

Reviving the Colorado Fire Prediction System (CO-FPS)

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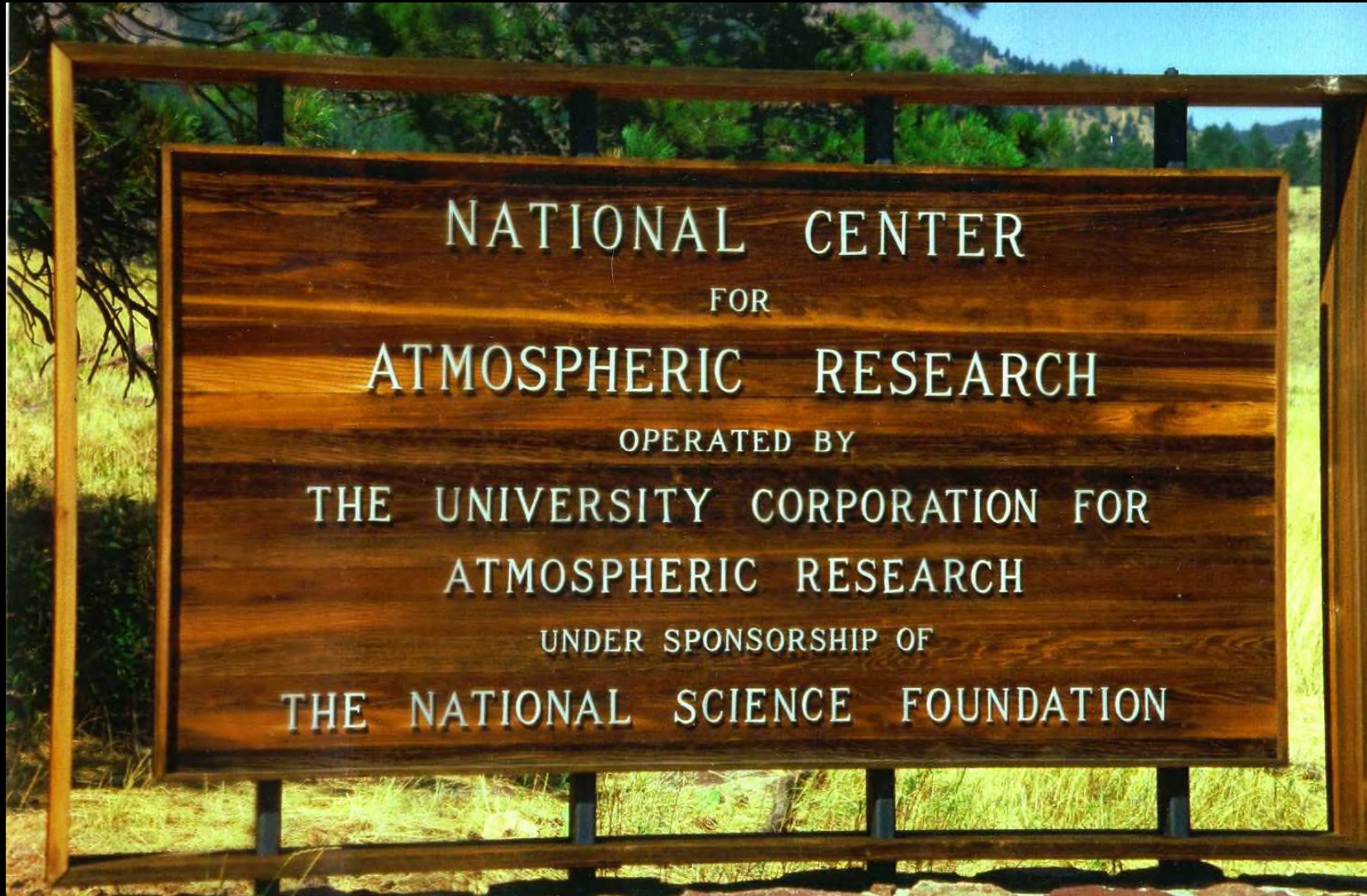
Wildfire Matters Review Committee meeting
29 August 2023



This presentation will answer four questions

1. What are NCAR and UCAR?
2. What is the Colorado Fire Prediction System (CO-FPS) and what is its history of state support?
3. Why is CO-FPS a valuable tool for helping the state to meet the challenge of reducing harm from wildfires?
4. What does NCAR recommend for the future of CO-FPS?

