

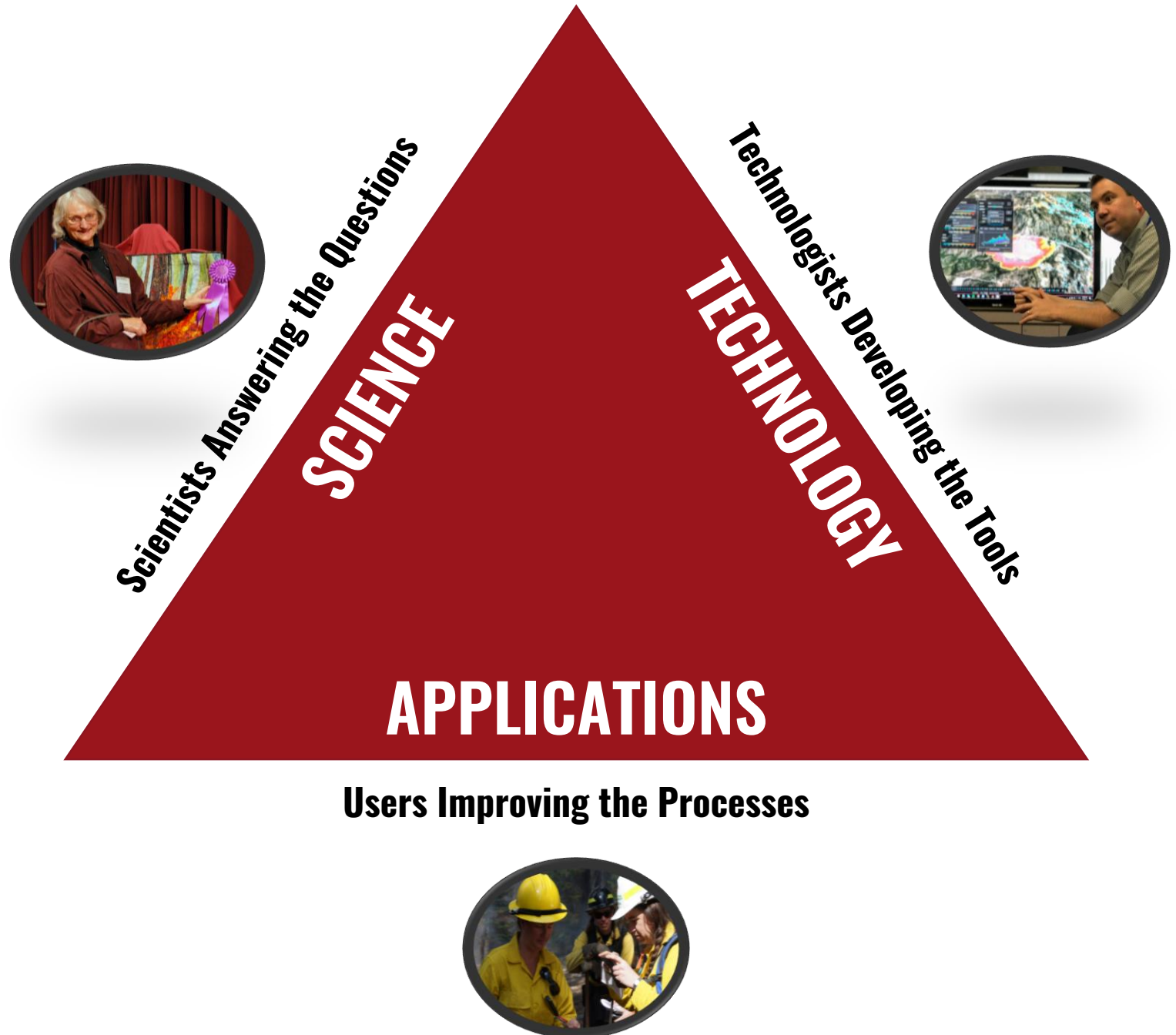
LEVERAGING REMOTE SENSING DATA IN SUPPORT OF WILDLAND FIRE





Two companies speaking as advocates for the community of companies that partner for wildfire solutions.

We are Wildland Fire Technologists



How we help



- Wildfire problems are growing faster than we can apply solutions.
- We are laser-focused on speeding up solution adoption.
 - Technical Friction – standards, silos, interoperability
 - Social Friction – clients that communicate, data sharing, **#NoBullies**
 - Adoption Friction – ‘pilot project’ vs ‘sustained program’ paradox

What we both bring together



- **Operational Expertise – understanding intel, ops and outreach**
- **Technology Expertise – we live your wildfire needs**
- **Science Expertise – operationalizing fire science**
- **Social Expertise – we help build your wildfire community**

- **Technology Interoperability** – software and data integration, standards, APIs
- **Company Interoperability** – how do companies think, how can they work as a team?
- **Agency Interoperability** – policies, standards setting, training systems
- **Effectiveness Interoperability** – mitigation to ops, fireline intel, risk/resiliency/response, all-hazards

**What Can
YOU Do.**



WHAT WE DO

**Technology to connect
Firefighters and
Communities**



- Formed in 2010
- Initial focus was COP for Wildfire Incident Management
- Linking Operations, Remote Sensing, and Preplanning
- Expanded to all-hazard (2013) and data analytics (2017)



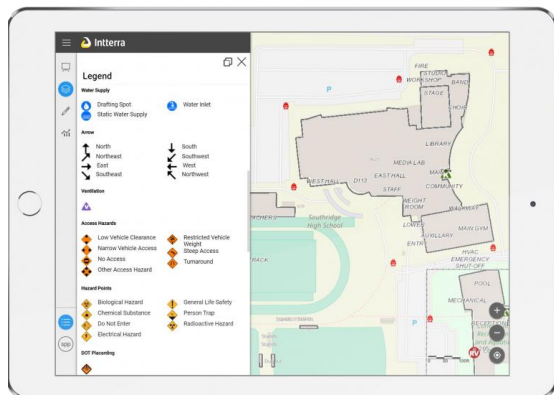
Intterra Applications

Integrated Partners

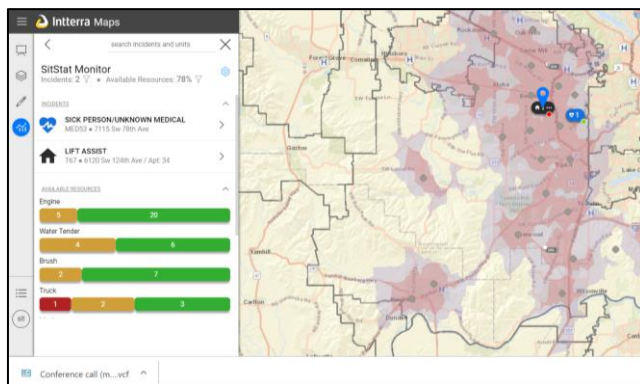


Sensors/Systems

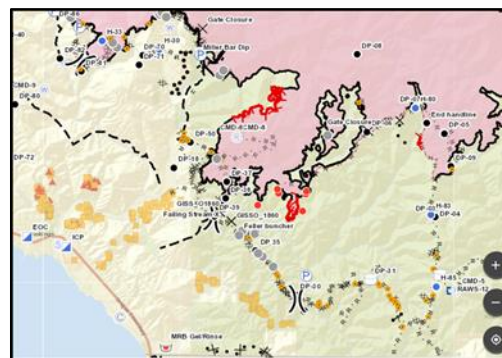
Bode MAXAR
Courtney Overwatch
Aevex Churchill



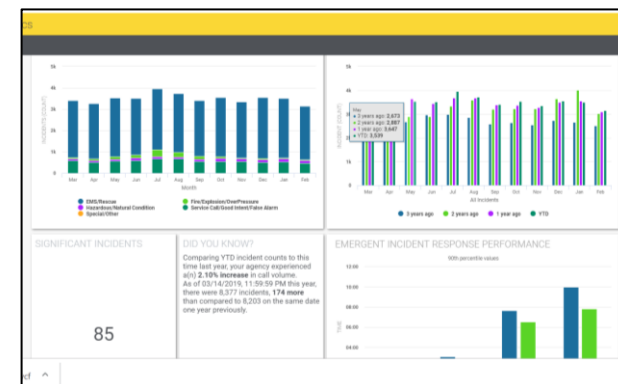
PrePlanning – Wildfire / Structure / All-Hazard / Active Shooter



Operations – Realtime resource and incident status, tracking, and sensor systems



Incident Management – Realtime incident mapping, alerting



Analytics – Reporting and Analysis of data for outcome improvement

Company Interoperability



Intterra enables technology + partnerships

Channels & Primes



Inter-agency



Air Support



Software



Sensor Fusion



Standards



Public-Private



Fire Modelling



Industry Groups

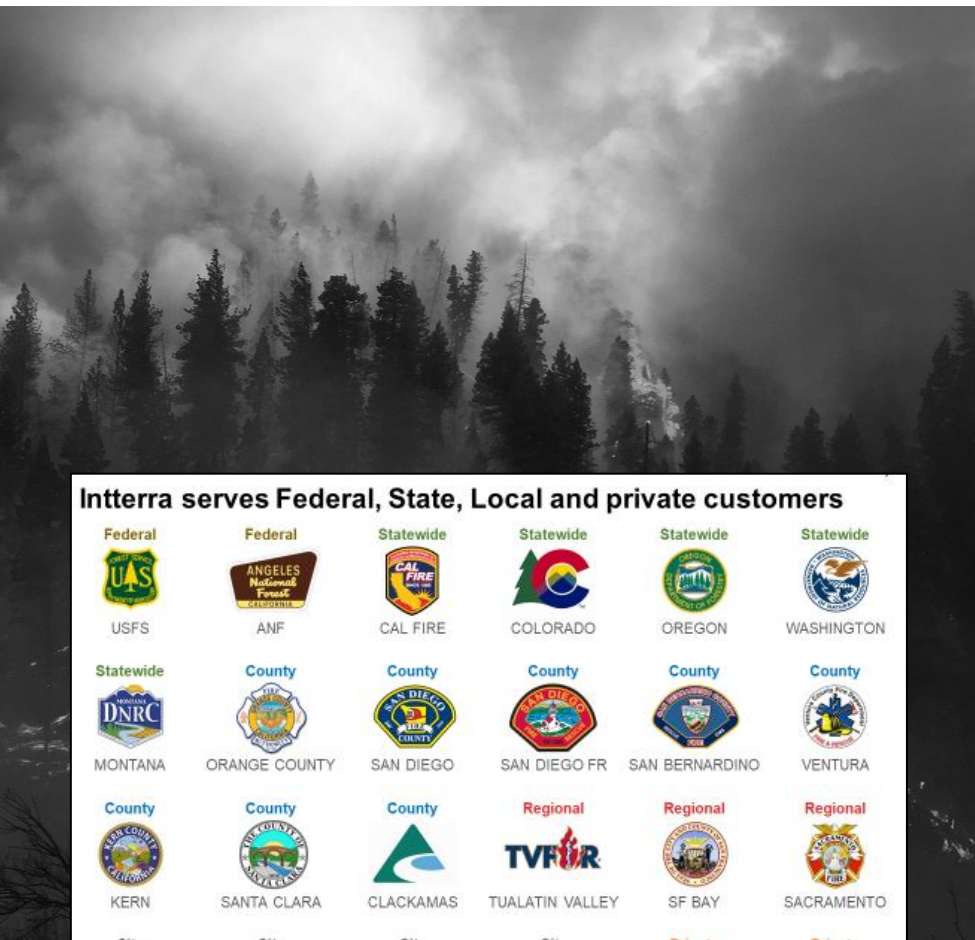


CAD/Dispatch



We foster collaboration across the ecosystem

Agency Interoperability



Intterra serves Federal, State, Local and private customers

Federal  USFS	Federal  ANF	Statewide  CAL FIRE	Statewide  COLORADO	Statewide  OREGON	Statewide  WASHINGTON
Statewide  MONTANA	County  ORANGE COUNTY	County  SAN DIEGO	County  SAN DIEGO FR	County  SAN BERNARDINO	County  VENTURA
County  KERN	County  SANTA CLARA	County  CLACKAMAS	Regional  TUALATIN VALLEY	Regional  SF BAY	Regional  SACRAMENTO
City  BOISE	City  SALT LAKE	City  PORTLAND	City  HOUSTON	Private  ERICKSON	Private  WILDFIRE DEFENSE INC.

