EXECUTIVE SUMMARY OF THE REPORT TO THE PRESIDENT

# Modernizing Wildland Firefighting to Protect Our Firefighters

Executive Office of the President

President's Council of Advisors on Science and Technology

February 2023

EXECUTIVE OFFICE OF THE PRESIDENT
**PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY**
WASHINGTON, D.C. 20502

President Joseph R. Biden, Jr.
The White House
Washington, D.C.

Dear Mr. President,

More than 100 million Americans now live in areas threatened by wildfires. The risk of catastrophic wildfires is growing at alarming rates in the West and the South, with disproportionate impacts on low-income and rural communities as well as communities of color. Your Administration has already taken important steps to prioritize community resilience to wildfires within a broader effort to prepare the American people for present and future impacts of climate change.

PCAST has sought to complement those efforts by focusing specifically on the role that science and technology can play in supporting our wildfire first-responders: the tens of thousands of state and federal wildland firefighters as well as thousands of additional local firefighters who risk their lives protecting the American people, property, and infrastructure from the devastating impacts of wildfires. With your encouragement during our meeting at the White House last summer, we have engaged extensively with dozens of wildland firefighters, from frontline hand crews and smokejumpers to incident commanders and resource allocators. Their perspectives have been complemented by discussions with subject matter experts throughout the federal government, the private sector, and academia.

Based on this outreach, we see exciting new opportunities to make the job of wildland firefighting safer and more effective. The recommendations that follow in this report highlight immediate needs that can be addressed with existing technology, and strategic, long-term investments in new science and technology to ensure that our firefighters do not have to face tomorrow's fires with yesterday's tools.

The needs of our wildland firefighters overlap substantially with those of America's warfighters. Whereas we have a national commitment ensuring that our warfighters are not sent into harm's way without the best of American science and technology at their disposal, no similar organizational framework exists to protect and empower wildland firefighters. We recommend that you establish a new joint executive office with Cabinet-delegated authorities to implement a unified S&T strategy for wildfires, similar to the joint strategies that have been achieved for national defense.

These recommendations can only deliver their full potential with your Presidential action designating a clear, empowered, and accountable leader to drive them forward throughout the federal government, e.g., via the proposed new joint-agency executive office. Our success confronting the wildfire challenge can demonstrate the possibilities enabled by science and technology to improve the lives of the American people and provide global leadership in confronting the impacts of climate change.

Sincerely,

The President's Council of Advisors on Science and Technology

# Executive Summary

The linchpin of our country's effort to combat wildfires is a dedicated corps of tens of thousands of state and federal wildland firefighters, who risk their lives to defend over 1.5 billion acres of fire-prone land in the United States.[1,2] Thousands of additional local firefighters are also called upon to protect communities at the wildland urban interface,[3] areas that now collectively house nearly one-third of the U.S. population.[4] PCAST aims to identify opportunities for science and technology to make the job of wildland firefighting safer and more effective. Progress in this arena can complement and amplify actions already taken by the Biden-Harris Administration to strengthen the firefighting workforce via enhancements to job salary and classification levels[5] and the 14% increase in wildland fire suppression and prevention funding included in the Fiscal Year (FY) 23 Omnibus Appropriations Law.[6] Our recommendations highlight immediate needs that can be addressed with existing technology as well as strategic, long-term investments in new science and technology to ensure that our firefighters do not have to face tomorrow's fires with yesterday's tools.

Forest management and similar long-term investments in wildfire prevention are also critically essential to reducing the burden on firefighters in the future. But technology needed to improve wildfire response is ready to help today. Hence, in this report we have intentionally trained our focus on critical aspects of wildfire response that are stuck—technologically and organizationally—in the last century. Several actions recommended in this report can be taken immediately to support the needs of today's wildland firefighters and vulnerable communities nationwide, as we also pursue the longer-term actions recommended here that can ensure an enduring focus on wildland firefighting science and technology development for decades to come.

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[1] National Association of State Forestry (NASF) State Forestry Statistics Survey. (2021). *State Foresters by the Numbers*. https://www.stateforesters.org/wp-content/uploads/2022/01/2020-State-Foresters-by-the-Numbers-01272022.pdf

[2] The White House. (2022, July 28). *The Biden-Harris Administration Continues Efforts to Address Growing Wildfire Threat [Fact sheet].* https://www.whitehouse.gov/briefing-room/statements-releases/2022/07/28/fact-sheet-the-biden-harris-administration-continues-efforts-to-address-growing-wildfire-threat/

[3] U.S. Fire Administration. (2022). Wildland Urban Interface (WUI): A Look at Issues and Resolutions. https://www.usfa.fema.gov/downloads/pdf/publications/wui-issues-resolutions-report.pdf

