U.S. Government Accountability Office

Forest Service: Next Steps Are Uncertain for Improving Communications for Wildland Firefighters and Tracking Their Locations

GAO-25-107905 [Accessible Version]
Q&A
Report to Congressional Requesters
September 25, 2025

Why This Matters

Federal wildland firefighters, the majority of whom work for the Department of Agriculture's Forest Service, are critical to protecting lives, property, and natural resources from wildfire. Not only is firefighting inherently risky, but wildland firefighters often work in remote, mountainous terrain that can make it difficult to know their locations in relation to the fire or communicate important safety information, such as weather conditions or changes in fire intensity (see fig. 1).

Figure 1: Radio Communications Directing Wildland Fire Operations

Source: U.S. Department of Agriculture Forest Service photo by Lisa Cox. | GAO-25-107905

You asked us to review the Forest Service's use of technologies and equipment critical for protecting wildland firefighters. This report examines the Forest Service's capabilities for communications among firefighters and tracking and mapping their locations, the agency's next steps for improving those capabilities, and related challenges the agency has identified.

Key Takeaways

- The Forest Service's communications capabilities among wildland firefighters are mostly based on voice communications over radios, which limits sharing important safety information, such as a fire's intensity and rate of spread, according to agency officials. Forest Service officials said that during fires, they can track and map the locations of aircraft, as well as the agency's fire vehicles when they are in areas with cellular coverage. However, the agency cannot track and map the locations of most of its firefighters on foot during wildfires.
- The Forest Service has taken various steps toward improving its communications, tracking, and mapping capabilities for wildland firefighters in recent years. However, Forest Service officials told us loss of staff led the agency to postpone, pause, or reduce the scope of some efforts planned or underway. In September 2025, agency officials said they increased their staff to previous levels; however, the agency's next steps for improving its capabilities were unclear.
- Forest Service officials identified several challenges the agency has faced or continues to face in its efforts to improve the agency's communications, tracking, and mapping capabilities for wildland firefighters, ranging from having too few staff with the required mix of technological and firefighting expertise to continuously evolving, expensive technologies.
- We recommend that the Forest Service develop a comprehensive strategic plan for improving the agency's communications, tracking, and mapping capabilities for wildland firefighters. In its written comments, the agency neither agreed nor disagreed with our recommendation.

Why is wildland firefighters' ability to communicate important?

Real-time, two-way communications among wildland firefighters and fire managers are critical for firefighter safety. In 2023, the President's Council of Advisors on Science and Technology and the Wildland Fire Mitigation and Management Commission each recognized the importance of improving communications during wildland fires.[1]

Large wildland fire incidents may involve more than a thousand firefighters from many different federal, state, tribal, and local agencies. For example, Forest Service firefighters may work with wildland firefighters from the Department of the Interior's Bureau of Indian Affairs, Bureau of Land Management, National Park Service, and U.S. Fish and Wildlife Service.

The Forest Service, like other wildland firefighting agencies, uses a structured incident command system to organize and manage its response to wildland fires. For large and complex fires, an incident management team determines firefighting tactics and orders the firefighting resources needed, including personnel, aircraft, and vehicles. In this report, we refer to the incident management team and other supervisors as fire managers, and the personnel working closer to the fire as firefighters.

The incident management team manages the overall fire response from an incident command post, which is located at a safe distance from the fire but close enough for managers to maintain command. However, large wildland fires can cover hundreds of thousands of acres in remote, mountainous areas with few access roads and limited or no cellular service. The management team may establish other locations closer to the fire, called spike camps, to support the fire

response with less travel time for firefighters. Firefighters may also work simultaneously on different parts of a fire that are not near each other.

The ability to communicate amid changing conditions and hazards helps ensure that firefighters can receive critical situational awareness information (e.g., a fire's intensity and rate of spread), regardless of their locations. If fire managers receive updated weather forecasts or predictions about fire behavior, they need to be able to communicate that information to firefighters. Similarly, if firefighters in the field observe changing local weather conditions or fire behavior, they need to be able to communicate that information to fire managers and other firefighters.

Why is the ability to track and map the locations of wildland firefighters important?

Tracking and mapping the locations of wildland firefighters is important in helping protect firefighter safety. Tracking and mapping firefighter locations improves fire managers' ability to communicate hazards and changing conditions and make better decisions, according to Forest Service documents. Firefighting conditions can change quickly, and knowing firefighters' exact positions in relation to a fire allows fire managers and firefighters to more quickly identify dangerous situations. Forest Service officials we interviewed emphasized the importance of seeing where firefighters are located on a map, not just collecting latitude and longitude data, to better visualize where firefighters are in relation to the fire.

Imprecise or outdated information about firefighter locations can contribute to firefighter fatalities.[2] It can also hinder search and rescue operations. For example, difficulty locating a helicopter that crashed in 2015 increased the severity of firefighter injuries, according to a Forest Service document.[3]

In 2019, the John D. Dingell, Jr. Conservation, Management, and Recreation Act (Dingell Act) required the Forest Service and Department of the Interior to jointly develop and operate a tracking system to remotely locate the positions of fire resources and depict their locations on real-time fire maps.[4]

What capabilities does the Forest Service have for communications among wildland firefighters?

The Forest Service's capabilities for communications among wildland firefighters consist primarily of voice communications using push-to-talk radios, according to agency officials we interviewed. Typical components of a radio system include handheld portable radios, mobile radios mounted in vehicles, radios at fixed locations (e.g., base stations), and repeaters that retransmit radio signals to extend the coverage area.

