

AN ESRI  
TECHNICAL PAPER

January 2023

# Wildland Fire Executive Briefing

380 New York Street  
Redlands, California 92373-8100 USA  
909 793 2853  
[info@esri.com](mailto:info@esri.com)  
[esri.com](http://esri.com)



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# Wildland Fire Executive Briefing

## Executive Summary

Wildfire incidents have claimed lives and destroyed thousands of structures. The expansion of the wildland urban interface (WUI)—areas designated at greater risk for catastrophic wildfires—and more frequent extreme weather conditions have magnified the impact of these incidents. The response and recovery to these increasingly complex events impact budgets, economies, and the communities we serve. Esri appreciates the opportunity to provide information related to our support of global wildland fire efforts.

Esri has supported the wildland community for decades. Using the ArcGIS® system, stakeholders can enhance collaboration across jurisdictions and agencies with shared situational awareness.

ArcGIS offers a unique set of capabilities that apply location-based analytics to preparedness, mitigation, response, and recovery practices. Agencies gain greater insights using contextual tools to visualize and analyze their data, collaborate with others, and share insights via maps, apps, and reports.

The ArcGIS system supports emergency response activities of multiple federal, state, and local agencies. The use of the ArcGIS system by these cooperating agencies provides seamless data sharing, improved communications, and more efficient resource management.

Recovery efforts to restore services are critical for communities. The ArcGIS system is leveraged to manage and report on damage assessment, monitor critical infrastructure restoration, and coordinate repopulation programs after an incident.

The future of geographic information system (GIS) applications for public safety includes the development of artificial intelligence, machine learning, and 3D products. Esri has several important partners doing work in fire predictive modeling and early fire detection as well as those that focus on improving the response cycle through preparedness and mitigation work. Each of these capabilities saves lives, property, critical infrastructure, and the environment.

Esri is focused on supporting our users by helping to build safer communities and a more resilient landscape. Esri supports wildland fire programs and a multifaceted approach to this significant problem.

The complex problem that wildfire poses will require a comprehensive solution. These solutions must be developed collaboratively by all stakeholders. This challenge also requires continued efforts in preparedness, mitigation, and response and recovery. Esri provides solutions to support these activities. Agencies can leverage ArcGIS, a foundational system most national and state governments already own, to perform data collection and analysis, provide operations support, and coordinate rehabilitation activities. Esri personnel are available to support the planning process at no additional cost.

## Introduction

Saving lives, preserving property, and protecting the environment are the primary responsibilities of every hierarchy of government and a variety of other organizations. Achieving these goals requires collaboration across agencies, organizations, and industries. This is evidenced by the multistakeholder approach that is critical to reaching the levels of community and environmental resilience that saves lives and property and preserves important environmental features like watersheds. Esri provides innovative solutions that help support governments, organizations, and others across the entire life cycle of a wildland fire.



*Top to bottom: Firefighters work at night to contain a wildfire; satellite imagery of an active wildfire; public information meeting.*

An enterprise license agreement (ELA) with Esri provides the use of Esri® ArcGIS software and advanced technical assistance. Agencies have unlimited access to ArcGIS software, along with timely and expert assistance from Esri, that enables them to successfully implement their enterprise GIS. This has greatly enhanced the capabilities of GIS users across all spectrums of an agency including resource coordination, mapping, and emergency data records. Two areas of note are the improvements to damage assessment activities and real-time data collection. These programs provide actionable intelligence to decision-makers at the appropriate time.

**An enterprise license agreement can**

- Reduce complexity.  
*Unite software licensing into a single, organization-wide agreement.*
- Optimize technology spending.  
*Lower the costs of software compliance and asset management.*
- Increase flexibility.  
*Build a scalable system that aligns with your agency's objectives.*
- Maximize value.  
*Provide mapping and GIS services where and when needed.*

## Current Capabilities

ArcGIS offers a unique set of capabilities for applying location-based analytics for your organization. You can gain greater insights using contextual tools to visualize and analyze your data. You can collaborate with others and share incident intelligence via maps, apps, and reports.

### Spatial Analytics

Spatial analytics is the heart and soul of ArcGIS. You use it to find the areas at highest wildfire risk, plan for smarter communities, and even determine where postfire disasters like landslides are likely.