1. What are NCAR and UCAR?



1. What are NCAR and UCAR?

NCAR, founded in 1960, is a federally funded research and development center (FFRDC) sponsored by the National Science Foundation

UCAR is a non-profit consortium of 100+ member colleges and universities (in Colorado: CU, CSU, UNC, MSU Den, DU) that manages NCAR and several other related organizations



1. What are NCAR and UCAR?

NCAR's mission

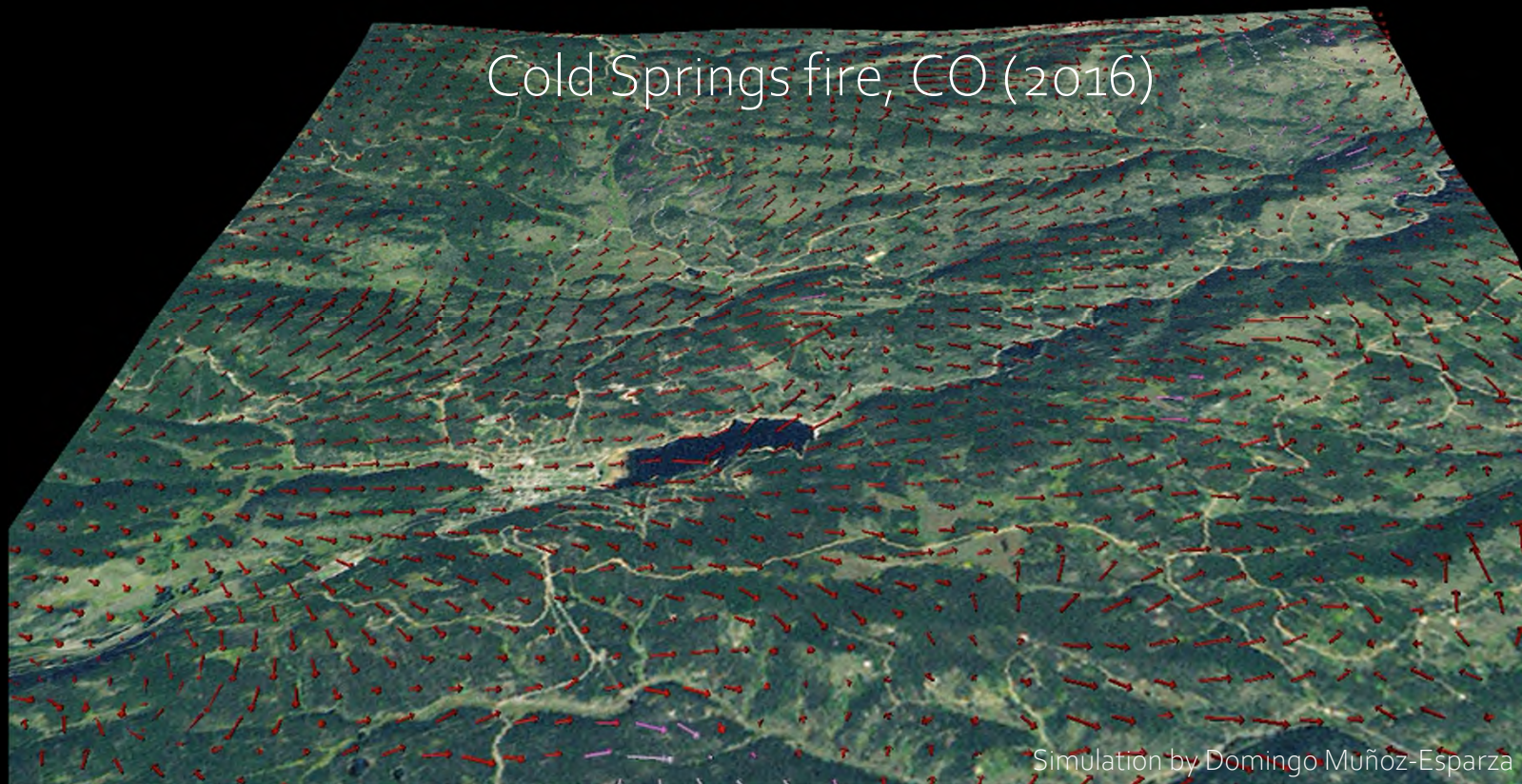
To understand the behavior of the atmosphere and related Earth and geospace systems