However, Forest Service officials told us that the ability to communicate beyond voice communications is also needed. For instance, they noted that communicating situational awareness information, such as the locations of fires and firefighters, is typically driven by visual products and requires data transmission capabilities that the agency's radios generally do not provide. The agency, to a limited extent, uses some technologies that can provide data transmission. For example, according to Forest Service officials:

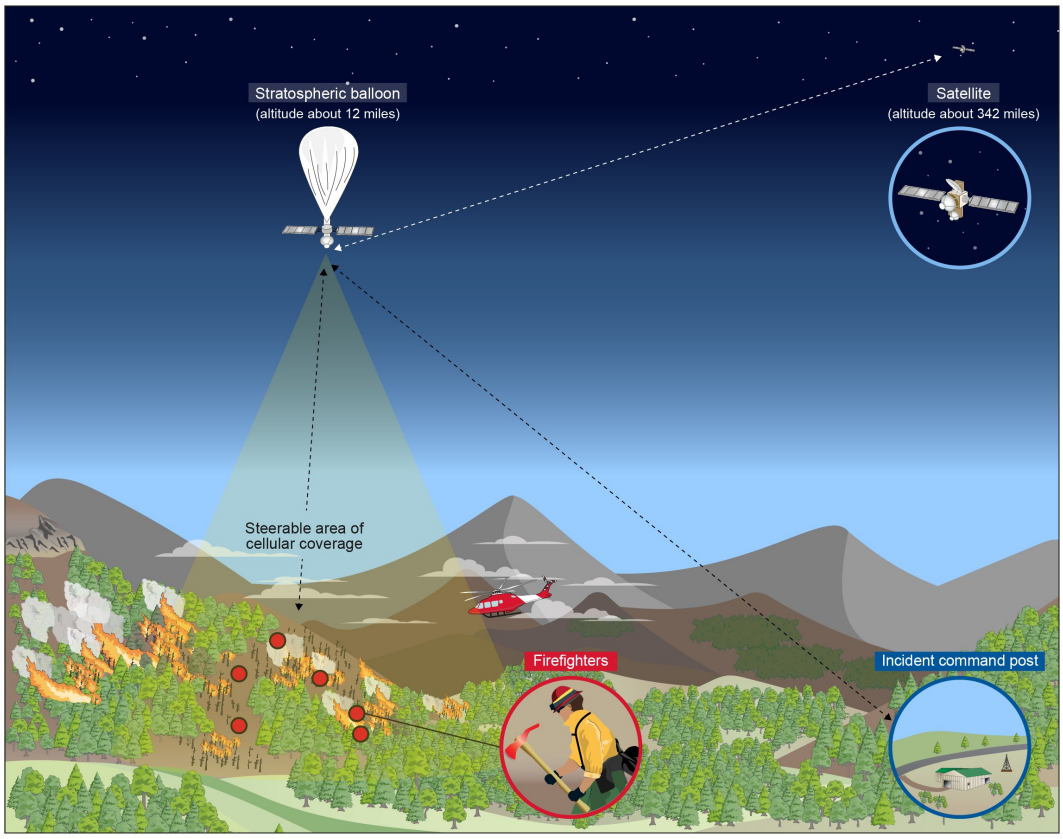
- Firefighters can sometimes use cell phones to receive data transmissions. However, most wildland fires are in areas with limited or no cellular coverage, according to a Forest Service document.5 In addition, fires can damage cellular network infrastructure and lead to power outages that disrupt cellular communications.

- The agency has contracted for the use of portable cellular towers to improve coverage at incident command centers. However, these trailer-mounted towers are not suitable for transporting in challenging terrain, limiting their use.
- The agency has used satellite radios and phones, which do not require a cellular connection, but use of these is minimal due to their high costs. In addition, satellite phones generally require the user to have a clear view of the sky with a good line of sight to the satellites, which can be difficult in canyons and areas of heavy forest canopy, smoke, or ash.6 Further, depending on the type of satellites used, there may be noticeable delays or drops in coverage.
- The agency has also used low earth orbit satellite systems to improve internet connectivity within about 100 feet of the necessary ground-based equipment. For example, Forest Service officials told us in September 2025 that the agency purchased 500 devices to provide internet access for firefighters in remote areas via low earth orbit satellites. However, use of these types of systems is limited by the need for a clear line of sight with satellites, as well as by cost. For example, officials told us in June 2025 that the agency rents low earth orbit satellite systems at an average cost of about $400 per day, which they said adds up to a significant expense across many fires.

The agency has also tested some options for improving communications capabilities, including the following examples identified by Forest Service officials:

- In 2023, the Forest Service collaborated with state agencies in California and Colorado to test mesh networking systems, which can establish or extend coverage by passing information via a signal from one device to another in a network of devices.
- In 2024, the Forest Service tested the ability of a stratospheric balloon carrying specialized equipment to provide cellular coverage over wildland fires (see fig. 2).[7] This testing was conducted in collaboration with the National Aeronautics and Space Administration (NASA); other federal, state, and local agencies; and industry. The balloon carried cellular communications equipment at an altitude of about 12 miles and worked with low earth orbit satellites to provide a steerable area of cellular coverage that was not otherwise available due to the vegetation or terrain.

Figure 2: Simplified Illustration of Stratospheric Balloon System for Communications Over a Wildland Fire



Source: GAO. | GAO-25-107905

Regardless of the capabilities of such technologies, Forest Service officials told us no single technology can address the agency's communications needs, and a multi-pronged approach is needed. The officials said that the agency's testing of new technologies has demonstrated the usefulness of various technologies but has not yet led to decisions about which ones to pursue.

What capabilities does the Forest Service have for tracking the locations of wildland firefighting resources?

Forest Service officials said the agency can track all its firefighting aircraft, as well as all its fire vehicles when in areas with cellular coverage. However, the agency is unable to track the locations of most of its firefighters on foot during a fire.

Tracking aircraft locations

The Forest Service can track the locations of all wildland firefighting aircraft owned or contracted by the agency via its Automated Flight Following system. Developed in 2003, this system uses geolocation and communications equipment installed in government-registered aircraft to track their location, speed, altitude, and heading and transmit the data via satellite to a ground-based flight monitoring system. However, the interval at which aircraft locations are updated in this system is approximately 2 minutes, according to a Forest Service document. If an aircraft crashes, that interval can make it difficult for emergency responders to locate the aircraft and assist victims, according to Forest Service officials.