### Imagery and Remote Sensing

ArcGIS gives you everything you need to manage and extract answers from imagery and remotely sensed data. It includes imagery tools and workflows for visualization and analysis and access to the world's largest imagery collection.

### Mapping and Visualization

Maps help you spot spatial patterns in your data so you can make better decisions and act. Maps also break down barriers and facilitate collaboration. ArcGIS gives you the ability to create, use, and share maps on any device.

### Real-Time GIS

Real-time GIS empowers you with location monitoring of any type of sensor or device—accelerating response times, optimizing safety, and improving situational awareness through a common operating picture across all assets and activities, whether in motion or at rest.

### 3D GIS

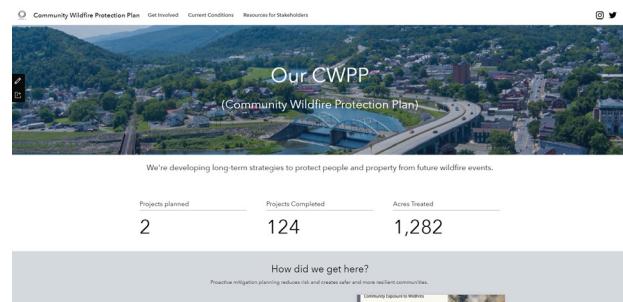
Three-dimensional GIS brings real-world context to your maps and data. Instantly transform your data into smart 3D models and visualizations that help you analyze and solve problems and share ideas and concepts.

### Data Collection and Management

With ArcGIS, you can easily collect, crowdsource, store, access, and share your data efficiently and securely. You can integrate data stored in your information systems and geoenable any type of data from any source.

## Preparedness

An agency's approach to wildfire preparedness can leverage multiple Esri solutions and technologies to be successful. An example of a wildfire preparedness activity is Community Wildfire Protection Plans (CWPPs). Agencies can utilize an Esri-provided CWPP template that makes use of ArcGIS Hub<sup>SM</sup> technology to coordinate the activities of agencies, communities, and organizations around wildfire planning efforts. Embedded in ArcGIS Hub are a variety of web maps and applications that help communicate the risk to critical infrastructure, residences, and the environment. Hub also acts as a digital center where residents and other stakeholders can monitor progress on projects that reduce wildfire risk, communicate the next meeting dates and locations, and even schedule executive briefings. ArcGIS Dashboards can be used for decision support, situational awareness of the program metrics, and mobile applications that allow field teams to conduct inspections and submit reports in real time from anywhere in the state.



Wildfire risk visualized with ArcGIS tools.

## Mitigation

At its core, mitigation work is meant to reduce the severity and consequence of wildfire occurrence. This may happen through several avenues including, but not limited to, hazardous fuel reduction programs, the implementation of prescribed fire, and community initiatives such as defensible space and home-hardening efforts.

Each of these mitigation strategies leverages ArcGIS in a multitude of ways. ArcGIS mobile applications allow users to collect and verify data about wildfire risk variables such as vegetation type and density. This provides more accurate insight into a given community or the level of risk of certain environmental features. Mobile applications also enable agencies and organizations to crowdsource data collection about residences and critical infrastructure, helping to drive the adoption of defensible space and home-hardening programs. ArcGIS Online and ArcGIS Living Atlas of the World offer the products and data that aid fire managers in determining the safe return and use of fire through carefully planned prescribed burns. ArcGIS system and

solutions support emergency response activities of multiple federal, state, and local agencies. The use of the ArcGIS system by these cooperating agencies provides seamless data sharing, improved communications, and more efficient resource management. Esri supports emergency operations centers daily with resource management and operational response solutions. As seen above, mapping and dashboard products are prominent in a state emergency operations center where they provide real-time decision support for ongoing incidents.

## Recovery and Rehabilitation

Recovery efforts leverage the ArcGIS system to collect damage assessment information, identify areas at high risk from negative postfire impacts like landslides, and help rehabilitate environments.



