

Workgroup Summary

Impact of Climate Change

Overarching Goal:

Prepare all firefighters for the climate-driven increase in wildfires in the wildland urban interface (WUI) and in rural and suburban communities by providing them with the proper training and equipment.

Issue:

The United States and every nation around the world is impacted by climate change. It affects us all. The fire service is facing new and increasing challenges driven by these climate events and hazards -- from extreme heat to extreme cold to drought, to severe storms, rising sea levels, wind, floods, and of course fire.

From 1980 to September 2024, there have been 396 confirmed weather/climate disaster events with losses exceeding \$1 billion each that have impacted the United States. According to NOAA, these events included 31 drought events, 44 flooding events, 9 freeze events, 202 severe storm events, 63 tropical cyclone events, 23 wildfire events, and 24 winter storm events. Overall, these events resulted in the deaths of 16,499 people and had significant economic effects on the areas impacted.¹ These occurrences not only result in substantial financial losses but also impose increasingly significant social and economic burdens. Specifically, recent wildfires, both in the United States and abroad, have led to substantial economic damage and have placed significant social strains on affected regions. Over the past decade, devastating wildfires perpetuated by extreme heat have surged in frequency, leaving a trail of destruction to property, natural landscapes, vital watersheds, and placing an increasing number of people and communities in harm's way.

The **wildland urban interface (WUI)** is where suburban and rural areas merge with the wildland. About one-third of the U.S. population—**99 million people**—live in the WUI, and it is estimated that **45 to 46 million structures**, nearly half of U.S. building stock, are in the WUI.

There is widespread expectation that climate change may further increase the intensity, duration, and frequency of wildfires. For example, in July 2023, NASA recorded the world's hottest month on record² since 1880. During that scorching month, more than half of the country experienced an extreme heat alert. Throughout 2023, the pervasive smoke from Canadian wildfires blanketed large swaths of the U.S. causing air quality concerns in states along the East Coast.³ On the morning of August 8, 2023, drought-driven wildfires coupled with hurricane-force winds on Maui devastated the town of Lahaina, resulting in the deadliest wildfire in the United States in over a century.

Additionally, 2024 also saw intense fire as the Park Fire in Northern California expanded at lightning speed amid record heat and high winds, leaving behind a vast burned area.⁴ Numerous communities continue to face heightened threats from increasingly frequent and more powerful storms. Ruidoso, New Mexico, experienced an enduring double disaster. In early 2024, two massive fires along the mountains encircling the town, burned more than 25,000 acres and nearly a thousand homes, and killed two people. Since June 2024, eight floods came down the same mountainsides into the village.⁵

While these extreme weather events have a profound impact on the overall well-being of communities including supply chain operations, infrastructure stability, food security, and overall public health, it is our fire and rescue departments that stand on the frontlines. They are the first responders charged with swiftly engaging in the aftermath of these events by issuing alerts, facilitating evacuations, conducting rescues, and striving to stop catastrophic outcomes.

Throughout history, fire and rescue departments have dedicated countless hours preparing to respond to catastrophic events, making every effort to limit the impacts on the communities they protect. However, the seemingly relentless effects of climate change are causing our fire service leaders to rethink their customary risks and adjust to new and emerging threats of today's emergency response environment.

WUI fires are one of the most devastating fire problems in the United States. The increasing incidence of climate-driven wildfires that affect communities means that more municipal fire departments are responsible for wildland/WUI firefighting. In August 2023, the wildfire-initiated suburban conflagration of Lahaina, Hawaii, damaged or destroyed more than 2,200 structures and killed more than 100 people.

Currently, most structural firefighters receive little to no training on how to respond, remain safe and/or how to operate effectively in this type of extremely dangerous and dynamic fire environment. Structural firefighters, accustomed to fighting one structure fire at a time, are now being confronted with multiple structures burning simultaneously in urban and suburban communities and in the wildland urban interface and intermixed communities. They must react and respond with uncharacteristic tactics and strategies to successfully mitigate the event by reducing or eliminating fire spread. The reality is that they must add urban interface wildfire strategies and tactics to their operational skillset.

“Throughout much of the United States and globally, wildfires are growing in intensity, size, and destructiveness. When wildfire enters the interface, the effects on communities can be catastrophic, including overwhelmed response capabilities, tragic loss of life, disastrous property loss, and socioeconomic devastation. The threat of catastrophic wildfire in America’s interface and suburban communities demand national attention and a unified approach. Current approaches to wildfire mitigation and management do not match the scale of the issue.”

