be 4,400 hours of total volunteer time and likely even more. With a rate of $50/hour for a highway maintenance laborer, this would equate to savings of approximately $220,000 in annual labor costs. As for the environmental impact, 2,329 garbage bags—enough to cover a football field—were reported to have been collected in the past year.

Since many government agencies already utilize GIS to maintain their road systems, implementing an application like St. Louis County's Adopt-a-Highway

app allows counties to leverage existing data to augment staff resources and streamline existing programs. GIS can streamline a variety of workflows to improve service delivery and achieve efficient operations by using the most up-to-date data. As a result of implementing a geographic approach, St. Louis County expects the increase of highway adoptions to continue in the coming years.

Out of Sight, Not out of Mind: Moving Buried Assets Using GIS

The City of Sheboygan, Wisconsin, has worked diligently to replace an outdated, stand-alone GIS with an Esri enterprise GIS. Starting in 2017, the city secured resources and implemented a common geospatial platform to efficiently manage data, deploying location intelligence solutions to city employees and taxpayers. However, pipe inspection data was still siloed and inaccessible to many stakeholders.

Challenge

Once the city was on a stable Esri platform, Sheboygan began to look for other data silos that were inefficient. One of the first areas identified was its underground pipe inspection program. The asset management team could not visualize a complete picture of the sewer system and thus often struggled to analyze maintenance and asset data. Gathering, correlating, and managing disparate data were challenges when planning for sewer rehabilitation. The field inspection team's legacy CCTV pipe inspection software was antiquated and lacked any integration with GIS, forcing the team to use printed asset maps and make manual notes. A substantial effort was needed just to keep the system functional. Additionally, the system generated immense video data that was often transferred to physical media, like flash drives, which were siloed and inaccessible to the majority of the city employees.

Partner

ITpipes provides software inspection solutions for water and wastewater utilities to help effectively collect, analyze, manage, and integrate pipeline inspection data in a fully integrated Esri solution. The company is an Esri partner, and ITpipes software is listed on the ArcGIS Marketplace site.
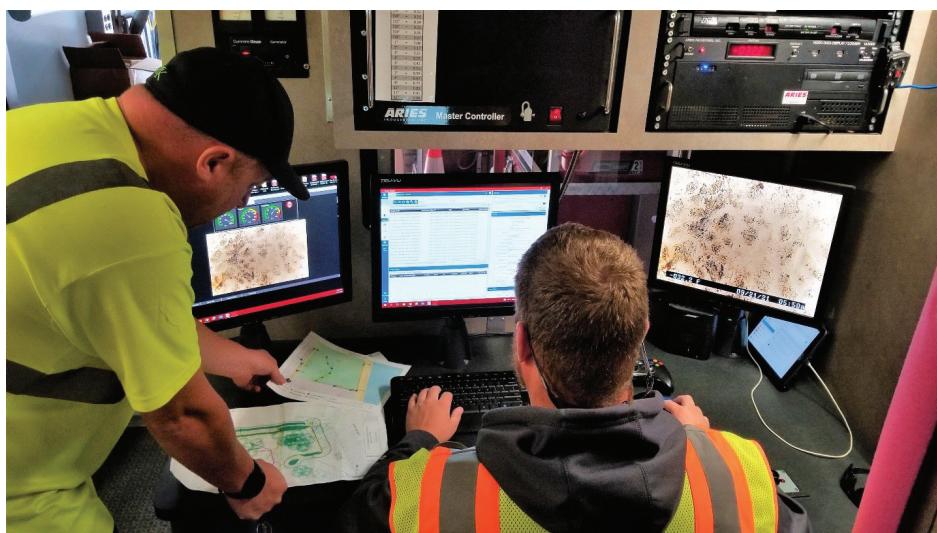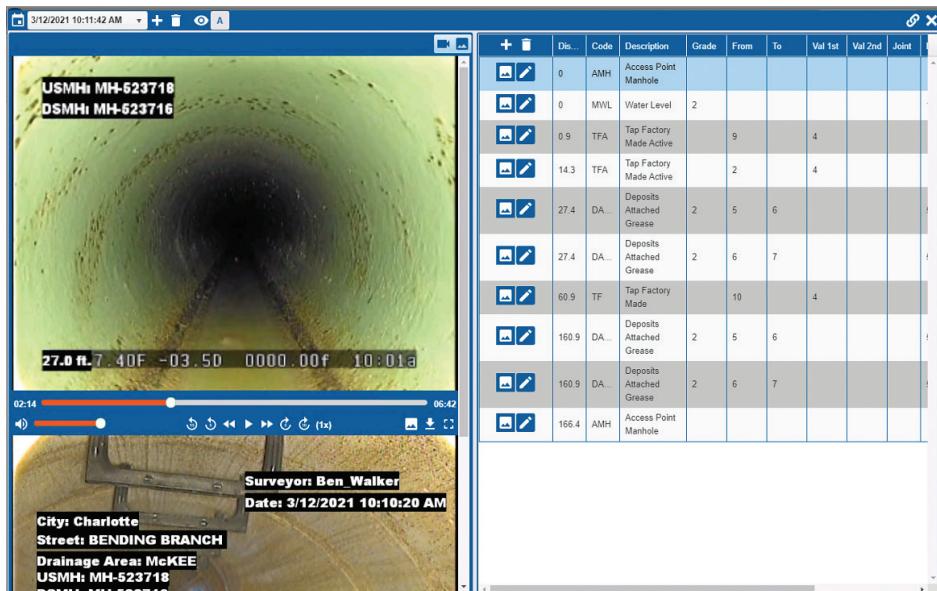
↑ Sheboygan field crews inspect underground pipes using ITpipes Mobile.

Solution

After the city reviewed several solutions, ITpipes software emerged as the best choice to meet the city's needs. ITpipes gave the city powerful ArcGIS mapping tools, and provided pipeline analytics visualization and instant access to comprehensive pipe inspection information. Pipeline videos and condition assessment information would be available with a single click. ITpipes' Mobile, Web, and Sync software offerings were identified as key modules to deliver visibility and control over Sheboygan's underground infrastructure.

The new solution was simple and easy to use for the team. In the field, pipe inspection crews benefitted from map/asset correlation. With ITpipes software directly importing the asset information

from the GIS, asset header information was automatically imported for each pipe inspection. With a simple user interface, crews were able to inspect and notate defects in more sanitary and storm sewer pipes each day. Then, when the field crews returned at the end of the workday, their computers were put online, and the CCTV inspection data automatically synced to ITpipes Web, eliminating "lost" inspection data. Through a configured Esri web app, office staff are instantly connected to the most current pipe inspection videos and reports on their Esri web map.

"I like the ease of operation for ITpipes. Being able to quickly find a line and or pull up videos for reference on a project is very user-friendly. Using the GIS system is much faster than looking through pages of maps, especially when in the field," said Fryman, field inspector at the City of Sheboygan.

Sheboygan now uses Esri's ArcGIS Enterprise as the authoritative source for dozens of datasets, including ITpipes' pipe inspection data. ITpipes' platforms replaced paper maps, increased efficiency of inspection and maintenance

workflows, connected all city employees with data, centralized data efforts, removed duplicate workflows, and allowed for easy data connectivity with constituents.

In the field, crews benefit from map/asset correlation by directly importing the asset information from the GIS, resulting in an increase of approximately 30 percent in the number of pipes inspected monthly.

In the office, the ability to visualize the location of underground pipe defects has been critical for Sheboygan engineers to monitor and plan asset maintenance, repairs, and replacement of pipeline infrastructure in ways they could never before. Utilizing a dashboard created using ArcGIS Dashboards, real-time pipe inspection and maintenance metrics are available to all users, creating accountability and, but more importantly, reducing time spent on compliance reports by almost 90 percent.