To support, enhance, and extend the capabilities of the university community and the broader scientific community, nationally and internationally

To foster the transfer of knowledge and technology for the betterment of life on Earth (*this includes providing expert guidance on policy and other forms of decision-making*)

2. What is the Colorado Fire Prediction System (CO-FPS)?

CO-FPS is a system of computer code that comprises two sophisticated models that interact: a weather forecast model and a fire behavior model



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Marshall fire, CO (2021)



Photo by John Fasullo

2. What is the Colorado Fire Prediction System (CO-FPS)?

Suite of CO-FPS products

Fire

- Extent of fire
- Rate of spread of fire
- Flame length
- Heat released by fire
- Smoke concentration
- Significant fire phenomena
- Likelihood of spot fires

Weather

- Wind speed, direction, gustiness
- Air temperature
- Relative humidity

Aviation

- Turbulence intensity
- Regions of downdrafts and updrafts
- Regions of wind shear

2. What is the Colorado Fire Prediction System (CO-FPS)?

Representative Jim Hurrell Bill Mahoney Governor Janice Coen
 Kraft-Tharp NCAR Director NCAR/RAL Hickenlooper NCAR/MMM



Bill (HB 15-1129) signed May 2015

An Act

HOUSE BILL 15-1129

BY REPRESENTATIVE(S) Kraft-Tharp, Duran, Garnett, Ginal, Hamner, Kagan, Mitsch Bush, Pettersen, Rosenthal, Ryden, Salazar, Singer, Vigil, Williams, Winter, Hullinghorst, Lontaine, Pabon; also SENATOR(S) Roberts, Grantham, Heath, Aguilar, Carroll, Donovan, Hodge, Jones, Kefalas, Kerr, Memfield, Newell, Todd.

CONCERNING DISASTER PREDICTION AND DECISION SUPPORT SYSTEMS BY THE DEPARTMENT OF PUBLIC SAFETY, AND, IN CONNECTION THEREWITH, MAKING AN APPROPRIATION.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. Legislative declaration. (1) The general assembly hereby finds and declares that:

(a) Wildland fires are exceedingly complex phenomena. Despite rigorous training, abundant resources, and weather forecasts, even seasoned responders may be tragically unprepared for complex, unpredictable, and dramatic fire behavior. Human intelligence cannot integrate all the interacting factors to anticipate when weather and other factors will combine with topography to dramatically amplify fire behavior.

**Center of Excellence for
Advanced Technology
Aerial Firefighting**

Photo by Brad Schmidt

Colorado The Official State Web Portal

COLORADO
Division of Fire Prevention and Control

cdpsdocs.state.co.us/coe/Website/COE_Brochure_3_10_16_final_non-print.pdf

2. What is the Colorado Fire Prediction System (CO-FPS)?

CO-FPS project timeline and current status

- 2015 Start of project (annual funding)
- 2015–20 Stakeholder meetings, design, development, testing, validation, real-time demonstrations (available for state to use)
- 2020 Transfer to state; runs in the cloud (Amazon Web Services)
- 2021 State unable to find third party to assume operational responsibility; COVID budget constraints eliminated funding
- Now Inactive, but can be quickly reactivated; upgrades available based on advancements since project's conclusion

3. Why is CO-FPS a valuable tool for the state?

Wildfires are inevitable, natural,
and some are good.
However, the bad ones...

