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ArcGIS® Empowers Faster Response for Vector-Borne Disease Surveillance and Control

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ArcGIS Empowers Faster Response for Vector-Borne Disease Surveillance and Control

Executive Summary

When vector-borne disease outbreaks occur, fast, effective response protects people from infection and its consequences. Integrated pest management programs respond through the vital functions of prevention, surveillance, and control activities. Temporal and spatial information are critical to those efforts to curb the spread of disease. Organizations that harness the power of a location platform can achieve faster, more efficient response.

Prevention

Disease prevention begins with education. Everyone can play a part in reducing the number of common vectors, such as mosquitoes, if only they have the right information at the right time. Location intelligence can ensure that messages are targeted where they are needed most.

Surveillance

Surveillance functions include monitoring, visualization, and analysis of data on climatic factors, vector abundance, and virus activity in the vector, its sentinel animals, and humans. Effective surveillance activities ensure a holistic view that facilitates an understanding of trends over time and space.

Control

Place matters when working to control vector populations and disease spread. Where were traps set? Which samples tested positive? How can call centers verify the locations of public reports of dead birds or green pools? How can field staff be deployed to the right place most efficiently? Where are pesticide treatments needed? Are there populations near treatment zones? All of these questions and more are implicitly spatial in nature, so it makes sense that a location platform can help.

Needs and Challenges in Common Workflows



Figure 1: Volusia County Tracking and Recording Treatments

- When field staff collect a sample from a trap, they need to know exactly where that sample was collected. Accurate sample tracking means precisely targeted treatments. Unfortunately, the process of noting sample locations, matching lab results, and targeting treatments can be mired in time-consuming steps that lead to delays.
- Epidemiologists need to know the incidence and spread of human infection, because that forms a basis for their choice of interventions and recommendations.
- Agencies want to respond quickly to public requests, from removal of dead birds to investigation of green pools. Call center employees need a way to quickly verify the location of each problem and pass that information along so that field staff can be assigned.
- Supervisors need to mobilize their field teams to apply treatments and often need to make difficult choices from among chemical controls. Without a clear understanding about the extent of disease or vectors, supervisors must wrestle with decisions about what types of treatments and where to apply them. A complete view is essential to fairly weigh the various risks of treatment options.
- Field staff for both surveillance and control activities need to know where to go and the best routes to get there. In some regions, these routes reach into places without adequate cell phone signal, requiring people to find their way while offline. Likewise, some sites cannot be found by using a simple street address search.
- Public information officers are responsible for providing timely risk communication, education, and resources to the populations they serve. It's never easy to communicate complex ideas to the general public so that people are aware of available resources.

Successfully combating vector-borne disease requires a platform that can capture multiple, complementary areas of expertise among epidemiologists, entomologists, health officials and staff, geographers, and others. When their collective knowledge and analysis center around location, a clear path forward emerges.

GIS Supports Modern Surveillance and Control Efforts

Overall computing technology has evolved, moving from desktop to laptop to tablet and smart mobile devices and including machine-to-machine communication and the adoption of cloud technologies. Agencies must consider which new technologies they need to adopt to modernize their processes. Today, the application of mapping and geographic information system (GIS) technology goes far beyond simple visualization. Mapping and GIS can be used to manage field operations, monitor disease activity, analyze patterns and trends, and target education and interventions efficiently and effectively.