Intterra was founded on data connectivity

Since 2010, Intterra, Local Agencies and the US Forest Service have worked to bring two perspectives together:



Intterra brings both sides together through a common data infrastructure, fostering collaboration through actionable intelligence

Idea Interoperability



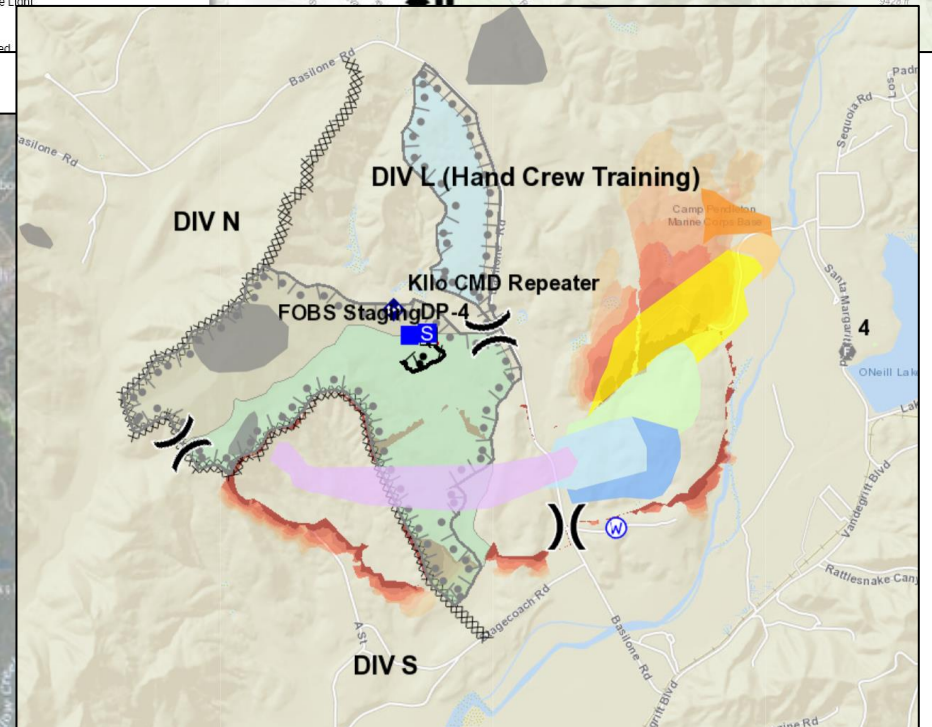
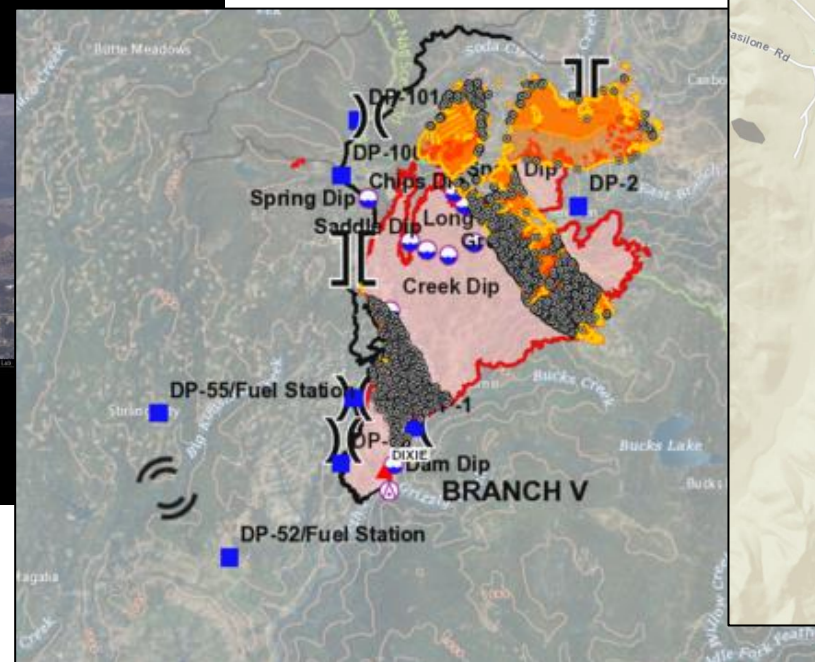
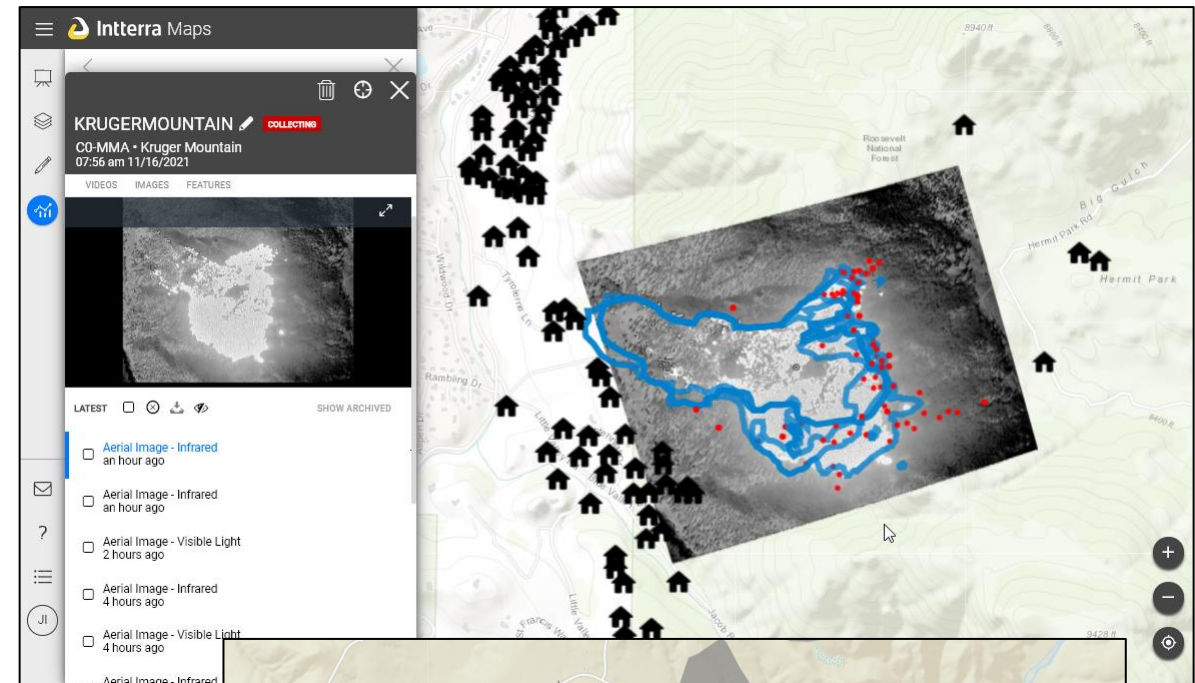
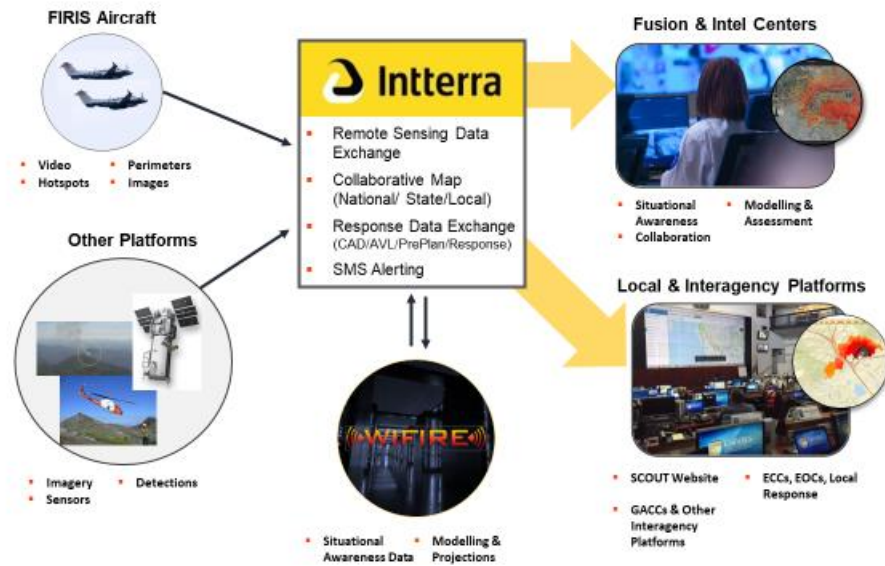
- Let's learn from each other
 - FIRIS + Colorado MMA + Oregon
 - Example = San Diego 'Fire School'

Effectiveness Interoperability



- **Preplan** -> Mitigation -> Response -> **Preplan**
- **Response** -> Preplan -> Mitigation -> **Response**

Intterra FIRIS Architecture as a Model



Case Study: Oregon Mitigation Tools

- Intterra developed a mitigation tool for Oregon's agencies, working with local governments to collate parcel-based risk assessments
- Over 34,000 structure assessments completed for local agencies and the State
- In Ashland, a WiRē Team (USFS RMRS) used the data to integrate local social science into wildfire education and mitigation programs
- Damage assessments and risk reports are available on-demand
- All in the cloud

Intterra's Oregon mitigation efforts have been replicated in other jurisdictions as they improve accountability and effectiveness





WHAT WE DO

We Operationalize
Wildfire Science

WHO WE ARE

About Technosylva

- ❖ We are wildland fire.
- ❖ Leon, Spain office was established in 1997.
- ❖ San Diego, CA office was established in 2013.
- ❖ We provide advanced fire behavior analysis products & services supporting operations and planning.
- ❖ We are 70+ people dedicated to wildland fire.
- ❖ We are a science & technology company, participating in 29 peer reviewed papers in the last two years, 10 as main authors
- ❖ JV Agreement with Missoula Fire Lab and founder of the SJSU WIRC



Incident Management

Multi-agency software for all hazard incident management, situational awareness, and data sharing and collaboration.



Wildfire Risk Forecasting

Advanced weather and fire spread prediction for on-demand incident analysis, what-if scenario analysis, and for short and long term risk forecasting.



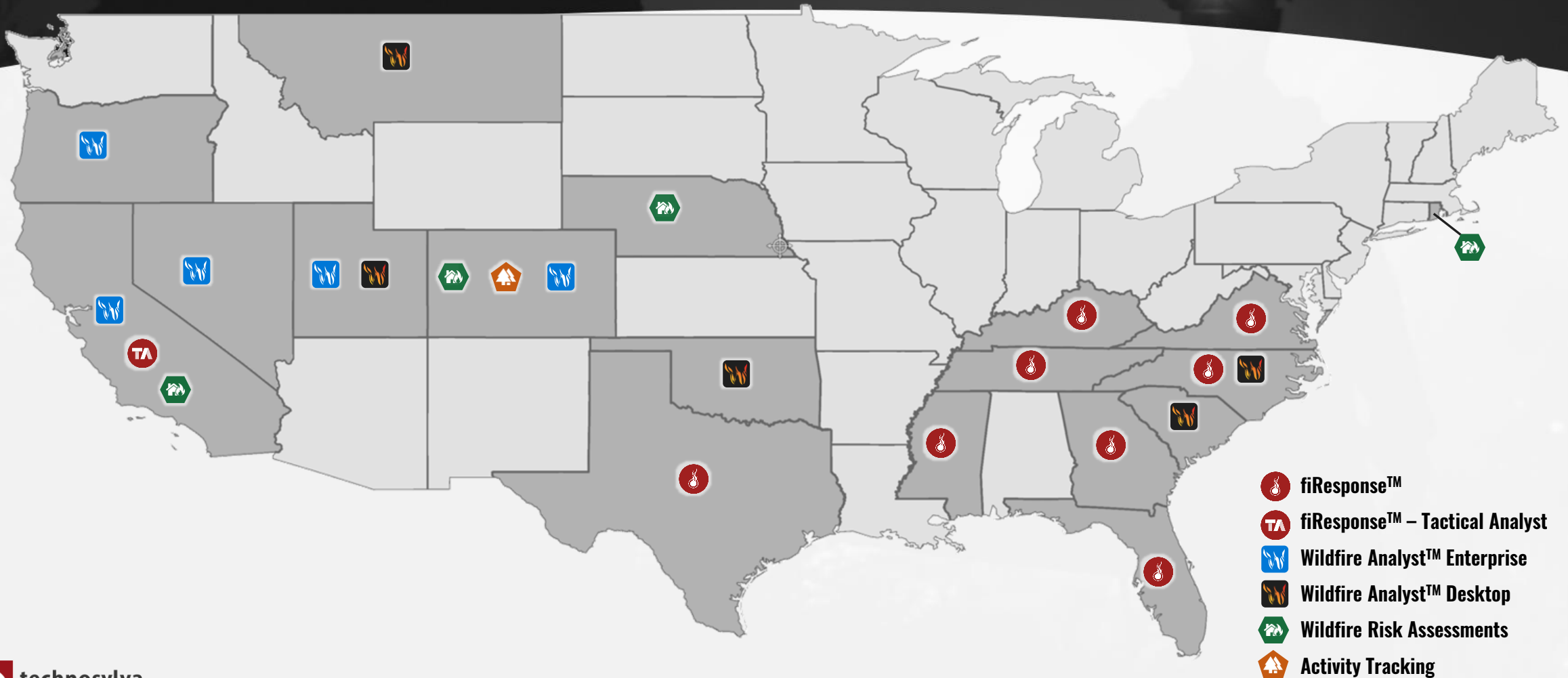
Wildfire Protection Planning

Tools for planners, decision makers, and the public to utilize risk assessment outputs for mitigation planning and preparedness.