Aftermath of Marshall fire, CO (2021)



denverpost.com
Photo by Hart Van Denburg, CPR News

3. Why is CO-FPS a valuable tool for the state?

Are deadly and expensive

- The worst fires are as costly as hurricanes

Threaten many people

- More than half of CO's population live in the wildland-urban interface (WUI)
- When smoke is considered, the threat extends to the whole state and beyond

Getting worse in some places

- Warmer and drier fire seasons in the western US led to 800% increase in area burned by severe fires over the period 1985–2017

Extremely complex

- Complex physical factors that affect fires span seconds to centuries, centimeters to continents
- Tools like CO-FPS are needed for the state to manage this complexity

3. Why is CO-FPS a valuable tool for the state?

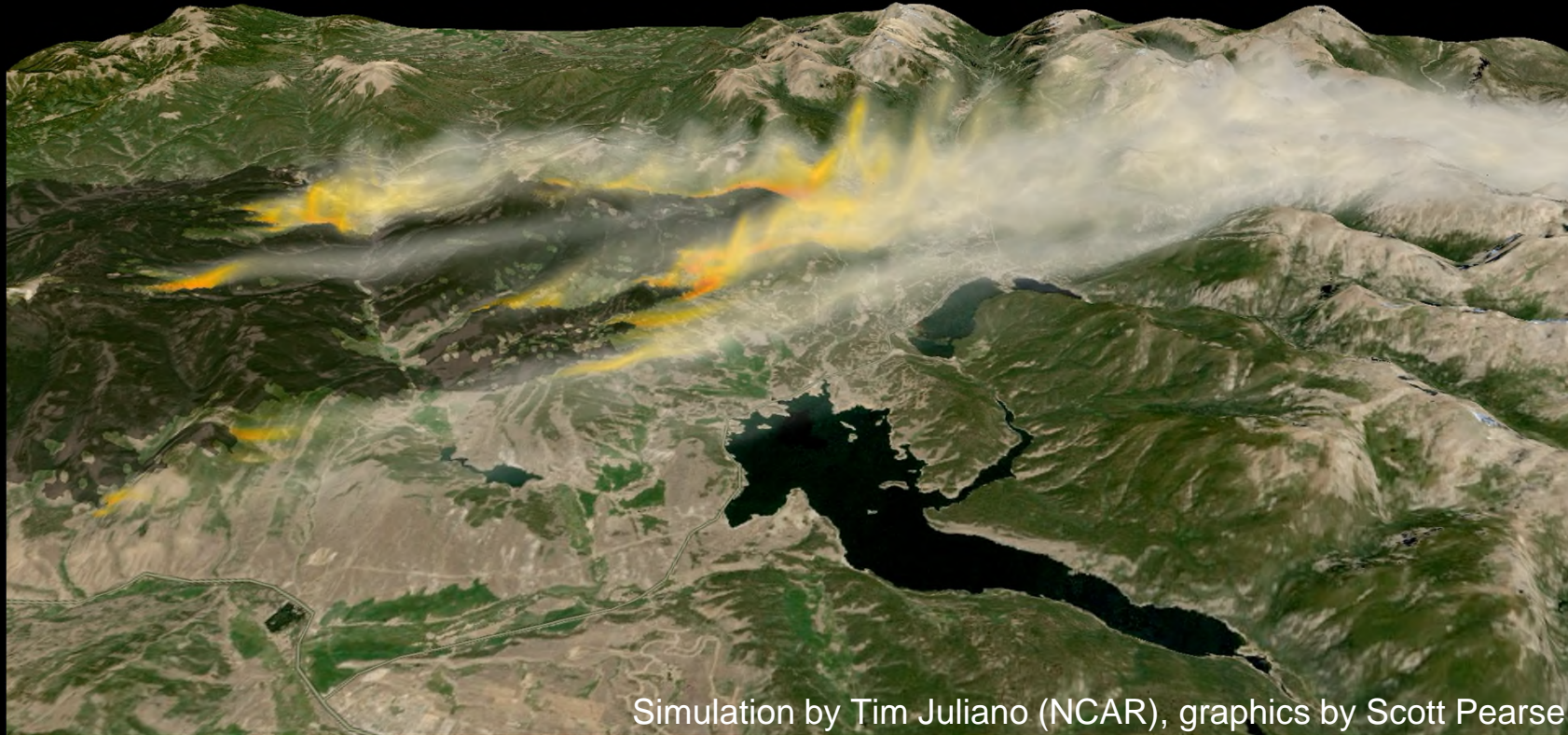
- Manage active wildfires (deployment of resources, suppression, evacuation, etc.)
- Plan for future wildfires (risk assessment, resource management, what-if scenarios)
- Support prescribed fires (reduce risk, increase successful burns)
- Evaluate mitigation strategies
- Investigate sources of fire ignition
- Evaluate effects of smoke on human health (including prescribed fires)
- Manage rangeland and forests
- Train personnel