Since 2021, the Forest Service has been testing a different technology—Automated Dependent Surveillance-Broadcast—for near real-time tracking of aircraft. According to a Forest Service official, this system is used by the Federal Aviation Administration and other flight operators and can provide a location every 10 seconds, at a potentially lower cost than the Automated Flight Following system. An agency report described testing in 2023 as relatively successful, with aircraft locations updated more frequently than the Automated Flight Following system, and called for additional testing, including in larger areas with diverse topography.[8]

Tracking vehicle locations

Agency officials told us that since May 2024, the Forest Service has had the ability to track the locations of all its wildland firefighting vehicles while they are in areas with cellular coverage, using a system called Geotab that came installed in its fleet of vehicles. In areas without cellular coverage, the officials told us that Geotab continues to collect location data, but the data cannot be transmitted until the vehicles return to an area with coverage.

Tracking firefighter locations

The Forest Service is unable to track the specific locations of most of its wildland firefighters on foot. Instead, officials said that the agency generally monitors firefighter locations through other means, such as information provided at morning briefings (e.g., where fire managers assign firefighters to work on specific parts of fires), firefighter radio communications with fire managers and dispatch, and personal observation at identified locations. According to a Forest Service website, when wildland firefighters communicate their locations verbally over radio, there is substantial room for error and misunderstanding, especially while they are under stress.[9]

The Forest Service has taken various steps toward improving its capabilities for tracking firefighters. For example:

- **Global Positioning System (GPS)-enabled radios**.[10] In 2020, the Forest Service tested a radio system capable of transmitting firefighters' GPS locations over radio. A Forest Service report evaluating the test recommended that all wildland fire agencies consider changing their existing radio systems to utilize GPS location services.[11] However, replacing existing radios with GPS-capable ones would require significant investment and provide less capability than cellular-based solutions to communicate situational awareness information, such as fire maps, according to a Forest Service document.
- **Wildland Fire Team Awareness Kit (WFTAK) mobile app.** In 2020, the Forest Service signed a 9-month, $150,000 cost share agreement with the Colorado Department of Public Safety for the department's Center of Excellence for Advanced Technology Aerial Firefighting to develop a location tracking system.[12] This system, known as WFTAK, is a smartphone app that tracks the locations of firefighters using it and allows users to see the locations of other firefighters using the app.[13] WFTAK was tested in 2020 and 2021. In 2022, the Forest Service signed a 5-year, $1.6 million cost share agreement with the center to, among other things, continue development of WFTAK.[14] Forest Service officials said that as of July 2025, about 378 of the agency's approximately 11,000 firefighters were voluntarily using the app while development and deployment of WFTAK is ongoing.

- **GPS tracking devices**. The Forest Service awarded a $982,000 contract for a vendor to temporarily supply 100 tracking devices for pilot testing conducted during several wildland fires in 2021, according to a Forest Service document.[15] Each device captured users' locations every 2 to 10 minutes and transmitted them to a satellite network. A Forest Service report on this testing recommended the agency continue to evaluate tracking solutions and did not recommend any specific tracking devices due to rapidly changing technology.[16] The Forest Service conducted additional testing of GPS devices in 2024, according to agency officials, and purchased 829 GPS tracking devices in November 2024. In September 2025, Forest Service officials told us that they had deployed 800 of the devices—allowing the agency to track the locations of some of its approximately 11,000 wildland firefighters.

What capabilities does the Forest Service have for mapping the locations of wildland firefighting resources?

When two-way data transmissions are available, the Forest Service's Enterprise Geospatial Portal maps the locations of the firefighting resources trackable by the agency, according to agency officials. These officials told us this web-based portal was upgraded in May 2025 and allows users to visualize on a single map the locations of firefighting aircraft, vehicles, and the small number of wildland firefighters who are using the WFTAK app or one of the 800 GPS devices deployed as of September 2025, as well as fire perimeters and areas of heat. Before the upgrade, viewers had to access multiple systems to see this information, according to agency officials. According to a Forest Service document, pulling information into a single system is more efficient and decreases the amount of time it takes to access it.

What is the status of Forest Service efforts to improve its capabilities?

Forest Service officials identified several efforts planned or underway for improving communications, tracking, and mapping capabilities for wildland firefighters. However, loss of agency staff and budget uncertainties led the agency to postpone, pause, or reduce the scope of some of these efforts, according to Forest Service officials. As of September 2025, the agency's next steps for these efforts were unclear.

Agency officials we interviewed told us the Forest Service's tools and technology program for fire and aviation management had been responsible for most of the agency's efforts to improve communications, tracking, and mapping capabilities for wildland firefighters and that the program had lost two of its three permanent staff between February and May 2025. The officials said that as of July 2025, the agency had not been able to fill the gaps created by the departure of these two subject matter experts due to a federal hiring freeze for the executive branch ordered by a presidential memorandum issued in January 2025 and extended through October 15, 2025.[17] Specifically, the officials told us that while they were able to transfer two staff from elsewhere in the agency in June 2025 to work part-time on some high-priority efforts, lost expertise had not been replaced, and they were not able to conduct all of the work previously planned. The officials also stated that it is difficult to plan or implement projects and to make commitments with other partners, such as NASA, until the program has a clearer picture of what its staffing level will be going forward. In September 2025, Forest Service officials said they had filled the two vacancies for the tools and technology program from within the agency. However, they did not explain whether they had

fully replaced lost expertise or whether they will be able to conduct all efforts that had been postponed, paused, or reduced in scope.

In addition, officials from the tools and technology program said that they rely on staff from other parts of the agency, such as contracting. In May 2025, the officials said staff losses in those offices and programs were affecting both efforts to improve capabilities as well as the ability to maintain existing capabilities. For example, they said the Forest Service was facing challenges completing maintenance on existing communications equipment, such as radios, radio towers, and repeater stations.