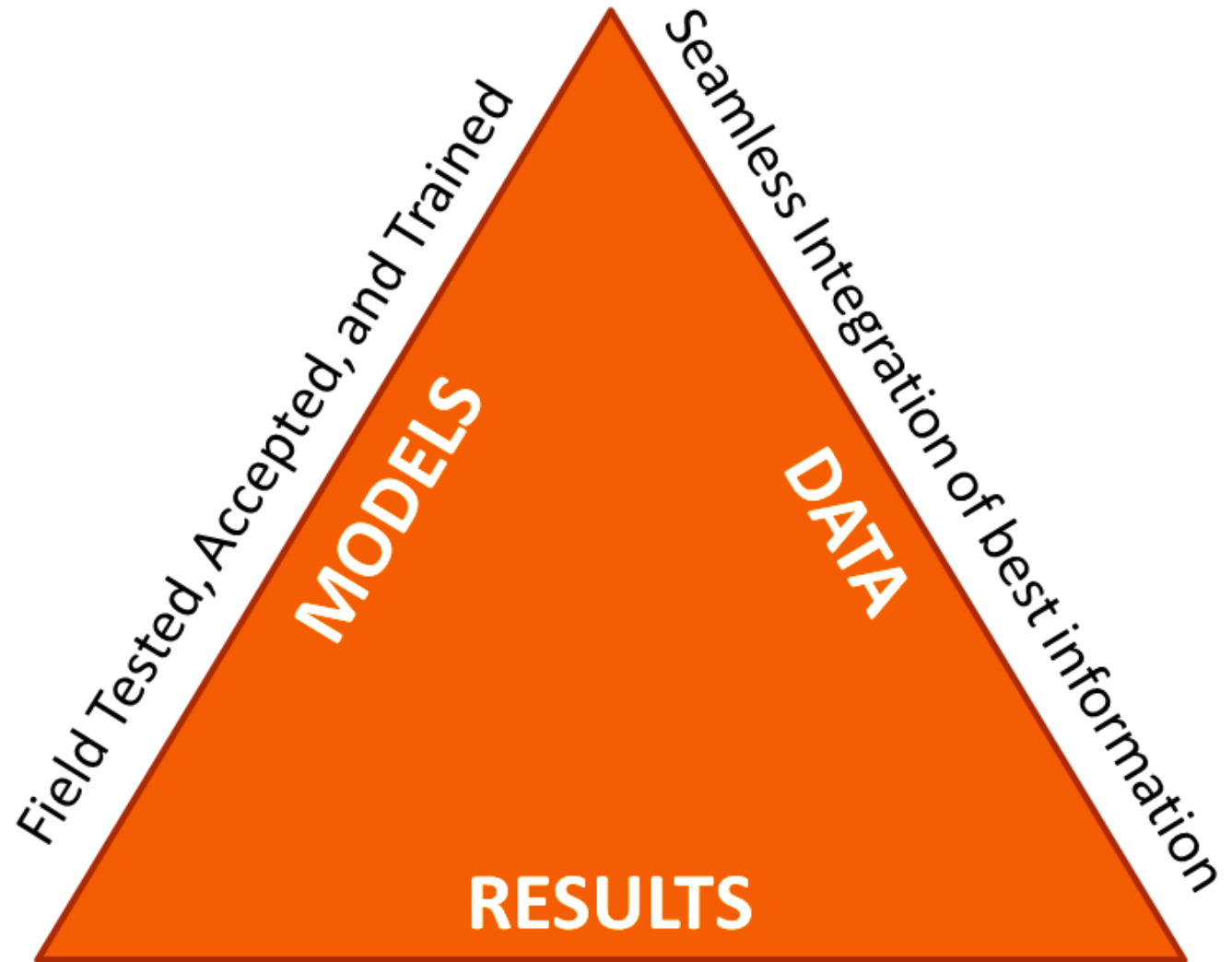


WHO'S USING OUR TECHNOLOGY

Technosylva US Software Deployments & Technical Services



The Operational Technology Triangle



Right Amount of Actionable Information



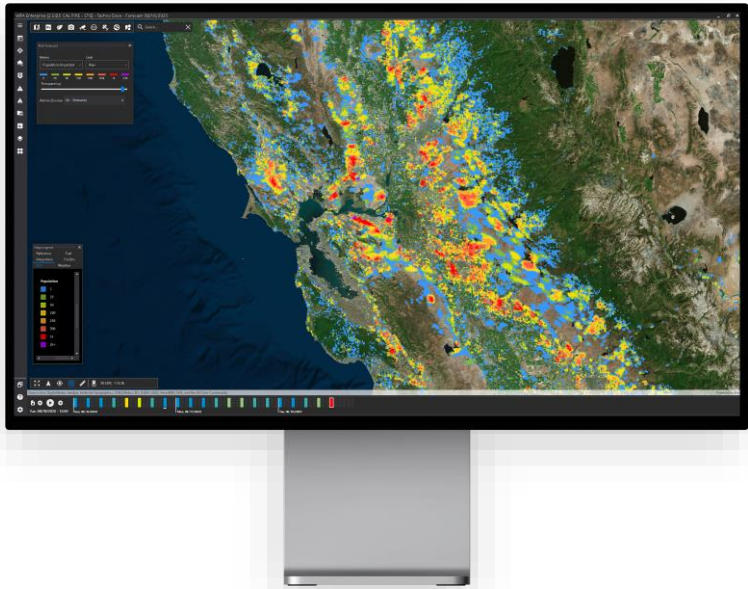
STUDY CASE: CALIFORNIA

WILDFIRE MODELING TECHNOLOGY SOLUTION.