In summary, integrating ITpipes software and solutions with Esri's ArcGIS Enterprise has proved to be a cost-saving investment for Sheboygan—multiplying efficiency, increasing data accuracy, and eliminating waste.
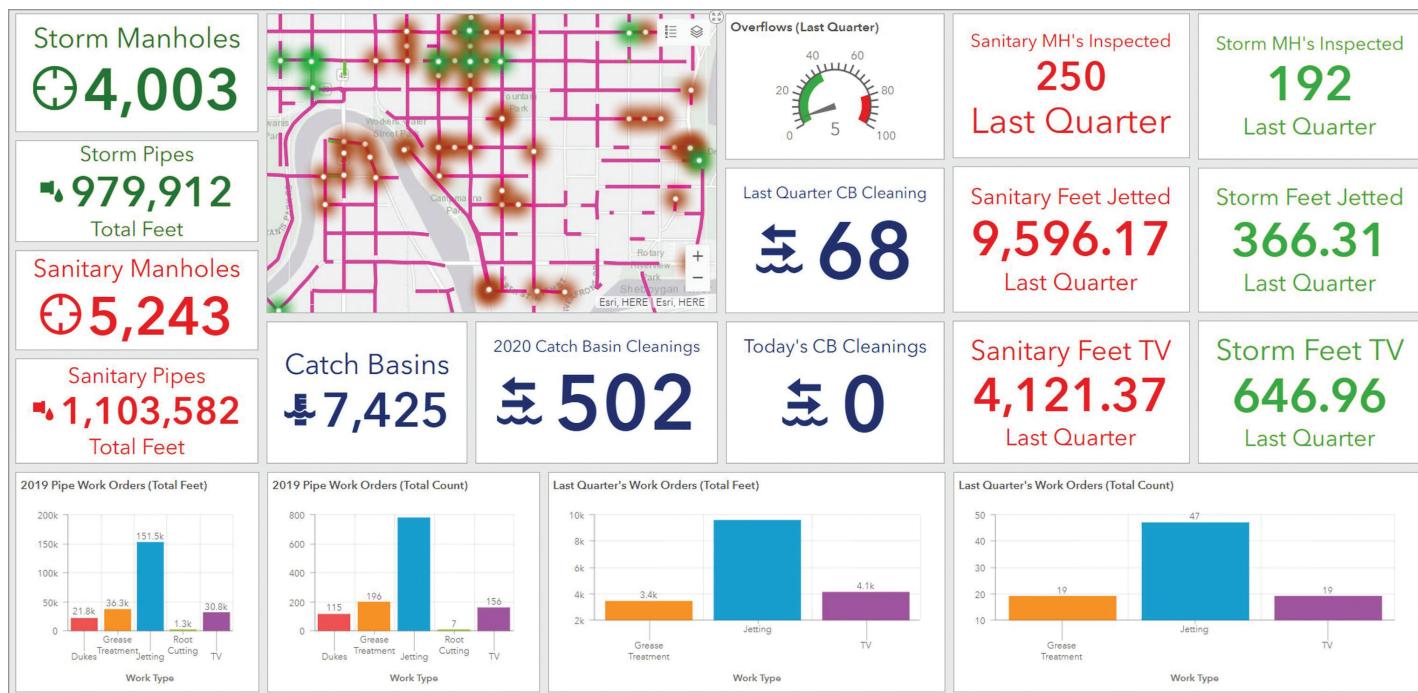
↑ Sheboygan utilizes Esri's ArcGIS Dashboards to broadcast real-time metrics for buried-asset maintenance to all users across the agency.

New ArcGIS Urban Capabilities Drive Neighborhood-Level Planning and Design

In a city, each space affects and reflects the function of every other. The size and shape of each building, parking structure, and green space, taken together, make up the physical form of the city—for better and for worse.

Over the last half century, urban development has tended toward tall glass buildings and wide roads that accommodate lots of cars, with little regard for walkability or more equitable mobility options. But if we look at the kinds of cities that most people seem to want to live in today, we often see that they devote very little space to road transportation and instead center on useful destinations like shops and cafés that people can easily walk or bike to.

To directly take on these challenges, urban designers must take geospatial context into consideration when formulating development plans. That's where ArcGIS Urban comes in. The web-based 3D modeling software enables users to sketch out various design scenarios, model buildings, and measure the performance of their plans by using interactive metrics.

City planners in Uppsala, the fourth-largest and fastest-growing city in Sweden, are using Urban, for example, to design a new district with 33,000 new housing units that will accommodate 50,000 new residents by 2050. The planners wanted to concentrate on sustainability while maintaining the quality of life that current residents of the centuries-old university town already enjoy. With ArcGIS Urban, city planners were able to test different design strategies for the project and run them against sustainability and quality-of-life metrics to ensure that the development wouldn't subtract from the area's existing biodiversity and would still enable the city to meet its goals for reducing carbon emissions.

On the other side of the world, the
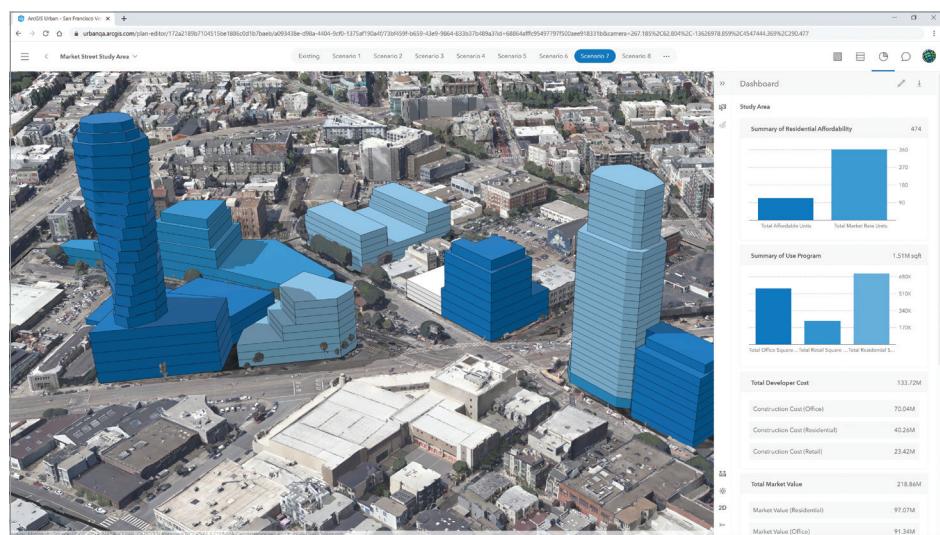
↑ Interactive dashboards enable viewers to visually assess metrics.

City of Des Moines, Iowa, is employing ArcGIS Urban to transform its historic East Village into a more walkable, dense, mixed-use neighborhood. When a local property developer floated the idea of building a new 40-acre market district, the city's planning and economic development teams wanted to visualize the prospective space to ensure that views of the gold-domed state capitol would be preserved. They built a digital twin of the area and, using the technology, were able to balance the desire for urban development and renewal with their responsibility to protect historic views, meet housing demands, and ensure livability and climate resilience in the area.

The past summer's release of ArcGIS Urban contains an assortment of new tools that can help urban planners meet their challenging design goals while giving them a smooth user experience. Read on to find out more about several of these advancements.

More Flexibility When Sketching Buildings

Buildings and space use types, which describe the function of a space within a building, are the centerpiece of any design scenario within an urban plan. Now, in ArcGIS Urban, users can modify buildings that have been procedurally generated and sketch buildings from scratch on a selected parcel by drawing a new space use. This opens up a world of possibilities when creating detailed site concepts. For instance, when drawing from scratch, users can demolish specific buildings, if desired, and then draw one or more buildings on the site, starting with the first floor. They can then easily add floors and incorporate other space uses into the building.

This new sketching capability also allows users to edit individual vertices of building floors, push and pull building walls, rotate building parts, and adjust the elevation of the entire structure. And support for snapping has been added throughout Urban, so users can snap new details to existing elements, making editing easier. In addition, it is now possible to adjust various attributes—such as the space use type, the height, and the net area of an individual building floor—on the fly. This means that for complex buildings, each floor can have unique

parameters without requiring users to make a bunch of new space use types.

Metrics for Real-Time Feedback on Goals

Previously, there was often a lag between the time designers created new urban scenarios and analysts evaluated them. But now, ArcGIS Urban makes the design formulation and evaluation processes seamless. As planners create new scenarios, they can use the technology to analyze the effects of their designs, including things like the financial performance of the plan; the overall distribution of housing units by type; and sustainability forecasts, such as how much the plan will reduce carbon emissions.