Forest Service officials identified several examples of planned efforts to improve the agency's communications, tracking, and mapping capabilities for wildland firefighters:

- **Communications**. As of January 2025, the Forest Service had planned to continue working with NASA to further test stratospheric balloons' capability to improve communications and collect imagery of wildland fires. However, Forest Service officials told us in May 2025 that this project had been postponed until at least 2026 and that its scope will likely be reduced to eliminate further testing of communications capability.

  Additionally, officials stated that the agency is developing plans to test new satellite-to-cellular technologies expected to be more cost-effective than traditional low earth orbit satellite systems.

- **Tracking aircraft.** In February 2025, the Forest Service issued a Request for Information for industry to provide options for modernizing the agency's Automated Flight Following system—for example, to increase the frequency of aircraft location updates.[18] However, Forest Service officials said that most of the responses to the request identified options that were cost-prohibitive or did not meet security standards. As of June 2025, officials said the agency planned to support the system within the Forest Service and Department of Agriculture rather than through a contractor, and plans for upgrades were uncertain.

- **Tracking firefighters.** Forest Service officials said the agency had planned to establish a blanket purchase agreement under which the agency could purchase more GPS tracking devices if additional funding becomes available.[19] However, the officials told us in May 2025 that establishment of the agreement was being postponed due to staffing shortages affecting the agency's contracting and procurement processes.

- **Mapping locations of firefighting resources.** The Forest Service had planned to improve the efficiency of its process for integrating data on firefighter locations into its Enterprise Geospatial Portal, according to agency officials. However, these officials told us that this effort had been paused as of May 2025.

What challenges has the Forest Service identified for improving its capabilities?

Forest Service officials we interviewed identified several challenges the agency has faced or continues to face in improving the agency's communications, tracking, and mapping capabilities for wildland firefighters. For example:

- **Continuously evolving technologies.** Forest Service officials stated that technologies for communications and tracking are constantly evolving and

can quickly become outdated. For example, officials said that the life cycle of GPS devices is approximately 3 to 4 years, with new features emerging that can make current technologies obsolete. Accordingly, the ability to test technology through a pilot project is an important tool for fire and aviation management given the rapid pace of technology changes, according to a 2022 Forest Service document.[20]

- **Interoperability of technology.** Forest Service officials told us that interoperability—the ability of one system to work with equipment of another—is of particular concern on large or complex fires involving personnel from multiple firefighting agencies. For example, federal agencies generally operate on different radio frequency bands than those used by state and local agencies, making it potentially difficult for different jurisdictions to communicate with one another, which could increase risks to wildland firefighters. Forest Service officials said that any changes to the agency's capabilities should consider the impacts on its ability to communicate and share data with other firefighting agencies. The officials also said that they should coordinate the changes ahead of time. Interagency interoperability is also critical to tracking and mapping firefighting resources when combining location data from different wildland firefighting agencies, according to a 2022 Forest Service document.[21]
- **Scaling up.** Forest Service officials expressed concerns about the agency's capacity to scale up from small pilot projects to full-scale deployment of new technologies across the agency. For example, while the agency may be able to deploy a single stratospheric balloon to test communications over a single fire, agency officials questioned whether the agency would have the resources to obtain and deploy balloons across 100 fires over the course of a fire season.
- **Cost.** Forest Service officials emphasized that it is expensive to acquire, operate, and maintain the technologies needed to improve the agency's communications, tracking, and mapping capabilities—and that these costs keep rising. For example, officials told us in February 2025 that mesh networking radios cost about $15,000 each, and the agency would need thousands of these, which would increase the acquisition cost very quickly.

  Further, in addition to initial purchase costs, technology improvements can require recurring costs for operating and maintaining equipment. For example, Forest Service officials told us that, of the $1.7 million it cost the Forest Service to purchase 829 GPS devices in 2024, approximately 80 percent of that total cost ($57,000 per month) was for an ongoing subscription to the satellite service needed to operate the GPS devices for the first 2 years.
- **Staff capacity.** Forest Service officials said that managing the agency's efforts to improve its communications, tracking, and mapping capabilities requires a long-term, specialized workforce that understands both wildland firefighting and the continuously evolving technology. However, officials said that the tools and technology program has had too few staff to effectively operate and has relied on short-term assistance provided by staff detailed temporarily from other offices.
- **Funding.** Forest Service officials said that the agency has not received funding specifically for improving its communications, tracking, and mapping capabilities for firefighters. As noted previously, the Dingell Act required the

Forest Service and Department of the Interior to jointly develop and operate a system to track fire resources subject to the availability of appropriations but, according to officials, did not provide appropriations to do so.[22] Forest Service officials also said that the 2021 Infrastructure Investment and Jobs Act appropriated funds for wildland firefighting to the Forest Service but did not direct funds specifically for improving its communications, tracking, and mapping capabilities.[23]

Forest Service officials said that without funding directed at improving the agency's communications, tracking, and mapping capabilities for wildland firefighters, such efforts compete for funding with other agency priorities. They noted that this limits their ability to make sustained investments in technology or to hire staff to execute their efforts. Nonetheless, officials said that the Dingell Act and the Infrastructure Act provided an impetus for the Forest Service to partner with other agencies and conduct pilot projects to test technologies for improving its capabilities, as described above.

To what extent does the Forest Service have a plan to improve its capabilities?

