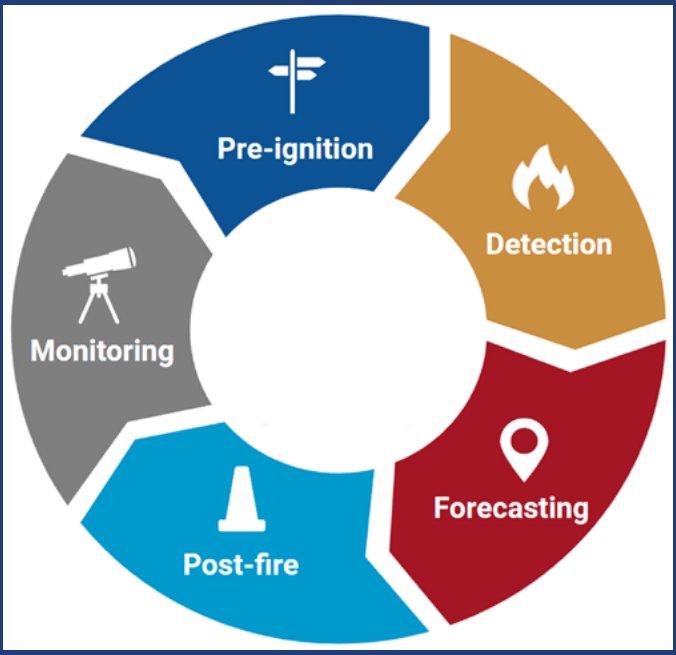
Tracking Wildfires and Smoke

How the View from the Sky Helps Fight Fires on the Ground

North America experienced a catastrophic wildfire season in 2023. In Canada, the total area burned by wildfires obliterated previous record highs—the fires consumed nearly 45 million acres. Heavy smoke from these fires descended over major metropolitan areas from the U.S. Midwest to the Mid-Atlantic, causing hazardous air quality conditions affecting millions of people.

NOAA plays a key role in detecting, monitoring, and fighting these kinds of devastating fires. NOAA's wildfire team includes experts from NESDIS, the National Weather Service (NWS), and NOAA Oceanic and Atmospheric Research (OAR). NOAA satellites provide critical, timely information on wildfires and smoke detection that is used by this team and by the National Interagency Fire Center (NIFC) which coordinates the nation's wildland fire management and suppression agencies.



Fire life cycle from a NOAA science and service perspective.

The NESDIS GOES and JPSS satellite missions supported Canadian wildfire monitoring efforts, and tracked the smoke that drifted across the Midwest and East Coast United States. From their positions in geosynchronous orbit over North America, GOES-East and GOES-West satellites observations tracking the heavy smoke from the Canadian wildfires allowed local communities to issue timely Air Quality Index alerts so vulnerable people, such as the elderly, or people with asthma, knew to stay indoors.

The VIIRS instruments on JPSS satellites provide data to help predict where wildfire smoke will affect air quality in the United States and the amount of particulates in the air. The data from JPSS are essential for running smoke models used by air quality forecasters to predict where smoke from wildfires will move. OAR developed a smoke forecasting capability and the NWS operated the model, increasing the accuracy of forecasts of wildfire smoke impacts on air quality.

While tracking the Canadian wildfires and smoke, NOAA satellites simultaneously monitored Alaska, the lower 48 and neighboring countries to the south for signs of burning.The satellite-derived data are generated routinely in near real time and accessible via interactive web-based mapping applications displaying detailed fire locations and smoke extent.

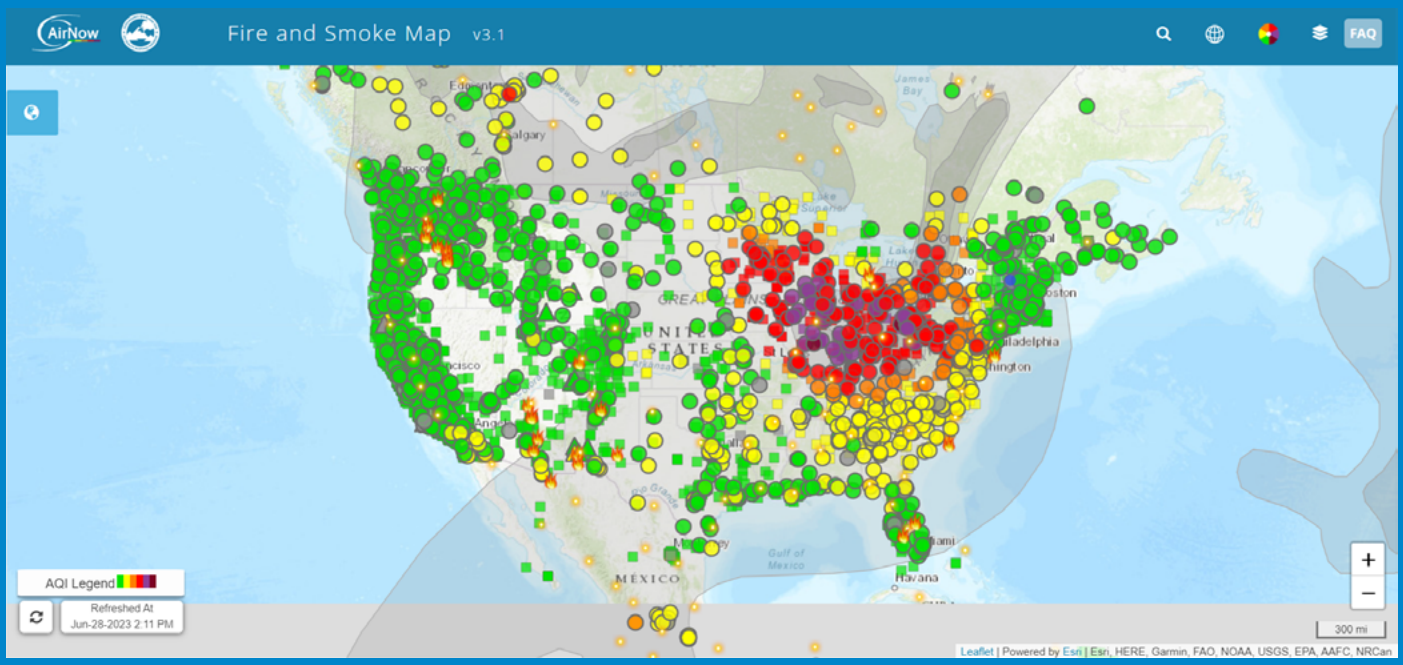
Forecasters at the National Interagency Fire Center (NIFC) use NOAA satellites and data to track the life-cycle of wildland fires beginning with monitoring and pre-ignition. This includes monitoring drought and dry conditions that inform land management agency assessments that a wildland fire may start.