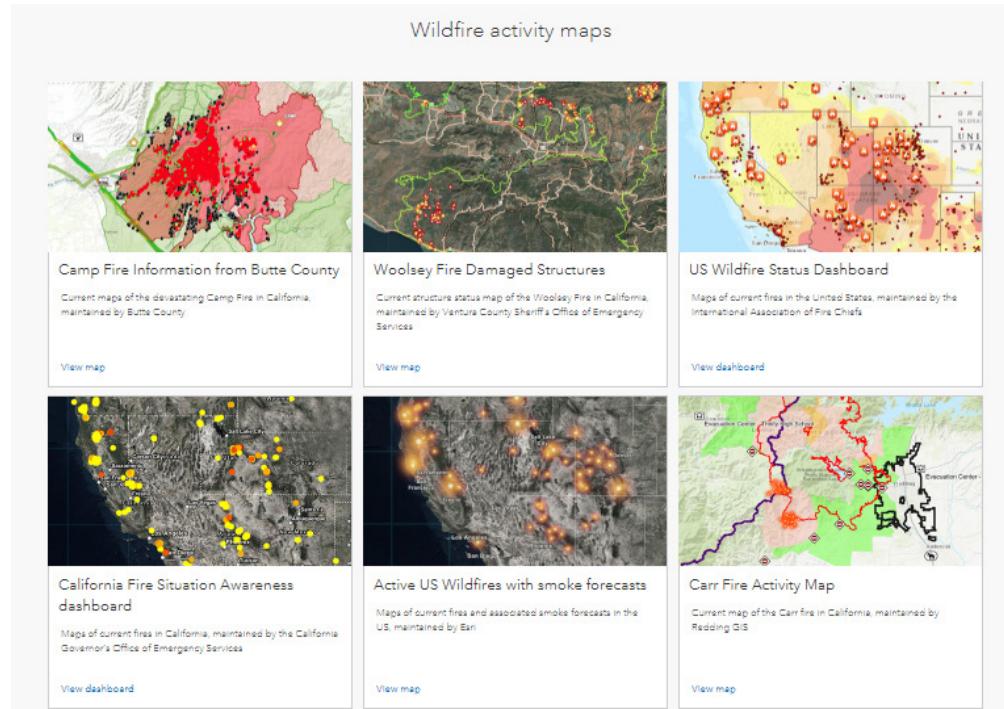
*Top to bottom: ArcGIS StoryMaps<sup>SM</sup> stories display structure damage data; aerial view of damage from a wildfire; and the remains of a residence postwildfire.*

The importance of postfire recovery efforts and documentation of fire impacts continues to increase, especially considering the severity of recent incidents. Esri is helping to provide cutting-edge solutions that leverage imagery, machine learning, and artificial intelligence to help automate damage assessment workflows. Additionally, postfire risk can be mitigated through emergency stabilization actions targeting areas prone to postfire flooding, debris flows, and landslides. Esri's mobile field data collection applications, ArcGIS Field Maps, Survey123, and QuickCapture, are being used to create a common operating picture during fire response and collect data during damage assessment and postfire workflows. It is a valued tool for agencies to help conduct operations in the field, update other mobile workers and decision-makers on the status of operations, and gather information used for disaster declaration thresholds. The use of Field Maps continues to be refined to improve both the quality and quantity of data collected before, during, and after an incident. The speed and accuracy of this application have allowed real-time data to be provided to fire managers and have enabled public information products to deliver critical information in a timely manner, using accurate and validated data.

Esri applications can also be used to develop data for analyzing the effectiveness of current WUI building codes and fire safety regulations.

## Public Information

Providing the public with clear, authoritative information during a disaster can mean the difference between a successful or unsatisfactory incident response.