The Forest Service does not have a comprehensive strategic plan for improving the agency's capabilities for two-way communications, tracking, and mapping for wildland firefighters, according to agency officials. Agency officials said that it has been difficult to dedicate staff time to such strategic planning amid increasingly intense and long fire seasons. However, Forest Service officials told us in September 2025 that agency leadership has made funding and staffing its firefighter communications and tracking efforts a priority. In light of this priority and the challenges the Forest Service faces in working to improve its capabilities, developing a comprehensive strategic plan could help the agency direct its future efforts. Our prior work has shown that such plans enable decision-makers to better guide program efforts and determine if they are achieving the desired results.[24] Forest Service officials also said that having a strategic plan would help the agency lay out its long-term vision. Table 1 describes the key components of comprehensive strategic plans for programs.[25]

Table 1: Key Components of Comprehensive Strategic Plans for Programs

Key component	Definition
Mission statement	A comprehensive statement that summarizes the main purposes of the strategy.
Problem definition, scope, and methodology	Identification of the issues to be addressed by the strategy, the scope of its coverage, the process by which it was developed, and key considerations and assumptions used in the development of the plan.
Goals and objectives	Identification of goals and objectives to be achieved by the strategy, activities, or actions to achieve them, as well as milestones and performance measures.
Activities, milestones, and performance measures	Identification of the steps to be taken to achieve the goals and objectives, as well as milestones and performance measures to gauge results.
Resources and investments	Identification of costs to execute the plan and the sources and types of resources and investments, including skills and technology, human capital, and other resources required to meet the goals and objectives.
Organizational roles, responsibilities, and coordination	Development of roles and responsibilities in managing and overseeing the implementation of the strategy and the establishment of mechanisms for multiple stakeholders to coordinate their efforts throughout implementation and make necessary adjustments to the strategy based on performance.
Key external factors	Identification of key factors external to the organization and beyond its control that could significantly affect the achievement of the long-term goals contained in the strategy. These external factors can include economic, demographic, social, technological, or environmental factors, as well as conditions that would affect the ability of the agency to achieve the results desired.

Source: GAO-24-105975. | GAO-25-107905

We previously found that strategic planning can provide a comprehensive framework for considering organizational changes and external factors, making resource decisions, and holding agencies accountable for achieving sustainable results.[26] A clear strategic direction can help provide clarity and focus for agency officials, including during times of staffing, organizational, and budget uncertainties.[27] Developing a comprehensive strategic plan that includes the key components identified in our prior work could better position the Forest Service to improve its communications, tracking, and mapping capabilities going forward amid any uncertainties and known challenges to help improve wildland firefighter safety. For example:

- Defining the goals and objectives for its efforts and the activities and milestones for achieving them could help ensure the Forest Service, Congress, and others understand what the agency aims to achieve and the steps needed to do so.
- Establishing performance measures could help the agency and others assess progress in achieving its goals.
- Identifying the expected costs and expertise needed to implement the plan could help the agency and others determine whether it is directing the resources necessary to achieve its goals.
- Identifying external factors that could affect the agency's ability to achieve its goals could help the Forest Service mitigate those factors and increase the likelihood of meeting its goals.

Conclusions

The ability of wildland firefighters and managers to communicate with each other and to know their locations during a fire is fundamental to improving firefighter safety. The Forest Service has taken a variety of steps to improve its communications, tracking, and mapping capabilities for wildland firefighters. However, loss of agency staff and expertise as well as budget uncertainties led the agency to postpone, pause, or reduce the scope of some of its efforts, as of

July 2025. While the Forest Service has since stated that the agency has made improving its communications and tracking capabilities a priority, the agency's path forward is uncertain.

A clear strategic direction is essential for agency leaders to effectively focus their efforts and resources. Yet, the Forest Service does not have a strategic plan for improving these capabilities. Strategic planning is a lever for clarity and efficiency when an agency needs it most. Developing a plan for improving the agency's communications, tracking, and mapping capabilities that includes the key components of a comprehensive strategic plan—such as defining goals and identifying the activities, costs, and experience needed to achieve them—could help the Forest Service mitigate the challenges it faces as it continues to improve its capabilities. Furthermore, developing a comprehensive strategic plan could better position the Forest Service to navigate future efforts to improve its communications, tracking, and mapping capabilities for wildland firefighters amid any organizational changes or staffing or budget uncertainties.

Recommendation for Executive Action

The Secretary of Agriculture should ensure that the Chief of the Forest Service—in coordination with the Department of the Interior and other firefighting agencies, as needed—develops a comprehensive strategic plan to improve its wildland firefighter communications, tracking, and mapping capabilities.

Agency Comments and Our Evaluation

We provided a draft of this report to the Department of Agriculture in August 2025 for its review and comment. In its written comments, reproduced in Appendix I, the Department of Agriculture's Forest Service generally agreed with our findings, and neither agreed nor disagreed with our recommendation.

In its written comments, the Forest Service acknowledged that the agency had undergone a period of transition and uncertainty and stated that the agency is making its efforts to improve communications and tracking capabilities a priority for funding and staffing going forward. The Forest Service highlighted improvements the agency had made to its communications and tracking capabilities in the month since receiving our draft report. We updated the report to reflect that the Forest Service stated that such improvements had been made as of September 2025.

The Forest Service also said that the title of our report did not accurately reflect the current state of its efforts to improve its communications, tracking, and mapping capabilities for wildland firefighters. We updated our report to include the Forest Service's statement that the agency has made improving these capabilities a priority and that it has filled staffing vacancies to do so. However, our report described several examples of efforts the Forest Service had paused, postponed, or reduced as of July 2025, and the agency did not provide information about its next steps for such efforts. Therefore, we continue to believe that the Forest Service's next steps for improving its communications, tracking, and mapping capabilities for firefighters are uncertain.

