TESTIMONY OF

DR. MICHAEL J. FALKOWSKI

CHIEF SCIENTIST, EARTH FIRE ALLIANCE

Before the

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

Hearing on

"Innovation in Disaster Prevention: Advancing Technology for Prediction and Response"

September 15, 2026

EXECUTIVE SUMMARY

Chairman Babin, Ranking Member Lofgren, and Members of the Committee, thank you for the opportunity to appear before you today.

My name is Dr. Michael Falkowski, and I am the Chief Scientist at Earth Fire Alliance (EFA), a U.S.-based global nonprofit building the technological infrastructure needed to detect, monitor, and understand Earth's wildfires. Before joining EFA, I led NASA's Wildland Fire Program, which focused on developing cutting-edge technology, including satellite and airborne systems, to drive discovery in global fire science and improve wildfire management. I have dedicated my career to understanding fire and land management needs, and ensuring science and innovation serves those in need of solutions on the ground.

Mr. Chairman – there is no doubt that our country is in a wildfire crisis. The frequency of devastating fires has dramatically increased over the past few decades. This year is no exception. As of September, wildfires have already burned nearly double the acreage of what burned in 2025, and we are just entering the peak fire season in places like California. We are experiencing major impacts on our communities and our economy, with homes destroyed in places like Spokane, Washington and Reno, Neveda; our cattle industry disrupted in places like Texas and Nebraska; and toxic air blanketing communities from Washington State, to Wisconsin, and even here in Washington, D.C.

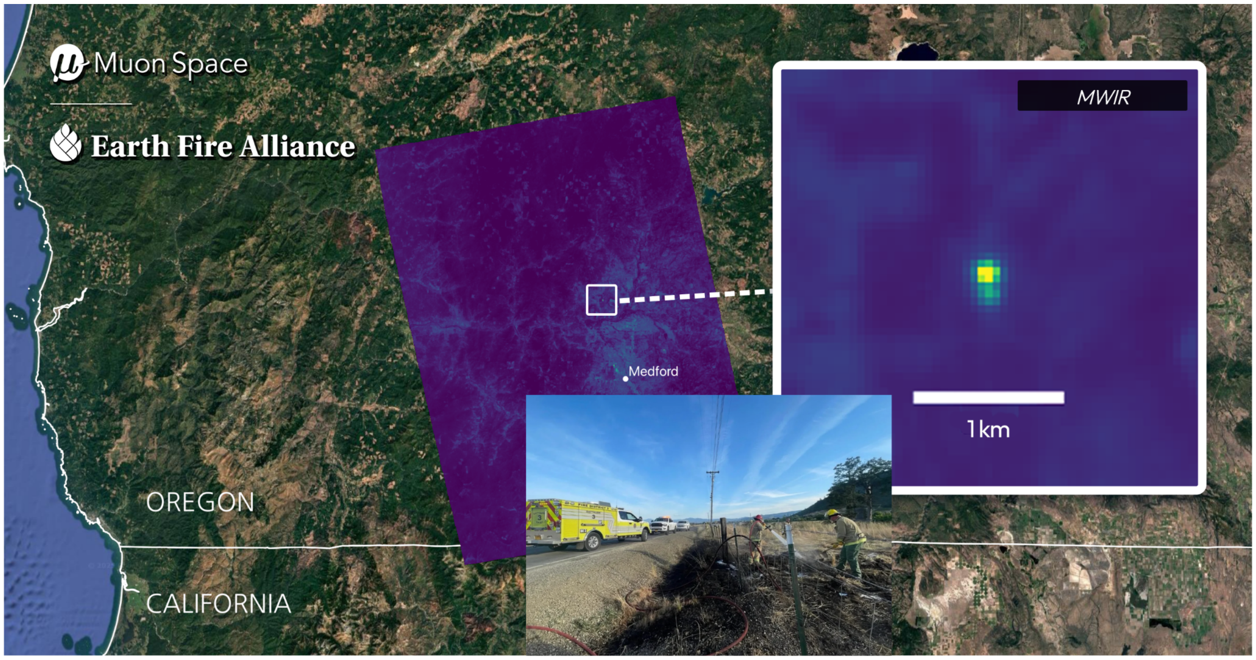
However, fire itself is not the problem – many of the forests and grasslands in our country require regular beneficial fire to maintain healthy ecosystems and reduce fuel loads that contribute to uncontrollable fire. The most devastating impacts occur when fire meets extreme weather conditions near under-prepared communities. This is exactly what happened this August when a series of fires quickly moved through Spokane, destroying nearly 850 homes and structures and forcing 65,000 people to evacuate.

So, what can we do? The U.S. desperately needs practical solutions to increase the resilience of our communities by applying cutting-edge technology that supports beneficial fires and predicts, identifies, and mitigates potentially catastrophic fires before they occur.

In much of the country, today's fire is still being managed and fought with technology developed 20 or 30 years ago. This is largely the result of a significant disconnect between operational fire management agencies and technology innovators. Although we are seeing major leaps forward in technology, individual agencies and companies often work in silos, which hinders the adoption of innovative tools that are fit for purpose.

Our nation's wildfire crisis will not be solved by any one organization or technology alone. But there are glaring gaps in current capabilities we should take urgent action to fill. For example, when I was at NASA, local leaders and firefighters repeatedly asked for higher resolution, higher frequency data on fire location, intensity, and spread. I joined EFA to help fill that gap. In collaboration with over 200 firefighters and fire scientists, EFA's flagship program, FireSat, was specifically designed and purpose built to meet these expressed needs.

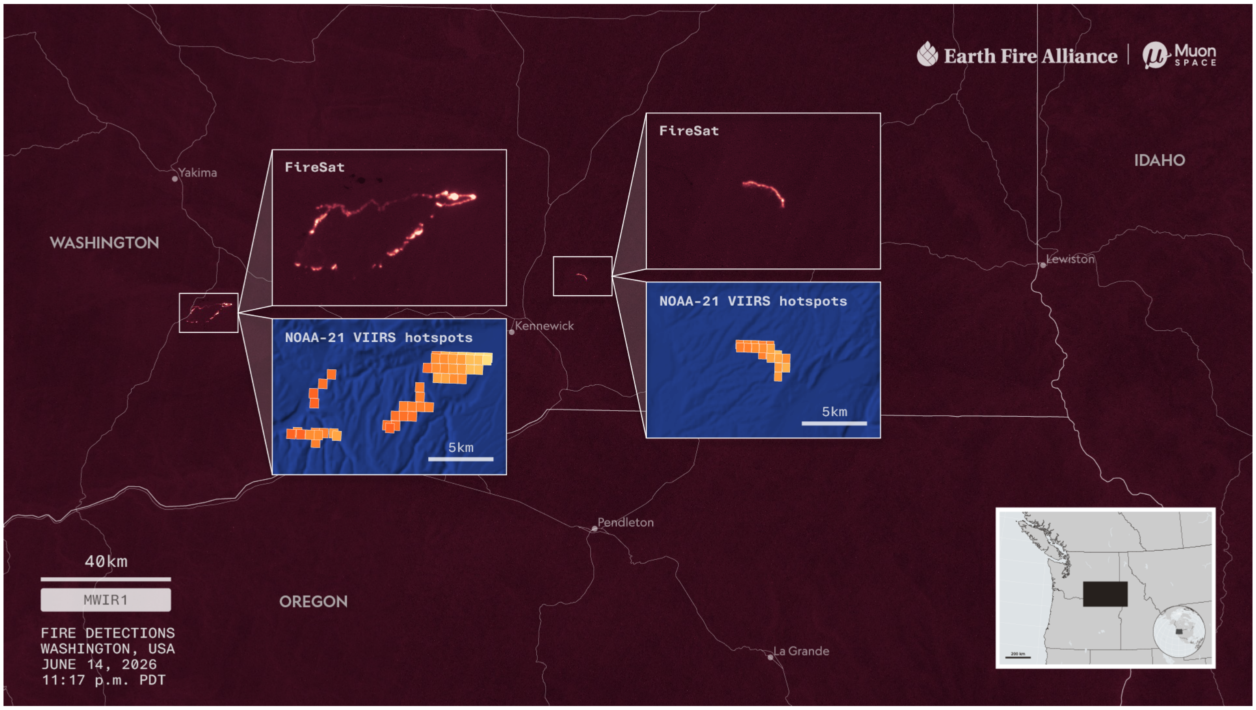
FireSat can detect small fires early and provide persistent observation as they progress. When fully operational, the constellation will deliver fresh data for any point on Earth every 20 minutes or less. This level of detail for early detection and frequency of data updates is unprecedented.