This is possible, thanks to a new capability in Urban: custom metrics. Users can now create their own metrics to report on objectives such as the total number of jobs a project will generate, how affordable a residential development will be, and parking supply and demand. Metrics can also be configured based on other metrics. For example, designers can simultaneously evaluate how many affordable housing units a residential development will contain and how many market-rate units it will have by dividing the total square footage of the development accordingly.

As users create their designs, they can always keep track of how their metrics relate to one another by using a dependency graph. A metrics dashboard allows users to report and visualize metric values in an easy-to-understand way across all planning scenarios. And the dashboard is interactive, giving users the ability to visually assess things like how much a building floor or surface will contribute to a particular metric. By clicking on charts related to parking, for instance, planners can see where demand is highest throughout the proposal and compare that to where available parking will be located.

Collaboration Gets a Boost

To make it easier for collaborators to exchange ideas about various planning scenarios, ArcGIS Urban has a new sharing and discussion functionality. Users can decide whom they want to share their designs with and then set up individual discussion channels in Urban for each group of stakeholders. People can make comments about the scenarios either by writing general notes or by annotating specific parts of the designs.

Of course, Urban users can still email their colleagues links to their design plans, and discussions can certainly happen outside the software. But this new commenting capability makes it easy to add fresh ideas to a plan, reply directly to comments made on a design, and evaluate various scenarios in detail and in context.

How to Get Started

This is just a sample of the new features available in ArcGIS Urban. To learn more about how to sketch new buildings, create metrics, conduct interactive shadow analyses, and more, go to ow.ly/FXhn50GedEr.
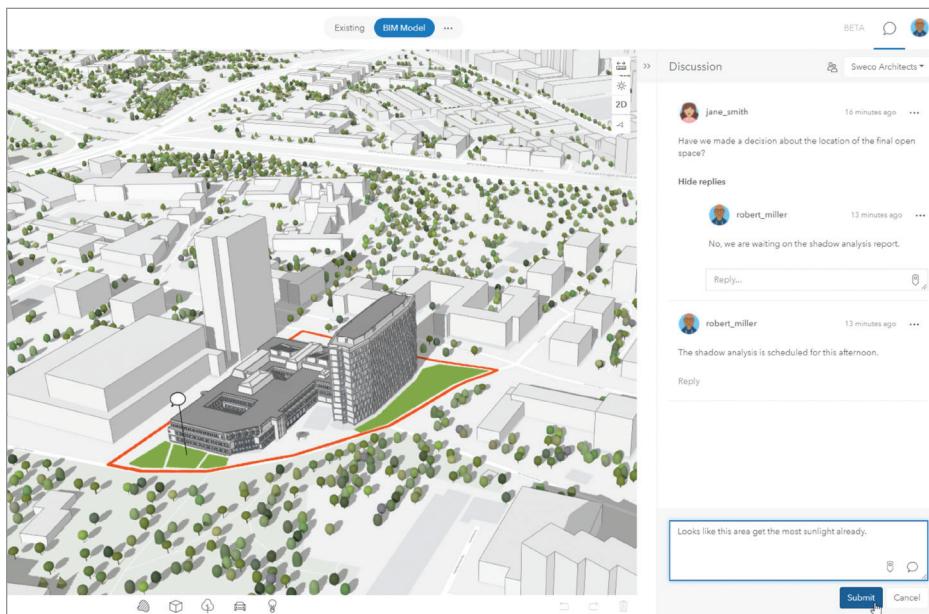
↑ Stakeholders can start a new discussion and mark up ideas directly on a design.
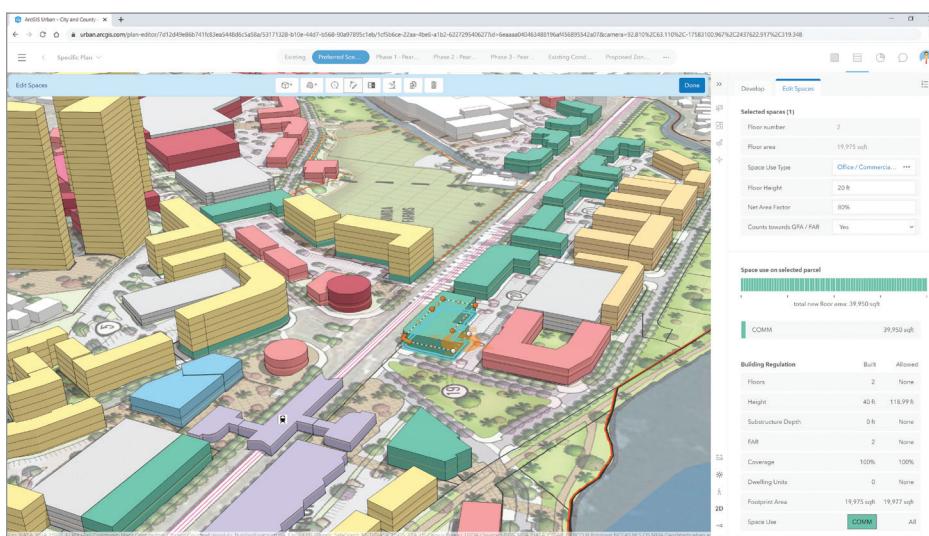
↑ Users can sketch out various design scenarios and model buildings.

Use the Newly Updated CDC PLACES Items in ArcGIS Living Atlas of the World to Improve Health in Your Community

By Diana Lavery, Senior Product Engineer at Esri

The past two years have caused governments, community organizations, businesses, and even individuals to focus a lot more on health. Increasingly, people are seeking health data at a very local level. Effective public health planning requires high-quality health estimates for small geographic areas.

Enter the Centers for Disease Control and Prevention's (CDC) Population Level Analysis and Community Estimates (PLACES) Project, whose tagline is Local Data for Better Health. This project is the first ever to release health information for many geography levels:

- Counties
- Census tracts
- Places
- ZIP Code Tabulation Areas (ZCTAs)

This system complements existing health surveillance data by providing the estimates necessary to understand the health issues affecting the residents of local areas of all sizes, whether urban or rural; develop and implement effective and targeted disease-prevention activities; identify health problems; and establish key health objectives. The PLACES Project is an expansion of the CDC's original 500 Cities Project, reflecting innovations in generating valid small-area estimates for population health.

PLACES Items in ArcGIS Living Atlas of the World

The feature layer (arcg.is/1LDSry0) available in ArcGIS Living Atlas of the World provides CDC model-based population-level analysis and community estimates for 29 chronic disease-related measures for all counties, places, census tracts, and ZCTAs. Since December 2020, when it was made publicly available, this popular feature layer has been viewed nearly 6 million times. That's because this one feature layer powers 30 maps and 5 web applications, all updated with recent data in December 2021.

That's right—there are 30 multiscale maps on topics such as arthritis, high cholesterol, and mental health. These maps now display more recent data, and with this update are two new maps on depression and general health. Each map has an informative pop-up that communicates details about what is being displayed. All the maps are useable by themselves as ArcGIS Living Atlas items, and all are viewable in the capstone application (cdc.gov/places/) that the GIS analysts at the CDC created using ArcGIS Experience Builder.

The Capstone Application

This app allows local health departments and jurisdictions—
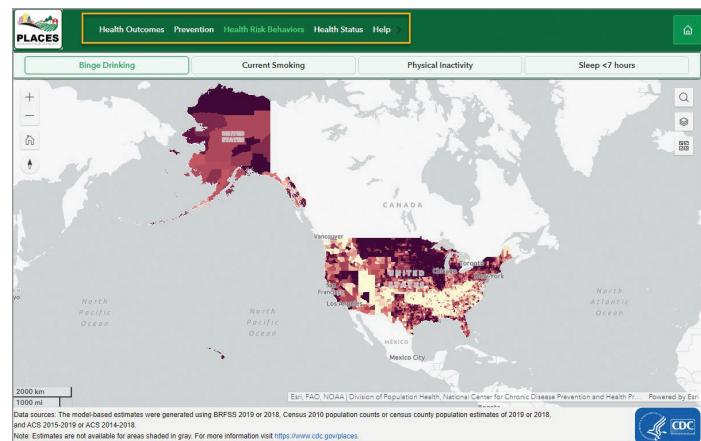
↑ This web application provides interactive maps for model-based estimates of 29 chronic disease-related metrics at the county, place, census tract, and ZCTA levels.

regardless of population size and urban/rural status—to better understand the burden and geographic distribution of health-related outcomes in their area and assist them in planning public health interventions. Use this app to explore your own community's health profile. If you work at a state or regional level, see which communities are in most need of assistance, or identify emerging health problems or risk behaviors.