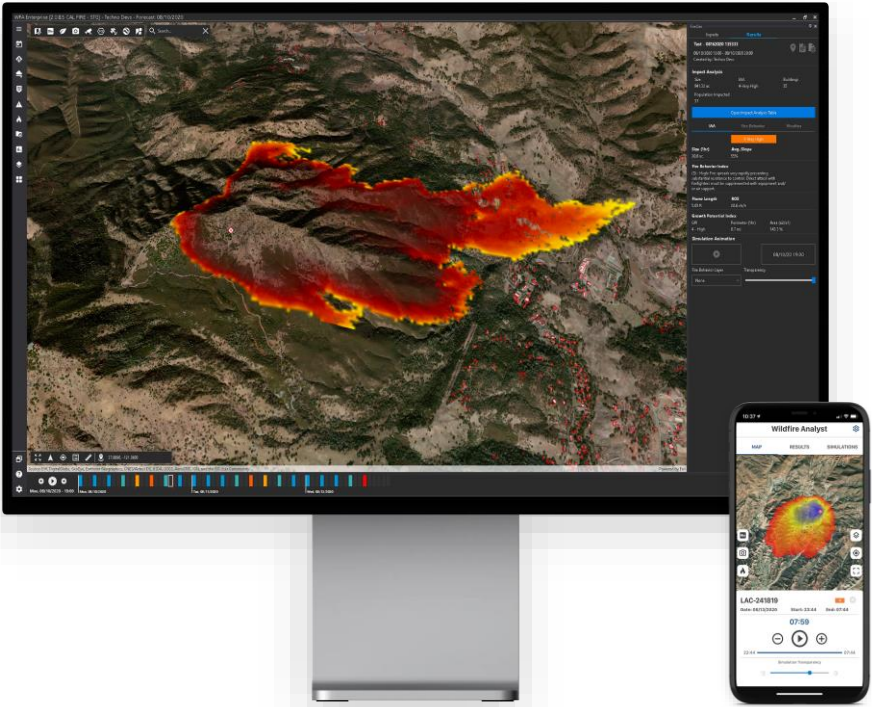
FireCast

Wildfire Risk
Forecasting & Monitoring



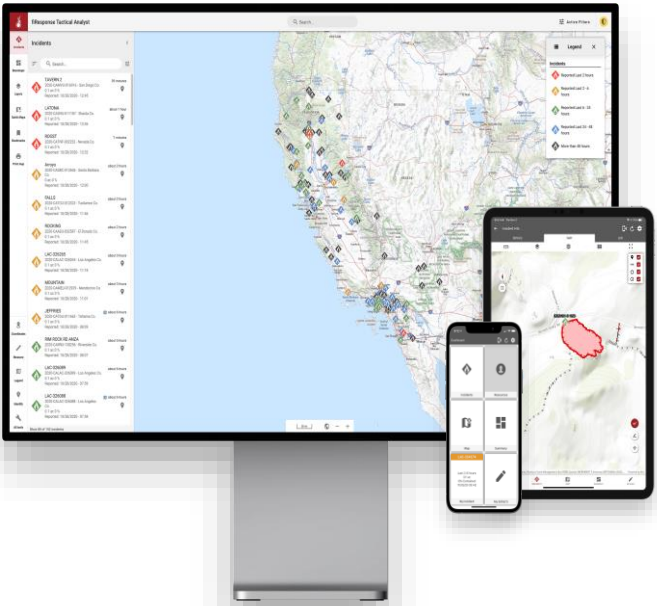
FireSim

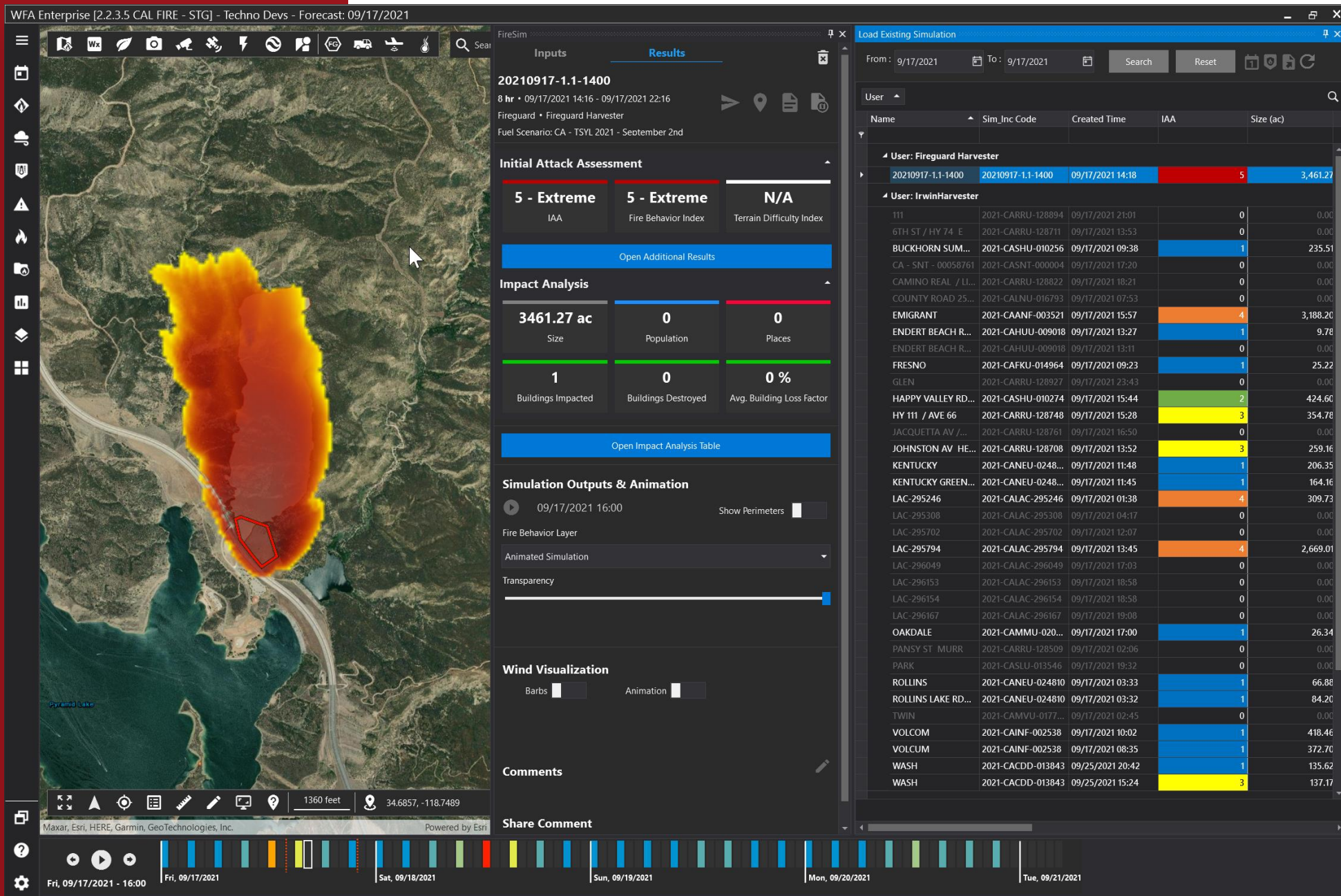
On-demand Wildfire
Spread Prediction



Tactical Analyst

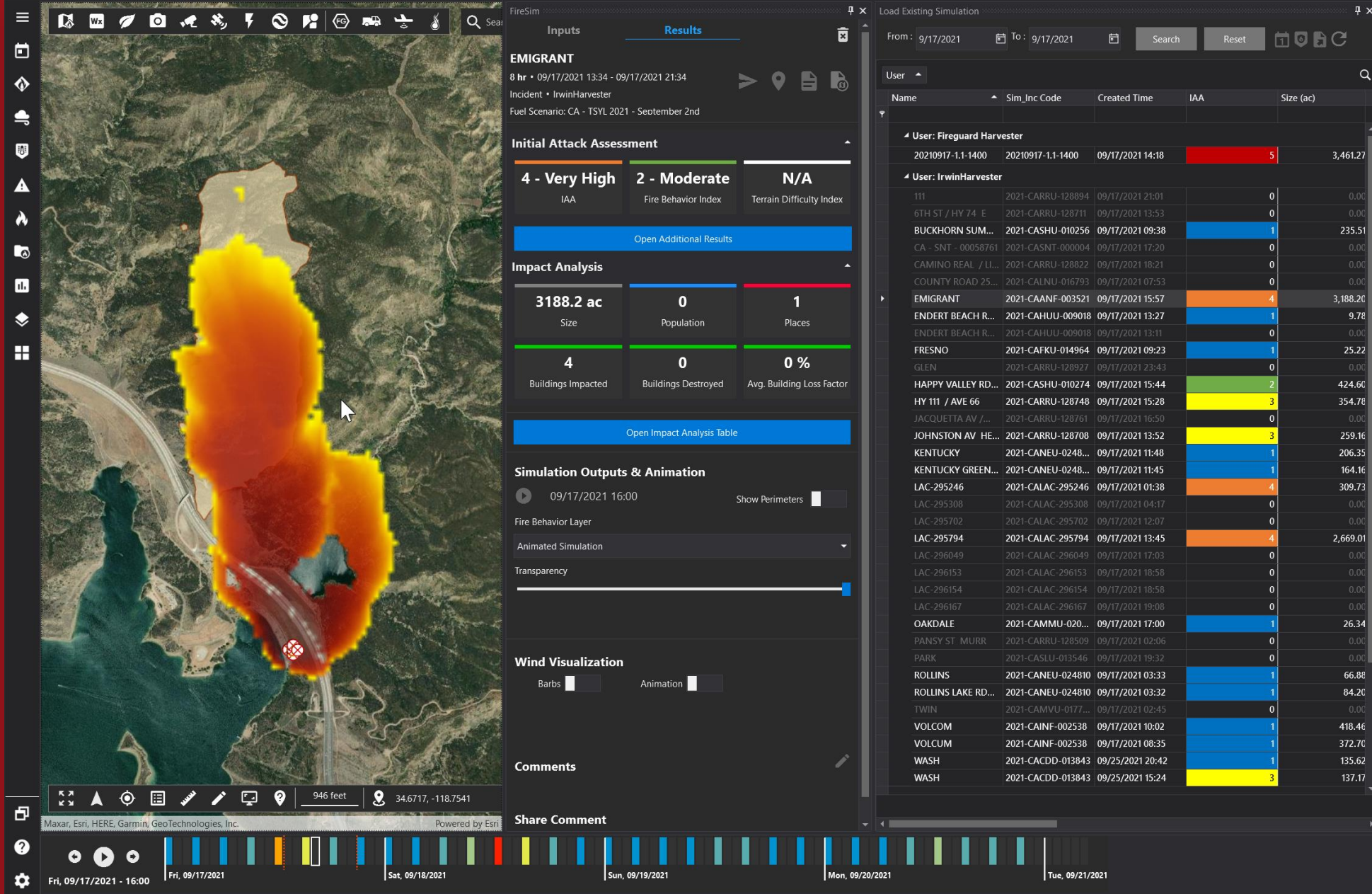
All Hazards Incident COP
& DSS





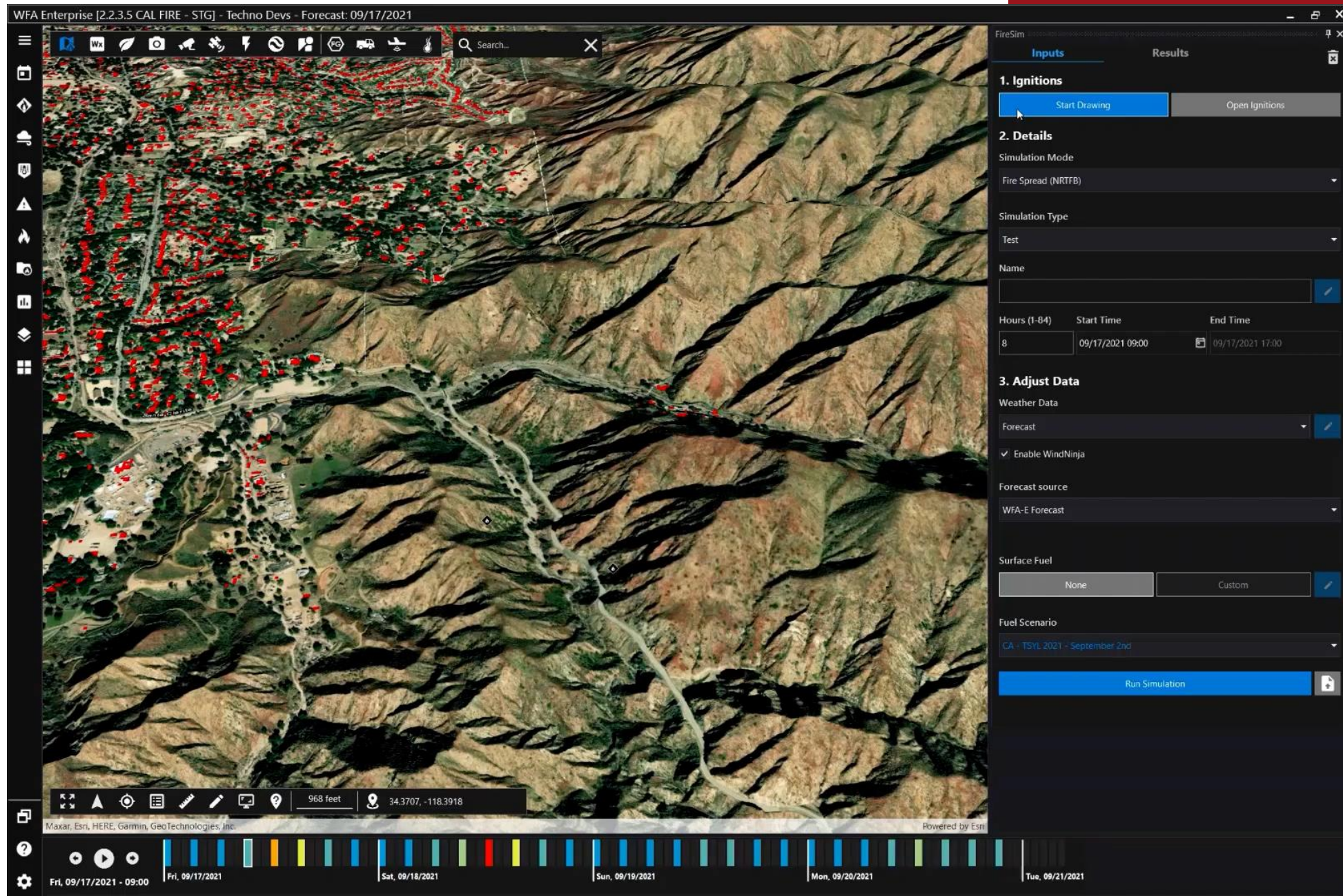
Integration with
CAL FIRE
dispatch system
& FireGuard
provides
automatic
predictions for
each fire.

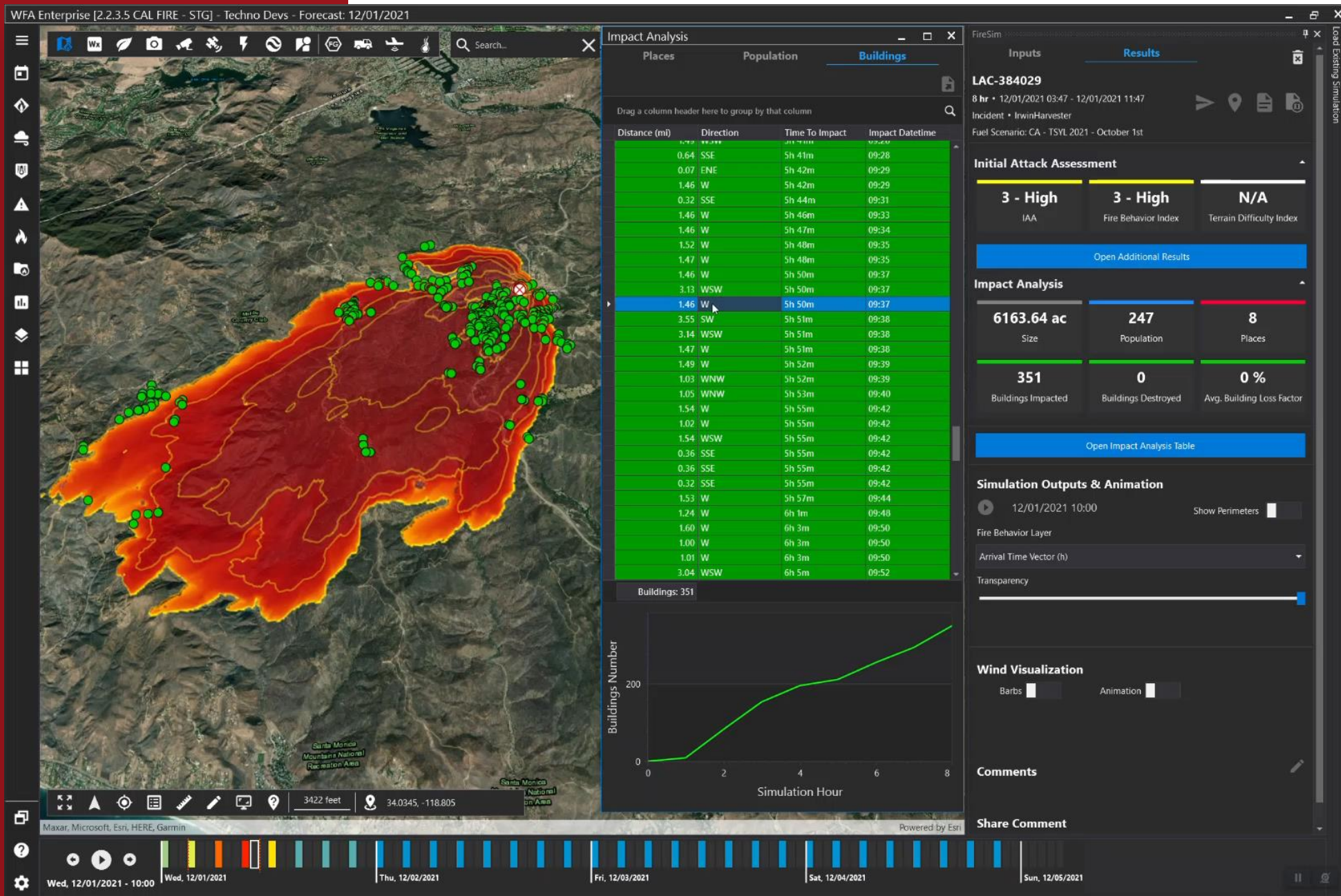
01



Integration
with CAL FIRE
dispatch
system &
FireGuard
provides
automatic
predictions
for each fire.

Real-time
fire spread
predictions
in seconds.