– Dr. Lori Moore-Merrell, U.S. Fire Administrator, 2024

According to the 2021 National Fire Protection Association's *Fifth Needs Assessment of the U.S. Fire Service* document, 87% of fire departments in the U.S. are responsible for responding to wildland and urban interface fires, yet 78% of these departments that perform wildland and WUI firefighting operations have unmet training needs – and these needs are even more pronounced in smaller departments. Nearly half (47 percent) of the departments that perform wildland and WUI firefighting operations indicated that their training does not include specialized WUI firefighting operations training.

Fire departments cannot safely and effectively respond to wildland or WUI fires without proper personal protective equipment (PPE). Two-thirds of departments have unmet needs for wildland PPE for their firefighters, both men and women.⁶ Research, innovation, and standards for respirators purpose-fit for wildland and WUI firefighting, as well as PPE for female firefighters are needed. There are significant risks associated with ill-fitting PPE because firefighters are not able to move as easily or as quickly as they need to.

If not addressed, the lack of wildfire/WUI training and appropriate PPE for all responding personnel in local fire departments will likely lead to an increase in firefighter injuries and deaths.

Accomplishments:

WUI Awareness

- ▶ The U.S. Fire Administration (USFA) developed and launched two WUI fire awareness tools to raise awareness about where WUI areas exist throughout the United States and potential susceptibility to fire in areas relative to wildfire hazard exposure.
 - ▶ **WUI Fire Property Awareness Explorer** – provides the initial data-informed basis for residents to “Know Where You Live” in proximity to the location of the WUI and other fire-prone areas. Raising awareness is the first step and serves as the starting point for residents to take action in preparing for and mitigating at the individual resident and property level. [WUI Fire Property Awareness Explorer \(arcgis.com\)](https://arcgis.com)
 - ▶ **WUI Fire Community Awareness Explorer** – provides a quick snapshot of counties or places in the United States and potential exposure to wildfire hazards for structures in the WUI. Users interested in building fire-adapted communities and resilience can quickly identify vulnerable structures or areas in the WUI to help inform community risk reduction planning and targeted outreach efforts. [WUI Fire Community Awareness Explorer \(arcgis.com\)](https://arcgis.com)

These new tools allow for local fire service and community stakeholders to apply consistent data in the implementation of community risk reduction, code adoption and enforcement, mitigation, and planning efforts toward building more resilient, fire-adapted communities.

Wildfire Field Sensors at the Urban Interface

- ▶ The Department of Homeland Security (DHS) Science and Technology Directorate (S&T) and USFA are working to develop, test, pilot, and deploy early wildfire detection technology. These wildfire sensors identify unusual concentrations or spikes in chemical gases and particulates providing 24-hour sensing and alerting capabilities to assist firefighters on the front lines and keep our communities safe and resilient.

In 2022-2023, the wildfire sensor initiative deployed 200 initial Alpha phase pilot sensors in collaboration with state and local government stakeholders throughout the United States and Canada. Those sensors have provided 185+ early detections, continue to provide fire alerts and warnings, and have collected over 1,000,000 hours of data in the field to enhance the Artificial Intelligence (AI) / machine learning (ML) algorithms now being deployed in the Beta version.

In 2024, the Department has deployed 215 Beta wildfire sensors to high-risk areas across the United States for operational testing and evaluation, including the 80 sensors across the Hawaiian Islands. The Beta version of the sensors require less solar power to recharge, are equipped with wind sensors to increase the accuracy of wildfire location prediction, and have better ability to operate in areas with limited cellular coverage.

National Fire Risk Index

- ▶ Starting in FY25, USFA is partnering with DHS S&T to develop a National Fire Risk Index to help understand the impact of different mitigations on community vulnerability in a network setting at the parcel and structure level.

The Index will be comprehensive of all types of fire and fire environments, with functionality to examine risks of each type of fire and environment separately. It will also account for how climate change will impact the likelihood of ignition, wind conditions, and vegetation characteristics as well as how such changes will alter risk. It will be designed to integrate with FEMA's National Risk Index and the National Emergency Response Information System (NERIS).

