



**The State of Federal Wildfire Science:
Examining Opportunities for
Further Research & Coordination**

Statement of

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Good morning, Chairwoman Johnson and Ranking Member Lucas. I am Fire Chief Erik Litzenberg, recently retired from the Santa Fe County Fire Department and current Chair of the Wildland Fire Policy Committee of the International Association of Fire Chiefs (IAFC). I appreciate the opportunity today to discuss the state of federal wildland fire science and opportunities for further research and coordination.

The IAFC represents the leadership of over 1.1 million firefighters and emergency responders. IAFC members are the world's leading experts in firefighting, emergency medical services, terrorism response, hazardous materials (hazmat) incidents, wildland fire suppression, natural disasters, search and rescue, and public-safety policy. Since 1873, the IAFC has provided a forum for its members to exchange ideas, develop best practices, participate in executive training, and discover diverse products and services available to first responders.

America's fire and emergency services are the only organized group of individuals who are locally situated, staffed, trained, and equipped to respond to all types of emergencies. There are approximately 1.1 million men and women in the fire and emergency service – consisting of approximately 300,000 career firefighters and 800,000 volunteer firefighters – serving in over 30,000 fire departments around the nation. They are trained to respond to all hazards ranging from earthquakes, hurricanes, tornadoes, and floods to acts of terrorism, hazardous materials incidents, technical rescues, fires, and medical emergencies.

Wildland fires are a growing area of operations for local fire departments that are located in rural locations, the wildland-urban interface (WUI), and more developed areas. Last year was one of the worst fire seasons on record. According to the National Interagency Fire Center, there were 58,950 fires totaling more than 10.1 million acres burned.¹ These fires resulted in federal suppression costs of almost \$2.3 billion.² As the American population grows more into the WUI, fires in these areas are proving to be very costly and most challenging to federal, state, tribal, and local authorities.

Research Needs of Local Fire Departments

Local fire departments are at the front lines of these wildland fires. They are the first on scene for eighty percent of fires, regardless of whether they occur on federal, state, local, private, or tribal lands. As such, it is vital that they work with state, tribal, and federal officials to prepare for wildland fires and respond to them. Federal research agencies, such as the National Science Foundation (NSF), National Institute of Standards and Technology (NIST), and National Aeronautics and Space Administration (NASA) can play a role in improving the preparedness and response to wildland fires.

Currently, these agencies do provide some assistance with wildland fires. The NSF has funded research into the flow of sediment and how it can affect post-fire mudslides. In addition, it has funded programs to predict the size of wildland fires and produce predictive fire analysis. The NASA's earth-observing satellites can detect fires, track the smoke from fires, provide

¹ Wildfires and Acres. National Interagency Fire Center, <https://www.nifc.gov/fire-information/statistics/wildfires>.

² Suppression Costs, National Interagency Fire Center, <https://www.nifc.gov/fire-information/statistics/suppression-costs>.

information about burn scars to the earth, and provide this information to local fire managers. The NIST has produced comprehensive studies of the 2018 Camp Fire and other major incidents and educated the fire and emergency service about lessons learned regarding how fires progress through communities. The NIST also has produced research supporting community mitigation efforts and the use of these efforts and building codes to reduce fire damage.

These federal efforts are appreciated by local fire departments. However, there are a number of opportunities for further federal scientific research that can help firefighters as they battle major wildland fires. Unmanned aircraft systems, machine learning, and remote sensing all offer opportunities for improving the response to wildland fires and reducing the costs to life and property.

The following are some fields for future focus to improve the nation's wildland fire response:

- Remote Sensing: It is easiest to suppress fires as soon as they are identified. While there are ground- and air-based remote sensing systems, NASA, the National Oceanic and Atmospheric Administration (NOAA), and other federal agencies can provide a satellite-based component to help better identify fires. For example, a satellite-based system can identify fires in low density areas near critical infrastructure. Local fire departments can then be informed of these fires and work to extinguish them. In addition, NASA's Earth-observing satellites should be able to provide better information about droughts and help target community preparedness efforts. In addition, federal, state, tribal, and local officials can do a better job of utilizing ground- and air-based remote sensing systems to identify the location and growth of fires.
- Fire Mapping: Risk mapping is an important tool for preventing and mitigating wildland fire incidents. These maps identify possible risk characteristics to guide mitigation projects, including hazardous fuels removal projects. Federal agencies can provide assistance in developing more accurate risk maps. In addition, the development of real-time and interactive maps would provide critical assistance to incident commanders during active wildland fire incidents.
- Predictive Analytics: The NASA and the other federal agencies also may be able to combine remote sensing and risk maps to develop tools for predictive analytics. Predictive analytical tools could help federal, state, tribal, and local jurisdictions to identify at-risk areas and focus on wildland fire prevention, community preparedness and mitigation activities.
- The Use of Unmanned Aircraft Systems (UAS): Drones and other UAS provide several important capabilities to the wildland fire arena. UAS can hover above a fire and track its progress for long periods of time. Infrared cameras on UAS can be used to identify hot spots at night. By combining aerial surveillance with fire maps and predictive analytics, an incident commander may have a greater understanding of the fireground and be able to make better informed decisions to save life and property.