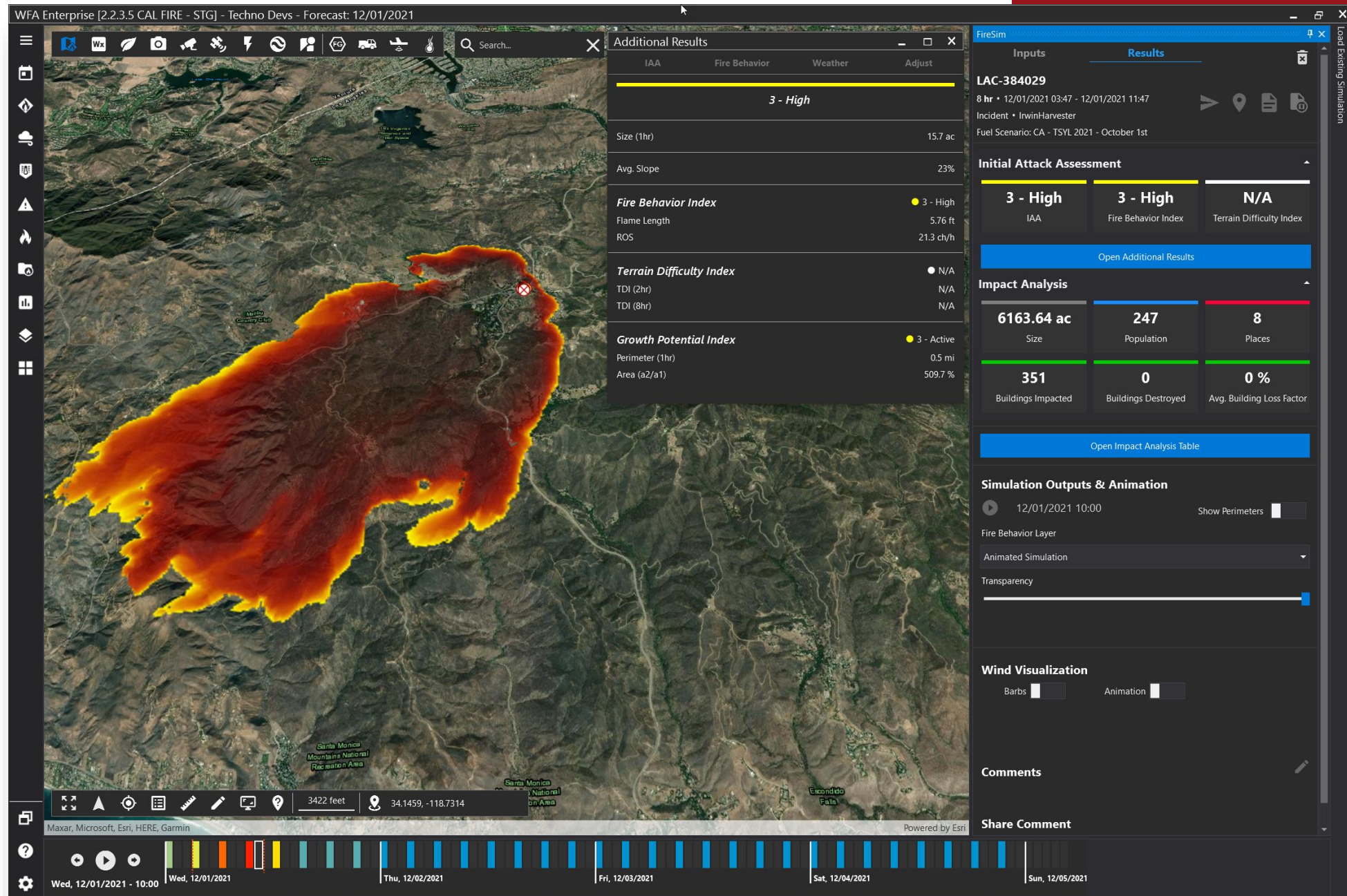


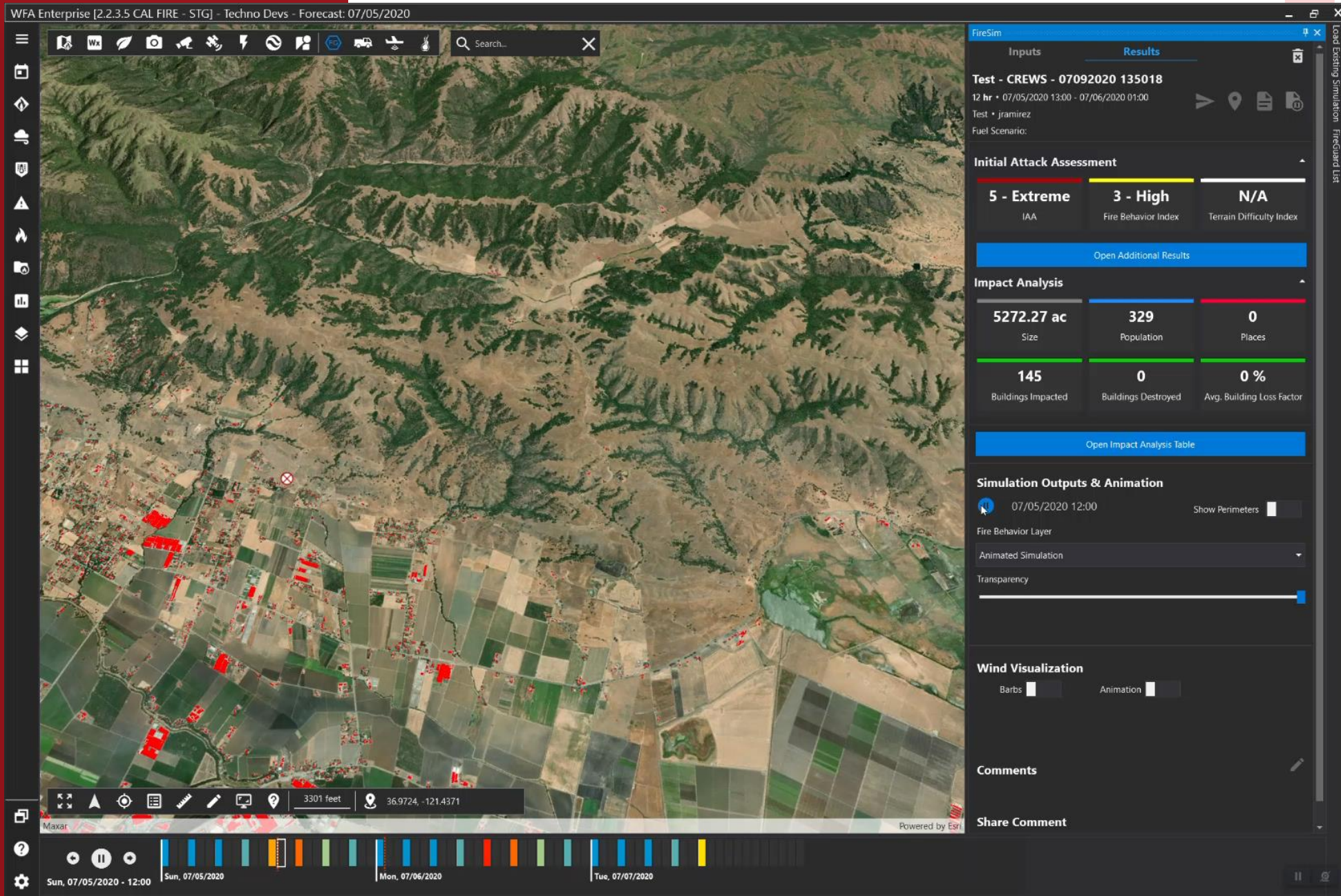


Automatic analysis of possible impacts to people and buildings.

4

Automatic
assessment of
initial attack
success
potential for
each fire.

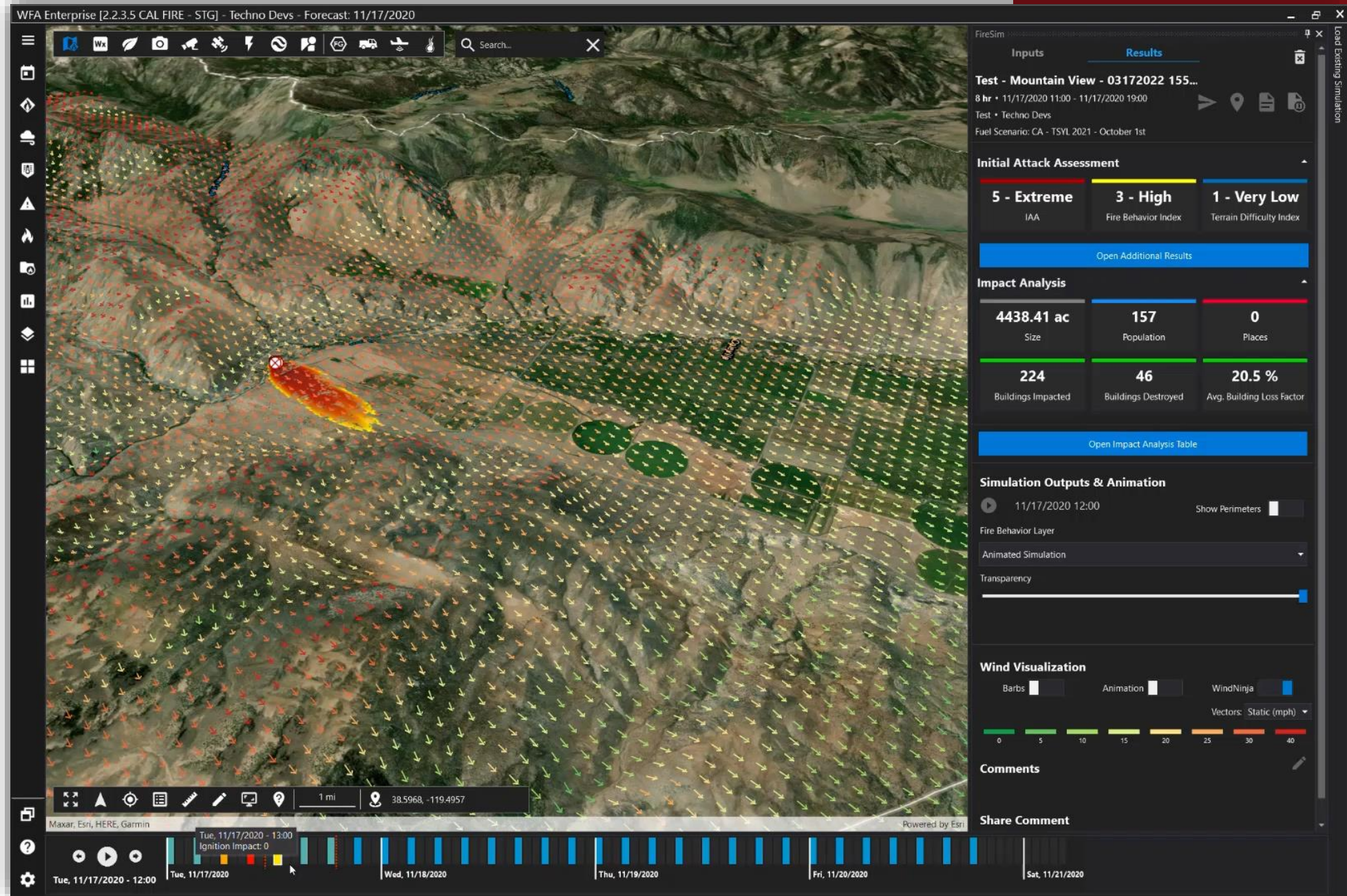




Integration
with detection
technologies
facilities
verification of
predictions &
on-going
calibration.

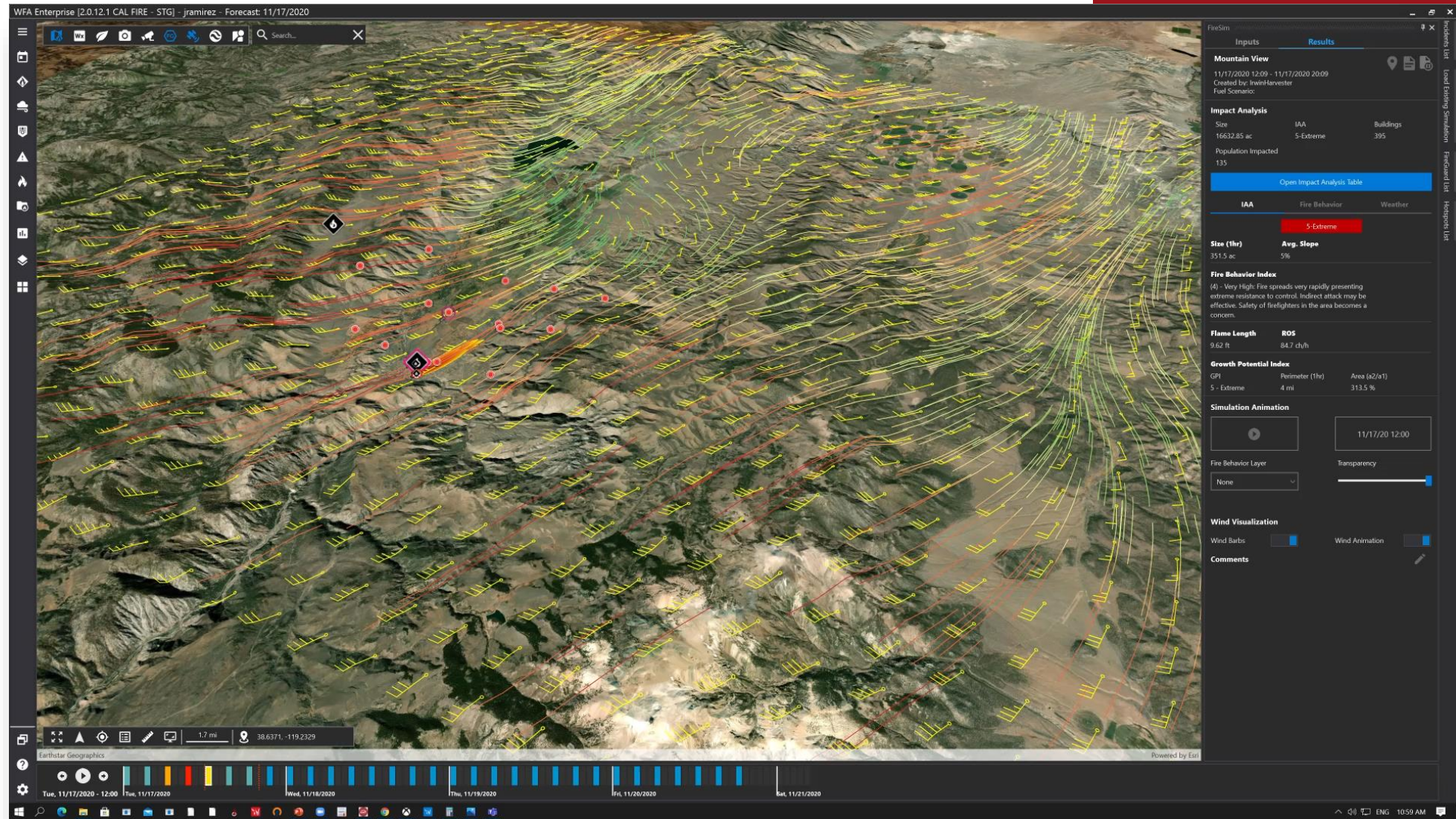
View wind forecasts & animations in conjunction with fire spread predictions.