Detection of wildfires by satellites has improved with the GOES-R Series, which is orbiting innovative instrument technology. The Advanced Baseline Imager (ABI) detects wildfire locations from more than 22,000 miles above the earth and within minutes of the wildfire

AirNow Fire and Smoke Map

Ron Evans serves as the US Environmental Protection Agency's (EPA) AirNow Fire and Smoke Map Coordinator, He notes, "The AirNow Fire and Smoke Map, a joint USEPA and USFS project, provides the NOAA smoke plume information to augment the air quality data which we provide in real time to the public. Users of the AirNow Fire and Smoke map have told us the smoke plume information helps them understand the sources of smoke in their area and any actions they need to take to protect their health."

—Ron Evans, EPA AirNow Fire and Smoke Map Coordinator, US Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality and Standards, Air Quality Assessment



The AirNow Fire and Smoke map provides real-time information on air quality, fire information, smoke plumes, and smoke outlooks.

being imaged. The Geostationary Lightning Mapper (GLM) assesses potential lightning that may ignite fires in remote and difficult-to-monitor locations.

NWS forecasters at field offices across the nation monitor satellite information and alert our partners in the wildfire and emergency management communities whenever they detect a "hot spot" or new fire start. Investments from the Supplemental Disaster Appropriations and Bipartisan Infrastructure Law will improve the use of ABI and GLM on GOES satellites for wildfire detection, tracking, and intensity classification through development of sophisticated algorithms and applications for decision making.

Real-time support of wildfire suppression crews requires specialized assistance—the kind provided by instruments on GOES-West and GOES-East (ABI and the GLM), and the JPSS satellites (Visible Infrared Imaging Radiometer Suite (VIIRS), which provide data 24 hours a day to all users.

Satellite images give crucial information, but firefighters might need specific information about wildfire and smoke. NOAA provides multi-faceted support to land management and fire agencies to aid decision making to better manage and suppress active fires. This support includes tailored, detailed weather forecasts provided by NWS Incident Meteorologists, and satellite imagery that fire behavior analysts can use to monitor trends in fire behavior. NOAA provides satellite-based analysis of smoke to the Environmental Protection Agency and is part of the EPA's AirNow fire and smoke mapping system. This allows forecasters to provide accurate hazard warnings to the public, so people can protect themselves.

"We use the satellites to inform decisions on where to stage assets across the country," said Brad Quayle of the Forest Service's Geospatial Technology and Applications Center, which plays a key role in providing remote-sensing data for active wildfire suppression. "When there's high competition for firefighters, tankers and aircraft, decisions have to be made on how to distribute those assets."

Forecasting and post-fire monitoring are an integral part of the year-round nature of managing wildfires. NOAA satellites provide data to help create products and imagery that enable forecasters to better understand how landscapes previously impacted by fire are recovering. This is essential for identifying areas that are vulnerable to mudslides and flooding during the rainy season. NWS forecasters use these data as they prepare rainfall forecasts and consider the potential for deadly debris flows and mudslides.

Disaster Supplemental and BIL funds

Using investments from the Disaster Relief Supplemental Appropriations Act, 2022 (P.L 117-43), NESDIS has been refining its ABI-derived hotspot detection algorithm. This will assist land management agencies and other users in identifying new wildfires in a timely manner, enabling a more rapid response to wildfires that are a threat to life and property. The combination of ABI and GLM, along with the traditional and AI-based weather nowcasting provided by GOES satellites, improves decision making that protects the public, firefighters, and aviation assets during fire suppression operations.

Additionally, the BIL directed USDA and DOI to collaborate with NOAA on space-based wildfire detection work. This coordination is on-going.

Looking to the Future

As the planet's climate changes, the nation's wildfire community will need more tools and resources. NOAA is defining requirements now for our next generation satellites to continue and enhance its support of wildfire and smoke management. NOAA's next generation geostationary satellites, GeoXO, and polar-orbiting satellites, Near Earth Orbit Network (NEON), will include enhanced imaging and new capabilities for detecting wildfires and tracking smoke, building on the GOES and JPSS satellite mission legacy.