How GAO Did This Study

To determine the Forest Service's communications, tracking, and mapping capabilities for wildland firefighters and the status of the agency's efforts to improve those capabilities since 2019, including how those efforts have changed in 2025, we reviewed documents from the Forest Service and others. We also interviewed and reviewed written responses from knowledgeable Forest Service officials, including those from the agency's tools and technology program. For example, we reviewed

- documents from the Forest Service, National Interagency Fire Center, and others on examples of pilot projects and technologies agency officials identified (such as GPS-enabled radios, GPS tracking devices, stratospheric balloons, and WFTAK), including testing reports, plans for additional testing or improvements, and related interagency agreements;[28]
- Forest Service acquisition documents for the GPS tracking devices purchased; and
- available information from Forest Service officials and documents on the actual or potential costs of efforts to improve communications, tracking, and mapping capabilities. This information is not comprehensive and is intended to provide illustrative examples of the potential magnitude of costs involved in improving communications and tracking capabilities as identified by the Forest Service. We corroborated testimonial evidence on costs with documentary evidence when possible but did not independently verify cost information. All actual costs are reported for the year in which they occurred, as indicated throughout the report.

We did not conduct a comprehensive review of all technologies used or tested, or projects completed or planned to improve communications, tracking, and mapping capabilities. Evaluating the effectiveness of the projects was beyond the scope of this review.

To identify the challenges the Forest Service faces in its efforts to improve communications, tracking, and mapping capabilities for firefighters, we interviewed agency officials. One analyst reviewed and categorized the challenges identified by agency officials during these interviews, and the team reviewed for consensus. The list of challenges in this report reflects examples of the challenges identified by Forest Service officials and may not be exhaustive.

In addition, we reviewed relevant portions of the Dingell Act and the Infrastructure Act to identify provisions related to Forest Service efforts to improve communications, tracking, and mapping capabilities for firefighters. We also identified key components of strategic program plans from our past work and requested strategic plans or similar planning documents for improving these capabilities.[29]

We conducted this performance audit from December 2024 to September 2025 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

List of Addressees

The Honorable Martin Heinrich
Ranking Member
Committee on Energy and Natural Resources
United States Senate

The Honorable John Barrasso, M.D.
United States Senate

We are sending copies of this report to the appropriate congressional committees, the Secretary of Agriculture, and other interested parties. In addition, the report is available at no charge on the GAO website at https://www.gao.gov.

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Appendix I

USDA United States Department of Agriculture | Forest Service | Washington Office | 1400 Independence Avenue, SW Washington, D.C. 20250

File Code: 1420
Date: September 10, 2025

Mr. Cardell Johnson
Director, Natural Resources and Environment
U.S. Government Accountability Office
441 G. Street, NW
Washington, DC 20548

Dear Mr. Johnson:

The United States Department of Agriculture (USDA) Forest Service appreciates the opportunity to respond to the U.S. Government Accountability Office's (GAO) draft report titled, "Forest Service: Next Steps are Uncertain for Improving Communications for Wildland Firefighters and Tracking Their Locations (GAO-25-107905)." The agency generally agrees with the GAO draft report, but would like to make a few comments and request a few changes. We understand that this audit was performed during a transition period for Washington Office (WO) Fire and Aviation Management (FAM), resulting from multiple personnel leaving the agency. Please consider the updates described below to be reflected throughout the report.

The workforce loss began in August of 2024. This was exacerbated by a continuing resolution limiting our information technology budget expenditures. However, many of the issues that came up earlier in the year have since been addressed. Any uncertainty surrounding the future of our investments and programs for firefighter tracking and improving communications has been resolved. WO-FAM and agency leadership have made these two areas a priority for funding and staffing. As such, we have been able to leverage the agency's workforce to provide critical staffing in these areas. Since this audit began, we have implemented the following:

- Purchased 500 low Earth orbit satellite communication mini devices for field deployment by firefighters to improve communications in remote areas.
- Distributed 800 low Earth orbit satellite communication devices for tracking our ground resources, even when they are out of cell service. This has increased our resource tracking to include:
  - all of our aviation assets,
  - all of our vehicles and engines,
  - all Forest Service (FS) Hotshot crews and many U.S. Department of Interior Hotshot crews, and
  - approximately 700 other ground resources.
- We worked with USDA to develop a priority protocol for dispatch centers experiencing network issues, radio issues and general communication issues. This has resulted in dispatch centers moving up in priority for establishing the latest internet and network access for our agency and department. We are also working to create low Earth orbit satellite communication panels that will handle our radio over internet (ROIP) network, and we will be procuring 20 of those devices for dispatch center continuity of operations as soon as they are ready for use.

We realize some of this information is within the report, but it is somewhat buried in the end, rather than highlighted throughout. Given the successes we have realized in this area in the past few months, we would like GAO to consider the following specific edits by page itemized below.

- Change the title of the audit report. We are not in an area of uncertainty any longer and do not feel it accurately represents the current state of our programs. Rather, we are rapidly expanding and improving our resource tracking and field communications efforts. Executive Order 14308 provides specific direction to address outdated technology and systems that hinder wildfire response. Further, it requires the completion of a technology road map to "to increase wildfire firefighting capabilities at the state and local levels, including through artificial intelligence, data sharing, innovative modeling and mapping

capabilities, and technology to identify wildland fire ignitions and weather forecasts to inform response and evacuation" (Sec. 3(b)(i)).