The app has a menu at the top that allows you to choose from the following four major categories: Health Outcomes, Prevention, Health Risk Behaviors, and Health Status.

Health outcomes include arthritis, current asthma, high blood pressure, cancer (excluding skin cancer), high cholesterol, chronic kidney disease, chronic obstructive pulmonary disease (COPD), coronary heart disease, diabetes, depression, obesity, loss of all teeth, and stroke.

Prevention measures include issues such as health insurance, routine medical and dental checkups, high blood pressure control, cholesterol screening, and colon cancer screening; mammograms and cervical cancer screening for women; and core preventive services for older adults (men and women).

Health risk behaviors include binge drinking, smoking, being physically inactive, and sleeping less than seven hours.

Health status measures include mental health assessed as not good more than 14 days per month, physical health assessed as not good more than 14 days per month, and poor or fair health overall.

The Next Generation of Self-Service Government

By Brent Jones, Land Administration and Cadastre Industry Manager at Esri

Self-service has been with us for a long time—grocery stores, fast-food restaurants, gas stations . . . and government. It will continue to grow because it's efficient for both the provider and the consumer of a service.

Serving the public is the government's mission. Most governments are looking for ways to do it more efficiently by reducing phone calls and counter traffic while better meeting constituents' needs.

It's estimated that 80 percent of data has a spatial or location component. It makes sense that the first step in finding information is often looking at a map. Locating information using a map has lots of advantages. Maps are easy to use and understand and communicate a lot of data.

Early attempts at self-service government often used maps. However, these were in-person processes that were cumbersome, multistep, time-consuming, and paper based. Staff would have to pore over the pages of tax, public works, zoning, water systems, or storm sewer system maps to find information. These processes wasted the time of everyone involved.

Locating information on a map is still often the first step, but now it is done digitally and more efficiently online. There are a lot of ways to search—by keyword, date, address, parcel number, location, and much more. For example, parcel, zoning, and flood hazard data can be overlaid so that a landowner or developer can understand what restrictions exist on a specific parcel. Public-facing web maps are inexpensive to set up and can be configured to meet specific needs and use an organization's brand and look and feel.

With ArcGIS, the web maps and apps deployed are responsive so that they are automatically configured for the best look and optimal use on a variety of devices, from smartphones to laptops. There is no longer the need to develop many device-specific versions of an application to share the same information.

Maps can answer a lot of questions, but it's not the whole picture. The expectations for accessing services have evolved, and this trend will continue. Consumers can order nearly anything online from Amazon, access nearly any song with Spotify, and even search the Home Depot website to learn where drill bits are located in the store. This type of customer experience is expected not just from business but also from government.

There is an old saying, "People don't want drills; they want holes," which could be restated today as, "Constituents don't want data; they want answers to their questions." Information products are designed to deliver answers to common, specific questions from residents. These information products are often maps, but they can be summary statistics, analyses, and ArcGIS StoryMaps apps. With new census data, information products can now include the most current demographic data and details of analysis highlighting any demographic changes.

In March 2020, many people began working from home. People who still went to the office often found public access was limited or nonexistent. Delivering information to residents became more difficult. Lacking technical and financial resources, many organizations turned to ArcGIS Hub to deliver maps and information products in a way that was residentcentric and easy to use.

ArcGIS Hub is an easy-to-configure community engagement software as a service (SaaS) offering that organizes apps, information products, and data. It can deliver tools and information about initiatives, such as a reassessment project or road closure. Because it is configurable, ArcGIS Hub enables governments and members of the community to add apps, maps, data, analytics, statistics, forms, and other capabilities as the need arises. Previously, updating public websites required programming. As new apps are deployed and older apps retired, ArcGIS Hub is easily updated because it's cloud-based SaaS.

A hub site turns all devices into information kiosks. Because ArcGIS Hub is responsive, it delivers current information and data on any device, so residents can quickly find answers to their questions. It also allows an organization to open a two-way conversation with residents or provide crowdsourced information. ArcGIS Hub delivers maps and apps in a well-organized, fast, and efficient manner.

Simple online map-based applications like pothole reporters have been around for a long time, but more advanced applications can help residents with tasks such as filing a valuation/tax appeal. This reduces taxpayer visits to government offices.

Residents now expect for immediate access to current information and answers to questions. By organizing public-facing maps and apps with ArcGIS Hub, governments can reduce phone calls and office visits and deliver a modern self-service experience.

Self-Service Government Begins with GIS

Explore a gallery of ArcGIS Hub templates (**https://bit.ly/3hBX7oE**) to see how others are using GIS for self-service government.

Nevada Sees Mule Deer Decline from Above, Connects Dots with GIS

By Mike Bialousz, Professional Services Practice Lead for State and Local Environment and Natural Resources at Esri

Unlike Nevada's lawmakers, who temporarily descend on Carson City each legislative session before leaving again, a group of mule deer has taken root in this capital city. It's increasingly rare to see a herd the size of this one anywhere else in the western US, and it's striking that these mule deer have chosen the state capital, where they may be hoping to have an influence.

According to Cody Schroeder, a big-game biologist and mule deer specialist at the Nevada Department of Wildlife

(NDOW), a particularly harsh winter nearly two decades ago "reset the whole bar" for mule deer in the state, and its effects are still being felt today after 30 percent of the population didn't survive.

Ongoing drought conditions in already-arid Nevada haven't helped, drying out some of the high-quality vegetation that mule deer need. Then there are other obstacles: grazing competition, invasive species, urban encroachment, changing climate, and healthier predators.

To get a handle on the status of the species, and to allocate the right number of hunting licenses to manage herd sizes, the NDOW takes to the sky in helicopters to tally numbers and determine the gender, age, and health of the mule deer below. Until recently, this effort involved staff members logging data on paper while they were in the air and often not being able to analyze or visualize the data until much later.

"Now, we can see right away where deer are concentrated and where we

precarious position are informed by a real-time understanding of populations and conditions.

Cody McKee, a biometrician and elk and moose specialist at NDOW, has been working on streamlining data collection, management, and analysis for several years. He was tasked with gathering historical aerial survey data from spreadsheets and filing cabinets, and he realized that NDOW needed to modernize its workflow to make a leap forward in efficiency.

"Helicopters are an important part of what we do, for that bird's-eye view of the landscape that gives our biologists a holistic perspective," he said. "It's also a dangerous part of our job, and at least for me, the question, 'Is this the last time I get into this ship?' is always in the back of my mind. We need to be sure that we are making the most of our time in the air."

McKee reached out to Esri to fit the capabilities of ArcGIS Survey123 and ArcGIS QuickCapture to create one app on one device for the aerial surveying task, and reduce the time spent looking down instead of forward, where hazards lie. NDOW staff worked through iterations to greatly improve what had been a paper-based process, using buttons rather than entry fields to standardize observations.

Previously, biologists would take notes and jot down GPS points while in the helicopter, and later, back in the office, they would spend a lot of time typing data into spreadsheets and then merging data and fixing transcription errors. NDOW estimates that biologists were spending half their in-flight time getting the data usable; if they spent 1,500 hours flying, it would take another 750 hours before the data could be analyzed.

Now, notes and photos are tagged with position and data going right to a shared database. The time saved on data wrangling gives biologists a chance to reflect. And they can study the data to see trends.

For mule deer and other species, the data supports queries about the cause of decline. "We used GIS to map the overlap between where mule deer and feral horses are and their preferred habitat," Schroeder said. "We're also looking at other things that are impacting them, such

have conflict areas," Schroeder said.

NDOW gathers population details and conducts analysis using GIS technology, which allows the agency's biologists to piece together a landscape-level understanding of wildlife and ecosystem health. The data informs decisions to address the ongoing mule deer decline.

Confronting Changing Conditions

With recent advancements in how NDOW conducts aerial surveys, decisions to balance the mule deer's

↑ A simple, big-button form eases data entry in the challenging environment of a moving helicopter.

Nevada Sees Mule Deer Decline from Above, Connects Dots with GIS

as invasive grass, the drought, and where mountain lions cluster and have kills."