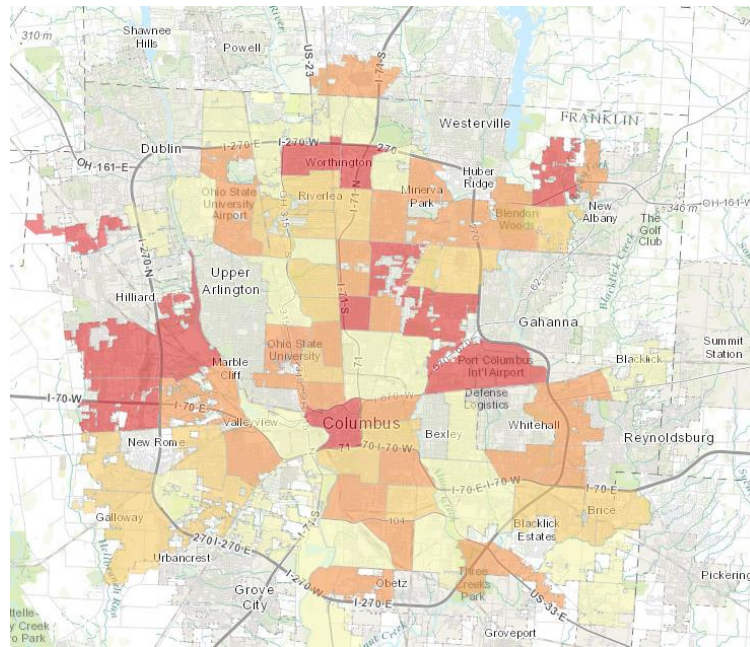


Figure 2: City of Columbus Public Health traps mosquitoes each June to test them for West Nile virus. This map shows the density of mosquitoes where they were trapped.

Location information is fundamental to addressing the needs of many organizations. The ability to generate insight from location data provides essential support to decision makers. To make the most of location information, you need a strategy.

A location strategy comprises both a philosophy and a plan. Foremost, it's a commitment to proactively use location as a frame of reference for understanding the work you do. Following that, it is the approach you use to incorporate maps and spatial analysis to effectively focus your people, resources, and capabilities. Moreover, many of the things you do involve repeatable analyses and workflows that can be created in your GIS one time and used again and again.

Executing a location strategy requires a location platform for your organization. Effective location platforms provide organization-wide access to authoritative content and capabilities and are accessible on any device. Key underlying elements of a location platform include the following:

- Infrastructure
- Software
- Data
- Apps
- Maps
- Training
- Guidance

Using a location platform, organizations can easily configure and create information products—interactive maps and apps—that help employees and contractors do their

jobs better. Once you start enhancing your work with location information, you quickly identify previously unseen patterns and trends. This new insight facilitates better decisions.

An ArcGIS Initial Operating Capability

Esri® ArcGIS® is a complete location platform that lets you apply location analytics across your entire organization. With ArcGIS, you can discover, use, make, and share maps from any device, anywhere, at any time. With flexible deployment options and a wide range of ready-to-use apps, maps, and data, ArcGIS works the way you want it to.

When the ArcGIS platform is applied toward vector-borne disease surveillance and control, agencies are able to address some of their toughest challenges. That's possible because location is a key dimension in those challenges: where things are happening, how the disease spreads geographically, and how to allocate limited resources across a region to perform surveillance and treatments. Below are several examples of apps on this platform that make the jobs of executives and supervisors, field and call center staff, epidemiologists, and public information officers easier and faster:

- Oversight app for decision makers
- Dispatch apps for effective response
- Field staff apps to maximize efficiency and productivity
- Analysis and communication apps to improve understanding that directs action

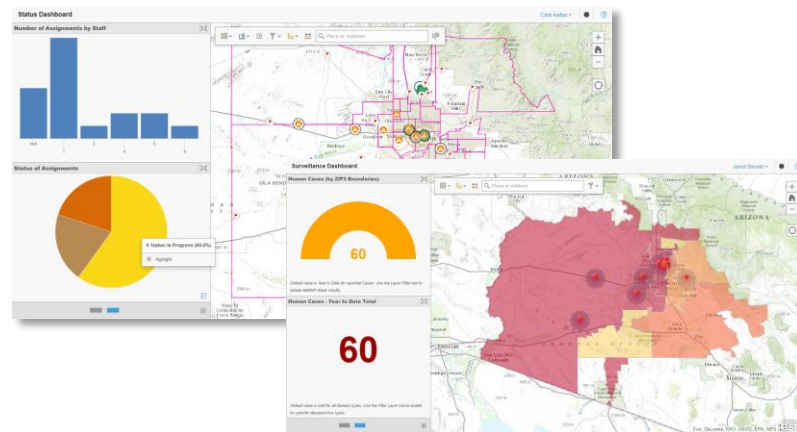


Figure 3: Oversight apps provide critical information in a dashboard format.