- Firefighter Location Tracking: The development of firefighter location tracking is a major goal of the fire service research agenda. While there are efforts to track firefighters in buildings, it remains important to be able to track firefighters in the middle of major wildland fire incidents. These systems will have to be lightweight to address the challenges of responding the fires in remote areas and be able to broadcast signals over long distances in rugged terrain. Ideally, these tracking systems will be able to provide basic health information to identify when firefighters may need to take time for rehabilitation during major fires.
- Uniform Data Collection: The IAFC recommends that the federal agencies develop a standardized data collection system, including formatting and methodology to capture and report wildland fire data. This data should include mitigation, prevention, and post-fire recovery efforts. Without a standardized system, it is hard for incident commanders and emergency managers to review information, compare it, and make the appropriate decisions based on the federal data.
- A Standard Warning System for Wildland Fires: The IAFC recommends that FEMA, NOAA and NIST work with the Wildland Fire Leadership Council (WFLC) and emergency management agencies to develop a standard warning wildland fire scale that relates to the magnitude of current and expected wildland fires. This scale would be similar to a Richter scale for earthquakes or the Saffir-Simpson scale for hurricanes and could relate the magnitude of the pending threat to communities. In addition, this standardized warning system would help communities plan for evacuation.
- Interoperable Communications: Interoperable communications remain a challenge on the fireground during wildland fires. In some cases, mobile devices may not get coverage and radios may not be interoperable between neighboring jurisdictions. As the amount of data available to an incident commander broadens to include interactive risk maps, images for UAS, and location information about wildland firefighters, it is important that the incident commander can access this information and distribute it to the personnel in the field. I would like to recognize the First Responder Network Authority's (FirstNet) efforts to create a nationwide public safety broadband system that will operate even during rural wildland fires. We urge the federal agencies to work with FirstNet to ensure that information like National Weather Service fire weather reports can be broadcast through FirstNet to the incident commanders and firefighters on scene.

Improved Federal, State and Local Coordination

The opportunity to link UAS surveillance; interactive real-time fire maps, information about firefighter location; and predictive analytics together through a seamless interoperable communications system would transform response efforts on the WUI fireground. However, these technologies must be integrated and coordinated through the federal, state, tribal, and local members of the incident management team. The federal research agencies can work with the U.S. Department of Agriculture and the U.S. Department of Interior to start planning how to integrate future technology into wildland fire operations. In addition, these agencies should accelerate their discussions with the National Interagency Fire Center and WFLC to begin

outreach to federal, state, and local stakeholders about how to develop and adapt technology for the wildland fire arena.

It is important to point out the role that research can play in preventing and mitigating wildland fires too if it is shared with state and local stakeholders. If federal remote-sensing resources can identify areas where there is localized drought or infestation by the bark beetle, they can work with state foresters and local communities to expedite hazardous fuels removal and community preparedness activities. The IAFC manages the Ready, Set, Go! (RSG) Program in partnership with the U.S. Forest Service. RSG helps communities in the WUI through local emergency response agencies to become involved in preparation, mitigation, and being ready to evacuate early and safely when a wildland fire strikes. Predictive analytics would help the RSG! Program focus on those communities most at risk of severe wildland fires and hopefully reduce life and property loss. In addition, research at NIST can be shared with standards developing organizations like the National Fire Protection Association and International Code Council to develop robust wildland codes to mitigate the risk to both communities and individual homeowners.

Professional associations and educational organizations, like the IAFC, also play a role in disseminating the results of applied research to the fire service community. On April 29, the NIST joined with the IAFC and U.S. Fire Administration to present the findings from their comprehensive analysis of the Camp Fire in a webinar for fire service leaders. This webinar included lessons learned for fire spread, fire behavior, community evacuation, and responses to structural fires caused by wildland fires. As federal research agencies develop technology and more scientific analysis of the growing wildland fire problem, they can partner with organizations like the IAFC to get their conclusions to practitioners in the field.

Conclusion

I thank the committee for the opportunity to testify today about the federal research into the wildland fire problem. Across this nation, local fire departments are first on scene to respond to this growing problem. The federal research agencies can conduct research and adapt technology to transform the nation's preparedness for wildland fires. The key is to bridge the gap between the federal lab or a federally funded research partner and the local incident commander and firefighters in the field. This gap can be closed by close coordination with state, tribal and local officials through organizations like the NIFC and WFLC. In addition, the federal agencies can work with professional nongovernmental organizations like the IAFC to educate practitioners on the results of such research and ways to adapt and integrate technology on the fireground. The IAFC looks forward to working with you to address this issue.