FireSat can detect wildfires as faint as a grass fire and as small as 5x5 meters–about the footprint of two parking spaces. One of the first images captured by the FireSat protoflight on orbit demonstration was this small, roadside fire in Oregon that existing satellites systems did not detect.

Current multipurpose satellites struggle to detect wildfires until they are orders of magnitude larger and do not provide updated data at the frequency required by firefighters. EFA currently has 4 FireSats in orbit, three of which launched in July. We are working closely with firefighters and scientists to build an accessible dataset that will be invaluable for implementing innovative fire management and resilience strategies to help keep U.S. communities safe.

Bringing FireSat from vision to reality required more than innovative technology; it demanded a new way of collaboratively funding, designing, building, and operating satellites. To achieve this, EFA was founded on what we call the P4 model, which partners philanthropic and public investment, with private and governmental innovation. FireSat would not be possible without the technological foundation agencies like NASA and NOAA developed and derisked over the last 30 years, or the hundreds of firefighters and scientists who informed its design.



FireSat hotspot detections shown alongside NOAA VIIRS data. Multi-purpose Earth observation satellites like VIIRS provide robust government technological heritage upon which the private sector can rapidly develop purpose-built systems like FireSat. They also provide trusted datasets to calibrate and validate emerging technology against.

EFA's novel approach offers a roadmap for what successful innovation and impact can look like. The nation cannot afford to continue developing technology for disaster resilience in silos. EFA's model shows the importance of driving innovation with the needs of those on the ground; the role that the non-profit, public sector, and philanthropic community can play in convening these essential collaborations; and the exciting possibilities commercial innovations present when integrated appropriately. I am confident that we have the tools and know how to solve this crisis.

I appreciate the Committee's leadership on these urgent issues and look forward to working together to address them.

THE GROWING WILDFIRE CRISIS

Fire is a first-order Earth System process that connects the biosphere, atmosphere, hydrosphere, and lithosphere with profound impacts on humanity. Over the last several decades, the frequency and intensity of large and destructive fires have increased globally. In some regions, these changes are partially due to fire exclusion from fire-adapted ecosystems for over a century (e.g., western

North America), whereas in other parts of the world fires are being introduced into non-fire adapted ecosystems (e.g., the Amazon) as a tool to alter land use and appropriate land. Regardless of the geography, increases in uncharacteristically large and severe wildfires have profound effects on the Earth system, ecosystems, and ultimately on human communities and economies both adjacent to and far removed from the fires. Ecosystem impacts include alteration of biogeochemical cycles and changes to ecosystem composition, structure, and function. Impacts on human communities such as degraded water and air quality as well as increased risks of landslides and flooding events can have severe implications for human health and livelihoods. Wildfire smoke alone is now estimated to cause over 1.5 million deaths per year worldwide, and in California specifically, one study attributed 52,500–55,700 deaths and $432–$456 billion in costs to wildfire smoke between 2008 and 2018[1, 2].

Global fire activity has surged in parallel; forests now lose more than twice as much tree cover to fire annually as they did two decades ago, four of the five worst years on record have hit since 2021, and the January 2025 Los Angeles fires caused an estimated $250–$275 billion in economic damage, part of a trend the United Nations Office for Disaster Risk Reduction (UNDRR) pegs as adding roughly $170 million a year in losses since 1970, with damages potentially tripling by 2070[1, 3].

In the United States, this shift is visible directly in fire behavior: average annual acreage burned has grown from roughly 2.9 million acres per year in the 1980s to more than 7 million acres per year over the past decade (2015–2024), a more than two-fold increase, even as the annual number of fires has stayed comparatively flat, indicating that individual fires are burning larger and more severely than in the past[5.] This growth has been especially costly where fire meets developed communities: wildfires have destroyed more than 130,000 structures nationwide since 2005[6], and the past decade includes some of the most destructive fires in U.S. history, including the 2018 Camp Fire in Paradise, California (roughly 18,000 structures destroyed, 88 deaths) and the 2023 Lahaina fire on Maui (over 2,000 structures destroyed and at least 102 deaths, the deadliest U.S. wildfire in more than a century)[7], as well as the January 2025 Palisades and Eaton fires in Los Angeles, which together destroyed more than 16,000 structures and killed 31 people[8].

Beyond the human toll, wildfires impose enormous and rising costs on the U.S. economy. A 2023 Congressional Joint Economic Committee analysis estimated that climate-exacerbated wildfires cost the country between $394 billion and $893 billion annually, roughly 2–4% of GDP, once property and infrastructure damage, lost income and tourism, timber losses, suppression spending, insurance payouts, and health impacts are combined, cautioning that this range likely still undercounts costs such as post-fire erosion and long-term ecosystem recovery[9]. Agricultural and ranching communities absorb a disproportionate share of these losses: the 2024 Smokehouse Creek Fire and related blazes across the Texas Panhandle burned roughly 1.2 million acres of rangeland and killed an estimated 10,000–15,000 head of cattle, driving agricultural losses of about $123 million, including $69 million in infrastructure damage, more than half of it for the 2,000–3,000 miles of fencing that had to be rebuilt at $15,000–$20,000 per mile[10]. Similar losses recur across the West: wildfires in Oregon, Idaho, and Washington in a single recent season burned 1.6 million acres of federal grazing allotments, killing livestock and forcing ranchers onto emergency pasture and purchased hay while the burned rangeland took two or more years to recover[11].

These direct losses compound a broader economic strain on rural, fire-prone communities, where rising insurance premiums (up 13% nationally between 2020 and 2023, and over 51% in Colorado over a similar period) and the withdrawal of major insurers from high-risk markets are eroding property values and local tax bases, squeezing the budgets small towns rely on for schools, police, and infrastructure even as they absorb the direct costs of fire recovery[12].