- Page 2, paragraph 1, last sentence states: "However, the officials said the agency cannot track and map the locations of most of its firefighters on foot during wildfires." This was true at the beginning of the audit. However, with the deployment of the low Earth orbit satellite communication devices, we are now tracking many of our firefighters. Perhaps change the language to reflect this. "While officials said the agency is tracking most of its firefighters on foot, they are still working to obtain 100% tracking of all ground resources." This appears again on page 5 and again on page 6. The report does not include the most recent deployment of the low Earth orbit satellite communication devices in this section. Therefore, this section is misleading as to the current state of affairs.
- Page 2, paragraph 2, WO-FAM started losing staffing in this area in August 2024 and continued to lose staff until May 2025. We have since been able to leverage the current workforce to bolster this work. Please update the dates to reflect that.
- On page 7, under "What is the status of Forest Service efforts to improve its capabilities?," the report states that "loss of agency staff and budget uncertainties since January 2025…" Our staff losses started in August of 2024 and our budgets are always uncertain, since we only receive one year of funding and for these efforts that funding must be information technology appropriations. We recommend dropping the "since January 2025" statement to better reflect the historical challenges in this area.
- On page 7, the statement, "Consequently, officials said, the next steps for improving the agency's communications, … are unclear," is misleading. As stated above, we are pushing forward and making large investments and improvements in these areas and we do not feel these are unclear.
- The next paragraph on page 7 starts with, "Agency officials we interviewed told us the Forest Service's tools and technology program…lost two of its three permanent staff in 2025." While this is true, we have since been able to fill all those positions from the workforce within our agency. That group, as of August 2025, is again staffed to the same levels as August 2024. We are also investigating the possibility of expanding that team in the near future.
- Page 12, conclusion paragraph, second sentence, states, "loss of agency staff and expertise as well as budget uncertainties since January 2025 have led the agency to postpone, pause, or reduce the scope of some of its efforts." As requested for changes on pages two and seven, please reflect updates to reflect changes in staffing levels since August 2024, as stated by Forest Service and the ongoing improvement to fill those positions.

Thank you again for the opportunity to review the draft report. If you have any questions, please contact Jennifer McGuire, Acting Chief Financial Officer, at jennifer.mcguire@usda.gov.

Sincerely,

THOMAS M. SCHULTZ, JR.
Chief

Accessible Text for Appendix I

File Code: 1420

Date: September 10, 2025

Mr. Cardell Johnson
Director, Natural Resources and Environment
U.S. Government Accountability Office
441 G. Street, NW
Washington, DC 20548

Dear Mr. Johnson:

The United States Department of Agriculture (USDA) Forest Service appreciates the opportunity to respond to the U.S. Government Accountability Office's (GAO) draft report titled, "Forest Service: Next Steps are Uncertain for Improving Communications for Wildland Firefighters and Tracking Their Locations (GAO-25-107905)." The agency generally agrees with the GAO draft report, but would like to make a few comments and request a few changes. We understand that this audit was performed during a transition period for Washington Office (WO) Fire and Aviation Management (FAM), resulting from multiple personnel leaving the agency. Please consider the updates described below to be reflected throughout the report.

The workforce loss began in August of 2024. This was exacerbated by a continuing resolution limiting our information technology budget expenditures. However, many of the issues that came up earlier in the year have since been addressed. Any uncertainty surrounding the future of our investments and programs for firefighter tracking and improving communications has been resolved. WO-FAM and agency leadership have made these two areas a priority for funding and staffing. As such, we have been able to leverage the agency's workforce to provide critical staffing in these areas. Since this audit began, we have implemented the following:

- Purchased 500 low Earth orbit satellite communication mini devices for field deployment by firefighters to improve communications in remote areas.
- Distributed 800 low Earth orbit satellite communication devices for tracking our ground resources, even when they are out of cell service. This has increased our resource tracking to include:
    - all of our aviation assets,
    - all of our vehicles and engines,
    - all Forest Service (FS) Hotshot crews and many U.S. Department of Interior Hotshot crews, and
    - approximately 700 other ground resources.
- We worked with USDA to develop a priority protocol for dispatch centers experiencing network issues, radio issues and general communication issues. This has resulted in dispatch centers moving up in priority for establishing the latest internet and network access for our agency and department. We are also working to create low Earth orbit satellite communication panels that will handle our radio over internet (ROIP)

network, and we will be procuring 20 of those devices for dispatch center continuity of operations as soon as they are ready for use.

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same levels as August 2024. We are also investigating the possibility of expanding that team in the near future.

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Thank you again for the opportunity to review the draft report. If you have any questions, please contact Jennifer McGuire, Acting Chief Financial Officer, at jennifer.mcguire@usda.gov.

Sincerely,

THOMAS M. SCHULTZ, JR.
Chief

Endnotes

1Executive Office of the President, President's Council of Advisors on Science and Technology, Report to the President: Modernizing Wildland Firefighting to Protect Our Firefighters (Washington, D.C.: Feb. 2023); and Wildland Fire Mitigation and Management Commission, On Fire: The Report of the Wildland Fire Mitigation and Management Commission (Washington, D.C.: Sept. 2023). The President's Council of Advisors on Science and Technology comprised 30 individuals from academia, government, and the private sector. A working group on modernizing wildfire response participated in preparation of the report, and the council obtained input from more than 100 experts and stakeholders. The 50-member Wildland Fire Mitigation and Management Commission was established under the Infrastructure Investment and Jobs Act in 2021 and worked with over 130 subject matter experts. Pub. L. No. 117-58, § 70203, 135 Stat. 429, 1252 (2021).

2For example, a review of a 2013 wildfire in Arizona identified insufficient information about the firefighter locations as a contributing factor to the deaths of 19 firefighters. Jim Karels and Mike Dudley, Yarnell Hill Fire June 30, 2013 Serious Accident Investigation Report (Phoenix, Ariz.: Arizona State Forestry Division, Sept. 2013). A multi-agency investigation team prepared this report for the Arizona State Forestry Division.

3Forest Service National Helicopter Program, Automated Dependent Surveillance-Broadcast (ADS-B) Near Real-Time Helicopter Tracking Project "Phase One" Summary (n.d.).

4Specifically, the Dingell Act required the Secretaries of Agriculture and the Interior to, subject to the availability of appropriations and in coordination with state wildland firefighting agencies, jointly develop and operate this system to track the positions of fire resources for use by wildland firefighters by March 12, 2021. This includes, at a minimum, any fire resources assigned to federal type 1 wildland fire incident management teams. Pub. L. No. 116-9, § 1114(d)(1), 133 Stat. 580, 616 (2019) (codified at 43 U.S.C. § 1748b-1(d)(1)). Type 1 wildland fires are the largest and most complex and involve multiple agencies. In 2019, the Forest Service and Department of the Interior formed an interagency team to develop, plan, and implement pilot projects for the tracking system called for by the Dingell Act.