06

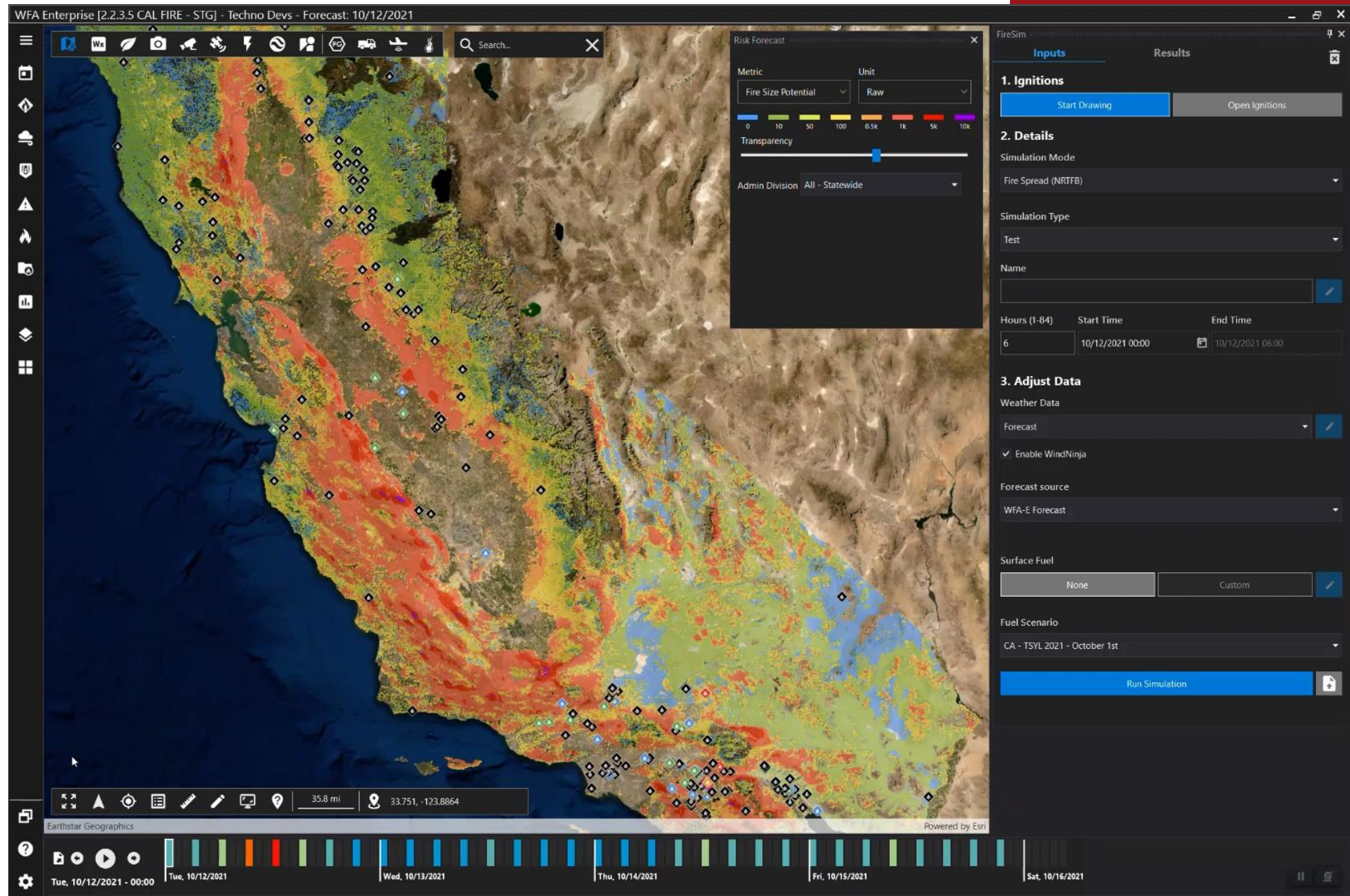


View wind forecasts & animations in conjunction with fire spread predictions.

06



Wildfire risk forecasts are derived daily, providing a 3+ day forecast of fire conditions.



08

Real-time tracking of air and ground resources in 3D.



A person wearing a red baseball cap is seated at a workstation in a control room. The workstation features a laptop and two large monitors. The laptop screen shows a map with a red and yellow fire hazard area, with the word 'Wildfire' visible in the bottom left corner. The larger monitor displays a similar map with a more detailed color-coded overlay. To the left of the person, another monitor shows a video feed of a fire. The background wall is made of diamond-plate metal and has a sign that reads 'FBAN' in red letters. A water bottle and some papers are on the desk.

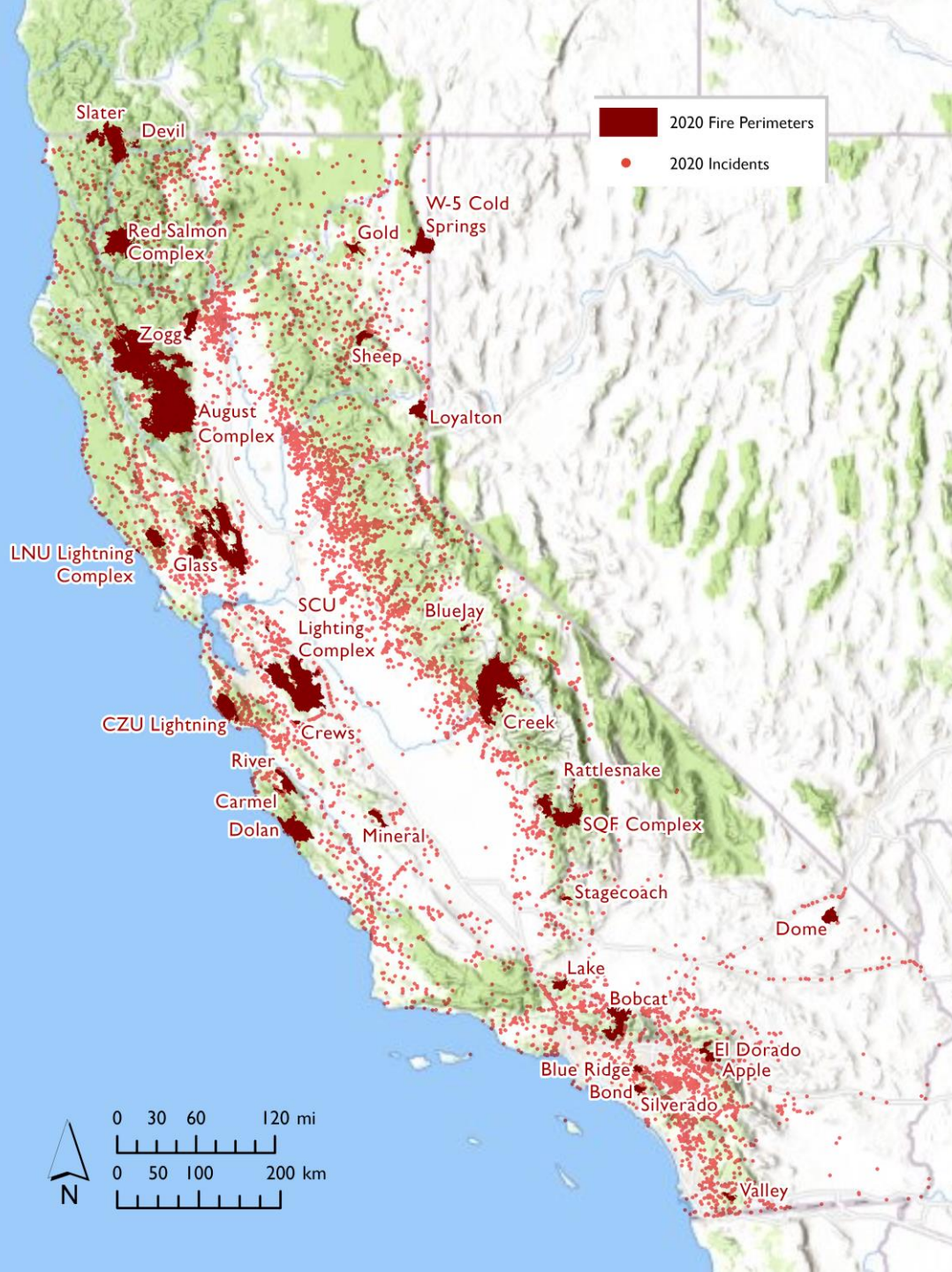
2020

- 12,326 sims
- 6,955 IRWIN Incidents
- 463 FireGuard
- 38.9 billions risk sims in 2020

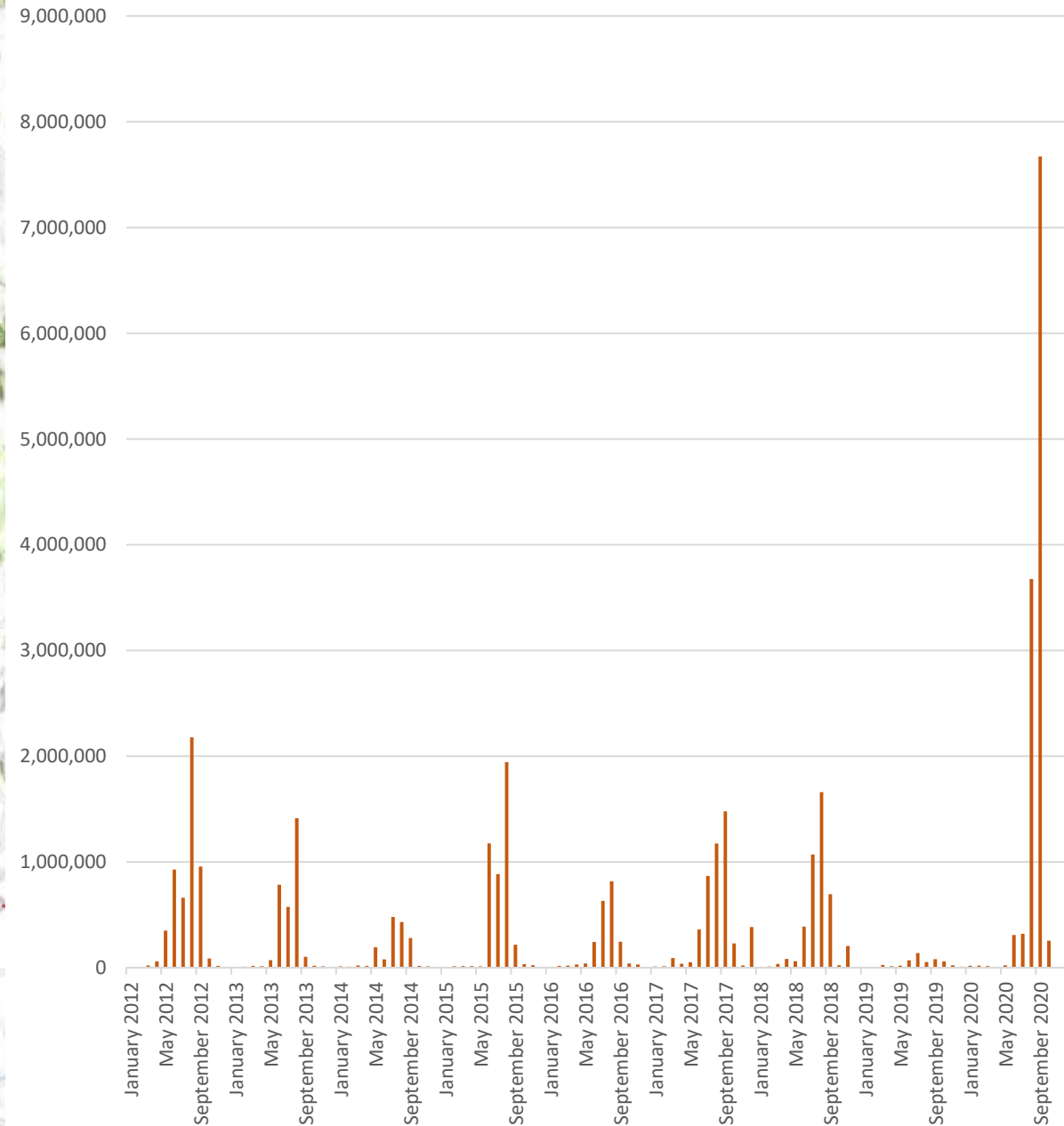
2021

- 22,244 sims
- 11,954 IRWIN Incidents
- 665 FireGuard
- 56.2 billions risk sims in 2021