3. Why is CO-FPS a valuable tool for the state?

NCAR is blending data from the US Geological Survey, US Forest Service, and satellites for better information about tree health

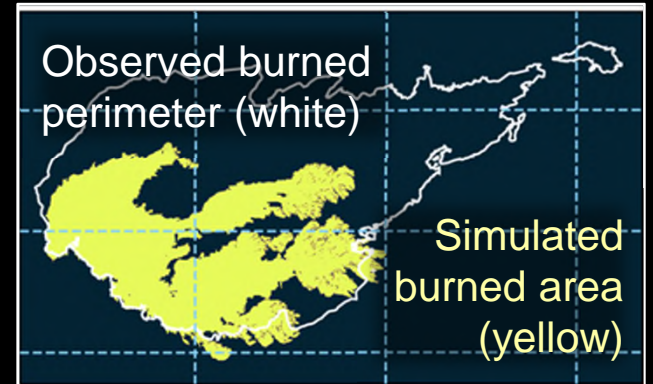
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East Troublesome fire, CO (2020)
Model simulation



Simulation by Tim Juliano (NCAR), graphics by Scott Pearse (NCAR)

Without beetle-killed trees

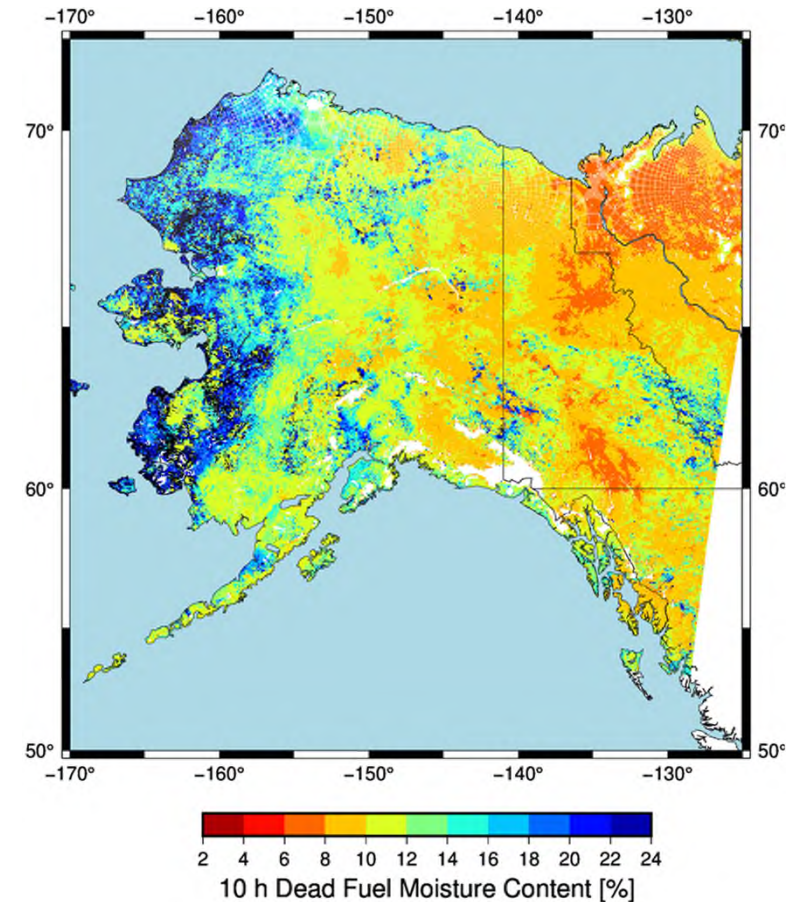
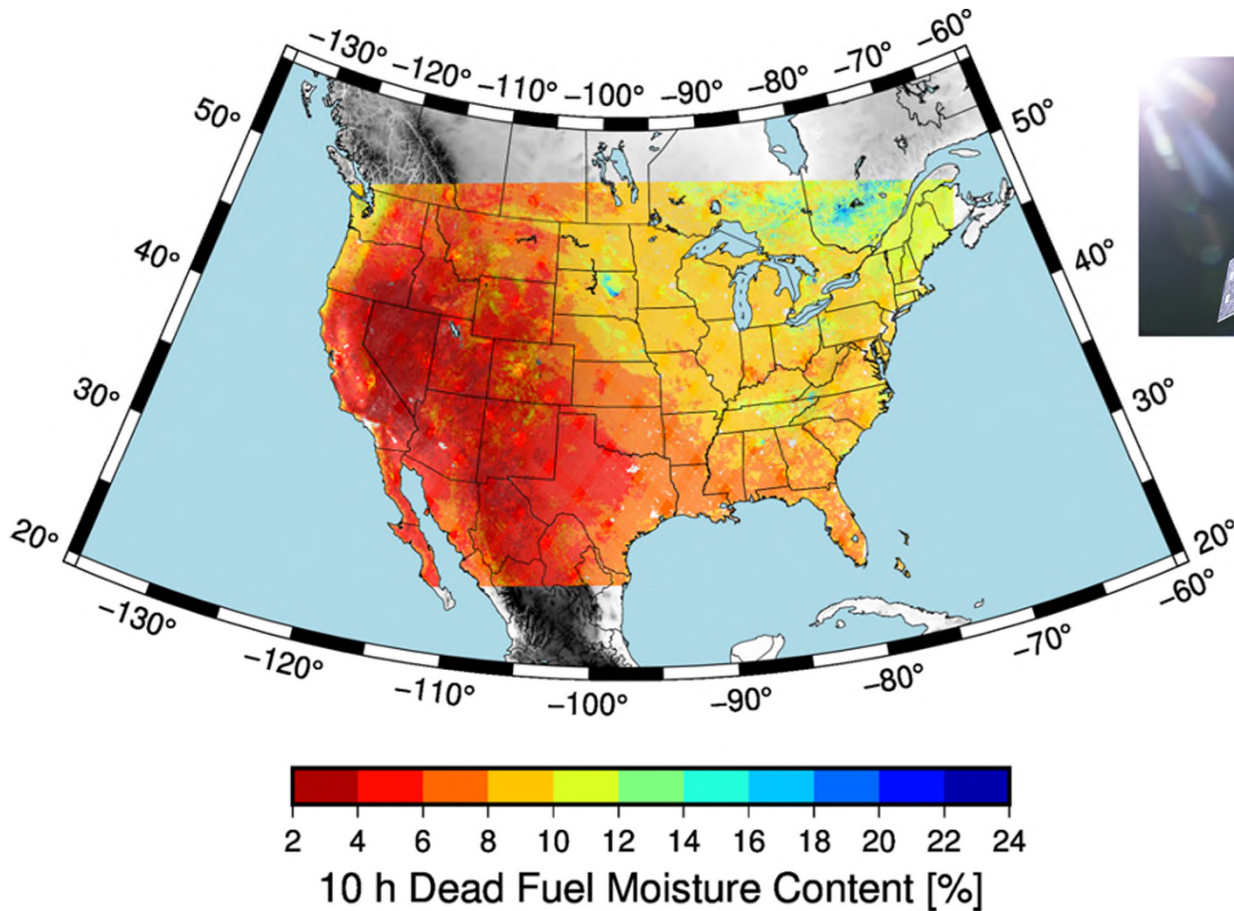


With beetle-killed trees



3. Why is CO-FPS a valuable tool for the state?

NCAR is applying artificial intelligence to estimate fuel moisture nationwide at unprecedented resolution



4. What does NCAR recommend for the future of CO-FPS?

- Secure an organization or state personnel that will be responsible for operations
- Fund operational use (cost of running in the cloud)
- Fund ongoing maintenance, plus upgrades that take advantage of improvements in wildfire modeling
- Adopt CO-FPS for prescribed burns
- Bring together a large, diverse set of stakeholders, scientists, and engineers to scope out how CO-FPS and additional breakthrough technologies can *further* help Colorado lead the nation in minimizing the harm from bad fires and maximizing the benefits of good fires

Thanks for your time.