The Cheatgrass Problem

One of the most vexing problems that Nevada land managers face is the growing impact of cheatgrass—a type of grass that steals water from native vegetation—that has sprouted in large areas where big fires have burned sagebrush habitat.

"Southern Oregon, southern Idaho, and Utah have had a big problem with cheatgrass, but Nevada has had a cheatgrass invasion," Schroeder said.

In winter, mule deer rely on brush sticking up out of the snow. When cheatgrass is present, native shrubs aren't, so deer have nothing to eat.

The grass flourishes in Nevada's lower arid elevations, where it has altered whole ecosystems.

"We've documented how cheatgrass changes the natural fire frequencies from 100-to-300-year cycles down to 3-to-5-year cycles," Schroeder said. "It used to be that fires in our ranges were rare, but now they burn over and over."

Feral Horses Multiply, Squeezing Out Other Species

More than 80 percent of the land in Nevada is public, and much of it is managed by the Bureau of Land Management (BLM), which is responsible for herd management of burros and feral horses. BLM sets the appropriate management level of herds and works to keep populations down, noting that an appropriate number in Nevada would be 12,811. However, the bureau estimates that there are 42,994 horses and 4,087 burros in the state as of March 2021.

Schroeder teamed with David Stoner from Utah State University and other researchers to write a paper about the impact of feral horses on other big-game species.

The research involved the spatial analysis of the range of species such as mule deer, bighorn sheep, elk, and pronghorn antelope, overlapped with the range of feral horses. The paper noted that the expanding populations of feral horses is a concern for all species.

Researchers are using GIS to drill into feral horses' impact on water holes during the drought, and on land with little or no vegetation, as well as what species are displaced and where.

"The research aims to determine how many horses is too many, and where exactly the conflicts arise around water and forage," Schroeder said.

Knowing Where to Apply More Management Practices

Aerial surveys are a key tool that biologists use to make all manner of wildlife-management decisions, because of the perspective it provides.

"Once you get up into a helicopter, you realize just how connected everything is," McKee said. "While there are many miles
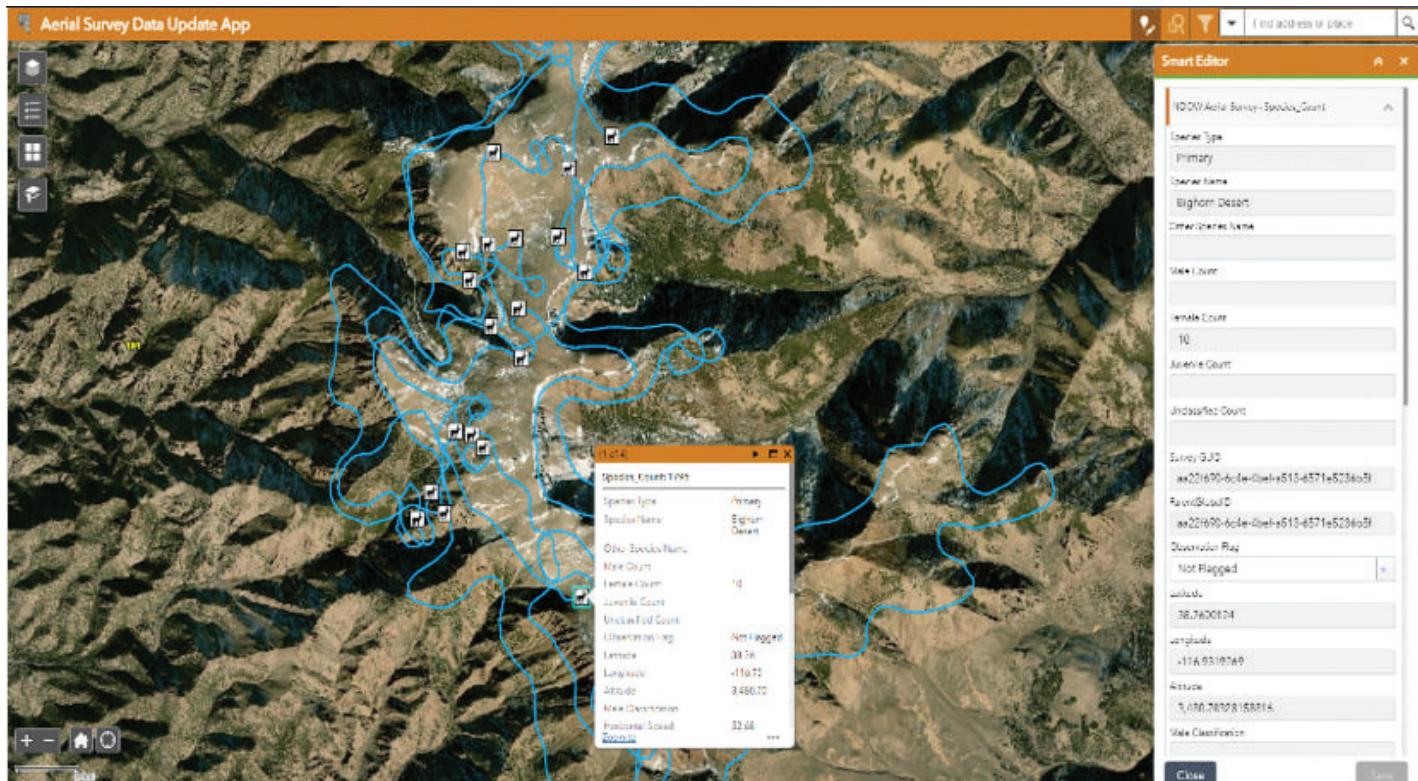
↑ The data of each survey pass can be easily displayed on a map alongside the path the helicopter took as well as what was observed.

↑ A dashboard view provides at-a-glance details about the current status of survey efforts as well as the running total of animals counted.

separating mountain ranges, the animals we're managing have the ability to cover those miles in a few hours if need be."

With streamlined data collection, NDOW biologists have started to look at pressures spatially, and ask geographic questions, based on the survey data about population health versus range conditions.

"This is going to help us investigate things and focus our habitat restoration efforts where we can create the most connectivity for wildlife," Schroeder said.

Addressing Regional Mule Deer Decline

In the mid-1990s, the Western Association of Fish and Wildlife Agencies developed a mule deer working group, which monitors the deer population across its full range, addresses disease concerns, and fosters best management practices.

NDOW biologists have shared their aerial survey approach with the working group and received great interest. Peers in all states have the same focus on ensuring longevity of species and making decisions that can sustain populations. With all the pressures mule deer and

other species face, this group wants forecasts.

"We go up and see this expansive, drought-stricken rangeland and know that unless we get the needed precipitation over this winter and spring, our wildlife is going to be faced with some big challenges in the coming year," McKee said.

Future study of Nevada habitat is planned to guide work in places where conflicts cause the most harm.

Biologists place hope in data-driven collaborations to predict and anticipate further catastrophic change. With the new streamlined workflows providing the ability to compare mule deer's reaction to changing conditions, NDOW hopes to engage with other states and stakeholders, including university researchers, to pinpoint causes of decline.

"We don't even know what changes we're going to be looking at in a couple of years," Schroeder said. "But now we can ask these landscape-scale questions."

For information on the benefits of rapid data collection from field observations, go to go.esri.com/datanevadamule.

CDC PLACES Items

Along with the main application, there is a focused application for each of the broad categories.

Use PLACES Data in Your Work

The feature layer behind it all is available in ArcGIS Living Atlas for your analysis workflows in ArcGIS Online, ArcGIS Pro, or ArcGIS Insights. This well-documented feature layer contains descriptive field aliases to assist you as you work. You can also create your own web maps, informative dashboards, captivating stories, and focused apps with the PLACES data to understand the health of your community and inform your stakeholders.

Find other ArcGIS Living Atlas favorites from the CDC, such as the CDC Social Vulnerability Index, at arcg.is/1L8yz1.

Improving Safety for Wildlife and People on Roadways

By Sunny Fleming, Industry Specialist for Environment and Conservation at Esri

With its waterfalls; geysers; and wide variety of wildlife such as bison, cougars, and grizzly bears, Yellowstone National Park in Wyoming remains one of most beloved spots in the US, drawing nature lovers from around the world to gaze at its wildlife and enjoy its astonishing vistas.

