Comprehensive open-source development of next generation wildfire models for grid resiliency

(Funded by California Energy Commission (CEC# EPC-18-026))

Electric Program Investment Charge Program (EPIC) Forum February 25, 2020

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Project Motivation

- Extreme wildfire events threaten public and the integrity of electricity grid
- Impacts to grid have *increased costs, reduced safety* and reliability to ratepayers



- Science lacks underlying information to forecast risk
 - $_{\odot}$ Current models cannot predict fire behaviors from large dead trees and duff fuels.
 - Fire-weather forecast underestimate extreme weather events
 - Models unable to forecast mid- to late-century fire risk
- IOUs need improved forecast capabilities to mitigate wildfire impacts

Project Team

Project Administration

David Saah (Lead PI) – Spatial Informatic Group Shane Romsos – Spatial Informatics Group Jean Pierre Wack – Spatial Informatics Group Christiana Darlington - Clere Andrea Drew – Drew Consulting

Weather Analysis and Weather Station Optimization

Janice Coen (Lead) – UCAR/NCAR Owen Doherty – Eagle Rock Analytics Tami Lavezzi - Sonoma Technology

Tree Mortality and Fuel Measurement and Mapping

Scott Stephens, PhD (Lead) – UC Berkeley Brandon Collins, PhD – UC Berkeley Mark Finney, PhD – US Forest Service John Battles, PhD – UC Berkeley David Marvin, PhD – Salo Sciences Chris Anderson, PhD – Salo Sciences

Near-term Risk Forecast Model & Decision Support Tool

Chris Lautenberger, PhD (Lead) – Reax Engineering Gary Johnson, PhD – Spatial Informatics Group Ali Tohidi, PhD – Spatial Informatics Group Mariko Geronimo – Lumen Energy Strategy

Long-term Projection Model and Planning Tool

Leroy Westerling, PhD (Lead) – UC Merced Matt Hurteau, PhD – University of New Mexico David Marvin, PhD – Salo Sciences Todd Hawbaker, PhD – US Geological Survey Ben Sleeter, PhD – US Geological Survey

Integration Team

John Battles, PhD (Lead) – UC Berkeley Max Moritz, PhD – UC Santa Barbara Joe Scott – Pyrologix Zeke Lunder – Deer Creek Resources Phil Dye – Prometheus Fire Consulting Services

Project Workflow



Outputs Key Outputs

- Weather Station Siting Framework ۲
- **Extreme Weather** Historical Analysis Report and Data Archive .
- State of Wildfire Science Report •
- Contemporary **Tree Mortality** Report and Data Archive
- **Near-term Forecast Modeling Framework**, Data Archive, **Decision** • Support Tool

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- Long-term Risk Projection Modeling Framework, Data Archive, • **Planning Support Tool**
- **Cost-benefit** Analysis and Fact Sheets •
- **Near-term and Long-term Results Integration** with IOUs, Stakeholders and California's Fifth Climate Change Assessment ۲
- **Open-source code for all models** ۲

Ensemble Fire Forecasts

- Multiple simulations are run with model inputs perturbed from baseline values
 - Wind speed and direction
 - Fuel moistures
 - Canopy layers
 - Spotting parameters
- Forecasts are aggregated to calculate burn probabilities
- Animation to the right is a series of 24-hour fire spread forecasts condensed to 2 seconds



Long-Term Risk Projections



- Annual Area Burned averaged over 10 years[.]
- Model: CNRM-CM5 (Cooler/Wetter)
 - Scenario: RCP 4.5*
- Population Growth Scenario: Central
 - 2070-2079



