

## Predicting wildfires to save lives and property with supercomputing

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*Researchers at the National Center for Atmospheric Research (NCAR) aid efforts to reduce future risk of wildfires with insight from HPE-powered supercomputers*

Wildfires are becoming more volatile each year, taking human lives, destroying property, impacting natural ecosystems, and creating major economic loss. In the United States alone, the number of large wildfires has increased since 2004, according to the [National Interagency Fire Center Data](#). Additionally, based on [current analysis](#) on warmer climate and drier conditions that factor into igniting fires, 2021 is also expected to have severe wildfires.

In a growing effort to fight wildfires before they cause major damage, researchers have been turning to supercomputers to model and simulate wildfire behavioral patterns to predict when, where, and how a fire will spread.

### Accelerating wildfire predictions with a one-of-a-kind forecasting model

A team at the National Center for Atmospheric Research (NCAR), one of the world's leading atmosphere and environment research laboratories based in Colorado, is focused on simulating behavioral patterns from wildfires by building high-resolution weather models using an HPE-powered supercomputer. The research analyzes influential factors that determine wildfire spread such as wind speed, weather, and the condition of plant life.

Current systems used for predicting wildfire behavior lack critical details such as how powerful drafts or turbulent storm outflows can drastically alter a fire's path or fail to provide insights on terrain conditions that are closer in proximity. NCAR closes these prediction gaps with its Weather Research and Forecasting (WRF) model that factors in comprehensive data of what triggers and spreads fires.

Since teaming up with the State of Colorado, NCAR has shared these granular predictive models with local decision-makers, such as first responders, meteorologists, and air quality specialists, to apply them to real events. The insight aims to take stronger action and strategically allocate resources to protect lives, including firefighters on the frontline tackling active blazes, and property.

### Simulating a wildfire's entire lifecycle and uncertain events

NCAR's WRF-Fire model incorporates a range of complex data to simulate the entire lifecycle of a fire and understand all variables of its uncertainty. These scenarios include:

- **Understanding fire movement from weather interaction** – Wind, humidity and air density can affect how fire will move and by incorporating these natural elements, researchers gain significant insight into how fire and weather interact during active blazes.
- **Determining a wildfire's path based on geography** – The angle of a mountainside's slope can drastically change the path of a fire. NCAR's models zoom in on these factors to provide localized details, allowing firefighters to plan and route their efforts accordingly.
- **Gaining accurate vegetation data based on moisture levels in vegetation** – Accurate vegetation data improves accuracy of modeling wildfire risks. By applying machine learning algorithms to simulations, NCAR's researchers are able to calculate accurate moisture levels and how they vary on a daily basis.

### Taking wildfire predictions to the next level with next-generation supercomputing

Building an accurate wildfire model and ensuring faster forecasting is no easy task. It requires a massive amount of compute performance, including specialized computing, such as graphic processing units that can harness image-intensive data, to understand complex physical processes in wooded areas or fire-prone regions. These capabilities are critical in processing high-resolution simulations that are key to making accurate predictions.

At HPE, we are inspired by researchers that tackle these challenging environmental and societal issues and are honored to support NCAR in its ongoing mission in doing so with next-generation supercomputing.

As a result of NCAR's growing research requirements for a significantly more advanced supercomputer, which will help forecast finer details of wildfires down to 100 feet of terrain conditions, HPE is honored to design and build NCAR a new system in 2022 to dramatically improve today's forecasting capabilities. The new system will also tackle predictions in other natural phenomenon, including solar storms, hurricanes, droughts and tornadoes, with a goal to predict events up to ten years.

The upcoming system, which has been named Derecho, a word for a widespread, fast-moving wind storm, will be 3.5X faster than NCAR's existing system and will be one of the first weather forecasting systems enabled by the HPE Cray EX supercomputer, a high performance computing architecture built to power next-generation supercomputing speed and capabilities.

We are saddened by communities impacted by extreme weather conditions across the world, including recent, catastrophic wildfires that broke in the western United States and flooding in western Europe. We hope by continuing our collaboration with leading research centers such as NCAR to bring powerful technology to fuel discoveries in weather and climate, we can help pave the way to building safer and sustainable environments.