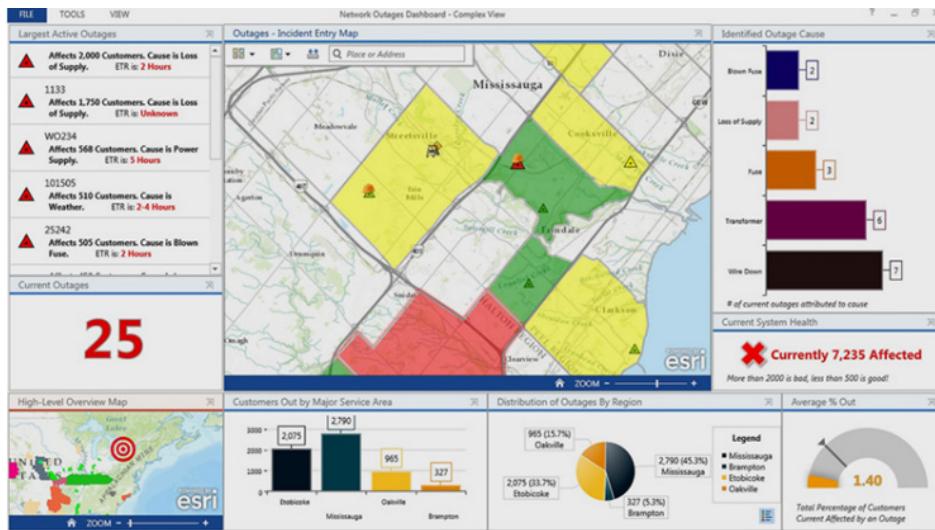
*Agency resources made available to the public through ArcGIS.*

Solutions from Esri provide public information products for pre, active, and postfire needs. These products are made available to the public to provide information on prefire planning efforts, mitigation programs, and incident information such as evacuations, fire perimeters, containment status, and repopulation guidelines. This information is regularly disseminated through social media and traditional public information sources like mass media and over the internet.

With Esri's technology powering these applications, they can scale to handle millions of hits from the public and the media while integrating the spatial information that defines these efforts. Esri's geospatial cloud provides an agency with a way to ensure that critical information is up-to-date and easily accessible.

### Public Utilities Coordination

Multiple agencies are coordinating data exchange with public utilities to ensure the safety of residents. This coordination includes notifications and the exchange of data in GIS formats. This data is used for potential public safety power shutoffs that may occur during conditions that promote wildfire growth. This allows responsible agencies to communicate the danger through public information products that use maps to help convey risk and necessary actions for the public. Esri partners are also key stakeholders in the utility space as they perform critical wildfire simulations that reduce the footprint and impact of public safety power shutoffs.

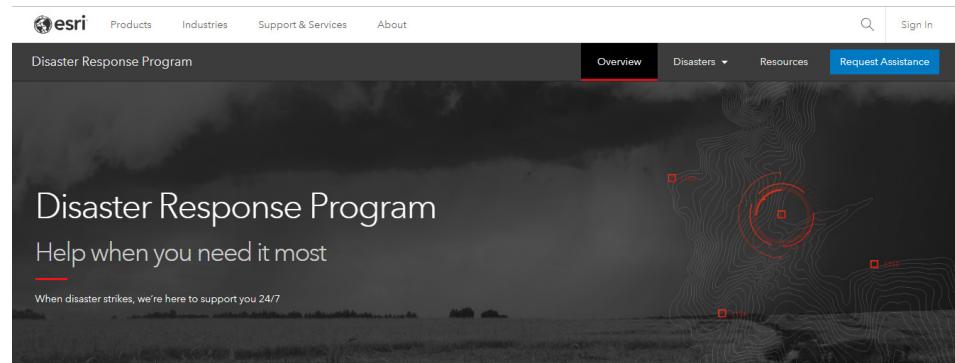


Utility monitoring dashboard view.

### Esri Support

By supporting our users and leveraging partners, Esri is helping to build safer communities. Esri supports wildland fire programs and a multifaceted approach to problems caused by wildland fires.

In addition to providing solutions, applications, and data to public safety agencies, Esri directly supports disaster response through the Esri Disaster Response Program. This program provides access to the ArcGIS system, technical support, and implementation assistance and helps with common workflows like damage assessment or public information provision when an agency's capacity is exceeded.



Esri's Disaster Response Program website.

### Future Capabilities

The future of GIS applications for public safety includes the development of artificial intelligence, machine learning, 3D products, and early wildfire detection. Predictive modeling capabilities continue to expand, and Esri has several partners that provide fire modeling solutions. These solutions not only model fire spread but account for a wildfire's impact on life, property, critical infrastructure, and the environment.