This year (2026) is no exception to this trend. As of early September 2026, the United States is in the midst of its most destructive wildfire season in at least a decade: more than 8.3–8.4 million acres have burned nationwide, well above the roughly 7.6-million-acre average of the preceding ten years and nearly double the acreage burned by the same point in 2025[13]. The Pacific Northwest and Intermountain West have borne the brunt of the activity, led by Oregon's Big Grass Fire — at roughly 579,000 acres, the largest wildfire in state history — alongside major fires such as Nebraska's Morrill Fire (over 640,000 acres, one fatality), Colorado's Aspen Acres Fire (over 100,000 acres, roughly 850 structures destroyed, and more than 4,000 evacuations), and Utah's Cottonwood Fire (nearly 100,000 acres, 145 structures destroyed)[14]. Nationally, the season has already claimed at least nine lives and pushed federal suppression spending past $6 billion, with individual states setting their own records — Oregon alone has spent over $236 million fighting fires and expects total seasonal costs to reach roughly $350 million, surpassing its 2024 record[15]. Set against a Department of the Interior estimate that U.S. wildfires already impose $87–$424 billion in annual economic and health costs in a typical year, the scale of the 2026 season illustrates how quickly a single active year can compound the longer-term trend toward larger, costlier, and more destructive fires[15].

THE WILDFIRE DATA GAP

Despite wildfire's importance in the Earth System and its profound impacts on humanity, it remains under-observed and poorly understood. This lack of understanding stems from the fact that active fire is very difficult to measure at relevant scales. Satellite remote sensing is one method that has been used to measure fire across large spatial extents to move forward our understanding of fire behavior. The U.S. government has been at the forefront of Earth Observation (i.e., the use of satellite or airborne imagery) for global fire science since NASA launched the first Moderate Resolution Imaging Spectroradiometer (MODIS) sensor on December 18, 1999, aboard the Terra satellite, and the subsequent launch of MODIS on Aqua on May 4, 2022. Data from MODIS, and now NOAA's Visible Infrared Imaging Radiometer Suite (VIIRS) sensor have improved our understanding of the role that fire plays in the Earth System. In addition, Geostationary satellites regularly provide high temporal cadence imagery to track large fires at course scales.

However, these datasets are limited in capturing data across the fire life cycle at temporal intervals and spatial scales relevant to operational fire management and fire science. For example, civil low earth orbit (LEO) satellite sensors such as MODIS, VIIRS, and those aboard Sentinel-2 and Sentinel-3 do not take observation at time periods of peak fire behavior (Figure 1). These peak burn periods are critical times for first responders who often have limited fire intelligence to maximize the effectiveness of fire intervention strategies and the protection of human lives. Additionally, from the perspective of Earth system science, these time periods of intense burning have profound impacts on ecosystems and the atmosphere, and this observational gap leaves scientists with a limited set of information for understanding these critical processes and impacts.

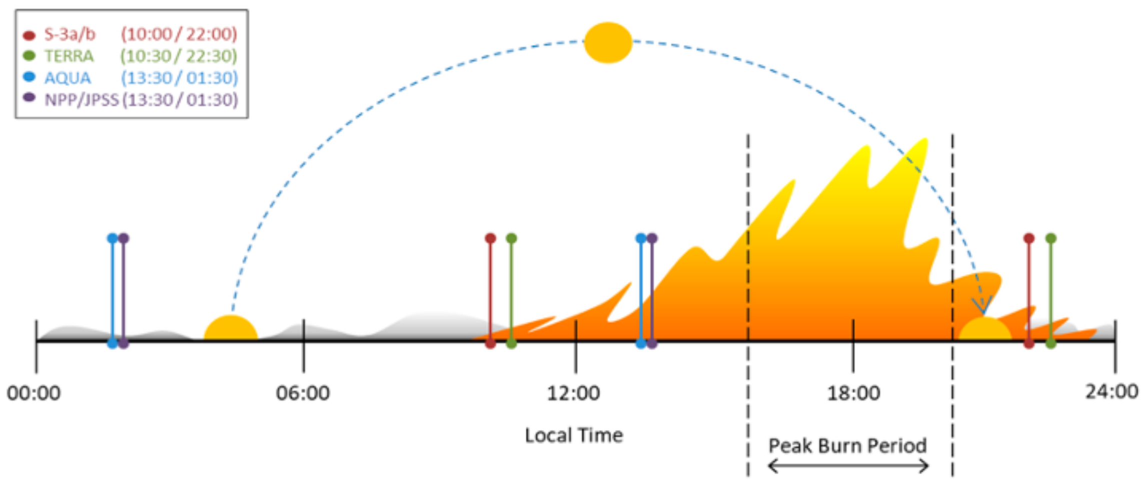


Figure 1: Overpass time of civil LEO Active-fire satellites in relation to diurnal wildfire activity. *Adopted from Johnston et al., 2020*[4].

In addition to these timing limitations, civil LEO and GEO satellites do not collect data with enough spatiotemporal detail for both operational fire management and global fire science. Geostationary sensors like Geostationary Operational Environmental Satellites (GOES)-16's Advanced Baseline Imager (ABI) image the same spot every five to 10 minutes but at roughly 2 km pixels, so they routinely miss small fires and smoldering fires below the heat-detection threshold. Polar-orbiting LEO sensors like VIIRS (375 m) and MODIS (1 km) resolve smaller fires as compared to GOES but only pass over a given location a few times a day, so fast-starting or short-lived fires can ignite, spread, and even die out between overpasses. These data gaps leave operational fire responders without reliable early warning on small spot fires and sub-canopy smoldering (which can turn into large destructive fires), or persistent monitoring of fire intensity and spread during destructive wildfire events. Additionally, small fires are systematically undercounted small in the burned-area and emissions datasets that global fire science rand air quality forecasters rely on, ultimately biasing our understanding of fire activity toward the large, easily detected events.

ADDRESSING THE DATA GAP: THE FIRESAT STORY

In 2022, the Environmental Defense Fund conducted extensive surveys and interviews with firefighters and fire managers to better understand how these critical data gaps impacted their work.

Conversations suggested that earlier detection and high spatial resolution, real time tracking of evolving wildfires could provide incident response with necessary situational awareness to contain fires that pose the most significant risks to human communities and critical ecosystems. If fires could be better understood during the initial attack phase, it could also reduce risk to life and property, decrease fire suppression costs, and maximize the efficient use of limited fire management resources. These observations could also be leveraged to help understand real time fire behavior, furthering our ability to predict fire spread, risk, and ultimately help decide when to intervene on a fire and when not to, ultimately leading to novel fire prevention and mitigation strategies that more efficiently and effectively manage ecosystems over time and reduce the overall frequency of damaging wildfires.

Motivated by the data gaps and operational fire management and fire science needs described above, a group of interested parties including the Environmental Defense Fund, Google Research, Muon Space (Muon), and philanthropic funders spearheaded an effort to co-design and co-develop a solution. The Earth Fire Alliance (EFA) and FireSat were born out of these early scoping discussions and studies. EFA and its technical partner Muon are now developing and operating FireSat through rapid action and radical collaboration. FireSat is an advanced satellite system purpose-built for the global wildfire challenge, and is starting to deliver timely, trustworthy data directly to fire agencies and scientists around the world who need it to protect communities and ecosystems. With a strong emphasis on data usability and accessibility, FireSat will ultimately provide high-cadence thermal and multispectral imagery to support early fire detection, active fire characterization, fire behavior tracking, and assessment of ecosystem and climate impacts at planetary scale.