These breathtaking landscapes and free-ranging animals are protected and managed in order to minimize the impacts of visitors who come to experience nature and wildness. But within and beyond protected federal lands, roads usher millions of visitors and vehicles through wildlife habitats and across migration and movement corridors, creating the potential for dangerous intersections of traffic and animals.

For instance, along the US Highway 191 corridor north of Yellowstone, near the Big Sky ski area, traffic increased 38 percent between 2010 and 2018, and animal-vehicle collisions now account for roughly 25 percent of all crashes.

The problem is not isolated. Across the US, car and truck crashes with animals take the lives of an estimated 1.5 million large mammals per year. Those crashes also injure 26,000 people and kill about 200 people annually. Additionally, there's up to $8 billion in damages each year.

The need for standardized data and maps where wildlife-vehicle collisions occur has accelerated recently with the passage of the Bipartisan Infrastructure Law. The law includes $350 million to build wildlife road crossings, provided there is data to support and guide decisions on where to place them.

Elizabeth Fairbank, who is a road ecologist for the Center for Large Landscape Conservation, said a new tool, known as the Roadkill Observation and Data System (ROaDS), was built using

Esri's ArcGIS Survey123 to easily gather spatially accurate data. "The ROaDS tool standardizes the information being collected by different groups in different jurisdictions with high spatial accuracy using GPS, all with just a few clicks on a smartphone," she said. "By standardizing the data, you can pool information collected by different groups across boundaries that don't exist for wildlife, and actually do meaningful analysis to prioritize the most important places to take action and invest in wildlife crossings at a landscape scale. Where things are right now, that's just not the case."

It Starts with the Data

Researchers are plotting the collected roadkill observation data on smart maps and conducting analyses using a GIS. The National Park Service (NPS) and US Fish and Wildlife Service (USFWS) have worked to create the ROaDS tool and analyze the data in partnership with the Western Transportation Institute (WTI) at Montana State University.

Collecting uniform wildlife-collision data across the nation has always been a problem due to both the lack of resources and the thousands of miles of roads that would have to be monitored 24 hours a day for roadkill incidents.

The need for action increases as human populations continue to encroach on the natural habitat, vehicle traffic becomes greater, and the climate crisis and wildfires force herds to seek greener pastures and cleaner water.

"It's tough on wildlife because, beyond protected public lands, we just keep expanding our own footprint of development across the landscape," said Amanda Hardy, a wildlife ecologist with NPS. "Understanding where [animals]

live and where they're moving to and from, and protecting those areas amid the matrix of development, is key to their long-term survival and our coexistence with wildlife."

When people download the ROaDS tool on a mobile device, they can collect roadkill observation data that can guide the mitigation measures needed to reduce these conflicts.

"Identifying wildlife migration corridors where they intersect with our transportation corridors—and where we might have wildlife-vehicle conflicts—is going to be really important going forward," Hardy said. "Making sure we put those protections into those areas is absolutely key. . . . But it starts with the data."

Healthy Mix of Science, Software, and People

The ROaDS tool allows scientists, park rangers, concerned residents, law enforcement, nonprofit groups, and students to collect key information that contributes to implementing solutions that have been long hampered by insufficient data.

Two projects around Yellowstone have been drawing significant interest among volunteers who want to help document vehicle-wildlife collisions. Using the ROaDS tool, they can note GPS coordinates, the time and date of an observation, and the wildlife species observed, along with other information.

"We have hundreds of wildlife observations recorded so far on the two highways we are monitoring in the greater Yellowstone ecosystem: Highway 191 [west of Yellowstone], and Highway 89 in the Paradise Valley [just north of Yellowstone]. So there's been quite a bit of use at least by a handful of dedicated
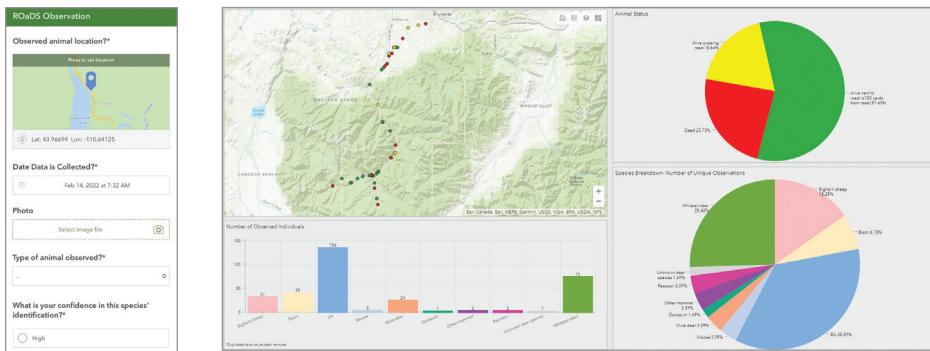
↑ **Left:** The Mobile ROaDS tool was built with ArcGIS Survey123. **Right:** Details collected in the ROaDS tool for US Highway 191 in Montana are aggregated on this dashboard to show the wildlife-vehicle interactions across space and time.

people who are going out and doing this on a regular basis," Fairbank said.

Fairbank said the aim is to provide usable information so that planners can select the appropriate type of wildlife crossings and build them in the most important and effective locations. "The goal is to provide information for transportation planning that accommodates safe passage for both wildlife movement and human movement, and that can actually save money in the long run by reducing wildlife-vehicle collisions."

Wildlife-Vehicle Collisions Keep Increasing

To make matters even more urgent, the number of wildlife-vehicle collisions in the US has risen by 50 percent over the past 15 years, even while the total number of crashes has remained relatively stable. That growing statistic often means even more stress on the survival of a species that may already be threatened or endangered.

Given that many wildlife-vehicle crashes are not reported to law enforcement or insurers, the Federal Highway Administration estimates the actual tally is between 1 million and 2 million incidents in the US each year; however, ROaDS can help clarify the number.

The ROaDS tool also can be used to focus on endemic species in an area, or to fit the purpose of a diversity of groups collecting slightly different types of data. "One interesting group is the Confederated Salish and Kootenai

Tribes," said Mathew Bell, research associate with WTI. "[Tribe members] started using the ROaDS tool, and we are actually going to look at their data and how it compares to Montana Department of Transportation's data . . . in the same road sections" of US Highway 93, where it crosses the Flathead Indian Reservation.

By taking samples from different groups, it may be possible to produce better estimates. "If nothing else, it definitely increases interest and awareness of the problems," Bell said. "Living in Montana, we know to watch out for wildlife, but as you get the public involved in these things, [people] start to acknowledge how many [animals] are actually getting hit, how much wildlife [is] dying, and the safety concerns as well."

Aiding Research in Diverse Places and Species

Although the work around Yellowstone National Park tends to focus on large mammals, a nonprofit group is tracing movements and tracking mortalities of the desert tortoise—a species protected under the Endangered Species Act—in the Mojave Desert.

It's not just the large mammals that are at risk, although the largest ones pose the most danger to drivers and passengers in the event of a collision. Many small species may also be injured or killed, potentially upsetting the balance of nature in the area. Smaller species can also cause crashes, as people swerve or stop for animals of all sizes.

That is often the case in areas managed by the USFWS, said Vincent Ziols, manager of the Transportation Safety Program for the USFWS National Wildlife Refuge System.

"We may not be dealing with huge collisions that get a lot of news coverage . . . but various species on our refuge units are getting hit," Ziols said. "It's very difficult to protect the integrity of complex ecological systems when there may be a dozen or so species at risk of becoming roadkill at one given point."

According to the Federal Highway Administration, in the US there are 21 federally listed threatened or endangered animal species for which road mortality is documented as a major threat to their survival.

The ROaDS tool allows observers to attach a photo of a deceased animal to the data collection form, improving the positive identification and documentation of mortalities of rare or at-risk species.

"ROaDS will go far to highlight the need to protect all wildlife from our nation's roads, and not just in those areas that have already received attention from the public," Ziols said. "Those in conservation can use this tool to address these issues all over the nation for both big and small animal species."

In Canada's Banff National Park, mitigation measures and a series of wildlife crossings, including both bridges and tunnels that allow animals to cross over and under roads, have reduced the collision of vehicles with all wildlife species by more than 80 percent.