Oversight app: Executives and supervisors need a common operating picture of everything affecting their organizations and the populations they serve. They will get a view into the current locations of field staff, positive sample test results, service requests, and areas where treatments have been applied or are overdue.

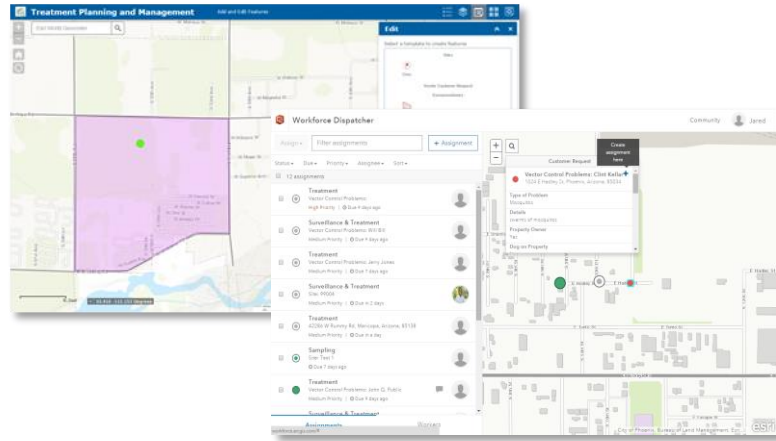


Figure 4: Dispatch apps streamline work assignments.

Dispatch apps: As public requests come in, call center staff can use an app to collect and verify the location information and capture other details. This information can automatically be shared with supervisors, who will have their own apps to match the way they work. Supervisors will review incoming requests, update their status, prescribe an action to be taken, and assign someone to perform the job at that location. By knowing where their field staff are currently, supervisors can assign work to the closest person. Because this app works from a mobile device, a supervisor can make these assignments from anywhere and shorten response times.

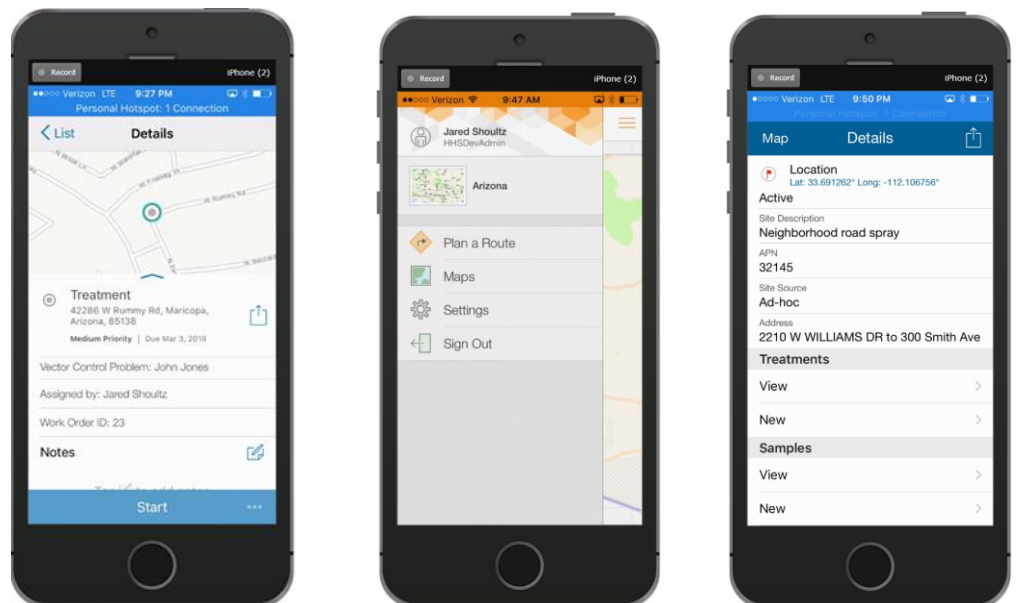


Figure 5: Field staff apps conveniently bring your work-related tasks together.