Wildfire Evacuation Initiative

- ▶ USFA convened two Wildfire Evacuation Roundtables in 2024 to integrate and connect resources and tools for improved wildfire evacuation before and during incidents. The events brought

together leaders, subject matter experts, researchers, federal interagency partners, fire service leaders, law enforcement, fire weather experts, academia, research and data experts, and technology developers.

Wildfire Risk, Resilience, and Insurance

- ▶ The American Property Casualty Insurance Association (APCIA), the Insurance Institute for Business & Home Safety (IBHS), and USFA jointly hosted an Executive Discussion on Wildfire Risk, Resilience, and Insurance in July 2024.

During the Executive Discussion, participants learned about the fire dynamics of recent conflagrations; advances in wildfire science; and the findings of the Wildland Fire Mitigation and Management Commission and discussed opportunities to advance individual and community level resilience to wildfire. Participants included senior leaders from the insurance industry, leaders from federal, state, and local fire service agencies, representatives from forest management agencies, and other related national organizations.

Wildfire Resilience Experiments

- ▶ IBHS and CalFire jointly conducted a series of 10 experiments testing structural resilience, structural hardening measures, and other variables required to measure the behavior of different types of buildings, codes, and materials exposed to wildfire conditions.

World Fire Congress Communities of Practice

- ▶ The inaugural World Fire Congress brought together delegates from 56 nations and established an international fire service Community of Practice focused on Climate Change Impacts. [World Fire Congress 2024 - National Fallen Firefighters Foundation \(firehero.org\)](https://www.firehero.org)

Training

- ▶ The International Association of Fire Chiefs (IAFC) Wildfire Programs Division, in cooperation with the USDA Forest Service and its fire-adapted community partners, is leading an effort to identify gaps and mitigate barriers in wildfire and WUI training for fire service personnel and other practitioners. This work includes a survey of practitioners and partners.
- ▶ The National Fire Academy (NFA) and partnering organizations have expanded WUI/wildfire training offered. Additional and planned courses include:
 - ▶ Wildfire Fatality Investigation Course (two deliveries expected after development)
 - ▶ This is a development between Western Carolina University, School of Forensic Anthropology, ATF, and NFA to educate structural fire investigators in wildland fire fatality concepts using human and animal cadavers.
 - ▶ Responding to the Interface (five deliveries expected after award)
 - ▶ This delivery contract between NFA and IAFF is to deliver up to five courses for structural firefighters teaching them how to operate in the interface with the equipment they have available.
 - ▶ WUI Risk Assessment and Mitigation for the Fire Service (five deliveries expected after award)
 - ▶ A Society of Fire Protection Engineers (SFPE) course highlighting WUI risk assessment for the fire service with field deliveries through the state fire training directors. This is expansion of an existing course unit into a new freestanding course that incorporates the review of new construction site plans with respect to ICC WUI code and NFPA 1140/1142 Standards for Wildland Fire Protection/Water Supplies for Suburban and Rural Firefighting.
 - ▶ NFA development of a two-day climate change course for weekend/field deliveries (internal development)

- ▶ Wildfire Investigation (FI-210/N0775) (two deliveries completed)
 - ▶ NFA/USFA/CALFIRE project to deliver wildland investigation courses for structural fire investigators in California.
- ▶ Wildfire Investigation (FI-110) (under development)
 - ▶ To be added as a complementary course to F/W0770 Fire Investigation: First Responders – creating added value for fire investigation students by giving them two courses within the same weekend offering.
- ▶ Complex Case Management of the Wildfire Investigation (FI-310)
 - ▶ To be delivered with NFA/USFS/BLM as an advanced/complex case investigation course using both wildfire and structural examples.
- ▶ NFA and state training partners have increased offerings for Incident Management Teams.
 - ▶ For FY 24, over 90 offerings with expectation to exceed 2000 students.
 - ▶ Supported Hawaii, Texas, Tennessee, North Carolina and Louisiana with building capacity and competencies after major events in those jurisdictions.
- ▶ The Wildland Fire Mitigation and Management Report Released

The Wildland Fire Mitigation and Management Commission released its report outlining a comprehensive, consensus-based set of 148 recommendations to Congress to address the nation’s wildfire crisis. [Media Release: Wildland fire mitigation and management commission report \(fema.gov\)](#)