The geospatial industry is quickly evolving as the capabilities of digital connectedness and collaboration are moving ahead exponentially. The biggest trends in GIS technology are centered on early fire detection, determining current firefighter locations and fire perimeter, and making data more accessible. These trends are buoyed by the needs now typical of the information age: fast and easy access to near real-time data.

Spatial analysis is important to any agency that recognizes location as a variable to success. Data can be overlaid on a map, allowing users to perform statistical analysis to discover details about the location of an incident or trends in incidents across a season. Maps communicate this information well, and in a web services environment, agencies will be able to make maps, graphs, and charts and perform analytics easily. Accessible from an organization's cloud, the power of GIS and mapping is easier accessed across the enterprise.

The ability to access vast amounts of data that provide insight into the environment and human behavior has changed the way all organizations function. That capability has evolved to include the integration of big data operations with spatial analysis. Today, anyone in the enterprise can access billions of environmental observations or tens of thousands of raster images from a spacecraft and analyze them.

Leveraging this vast network of devices and sensors is one of the latest trends and the number one priority for organizations that want to remain ahead in terms of having a comprehensive enterprise GIS for the future. Everything from smartphones to crowdsourced social media feeds is being used to integrate real-time data from the Internet of Things (IoT) directly into a GIS layer stack, where the data is analyzed, visualized, and reintegrated into online applications for use by response agencies and residents.

Another way that GIS is breaking out of its traditional space is by becoming more consumer friendly. Just as data from mobile devices is liberating responders who have been accessing GIS online and from the desktop, this same data is being used to power a new generation of easily accessible applications that tap into the rich science and analytics that only GIS can deliver. A much simpler user experience is now possible with the creation of a suite of apps and app builders. People can use iPhones or Android devices to collect geospatial data or explore it visually, anywhere and at any time. Responders in the field can use these apps to collect data or for observation, bringing the data directly into an enterprise services environment in the cloud. Field information is immediately input and analyzed.

The latest leap in GIS technology and computing is connecting the vast network of devices that are providing data in real time. It is the most revolutionary change we have seen since Esri was founded, and it brings fantastic opportunity. The more accessible and voluminous data is, the more important it will be to understand it, and maps are the visual language for understanding its context.

## Conclusion

The complex problem of devastating wildfire requires comprehensive solutions spanning all phases of wildland fire. Making progress on wildland fire issues requires continued efforts in fire risk reduction, prevention, and suppression operations. Esri provides solutions to support these activities. Organizations can leverage Esri ArcGIS—a software most land management and public safety agencies already own—to perform data collection and analysis to support planning and operations. Esri personnel are eager to partner with you and increase your organization's capacity to prepare, respond, and recover from wildfire incidents.

## Additional Resources

### [Wildfire Aware](#)

View current U.S. wildfire activity for community awareness.

### [Wildfire Resource Hub](#)

Get maps, datasets, applications, and more to support wildfire preparedness and response efforts.

### [Esri Disaster Response Program](#)

Provides access to the ArcGIS system, technical support, and implementation assistance and helps with common workflows like damage assessment or public information provision when an agency's capacity is exceeded.

Additional questions contact: [Anthony Schultz, Director of Wildland Fire Solutions](#)



Esri, the global market leader in geographic information system (GIS) software, location intelligence, and mapping, helps customers unlock the full potential of data to improve operational and business results.

Founded in 1969 in Redlands, California, USA, Esri software is deployed in more than 350,000 organizations globally and in over 200,000 institutions in the Americas, Asia and the Pacific, Europe, Africa, and the Middle East. Esri has partners and local distributors in over 100 countries on six continents, including Fortune 500 companies, government agencies, nonprofits, and universities. With its pioneering commitment to geospatial information technology, Esri engineers the most innovative solutions for digital transformation, the Internet of Things (IoT), and advanced analytics.

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#### Contact Esri

380 New York Street  
Redlands, California 92373-8100 USA

1 800 447 9778  
T 909 793 2853  
F 909 793 5953  
[info@esri.com](mailto:info@esri.com)  
[esri.com](http://esri.com)

Offices worldwide  
[esri.com/locations](http://esri.com/locations)

For more information, visit  
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