[4] Radeloff, V. C., Helmers, D. P., Kramer, H. A., Mockrin, M. H., Alexandre, P. M., Bar-Massada, A., Butsic, V., Hawbaker, T. J., Martinuzzi, S., Syphard, A. D., & Stewart S. I. (2018). Rapid growth of the US wildland-urban interface raises wildfire risk. PNAS, 115(13), 3314–3319. http://dx.doi.org/10.1073/pnas.1718850115

[5] The White House. (2022, June 21). The Biden-Harris Administration Announces New Pay Raises & Supports for Wildland Firefighter Workforce from Bipartisan Infrastructure Law [Fact sheet]. https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/21/fact-sheet-biden-harris-administration-announces-new-pay-raises-supports-for-wildland-firefighter-workforce-from-bipartisan-infrastructure-law/

[6] Committee on Appropriations, Chairman Patrick Leahy. (2022). Fiscal Year 2023 Omnibus Appropriations Bill: Highlights, 5. https://www.appropriations.senate.gov/imo/media/doc/HIGHLIGHTS%20DOCUMENT%20FY%2023.pdf

**Recommendations**

- **Recommendation 1: Given the vulnerabilities and shortfalls in wildland firefighter communications, connectivity, and technology interoperability, immediately assess, adapt, and field currently available technologies.** Technologies such as mobile area networks are now commonly used in the commercial and defense sectors, and they can enhance communications in terrain that is especially challenging and dangerous for wildfire response. U.S. Department of Agriculture (USDA) and Department of Interior (DOI) should also develop a program to begin training all federal wildland firefighters on the use of the new technologies immediately. Staff within the National Interagency Fire Center (NIFC) could lead these efforts if allocated a significant increase in their personnel and budget capacity to identify improvements in communications concepts, technology, and delivery systems to support wildland firefighter stakeholders. NIFC could lead the effort with support from National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), Federal Communications Commission (FCC), and Federal Aviation Administration (FAA).

- **Recommendation 2: Reverse the current trend of rapidly growing wildfire suppression costs by establishing a joint-agency executive office (hereafter Joint Office) that can accelerate enterprise-level development and deployment of new technologies that enhance situational awareness and initial attack capabilities.** This Joint Office would serve to advance coordination, streamline authorities, and drive progress in enabling technology adoption across the numerous federal agencies with equities for wildland firefighting science and technology (S&T) within NIFC. It is imperative that the Joint Office leader have Cabinet-delegated decision-making authorities as well as the mandate and budget needed to develop and execute a unified technology roadmap. Once operational, the Joint Office could assume responsibility for activities in Recommendations 3 through 5 below.

- **Recommendation 3: Strengthen the full operational sequence of wildland firefighting—detection, alert, response, and suppression—by assessing existing technologies available within the federal arena, the private sector, and allied nations that could be integrated at each stage.** This assessment should establish clear priorities and develop an all-agency roadmap for testing and transition into operations. In addition to the information technologies identified in Recommendation 1, this broader assessment should identify existing technologies, such as uncrewed aerial and ground vehicles, commercial satellite data feeds, field sensors, wildland-urban interface firefighting simulation training, and personal protective equipment that can enhance the safety and effectiveness of wildland firefighting. We recommend that the U.S. Fire Administrator lead this effort until the above-mentioned Joint Office is established. The U.S. Fire Administrator could be supported by other government agencies, including, but not limited to NASA, in assessing current technologies that would help validate the technology roadmap.

- **Recommendation 4: Accelerate improvement of predictive wildfire modeling tools by expanding research community access to archived satellite data from defense and other government sources.** Effective AI modeling of wildfire spread based on terrain, vegetation cover, soil moisture, wind, and other factors is within our grasp, but only with much broader access to abundant historical data—some of which exists in defense archives but is currently classified. We recommend that the Department of Defense (DoD), with the support of partners in the intelligence community, NOAA, and NASA, lead a review of the classification level of the archived data.

- **Recommendation 5: Expand our nation's wildfire response capacity by encouraging development and field demonstration of prototype autonomous detection, assessment, and containment systems for wildland fire.** Uncrewed aerial vehicles and other autonomous systems are poised to be able to dramatically increase our nation's wildfire response capacity, especially at a fire's incipient stages, while also providing new means to protect firefighters on the scene of active wildfires. Emerging private sector efforts can be dramatically accelerated in partnership with federal agencies. One key facet of this task will be to develop a cross-jurisdictional regulatory and operations framework and concept of operations governing land access, aircraft and airspace operations, and other operational factors. We recommend that the Aeronautics Research Mission Directorate within NASA lead this effort until the Joint Office is established, in close coordination with DOI, the United States Forest Service (USFS), and the FAA. NASA could also help to develop and assess technology prototypes for eventual transition to respective organizations and industry.

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