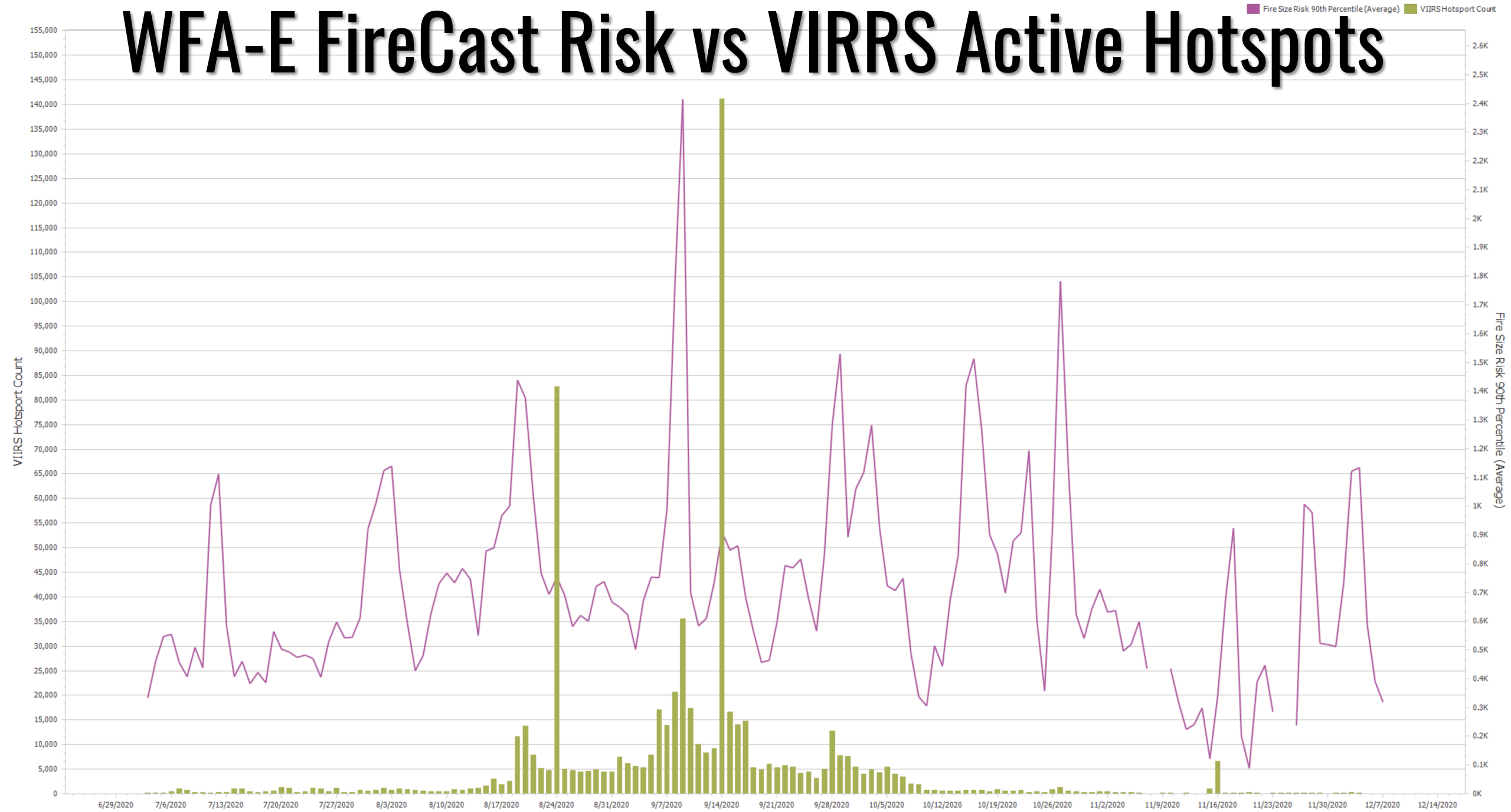
Hotspots Validation of 4 days Wildfire Risk Model



Monthly Total Fire Radiative Power (megawatts/px) in California from VIIRS sensor



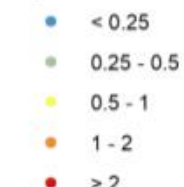
WFA-E FireCast Risk vs VIRRS Active Hotspots



Simulations Calibration with Fireguard

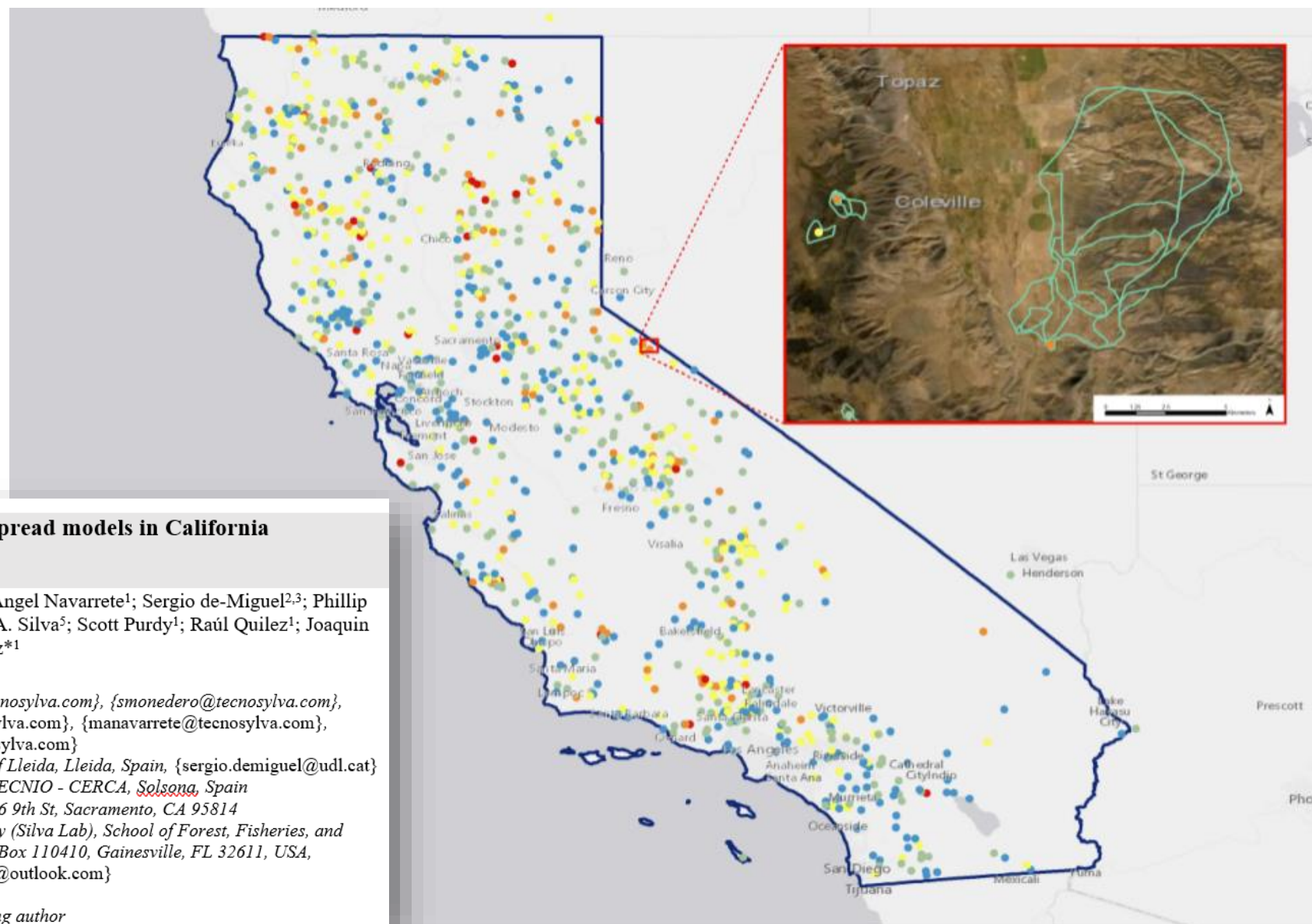
First burning period (until 8 hours)

Ignitions - ROS (km/h)



— Fire Guard Perimeters

□ California State Perimeter



Validation of operational fire spread models in California

Adrián Cardil^{*1,2,3}; Santiago Monedero¹; Miguel Ángel Navarrete¹; Sergio de-Miguel^{2,3}; Phillip SeLegue⁴; Geoff Marshall⁴; Tim Chavez⁴; Carlos A. Silva⁵; Scott Purdy¹; Raúl Quilez¹; Joaquín Ramírez^{*1}

¹ *Technosylva Inc, La Jolla, CA, USA* {acardil@tecnosylva.com}, {smonedero@tecnosylva.com}, {jramirez@tecnosylva.com}, {spurdy@tecnosylva.com}, {manavarrete@tecnosylva.com}, {rquilez@tecnosylva.com}

² *Department of Crop and Forest Sciences, University of Lleida, Lleida, Spain*, {sergio.demiguel@udl.cat}

³ *Joint Research Unit CTFC - AGROTECNIO - CERCA, Solsona, Spain*

⁴ *CAL FIRE Resources Building, 1416 9th St, Sacramento, CA 95814*

⁵ *Forest Biometrics and Remote Sensing Laboratory (Silva Lab), School of Forest, Fisheries, and Geomatics Sciences, University of Florida, PO Box 110410, Gainesville, FL 32611, USA*, {carlos_engflorestal@outlook.com}

**Corresponding author*

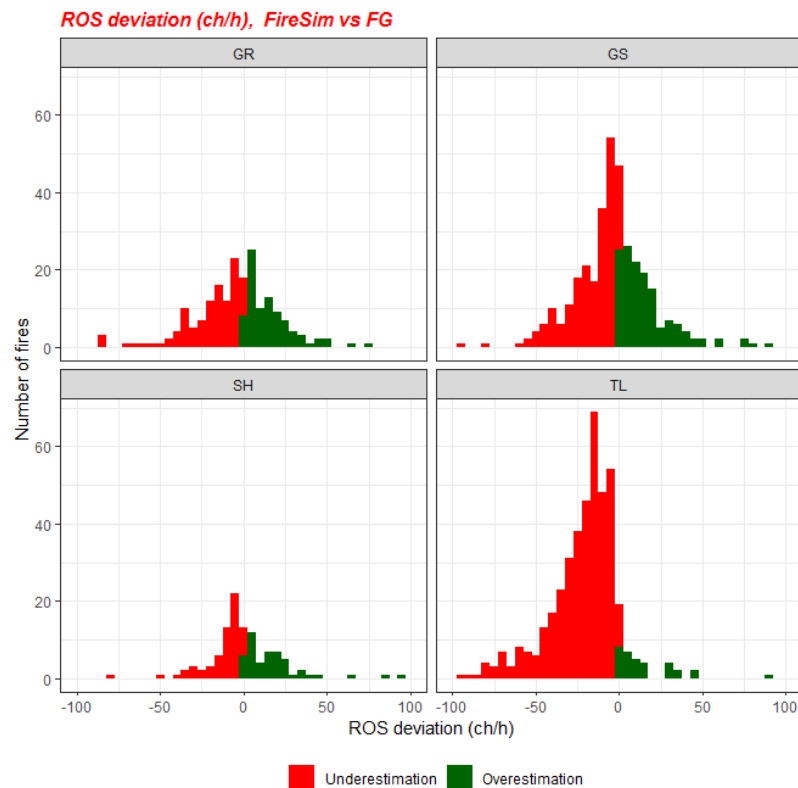
Simulations Calibration with FireGuard

First burning period (until 8 hours)

Statistical Analysis

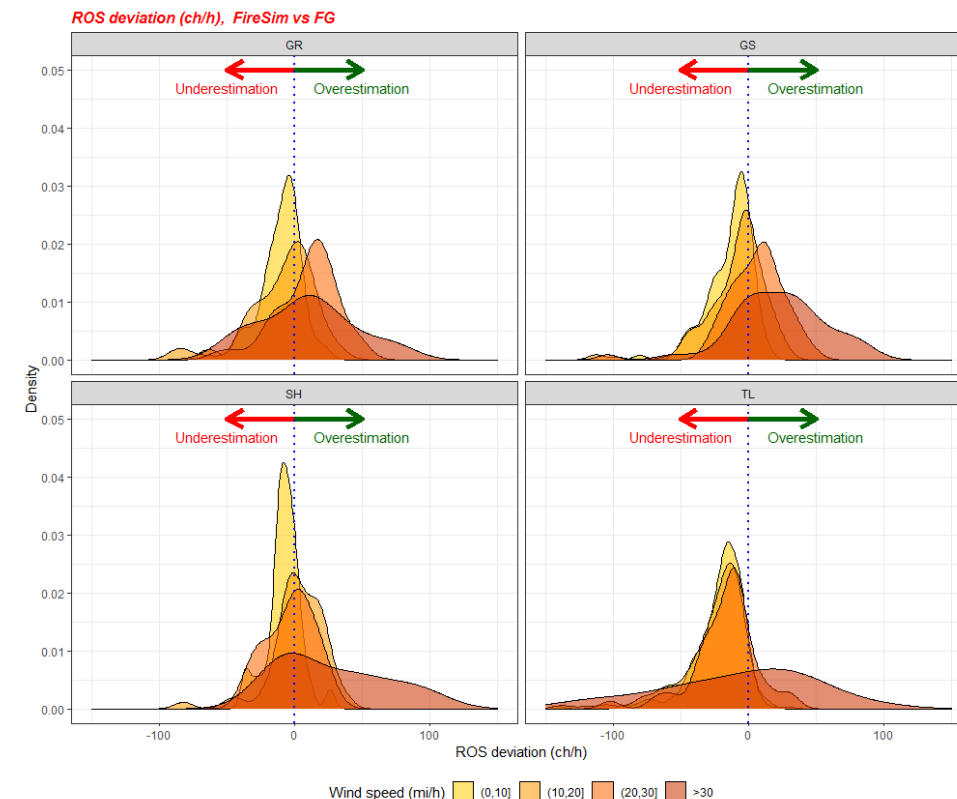
FUEL TYPE

- The histogram plots analyze the ROS deviation (FG ROS - FIRESIM ROS) for the different fuel types.