5U.S. Forest Service, Dingell Act Resource Tracking Project Update for Fire and Aviation Management: An Interim Report on Behalf of the Dingell Act Resource Tracking Team (2022).

6Satellite phone systems use geosynchronous equatorial orbit satellites or low earth orbit satellites. Geosynchronous equatorial orbit satellites orbit at about 22,400 miles above the earth in fixed positions in the sky. They can provide near-continuous global coverage with only a few satellites but calls or data services may involve delays due to longer signal transmission distances. In contrast, low earth orbit satellites orbit at 480 to 930 miles. The user must maintain a line of sight to at least one low earth orbit satellite at all times. Because low earth orbit satellites move with respect to the ground, larger arrays of these satellites are required to maintain continuous coverage and minimize dropped calls or interrupted data transmissions. Low earth orbit data transmission speeds are also much slower than speeds of geosynchronous equatorial orbit systems. See U.S. Department of Homeland Security, National Urban Security Technology Laboratory, System Assessment and Validation for Emergency Responders (SAVER) TechNote: Satellite Mobile Phones (Manhattan, N.Y.: June 2015); and U.S. Department of Agriculture Forest Service, Missoula Technology and Development Center, Emergency communications for remote operations, Tech Tip 0767–2301–MTDC (Missoula, Mont.: 2007).

7The stratosphere extends from 4 to 12 miles above the Earth's surface to around 31 miles.

8Forest Service National Helicopter Program, Automated Dependent Surveillance-Broadcast.

9"Location & Intelligence Sharing," Forest Service, accessed June 23, 2025, https://wftak.wildfire.gov/pages/location-sharing-wftak.

10GPS uses a system of navigational satellites operated by the U.S. Department of Defense and available for civilian use. The system can track objects anywhere in the world with an accuracy of approximately 40 feet.

11U.S. Forest Service, GPS Reporting Over Radio System Demonstration Report (n.d.).

12Specifically, the Forest Service and Colorado Department of Public Safety entered into an agreement under which the Forest Service is to reimburse the state for actual expenses incurred, not to exceed $150,000, and the state is to provide $56,568 total in noncash and in-kind contributions.

13The Team Awareness Kit is a free application originally developed by the Department of Defense to facilitate communication for shared tactical awareness across multiple users. The Colorado Department of Public Safety's Center of Excellence for Advanced Technology Aerial Firefighting developed a Team Awareness Kit server for wildland firefighting.

14Specifically, the Forest Service and Colorado Department of Public Safety entered into an agreement under which the Forest Service is to reimburse Colorado's Center of Excellence for Advanced Technology Aerial Firefighting for actual expenses incurred, not to exceed $1,628,460 total for calendar years 2022 through 2026, and the center is to provide $418,230 in noncash contributions.

15U.S. Forest Service, Dingell Act Resource Tracking Project Update.

16U.S. Forest Service, Dingell Act Resource Tracking Project Update.

17Memorandum on Hiring Freeze, 2025 Daily Comp. Pres. Doc. 141 (Jan. 20, 2025); Memorandum on Extension of Hiring Freeze, 2025 Daily Comp. Pres. Doc. 496 (Apr. 17, 2025); and Memorandum on Ensuring Accountability and Prioritizing Public Safety in Federal Hiring, 2025 Daily Comp. Pres. Doc. 753 (July 7, 2025).

18U.S. Department of Agriculture, Automated Flight Following (AFF) Next Generation RFI (Feb. 20, 2025). A request for information is a tool for researching capabilities, interest, price, and other information in the planning phase of the acquisition process.

19Blanket purchase agreements are agreements between government agencies and qualified vendors with pre-negotiated terms and conditions, including prices, in place for future purchases. They are a simplified method of fulfilling repetitive needs for supplies and services.

20U.S. Forest Service, Dingell Act Resource Tracking Project Update.

21U.S. Forest Service, Dingell Act Resource Tracking Project Update.

22See Pub. L. No. 116-9, § 1114(d)(1), 133 Stat. 580, 616 (2019) (codified at 43 U.S.C. § 1748b-1(d)(1)).

23Pub. L. No. 117-58, 135 Stat. 429, 1393-1394 (2021). The act provided appropriations for wildland fire management for fiscal years 2022 through 2026 but did not appropriate funding for Forest Service specifically for improvements to communications, tracking, and mapping of wildland firefighters. The Infrastructure Act also authorized the Secretary of Agriculture, acting through the Chief of the Forest Service, and the Secretary of the Interior to undertake various efforts related to wildfire risk reduction. See id., 135 Stat. 1097-1105.

24GAO, Managing for Results: Critical Issues for Improving Federal Agencies' Strategic Plans, GAO/GGD-97-180 (Washington, D.C.: Sept. 16, 1997).

25GAO, Nuclear Waste Cleanup: Closer Alignment with Leading Practices Needed to Improve Department of Energy Program Management, GAO-24-105975 (Washington, D.C.: June 4, 2024).

26GAO, Climate Change Adaptation: Strategic Federal Planning Could Help Government Officials Make More Informed Decisions, GAO-10-113 (Washington, D.C.: Oct. 7, 2009).

27In June 2025, the President issued an executive order directing the Secretaries of the Interior and Agriculture, to the maximum degree practicable and consistent with applicable law, to consolidate their wildland fire programs within 90 days of the executive order. The executive order states that the Secretaries are to consolidate their programs to achieve the most efficient and effective use of wildland fire offices, coordinating bodies, programs, budgets, procurement processes, and research and, as necessary, recommend additional measures to advance this objective. Exec. Order No. 14308, § 2, 90 Fed. Reg. 26,175, 26,175 (June 18, 2025).

28Other sources of documents we reviewed included NASA and the state of Colorado's Center of Excellence for Advanced Technology Aerial Firefighting.

29See GAO-24-105975 and GAO/GGD-97-180.