The FireSat constellation is designed to provide broad-area coverage with multispectral infrared (MSIR) fire data products for delivery to wildfire management stakeholders for detection, monitoring, and characterization of global active fires. From mission conception to implementation, Muon and EFA have worked closely with wildfire management stakeholders evolving from initial formulation and concept to an on-orbit pathfinder system, FireSat0, that launched in March 2025. The next three satellites in the FireSat constellation represent the initial operating capabilities (IOC) and were deployed in July 2026. At least four additional FireSats are manifested for launch by 2028, with the goal of a ~50-satellite constellation to be completed in the early 2030s (Table 1). Figure 2 shows these missions and their respective communication and processing paths to get information to users as fast as possible. Some of these paths utilize optical communication systems, which are paradigm changing from a downlink and mission design perspective, greatly reducing data latency, ultimately getting actionable data into fire managers' hands quicker.

Table 1. FireSat satellites. *Launched and planned FireSat missions through FY 2028 (FireSat0 and FireSat IOC are currently on-orbit)*

Mission	# of Sats	Launch Date	Orbit	Payload(s)
FireSat0	1	Mar 2025	590 km SSO	6-band Multispectral EO/IR
FireSat IOC	3	July 2026	600 km SSO	6-band Multispectral EO/IR
FireSat-SBEM	2	Q4 2027	600 km SSO	9-band Multispectral EO/IR
FireSat-SBEM	1	Q2 2028	600 km SSO	9-band Multispectral EO/IR

The FireSat constellation is equipped with Muon's novel MSIR payload to provide global wildfire monitoring with an unprecedented combination of sensitivity, revisit, and latency. FireSat is designed to constantly collect multispectral imagery over global landmass using a scanned aperture with five unique spectral bands (six channels), including Visible (VIS), Near infrared (IR) (NIR), Short-Wave IR (SWIR), Mid-Wave IR (MWIR) and Long-Wave IR (LWIR) to achieve key fire detection, characterization, and monitoring goals. Details of these channels are given in the table in Figure 3. The spatial resolution at nadir is 50 m, and 150 m at the full scan angle of 55˚, creating a swath width of 1500 km. The instrument architecture leverages this targeted band selection, detector technology and scanning concept of operations (CONOPs) to map fire perimeters, measure fire radiative intensity, and detect thermal anomalies as small as 5m x 5m with high confidence. The constellation configuration has been optimized for coverage, revisit, execution feasibility, deployment timeline, and cost.

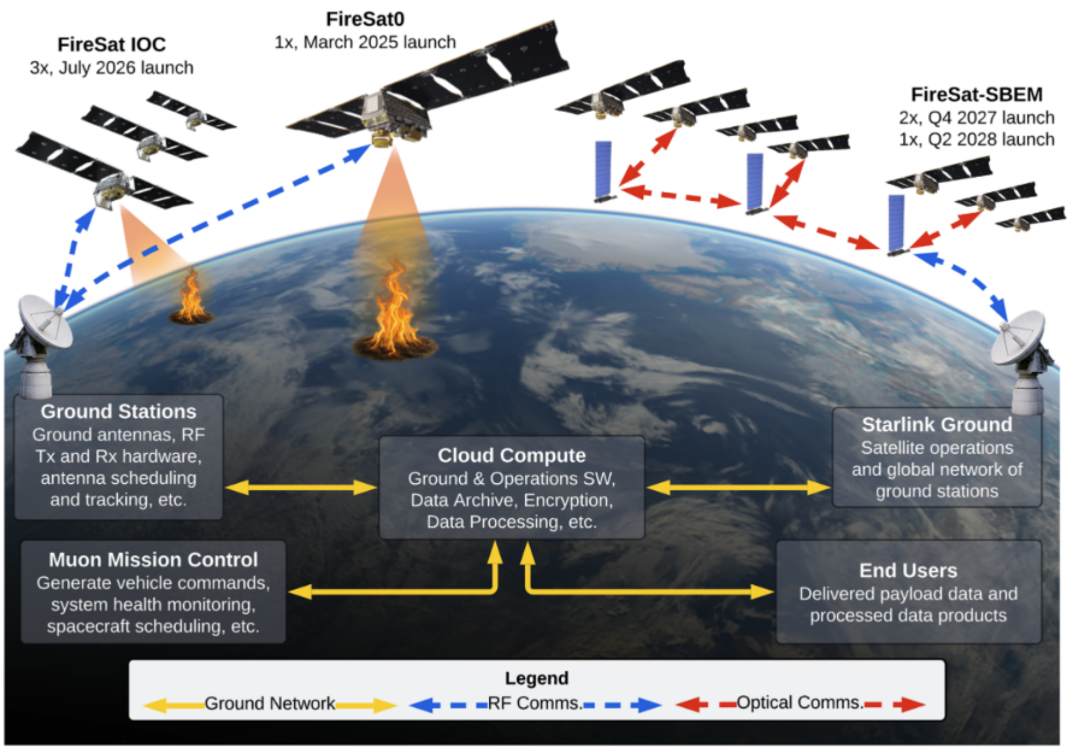


Figure 2: FireSat constellation build-out. *Plans through early 2028 for FireSat constellation additions. Future FireSats will include Optical Inter-Satellite Links for rapid downlink of data products.*

Since initial formulation, the Quickbeam instrument has undergone significant development, including a first flight onboard the FireSat0 space vehicle. A second iteration, Quickbeam V1.1 (Figure 3, right), was developed to support the IOC mission, incorporating minor design changes for enhanced geolocation accuracy requirements, thermal performance, manufacturability, and environmental ruggedization.

The FireSat MSIR payload leverages the six spectral channels to provide a multifaceted approach to wildfire intelligence. As illustrated in Figure 4, the Red and NIR bands are critical for assessing pre- and post-fire landscapes, utilizing indices to delineate burn scars and vegetation. VIS, NIR, and SWIR reflectances are critical for false alert screening, including bright surfaces and solar glint. The two MWIR channels serve as the primary engine for active fire detection and characterization. The combination of an MWIR band and attenuated MWIR band enables observational sensitivity to a wide spectrum of wildfire thermal signatures. Complementing these, the LWIR band provides essential context by characterizing the thermal environment and identifying cloud cover. Together, these discrete spectral responses integrate into a high-fidelity, comprehensive diagnostic of wildfire behavior and environmental impact. An example of a sub-pixel fire detection in MWIR from FireSat0 is shown in Figure 5, and examples of regional detection is shown in Figure 6 demonstrating the differences in fire features observable between MWIR and LWIR.

Spectral Bands	Spectral Bands	FWHM Bandwidth
VIS / NIR	Red - 0.64 um	0.08 um
	NIR - 0.87 um	0.06 um
SWIR / MWIR	SWIR - 1.60 um	0.10 um
	MWIR1 - 3.75 um	0.51 um
	MIWR2 - 3.75 um (attenuated)	0.44 um
LWIR	LWIR - 10.75 um	0.33 um

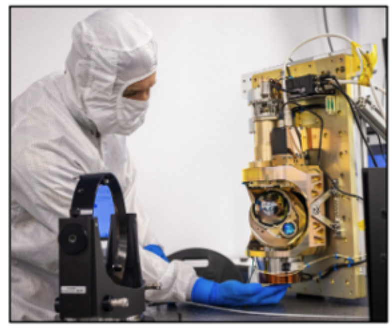


Figure 3. FireSat multispectral infrared payload – Quickbeam. *Left: Quickbeam spectral bands and bandwidths enabling wildfire observation. Right: An IOC flight payload under test (launched July 2026).*