WIND SPEED AND FUEL TYPE

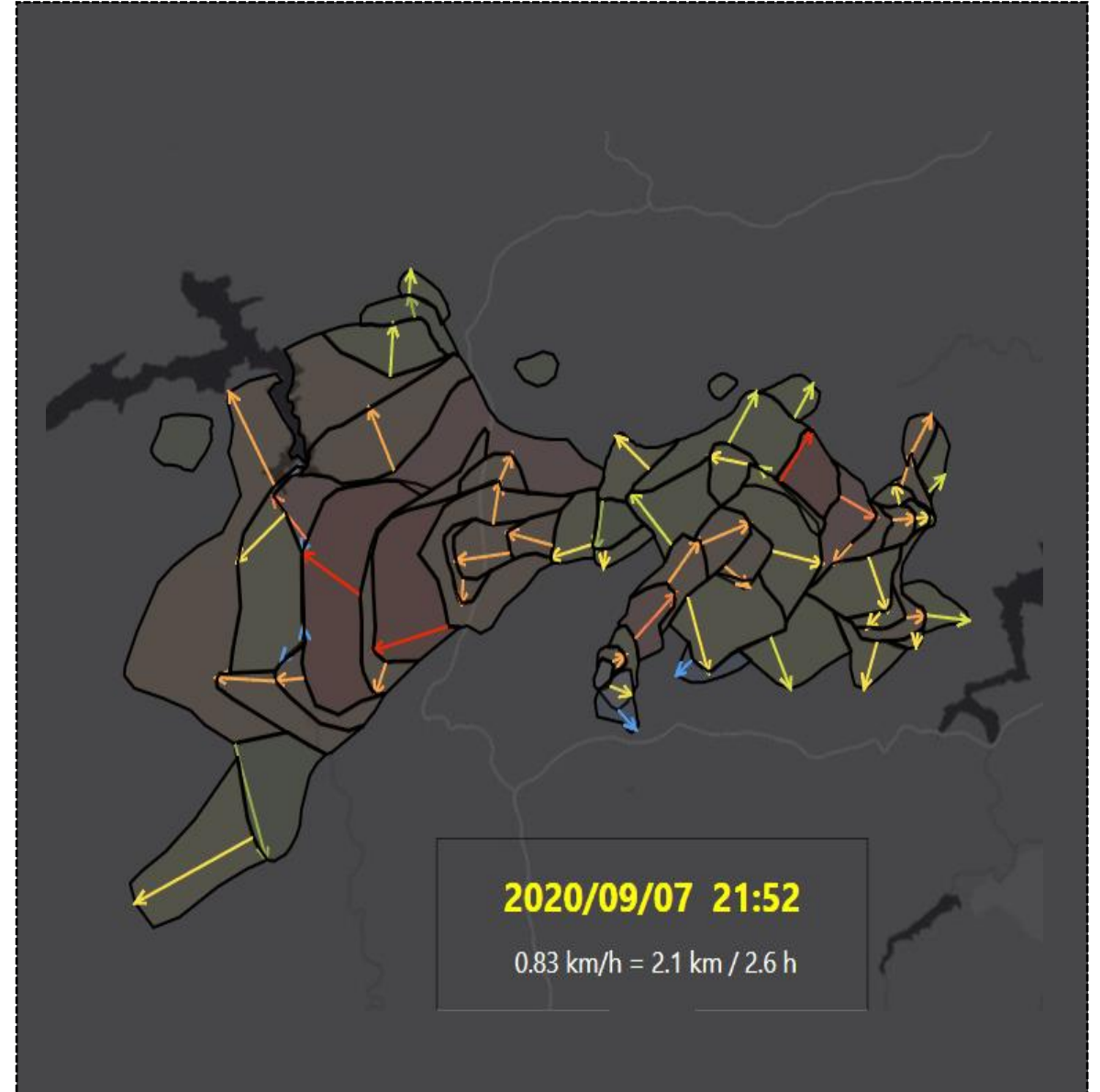
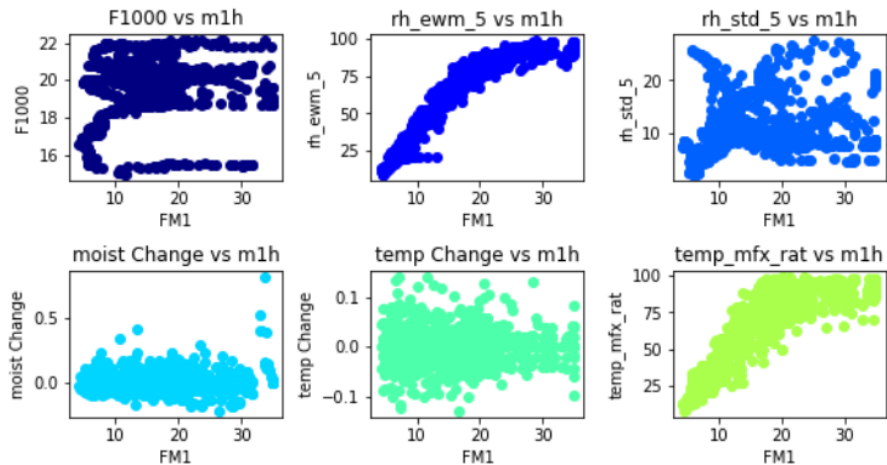
- The histogram plots analyze the ROS deviation (FG ROS - FIRESIM ROS) for the different fuel types and wind speed thresholds.



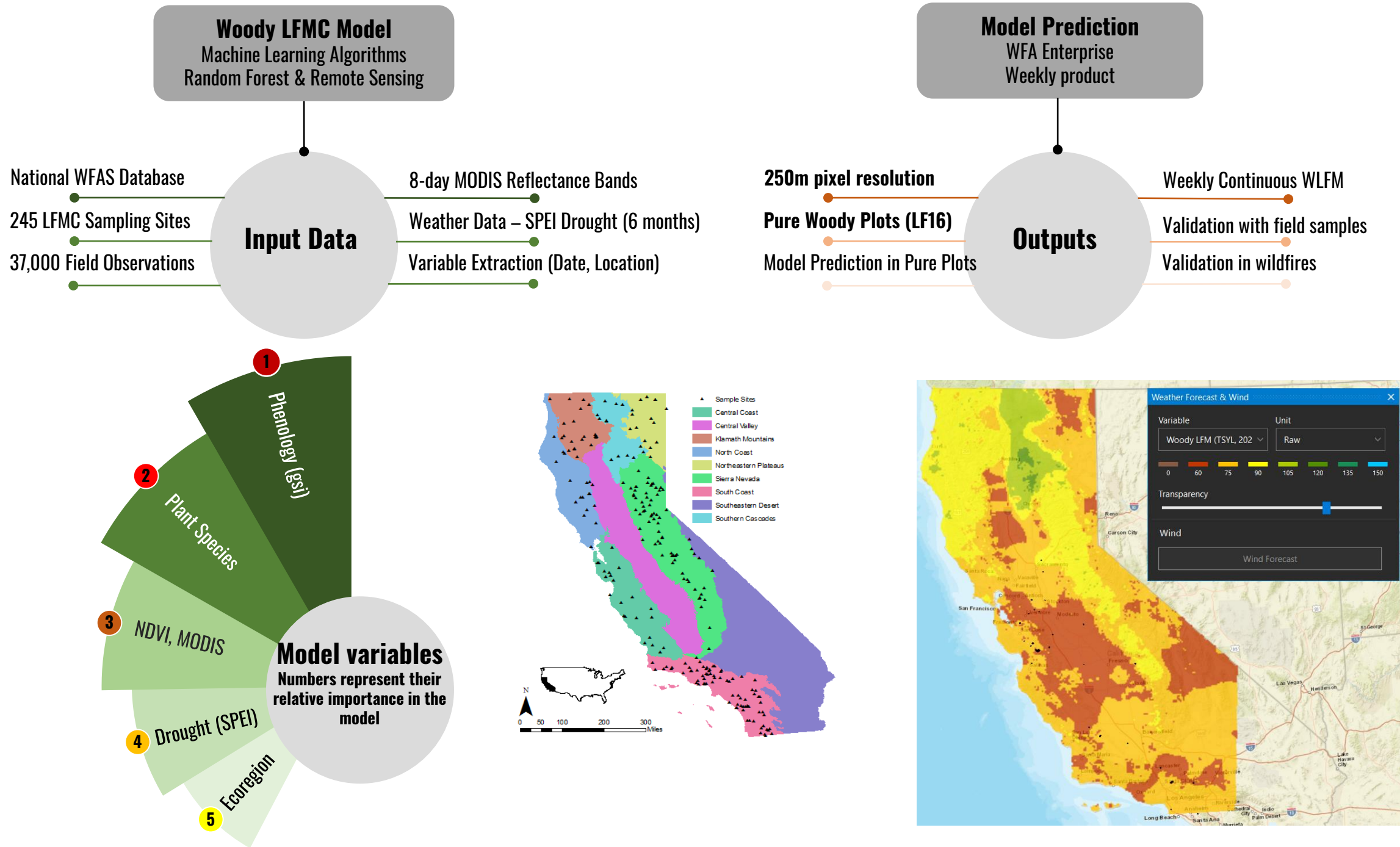
Deep Learning with FireGuard data

Deep Learning

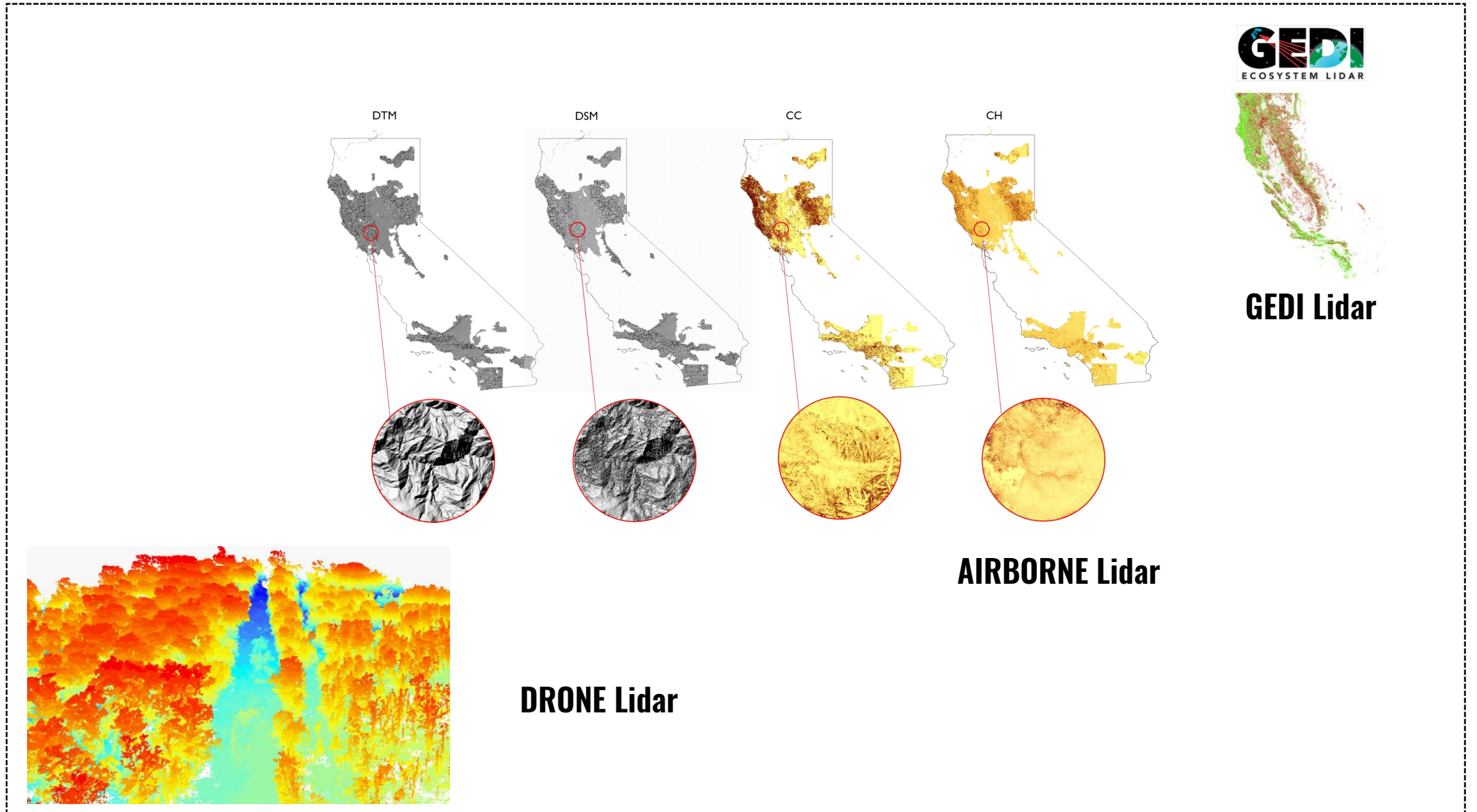
- Observed VS Predicted ROS to adjust the model
- Long Short-Time Memory (LSTM) Neural Network for regression analysis.
- Random Forest and Support Vector Machines to analyze the relevance of different input parameters



Herbaceous & Woody Live Fuel Moisture Model



Multiscale Lidar fuels yearly update





Technology + Power Users Better Future

RDS2 - Intel Summit Santa Rosa 2022

Technology That Supports Frontline Change



- Using technology tactically
- Scale and tempo of decision-making
- Automating alerts, evacuation, locations
- Using remote sensing routinely
- Connecting mitigation with operations



- **Interoperability**
- **Collaboration**
- **Integration**
- **Data Sharing**