Data shows that the number of elk and deer, specifically, that were hit by vehicles has been reduced by more than 96 percent in Banff National Park. It's an example of how a concentrated effort supported by clarifying research and strong funding can produce outstanding results to benefit both driver safety and wildlife survival.

It's also a reminder that the $350 million contained in the Bipartisan Infrastructure Law has the potential to

The Biggest Little City in the World Runs on GIS

Many think of Reno, Nevada, as the Biggest Little City in the World. Known for its neon lights and mountain views, there are also inconspicuous issues the city must address to make Reno a community that is livable, operational, and able to deliver unparalleled service to its residents and visitors.

At the core of operations to enhance the city's livability is the foundational use of GIS technology. The City of Reno has entered a new phase of modernization of GIS in all departments through the adoption of an enterprise approach.

Modernizing Reno's Geographic Approach

Reno's GIS division of IT is composed of a strong team led by two GIS analysts, Eric Friedlander and Jacob Fausett, and a GIS technician, Robert Johnson. GIS has always been a foundational tool for innovating and problem-solving across the organization. This team assists departments like public works, development services, and city clerk election operations by enhancing their workflows through GIS solutions.

The GIS management team, although small, supports various city departments. Team members recognized the significant role of GIS in achieving their vision of modernizing the way they worked. Eager to expand and advocate the use of GIS and empower departments in the city with new capabilities, Reno's IT director turned to the Esri account team to see what was possible. The goal was to enable the organization with the tools and data to effectively carry out daily tasks. The City of Reno hosted a GIS Day celebration, which included a conversation with the city decision-makers and department directors across various departments at City Hall. The Esri account team then worked with the everyday users of GIS to take a deep dive into expanding the city's GIS capabilities.

While the GIS team was searching for funding for an Esri enterprise agreement, the pandemic created a new challenge for the city. With most employees finding themselves in a work-from-home situation, the need to expand GIS services and licensing was more critical than ever. This challenge resulted in the purchase of licensing through an enterprise agreement using the Coronavirus Aid, Relief, and Economic Security (CARES) Act funds. This has allowed Reno to be nimble in new ways. Through the adoption of an enterprise system, the goal was to strengthen the city's existing foundational use of GIS to aid Reno's vision of creating a smart community that can drive down costs, reduce time to action, and support policy decisions that improve the overall quality of life, neighborhood by neighborhood.

From Map Shop to Information Hub

The traditional ideology of GIS is typically associated with just making maps, but as any GIS professional knows, it goes way beyond that. Friedlander has been able to truly modernize the team's use of GIS in many ways.

"For me, being a part of the City of Reno's modernization has been amazing. We went from being just a map shop to being an information hub. That barrier of traditional GIS has been broken, and with the organization's adoption of a geospatial mindset, it has allowed us to empower stakeholders with knowledge and new capabilities," Friedlander said.

Setting a Vision for the Future

Prior to the adoption of an enterprise vision for the organization, the city was limited in its knowledge of GIS, access to data, and ability to create appropriate apps to systematically work within the organization. With the enterprise agreement, Reno has entered the innovative phase of modernization that allows the GIS team to truly enable data-driven decisions by working on the following:

- Visually reporting data with ArcGIS Dashboards to city officials
- Redrawing Federal Emergency Management Agency (FEMA) boundaries
- Addressing homelessness in the community
- Visualizing and analyzing crime
- Supporting changes in zoning code
- Strengthening programs for clean and safe parks

GIS Use Case: Development Services

Originally, the development services department stored all its data in unstructured, legacy formats, which made the data overwhelming to look at and sort through. By working with the GIS team, staff were able to migrate their data into a modern format and integrate new functions and search features, informational features, and zoning layers, which has allowed personnel to access insight at a quicker rate.

GIS Use Case: Homeless Outreach

With the community's needs in mind and the vision to address homelessness, Reno deployed an ArcGIS Survey123 app to answer questions like the following: Does this community member have a disability? Was the community member referred to services? Where is the location of the encampment? Does the encampment require any repairs?

What occurs in Reno's community is inherently and geographically personal. By mapping and applying spatial analysis, officials can better understand their community's makeup and help residents understand what happens and why—enabling the city to make data-driven decisions in the context of where people live.

GIS Use Case: Elections

Through a geographic approach, the GIS team created a web application for the government affairs team to engage the community. Community members would be able to use their location to find and identify their electoral districts and get a summary of their parcel information to see their congressional districts, county commissioner, school district, etc.

Strengthening the Operational Foundation

GIS has proved to the City of Reno why things should be developed with a geospatial lens. Through the adoption of an enterprise vision, individual departments now house the expertise and capabilities to address data equity, affordability, and availability in their organization and work to address broadband issues, homelessness, land use and zoning, asset management, and much more.

"As we plan long term, our strategic plans have a geographic lens, and we've been able to synchronize the vision of the entire organization to have that mindset. We look forward to using GIS, developing data governance, elevating training opportunities, and finding new ways to engage the public. Our tools
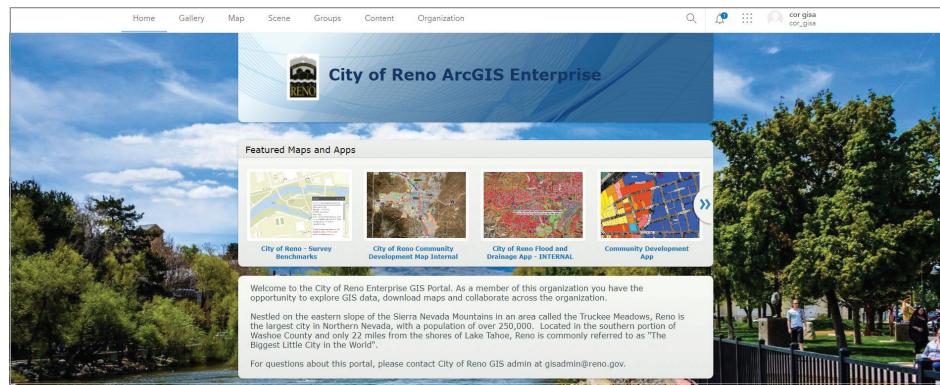
↑ Via the City of Reno's ArcGIS Enterprise portal, where city staff can access GIS data and web maps and collaborate across the organization.
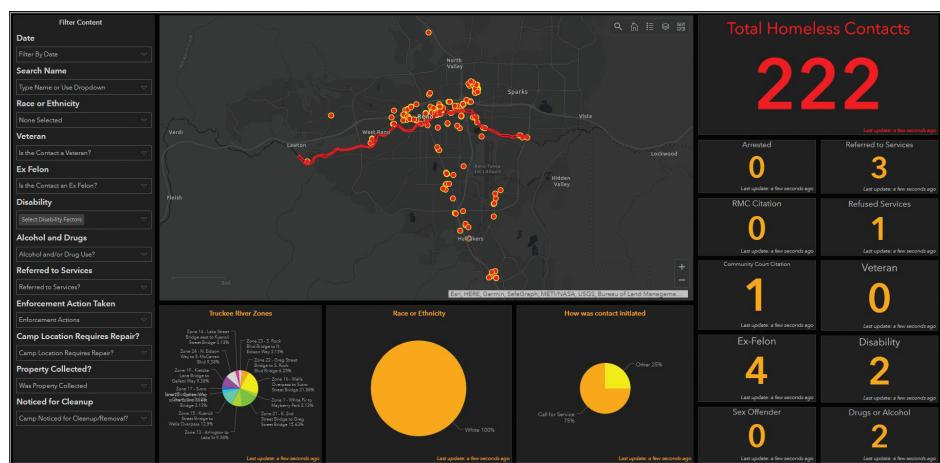
↑ City staff use this dashboard to filter through data that is collected when contacting individuals experiencing homelessness.
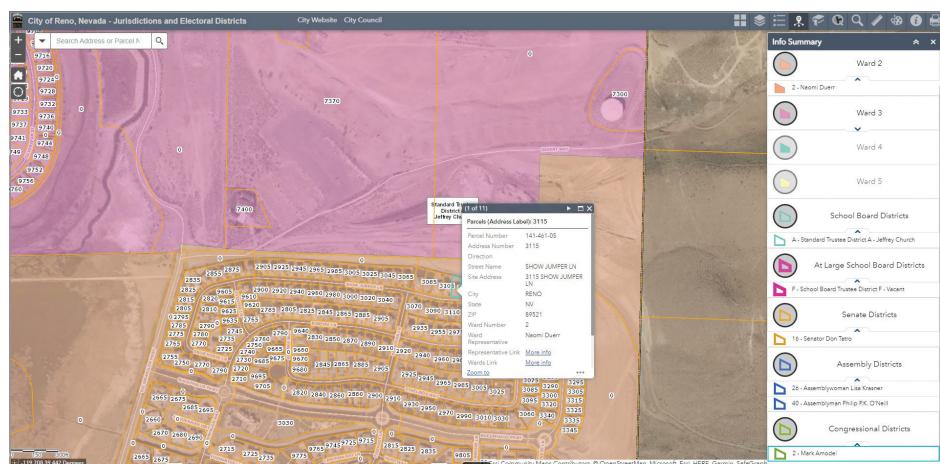
↑ The Jurisdictions and Electoral Districts web map makes it easier to see which properties are within a district of interest.