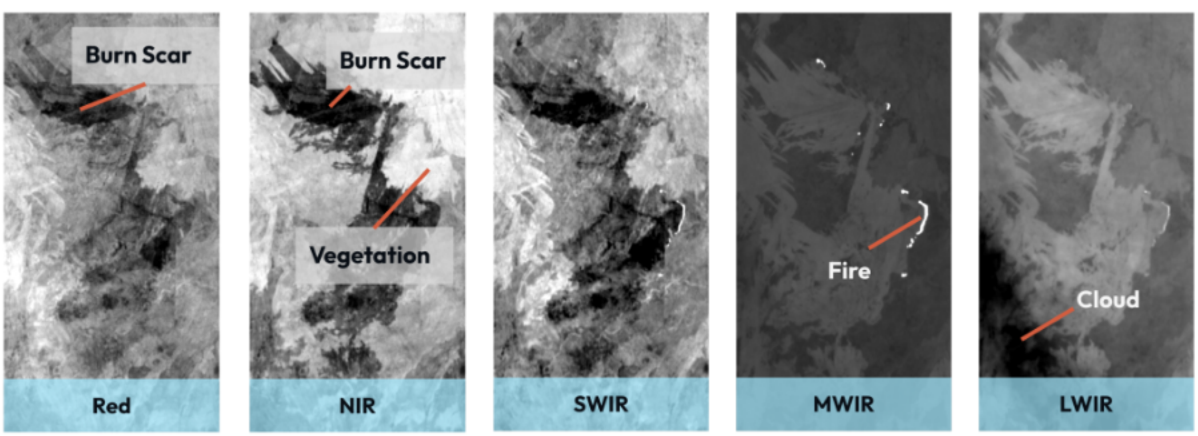


Figure 4. FireSat spectral coverage and wildfire utility. *Example of FireSat imagery detailing the various wildfire utility in each spectral band. Image taken from Lajamanu, Australia, July 18, 2025.*

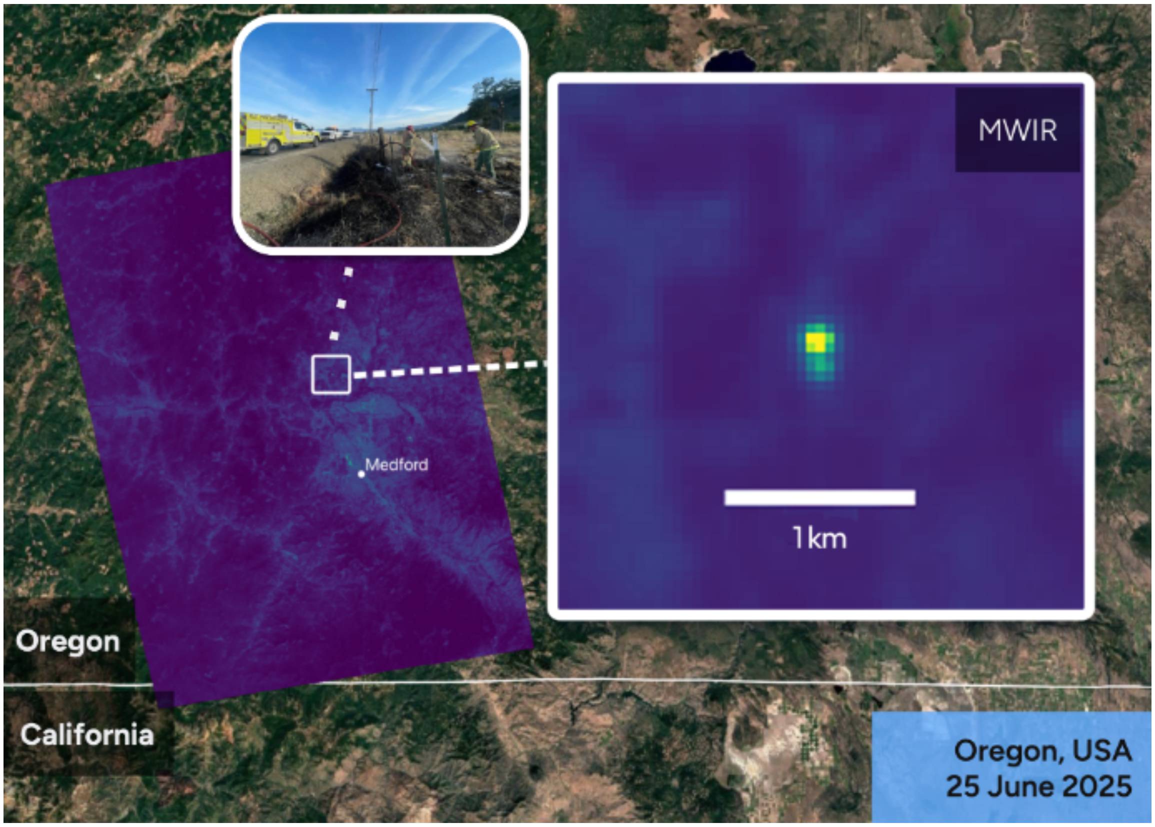


Figure 5. Small, early-Stage wildfire detection. *Example of FireSat imagery detecting a small fire at an early stage in Oregon, June 25 2025.*

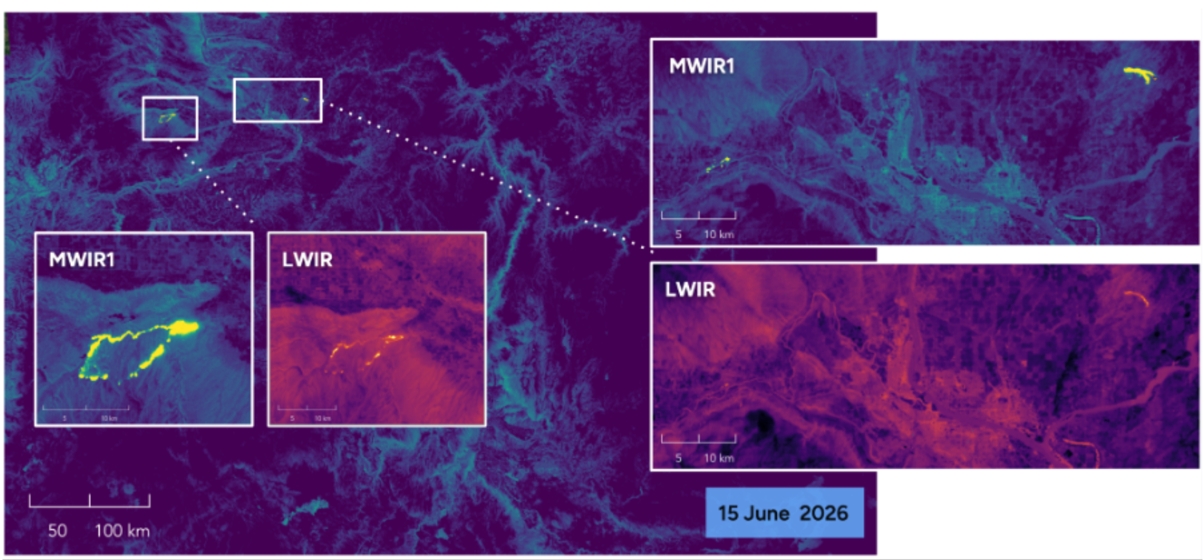


Figure 6. Example of regional fire detection. *Different details of the fire are visible in MWIR and LWIR; Eastern Washington, June 15 2025.*

HOW FIRESAT CAN SUPPORT THE US MISSION

Given the observational capabilities offered by the FireSat constellation and the quantity of thermal data that will be collected, FireSat offers the Earth Science community significant opportunities in coming years, both as a contextual data source and as a demonstrative model for leveraging commercial space systems to address scientific and societal challenges. As agencies such as NASA pursue “Science-as-a-Service” and restructures the Earth Venture Orbital (EVO) program as pathways to create unique public-private partnerships that leverage commercial on-orbit capabilities and PI-led cost-capped investigations in LEO, FireSat data can inform, validate, and help formulate mission solutions and science applications for NASA, other federal agencies, and in the future, other countries. FireSat data can also be seamlessly integrated into fire management work flows for a variety of fire agencies at local, state, and federal levels.