Field staff apps: Field staff can view their assignments from mobile devices. Clicking on a task will bring up directions to its location, including routing that works offline. On site, field staff can digitally collect information, including photographs. The app automatically stores the location of samples collected and treatments applied. In addition, the app can record vital data, like the sample's unique identification number, which chemical was used, and how much chemical was applied. This vital data is commonly required for reporting to state and national agencies.

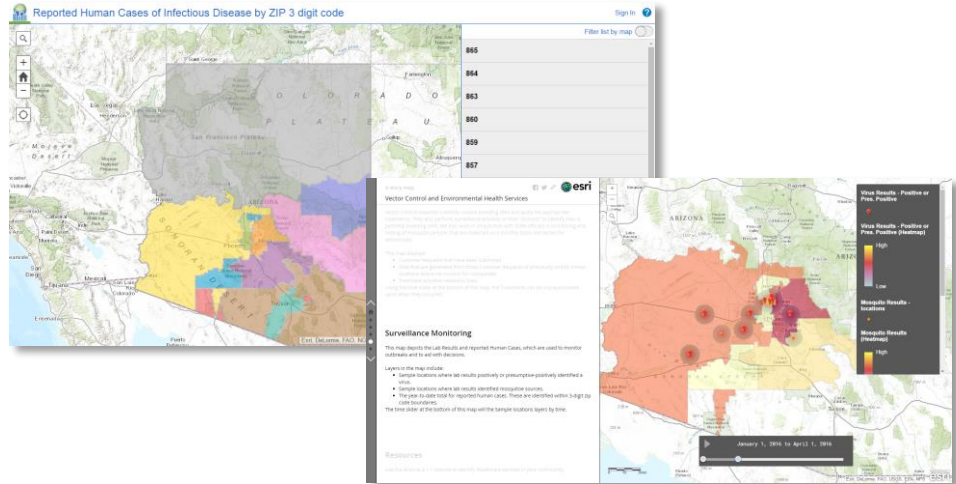


Figure 6: Analysis and communication apps reveal trends and engage stakeholders.

Analysis and communication apps: As agencies receive lab results, a digital map provides an easy way to understand how those results are tied to the locations from which vector samples were taken and the respective populations nearby. Analysts can estimate which populations and water bodies may be impacted by treatments. Also, epidemiologists will analyze trends and detect clusters of human cases. Together, the analysis from vector tests and human trends will allow the public information officer to communicate what might be a complex story in a clear and engaging way.

It doesn't take months, years, or thousands of person-hours to get started. The Esri ArcGIS platform is simple to activate and use, facilitating key capabilities.

Vision for a Better Future

The Esri platform grows with your organization. ArcGIS automatically scales to meet demands, relieving you of worries about system reliability and scalability. The entire suite of ArcGIS apps is always available to ensure that you can quickly configure the right app to meet the needs of new or evolving workflows. For more than 40 years, Esri has worked with agencies just like yours. Esri doesn't just provide software and solutions—it partners with you to ensure your success now and in the future.

About Esri

When Esri was founded in 1969, the company realized even then that GIS technology could make a difference in society. Working with others who shared this passion, Esri was encouraged by the vast possibilities of GIS.

Today, the company's confidence in GIS is built on the belief that geography matters – it connects the world's many cultures and societies and influences people's way of life. GIS leverages geographic insight to ensure better communication and collaboration.

Explore the Esri website to discover how customers have obtained the geographic advantage by using Esri software to address health, social, economic, and environmental concerns at local, regional, national, and global scales. Join the Esri community in using GIS to create a better and healthier world.

For more information, visit
go.esri.com/vector-ready



Understanding our world.

Esri inspires and enables people to positively impact their future through a deeper, geographic understanding of the changing world around them.

Governments, industry leaders, academics, and nongovernmental organizations trust us to connect them with the analytic knowledge they need to make the critical decisions that shape the planet. For more than 40 years, Esri has cultivated collaborative relationships with partners who share our commitment to solving earth's most pressing challenges with geographic expertise and rational resolve. Today, we believe that geography is at the heart of a more resilient and sustainable future. Creating responsible products and solutions drives our passion for improving quality of life everywhere.



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