provided us [with] the ability to help city decision-makers and elected officials make data-driven decisions, and that is a mission I am proud to be a part of," said Kannaiah Vadlakunta, director of information technology.

For updates on and examples of using GIS to align recovery efforts with federal funding objectives, visit Esri's web page at go.esri.com/SLNstimulusfunding.

Placer County, California, Advances Broadband Strategy through the Aid of ARPA Funding

Rural broadband advocacy is a top priority for Placer County as a means of closing the gap in the digital divide for the county's residents. This Northern California county's broadband plan is designed to create economic opportunity through a connected, countywide strategy. In a recent statement, Placer County chief information officer Jarret Thiessen said, "The county has been tirelessly advocating for the expansion and improvement of broadband services on behalf of its residents, especially those in our rural communities."

The vital importance of broadband connectivity became abundantly clear at the start of the COVID-19 pandemic, when many residents found themselves working from home or going to school online. Those without adequate broadband service found themselves at a distinct disadvantage, and in Placer County, this primarily impacted rural communities. The emphasis of broadband as critical infrastructure for all was accentuated in the American Rescue Plan Act (ARPA) and the recently passed Infrastructure Investment and Jobs Act. Placer County capitalized on the opportunity these stimulus efforts afforded, allocating $10 million of its $78 million ARPA grant funds to broadband improvement.

GIS Helps Manage the Program for Maximum Impact

While grant funding will go far in helping the county meet its broadband goals, leadership recognized that building out broadband infrastructure to cover over 400,000 residents spread across 1,052 square miles of mountainous terrain would require careful and considerate planning. The county turned to GIS technology to better understand coverage, see gaps in service, and make a positive impact on vulnerable populations.

With the COVID-19 pandemic, it became very clear that across the United States, the digital divide was greater than it appeared, and the need for quality broadband became a national priority. Many children could not do their homework due to a lack of basic internet service, and elderly residents had difficulty getting access to care with many health-care services going virtual. Broadband had become a tool that provided basic human connection in society, and individuals who did not have access were put at a disadvantage.

Interestingly, when the county began evaluating the existing network, staff realized there was not enough data to identify the extent of the service divide, and service gap location information was lacking. The Placer County information systems team decided to begin mapping existing provider networks in relation to underserved and unserved residents and businesses. The county recognized the need to balance its plans by seeking input through a public survey to further identify at-risk communities. GIS was viewed as an essential part of the county's strategy to map not only the infrastructure but also the actual survey results.

Addressing Broadband Is Placer County's Key to Sustainable Infrastructure

Placer County has always accepted GIS as a foundational tool. Staff have met many challenges like addressing homelessness in the county with GIS, so broadband was the next challenge, and the information systems team was ready with the geospatial infrastructure to address it.

Phil Salter, GIS manager at Placer County, said, "We have the tools in GIS for data collection and broadband design framework. We see GIS as a vehicle to visualize things we need to know, like existing providers in the county and even community demographics."

The team at Placer County wanted to know more specifics on broadband service quality to better support the business community as well as provide internet access to students and employees working from home. This level of community engagement would allow the team to collect more detailed information from residents and businesses and get a clear picture of their needs.

Dieter Wittenberg, the information technology telecom manager responsible for overseeing broadband efforts at Placer County, said, "Solving for accuracy in planning was a critical component of our approach. For us, it starts with geospatial data. We must see and understand the magnitude of the [issues], know where those issues are, and ultimately try to determine an equitable distribution across our rural districts."
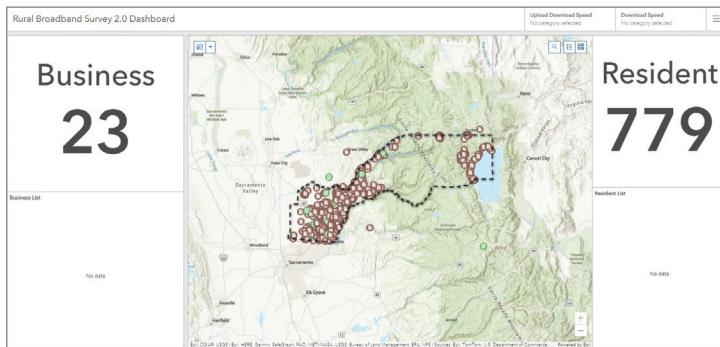
↑ A dashboard displays survey results, which helps inform decision-makers on current broadband needs.

↑ Survey results identify current internet download speeds across the community.

GIS Comes into Action

To start to develop a more holistic understanding of the community, Salter determined the GIS work would include a two-step process. First, the county needed to crowdsource additional data and gain insight; then, the county fed this information to dashboards that decision-makers could use to better allocate resources and determine priorities. To hear directly from the community, Salter launched a survey tool using ArcGIS Survey123, which asked residents questions like the following:

• What is your service address?
• What is your current internet service provider at this address?
• What is your current download speed?
• How would you rate your internet consistency?
• Do you experience outages or slowdowns?

These questions allowed the team to better understand and visualize who was affected by poor connectivity, who was in need of greater internet reliability, and so forth. The data from the survey was then displayed via ArcGIS Dashboards, which allowed the county to compare the service levels of businesses versus residents, understand the balance of the different providers in the county, and identify areas where service was lacking. Empowered with this information, decision-makers can now direct broadband expansion activities in the areas that need it most, through data-driven analysis of coverage areas.

Placer County rolled out its 2021 Last Mile Broadband Grant program to provide resources to new and existing internet service providers. This is to encourage investment into broadband infrastructure that will support economic development, public safety, remote learning, telehealth services, and overall community prosperity. The county continues to seek new grant opportunities for rural broadband programs at the federal and state levels with the intent to deploy funds for broadband infrastructure improvements in the future. GIS was an essential part of this strategy.

What's Next for Placer County

Placer County is in the beginning stages of implementing its broadband initiative plan. While working to collect data and understand the county's needs, staff are looking into things like how they can enable cross-departmental collaboration. For example, they are looking to find a mechanism rooted in GIS to coordinate construction with other capital projects while upgrading the county's current broadband. Staff hope to be able to take data from the transportation team and identify the parts of the county with private roads versus where there is public infrastructure—this information will help prioritize the rollout of modifications to existing infrastructure. For Placer County, GIS plays a part in the county's vision. Early on, staff understood the foundational role GIS could serve in the county's broadband project. They were able to improve decision-making, more

accurately place resources, and increase cross-departmental coordination, and they continue to advance their initiative to address sustainable broadband service.

For updates on and examples of using GIS to align recovery efforts with federal funding objectives, visit Esri's web page at go.esri.com/SLNstimulusfunding.

Improving Safety

fund many safe-passage projects for animals in the US, and these projects will have the most impact where data shows the highest wildlife road mortality.

"You probably aren't going to get one of those grants unless you come to the table with the information that justifies why you would be putting an investment at a given site," said Hardy. "It's really exciting to see that they're providing that type of funding for those projects. But it starts with data."

Ultimately, the ROaDS tool enables people and agencies to collect the data needed to effectively invest in measures to reduce wildlife-vehicle collisions.

Learn more about how GIS is used to guide environmental and wildlife management—go to go.esri.com /wildlifesafety.

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