Using existing contractual mechanisms, the U.S. government could access FireSat data without the need to build, own, or operate the constellation. For example, NASA’s Commercial Smallsat Data Acquisition (CSDA) program licenses commercial EO data (SAR, hyperspectral, methane, etc.) for NASA-funded scientists, and the data are broadly available for use across the U.S. Government for research use. FireSat's active-fire and fire radiative power products are a natural fit for integration with that pipeline, giving government funded researchers ready access to FireSat data without having to develop a new mission line.

The foundation for this is already beginning to be built. In July 2026, NOAA's National Environmental Satellite, Data, and Information Service (NESDIS) selected Muon Space, the company that designs and operates the FireSat constellation for the Earth Fire Alliance, for a wildfire imagery data pilot under its Commercial Data Program. The $2.51 million award, running from August 3, 2026 through June 3, 2027, procures the multispectral infrared satellite imagery that FireSat0’s Quickbeam payload collects, and will be used to evaluate wildfire detection, characterization, monitoring, and mapping performance against NOAA's operational needs. The pilot pairs NESDIS's Commercial Data Program with NOAA's Wildland Fire Team to assess data quality and real-world operational impact, and is authorized under the Weather Research and Forecasting Innovation Act of 2017, the same statute NOAA has used to build out its broader portfolio of commercial data purchases. A successful pilot could lead to sustained commercial data buys that supplement NOAA's own satellites, giving FireSat a concrete government pathway into national wildfire monitoring and response operations.

FireSat can also play a role in advancing the U.S. federal government's collaborative calibration and validation activities. For example, NASA currently runs airborne and ground-based fire focused field campaigns (e.g., FIREX-AQ, FireSense, The INjected Smoke and PYRocumulonimbus Experiment (INSPYRE)) where satellite, airborne, and ground measurements are co-collected. These types of activities could be leveraged to independently verify FireSat's fire data products as a route to build community trust in, and adoption of the data. Additionally, the government currently operates and maintains calibration sites and tools that are critical for the commercial industry for the calibration of space-based sensors. This includes sites like the Jet Propulsion Laboratory's Thermal Radiometer Validation Sites and RadCalNet. Further, the continued availability of national, reference-class space-borne instruments (e.g., NOAA's VIIRS sensor) to provide top-of-atmosphere intercomparisons is critical to the ability of commercial providers to tie their data to the same scale and to demonstrate to the Earth observation community that the data can be incorporated into their models. In order to use these data, hyperspectral references to calculate spectral band adjustment factors over a range of calibration sites should be made easily available using modern tools and interfaces. Continued development of the Moon in both the solar-reflected wavelength range and the thermal infrared as a calibration target will support high-quality intercalibration of commercial constellations.

These collaborative calibration and validation activities work feeds directly into another opportunity: building a harmonized, multi-decade data records. The planned sunset of MODIS operations coupled with the launch of the operational FireSat constellation presents a unique opportunity to preserve and extend long term Earth system records related to fire. NASA has managed similar sensor transitions in the past, including establishing active-fire data continuity between MODIS and VIIRS. The same cross-calibration approach could be used to harmonize FireSat's higher-resolution, higher-cadence detections onto the existing MODIS/VIIRS active-fire time series, extending a 25-year global fire record, while also providing more detailed fire measurements that will be invaluable to fire science and wildfire management.

Finally, for any of this to have lasting scientific value, the resulting data needs a durable home. NASA's Earth Science Data Systems (ESDS) Program and its network of Distributed Active Archive Centers (DAACs) - LP DAAC and LAADS DAAC - already archive MODIS/VIIRS fire products. Those data systems could ingest, standardize, and preserve FireSat and FireSat-MODIS/VIIRS-merged records for open long-term access, the way NASA already does for its other Earth observation missions.

LEARNING FROM THE FIRESAT PARTNERSHIP MODEL

The federal government is pursuing radical acquisition reform through Executive Orders that promote competition, streamline and expedite acquisition processes, review unnecessary regulations, increase access to commercial capabilities, and elevate subscription and "as-a-service" models that encourage cost sharing across customers. The design, delivery, and operation of FireSat provides a model for mission-focused partnership among industry, nonprofits, and government agencies to accelerate technology development, demonstration, and rapid acquisition and scaling of national and global space-based wildfire solutions.

Building FireSat required more than innovative technology; it demanded a new way of collaboratively funding, building, and operating a satellite constellation. Early philanthropic funding paid for the initial study at Muon that subsequently motivated funding from several philanthropic organizations. EFA was established to manage the funding and interface to the science and operational communities, and operates on what it calls a public-private-philanthropic partnership (P4) model, that unites philanthropic and public investment, commercial innovation, and scientific expertise. Through this arrangement, Muon (a venture capital backed startup) and EFA jointly funded the pathfinder mission, FireSat0, and the following three satellites (IOC); additional satellites are planned to rapidly achieve a persistent, global wildfire detection and monitoring capability. In October 2025, the U.S. Space Force (USSF) awarded Muon a $44.6M Small Business Innovation Research (SBIR) Phase III award using Other Transaction Authority (OTA) to rapidly demonstrate dual-use space based environmental monitoring capabilities to meet both military theater weather intelligence requirements and advanced wildfire detection and monitoring needs via future FireSat satellites. By making slight modifications to the instrument, the defense customer benefits from common datasets and accelerated fielding of the constellation with four more satellites by 2028. By leveraging philanthropic, venture capital, and defense funding, the FireSat constellation is on track to bring paradigm shifting wildfire data to scientists and fire operators on a timescale that historically would have been impossible. Programs like FireSat that pair the public and private sector with end users facilitate rapid iteration and scaling of mission-focused capabilities while helping identify and address technical gaps.

OPPORTUNITIES FOR COST-SAVING AND MULTI-USE RESOURCES

With expanded access to LEO, new commercial and government applications have emerged, ranging from communications systems to whole-Earth imaging. There are many opportunities for these applications to overlap with goals related to science and disaster response and resilience. Common systems can be built to address multiple needs, ultimately saving money and time. Dual-use or multi-mission capabilities underpin the FireSat long-term plan. Considering multiple applications early in the design process can enable more cost-effective solutions that produce science-grade data at scale. For example, through the FireSat-SBEM demonstration program, the U.S. Space Force is supporting Muon in the evaluation and calibration of this data for operational use. In fiscal year 2027, USSF is formally establishing a program and budget to buy commercial Environmental Monitoring (EM) “Data-as-a-Service” (DaaS). This model could be explored as a model for SaaS that pivots away from custom designs (see next subsection) by proactively incentivizing hybrid, mission-as-a-service models that integrate commercial capabilities to fill critical government and scientific needs.