 - ▶ The Commission, created by President Biden’s Bipartisan Infrastructure Law and [announced](#) in December 2021, was charged with making recommendations to Congress to improve federal policies related to the mitigation, suppression and management of wildland fires in the United States, and the rehabilitation of land devastated by wildland fires.
 - ▶ The Commission noted that only by putting significantly more focus and resources toward proactive pre-fire and post-fire planning and mitigation can we break the current cycle of increasingly severe wildfire risk, damages, and losses.
- ▶ The Northeast Region Cohesive Wildland Fire Management Strategy group (NE RSC) has been actively engaged in increasing outreach and education of local fire departments on wildfire and WUI topics. Fire department engagement has expanded into a set of resources on the organization website (<https://www.northeasternwildfire.net/fire-department/>) including a training “Fire Adapted Communities for the Fire Service” developed by the IAFC as part of its cooperative agreement with the USDA Forest Service.

Northeast Regional Cohesive Strategy is chartered under the national Wildland Fire Leadership Council (WFLC) to coordinate and support its mission and priorities across 20

“The wildfire crisis in the United States is urgent, severe, and far reaching. Wildfire is no longer simply a land management problem, nor is it isolated to certain regions or geographies. Across this nation, **increasingly destructive wildfires are posing ever-greater threats to human lives, livelihoods, and public safety.** Further, the drivers of the wildfire crisis are numerous and complex, and themselves are influenced by multiple forces and factors at all scales. Despite widespread recognition of this crisis and decades of concerted action, wildfire impacts continue to mount.”

– ON FIRE: The Report of the Wildland Fire Mitigation and Management Commission, 2023

Northeast and Midwest states. [Northeast Region Cohesive Wildland Fire Management Strategy \(northeasternwildfire.net\)](http://northeasternwildfire.net) NE RSC works to facilitate understanding of wildland fire policies and how they can be applied to make meaningful progress towards landscape resilience, fire adapted communities, and a safe, effective wildfire response.

Personal Protective Equipment (PPE)

- ▶ UL Research Institutes' Fire Safety Research Institute (FSRI) is conducting ongoing research on the effectiveness of wildland firefighting respirators.
- ▶ A research project on "Development of Novel Personal Protective Clothing (PPC) Designs for Structural/Wildland Female Firefighters" is being conducted by Florida State University and North Carolina State University with collaborative support from the Fire Protection Research Foundation. Funding for this project is through a DHS/FEMA Assistance to Firefighters Grant (AFG) Program. The research will evaluate female structural and wildland firefighting personal protective clothing (PPC) for its improved fit, functionality, mobility, and comfort and develop the first female firefighting PPC designed using body measurements from actual U.S. female firefighters.

Recommendations:

Training

- ▶ Develop a searchable online database/knowledge base of available training courses that enables partners and practitioners to locate and access training through a single platform.
- ▶ Identify gaps and opportunities in content and delivery.
- ▶ Prioritize identified gaps and opportunities to inform short-term actions that mitigate those gaps and maximize opportunities.
- ▶ Ensure that all USFA NFA courses and content offered by fire service partners are available virtually/online.
- ▶ Modernize all existing curricula by partners such as the National Wildfire Coordinating Group (NWCG) and the U.S. Fire Administration (USFA) that includes relevant concepts such as mitigation, fire adaptation, Cohesive Strategy, Community Wildfire Protection Plans, post-fire processes and needs, etc.
- ▶ Create new curricula where needed.
- ▶ Publicize availability and importance of wildfire/WUI training courses to municipal fire departments.

Personal Protective Equipment (PPE)

- ▶ All local (municipal) departments must have appropriate PPE for all personnel responding to wildland and WUI fires.
- ▶ Gain consensus between National Fire Protection Association (NFPA), National Institute for Occupational Safety and Health (NIOSH), and other federal and state occupational safety agencies on the definition of "WUI environment" for the purposes of defining the minimum requirements for respirators for wildland and WUI environments.
- ▶ Secure funding and establish public-private partnerships to complete necessary research and innovation for respirators that are purpose-fit for wildland and WUI firefighting.
- ▶ Secure funding and establish public-private partnerships to complete necessary research into design standards for PPE for female firefighters for structural as well as wildland and WUI fires.
- ▶ Incorporate the subsequent design standards for PPE for female firefighters into official standards.
- ▶ Advocate for the design, manufacture, and purchase of PPE for female firefighters designed to the proper standards.