Further, increased communication and coordination among NASA, NOAA, and USSF regarding common requirements would promote hardware development that meets needs across agencies, cost sharing, and interagency opportunities and contracts. This construct blends initial government funding for core instrument development and calibration, through collaboration with U.S. federal agencies, with a DaaS model for long-term operations and sustainment, with the contractor taking responsibility for maintaining data quality, constellation performance, and ultimately constellation replenishment. The approach could be used to address science questions and disaster response and resilience needs while creating cost-saving collaborations.

THE COMMERCIAL ADVANTAGE

The U.S. government no longer has to worry about launch vehicle integration thanks to the standardization and reliability of modern commercial launch. Similarly, commercial satellite providers are now offering solutions for science and applications on orbital platforms. Commercial mission providers can regularly supply standardized, flight-proven platforms for space-based payloads, with technical support to architect mission designs, and the infrastructure for commissioning and long-term operations. By embracing standardized satellite solutions for a subset of appropriate missions, could shorten time-to-science and applications, making implementation more affordable.

RECOMMENDATIONS: IMPROVED GOVERNMENT TECHNOLOGY ACQUISITION

NASA and NOAA have initiated commercial partnership models like the Commercial Satellite Data Acquisition (CSDA) program and the Commercial Data Program (CDP). These programs benefit the U.S. government and the research community by enabling more frequent science and technology demonstration opportunities at relatively low cost. Additionally, by strategically investing in the growth of the U.S. commercial space industry, the agencies are broadening the supply of commercial space services – for itself, other agencies, and non-government customers. The continued success of programs like CSDA, CDP, and Venture Technology Accelerator (VTA) that provide access to commercial science capabilities depends on the use of contracting, licensing, and partnership mechanisms that align with commercial business, such as block buys, fixed-price contracts, and service level agreements.

To further these types of interagency and industry dual-use and multi-mission collaborations, these of flexible contracting mechanisms and programs designed to rapidly evaluate and operationalize commercial space capabilities for supporting science and disaster response and mitigation could be explored. These include:

- Other Transactions Authority (OTA) agreements that share risk and cost for research and prototyping and provide a pathway to follow-on procurements for successful prototype efforts. OTA agreements attract non-traditional startups and laboratories because they lack the rigidity of FAR-based contracts, can be awarded more quickly, include negotiable terms for Intellectual Property (IP), data rights, and audit requirements, and allow milestone-based payments. OTA awards like the Space Force FireSat-SBEM program provide a partnership model for continuously deploying improvements and incorporating emerging features in months versus years. Other federal agencies could seek authorities similar to the Department of War to move from prototype-to-procurement via existing OTA agreements.

- Commercial Solutions Openings (CSO) modeled after those pioneered by the Defense Innovation Unit and USSF. Using a three-phased approach with rapid pitch and proposal cycles similar to private sector business models, the CSO process can lead to signed agreements in 60 to 90 days. CSO's offer a negotiable IP framework and opportunities for parallel or "competing" prototypes to allow NASA to evaluate multiple approaches or solutions. Through CSO's, other U.S. government agencies can leverage its funds with venture capital investments.

- Multi-year block buys for missions, spacecraft, or data sets to shift the U.S. Government to a high-volume subscriber of commercial and dual-use space services. If NASA-unique capabilities are required, an approach similar to the USSF FireSat-SBEM model could be applied to provide seed funding for variations on instruments and commercialization of U.S. government-developed capabilities in a commercial system.

- Indefinite Delivery, Indefinite Quantity (IDIQ) contracts which onboard multiple awardees and issue frequent competitive opportunities and task orders to be issued among the vetted pool. Examples are SDA's Hybrid Acquisition for Proliferated Low Earth Orbit (HALO) OTA-based IDIQ and the National Security Space Launch contracts.

- Strategic Breakthrough Awards and other new authorities in the 2026 Small Business Innovation and Economic Security Act. Under the new "Strategic Breakthrough Awards" program, agencies like NASA, DoW, and DOE can apply a percentage of their budgets to award Small Business Innovation Research (SBIR) contracts of up to $30 million per project over a period of four years in milestone-based payments to bridge the "valley of death" between research and mission deployment. Additionally, NASA for example has Direct-to-Phase II authority for the STTR program for the first time, allowing the agency to bypass Phase I for firms that can demonstrate technical feasibility, speeding up the development of complex technologies. NASA should also continue to use the Phase II-Extended (II-E) awards to support commercialization and leverage its new Broad Agency Announcement framework for continuous SBIR program calls throughout the year.

References

1. MacCarthy, J., et al. The latest data confirms: Forest fires are getting worse. World Resources Institute. https://www.wri.org/insights/global-trends-forest-fires
2. Rachel Connolly et al., Mortality attributable to PM2.5 from wildland fires in California from 2008 to 2018. Sci. Adv.10,eadl1252(2024). DOI: 10.1126/sciadv.adl1252
3. Walser, G. (2025, January 13). The invisible costs of wildfire disasters in 2025. United Nations Office for Disaster Risk Reduction (UNDRR). https://www.undrr.org/news/invisible-costs-wildfire-disasters-2025
4. Johnston, J. M., et al. (2020). Development of the user requirements for the Canadian WildFireSat satellite mission. Sensors, 20(18), 5081. https://doi.org/10.3390/s20185081
5. National Interagency Fire Center (NIFC). Wildfires and Acres. https://www.nifc.gov/fire-information/statistics/wildfires
6. Headwaters Economics. Structures Destroyed by Wildfire. https://headwaterseconomics.org/natural-hazards/structures-destroyed-by-wildfire/
7. Fox Weather. A look at the deadliest US wildfires in modern history. https://www.foxweather.com/learn/california-hawaii-fires
8. FireRescue1. (2026, January). By the numbers: 1 year after the Palisades and Eaton fires devastated Calif. https://www.firerescue1.com/wildfire-and-wildland-urban-interface/by-the-numbers-1-year-after-the-palisades-and-eaton-fires-devastated-calif
9. Joint Economic Committee (JEC), U.S. Congress. (2023, October). Climate-Exacerbated Wildfires Cost the U.S. Between $394 to $893 Billion Each Year in Economic Costs and Damages. https://www.jec.senate.gov/public/index.cfm/democrats/2023/10/climate-exacerbated-wildfires-cost-the-u-s-between-394-to-893-billion-each-year-in-economic-costs-and-damages

10. Farm Progress. Wildfire loss estimates continue to grow. https://www.farmprogress.com/livestock/wildfire-loss-estimates-continue-to-grow
11. Drovers. As Wildfires Rage in West, Ranchers Lose Cattle, Rangeland. https://www.drovers.com/news/wildfires-rage-west-ranchers-lose-cattle-rangeland
12. Headwaters Economics. Cascading wildfire insurance issues impact local and state budgets. https://headwaterseconomics.org/natural-hazards/wildfire-insurance-local-state-budgets/
13. Newsweek. (2026, September). US Wildfire Acreage Hits 10-Year High as Fires Rage Across West. https://www.newsweek.com/us-wildfires-hit-highest-acreage-burned-in-a-decade-12409322
14. Wikipedia. 2026 United States wildfires. https://en.wikipedia.org/wiki/2026_United_States_wildfires
15. TIME. (2026, September 12). The U.S. Is Having One of Its Most Active Wildfire Seasons. Here's How the Costs Are Adding Up. https://time.com/article/2026/09/12/the-u-s-is-on-track-for-a-record-wildfire-season-here-s-what-it-could-cost-americans/

APPENDIX TO TESTIMONY

About Earth Fire Alliance

Earth Fire Alliance (EFA) is a global nonprofit coalition building the technological infrastructure the world needs to detect, monitor, and understand fire — and deliver critical data to the firefighters, scientists, and communities who need it most. Grounded in radical collaboration and united by the belief that every community deserves to coexist confidently with fire, EFA partners with operational agencies, scientists, and technologists across continents to make fire data globally accessible, actionable, and available for the public good.

Earth Fire Alliance's purpose is to illuminate the world's fires—delivering the transformative data that first responders, scientists, and communities need to better understand, respond to, and recover from wildfire.

We envision a future where humanity's relationship with wildfire is guided by knowledge and every community can confidently coexist with fire.

Our mission is to:

*****Observe** our planet's fires comprehensively.

*****Serve** communities worldwide with timely and trustworthy fire information.

*****Conserve** ecosystems, protect lives, and strengthen resilience by making critical fire data globally accessible.

FireSat: A Transformative Tool

The U.S. needs to rapidly detect when wildfires start, continuously monitor ongoing events, and understand the effects of fire on our communities, economic security, and way of life. Our perception of a wildfire should be like that of a developing hurricane for which we can see potential paths, project severity, and empower communities to act.

EFA's FireSat constellation will empower firefighters across echelons with frequent, high-resolution thermal imaging data. This actionable wildfire intelligence will enable end users to:

- **Detect Wildfires Earlier:** Identify heat anomalies and fire ignitions before they escalate, reducing response time and potential damage.
- **Track Fire Behavior in Near Real-Time:** Monitor fire spread, intensity, and direction with frequent updates, supporting dynamic resource allocation.
- **Enhance Situational Awareness:** Provide a comprehensive view of active fire zones.
- **Improve Predictive Modeling:** Support fire risk assessments, resource planning, and mitigation strategies.

- **Aid Recovery Efforts:** Assess post-fire landscapes, support damage assessments, measure burn severity and enable ecological restoration planning.

A recent World Economic Forum report on wildfire resilience concluded: new funding mechanisms are necessary to reward verified risk reduction; and every $1 spent on wildfire mitigation generates $4 in avoided losses. Wildfires cost the U.S. $400B+ annually. For a mere fraction of these costs, technology like FireSat can enable the nation to detect, monitor, and respond to wildfires in a way never before possible.

Delivering Data for the Public Good

To address adoption challenges, data usability and accessibility are core to the FireSat program, which is modeled as a data-agnostic public service akin to severe weather warnings or GPS. EFA will offer seamless integration of FireSat data into as many existing operational and scientific end user applications as possible. EFA's data products are also designed to integrate within the current fire technology ecosystem (e.g., cameras, drones, other satellites) to provide complementary data and insights.

FireSat data products include:

- **Hotspot Identification:** Early detection and assessment of new or growing wildfires.
- **Fire Perimeter:** Efficient resource allocation from a near real-time common operating picture.
- **Fire Radiative Power:** New measures of ecosystem impacts from heat intensity.
- **Fire Progression:** Improved safety for the frontline and public with persistent situational awareness.

The FireSat system architecture allows for low-latency data delivery to first responders on the front line, enabling them to optimize fire response and resource allocation throughout a wildfire's entire lifecycle. FireSat will also deliver a world-class dataset for scientific applications, AI-based predictive modeling, and ultimately support the development of improved wildfire mitigation and resilience strategies.

What's Next for FireSat

The three satellites launched in July 2026 are undergoing testing and checkout ahead of nominal operations:

- **Q4 2026:** Operational FireSat data will reach EFA's Early Adopters—fire agencies and scientists across the world's most fire-prone geographies—at least twice daily.

- **2027-2028:** Data availability will expand throughout 2027 to support fire science and wildfire resilience activities as well as emerging commercial applications, with global access anticipated by 2028.
- **2029+:** As additional satellites join the constellation, EFA's next impact target is a global revisit rate of one hour or less by 2029, followed by a goal of 20 minutes or less in the early 2030s.
- **Beyond FireSat:** EFA is also building two emerging programs: FireImpact, which will translate FireSat's global dataset into actionable scientific knowledge; and FireConnect, which will connect that data to local action and resilience-building in communities worldwide.

The Power of the Collaborative P4 Model

EFA was built on a unique public-private-philanthropic partnership (P4) model which has a number of benefits:

- **Resource Maximization:** Fire agencies can access wildfire data, tools, and expertise without additional costs.
- **Rapid Innovation:** Leading-edge solutions are co-developed based on the lived experiences and expressed requirements of end users.
- **New Technology De-Riskment:** Philanthropy funds rapid early development and test cycles.
- **Adoption at Scale:** Early adoption programs prove technology and pave the way for broader operational use.
- **Sustainable Growth:** End users provide the authority and framework to scale innovation into lasting programs.

Shared resources and responsibility accelerate change, adoption, and impact. By coordinating efforts, steps that are typically sequential in technology development can occur concurrently, significantly reducing the development to adoption timeline.

EFA's Growing, Global Coalition

EFA's superpower is that it is a platform for collaboration and coordination. The organization is funded by leading foundations and companies, and works through and with best-in-class technologists, scientists, and government agencies.

EFA's Core Funders

- Bezos Earth Fund

- Google.org
- The Gordon and Betty Moore Foundation
- The Patrick J. McGovern Foundation
- Twilio

EFA's Core Partners

- Environmental Defense Fund
- Esri
- FireWERX
- The Food and Agriculture Organization of the United Nations Global Fire Management Hub
- Google Research
- OroraTech
- Muon Space
- Wildfire Interdisciplinary Research Center, San Jose State University

FireSat Early Adopter Program

EFA drives its requirements and data access approach through an early adopter program. EFA works with fire agencies, modelers, and scientists worldwide to better understand immediate use cases and impacts of FireSat data, and to strengthen community feedback loops to continue improving the FireSat program. This ensures FireSat data is actionable from day one. There are currently 18 program participants across five continents, including fire management agencies (operators), fire science organizations (modelers), and industry partners (pathways). This includes:

Operators

- California Department of Forestry and Fire Protection (CAL FIRE), USA
- The Central Asháninka del Río Ene, Peru
- Colorado Division of Fire Prevention and Control (DFPC), USA
- Oregon State Fire Marshal (OSFM), USA
- Texas A&M Forest Service, USA
- Australian Capital Territory Rural Fire Service (ACT RFS), AUS
- New South Wales Rural Fire Service (NSW RFS), AUS
- Queensland Fire Department, AUS
- South Australia Country Fire Service (SA CFS), AUS
- Tasmania Parks and Wildlife Service (TPWS), AUS
- Agency for Integrated Rural Fire Management (AGIF), Portugal
- The Technical Unit of the Wildfire Response Group of Catalan Fire and Rescue Service, Spain
- The Central Asháninka del Río Ene, Peru

Modelers

- Amazon Environmental Research Institute (IPAM), Brazil
- Moroccan National Agency for Water and Forests (ANEF), Morocco
- Western Fire & Forest Resilience Collaborative, USA
- Woodwell Climate Research Center, USA

Pathways

- Satellites on Fire, Argentina
- Watch Duty, USA