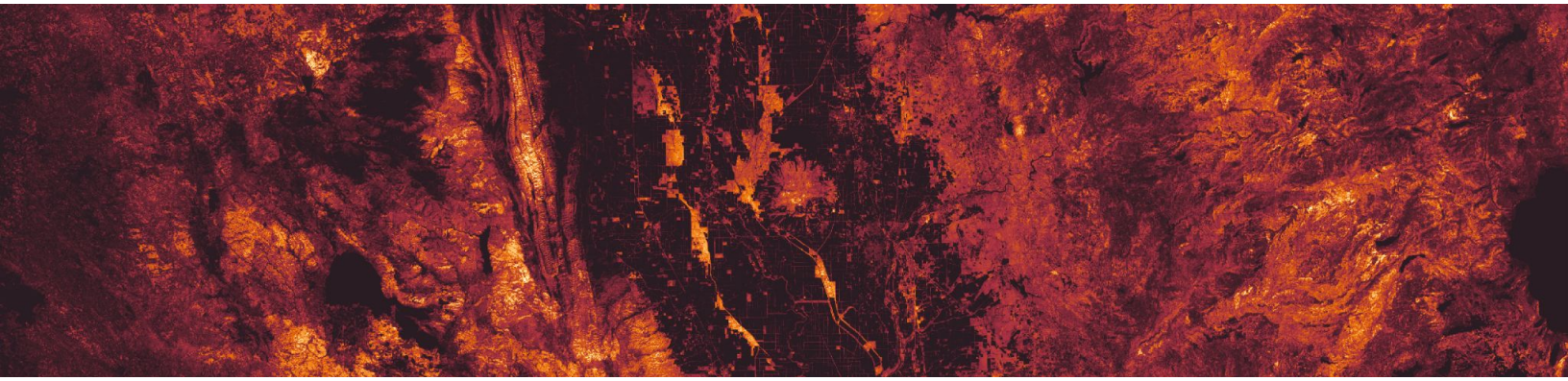
Understanding Wildfire Risk at High Resolution

RECENT BREAKTHROUGHS IN WILDFIRE HAZARD MODELING



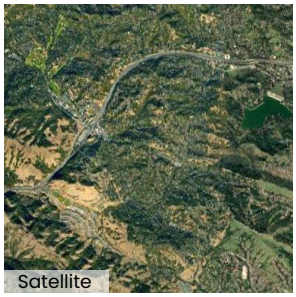
Salo Sciences has developed a proprietary, satellite-based vegetation monitoring system—the **Forest Observatory**—to produce high resolution, high precision, up-to-date maps of the fuel loads that predict wildfire behavior. But while these data provide unprecedented clarity into the densities and distributions of vegetation fuels, do these maps predict a new geography of risk?

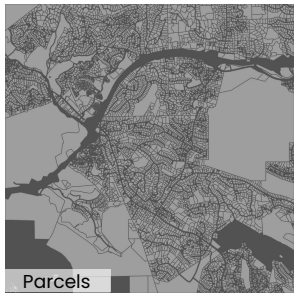
To quantify patterns of **burn probability** and **fire intensity**, we simulated over 200 million wildfires across California using hourly weather data, high resolution terrain maps, and a custom ignition probability layer. The number of times each area burned was used to calculate burn probability, while flame lengths and spread rates were used to calculate expected fire intensities. We synthesize these values into a composite metric—**wildfire hazard**—which, paired with information on asset susceptibility and value, can be used to estimate **wildfire risk**. And we show a dramatic shift in the risk landscape.

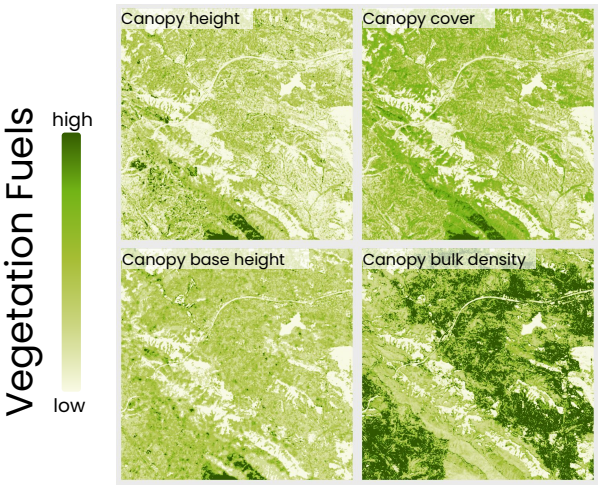
This report includes sample data on wildfire hazard and vegetation fuel loads at areas of interest requested by your organization. For a 1 km^2 area around each AOI, we include a side-by-side comparison of our fuels and wildfire products against standard USDA/USFS fuels and wildfire products. Quantitative values of wildfire hazard, burn probability, and flame length are provided for the requested location, along with the average and range over the 1 km^2 area.

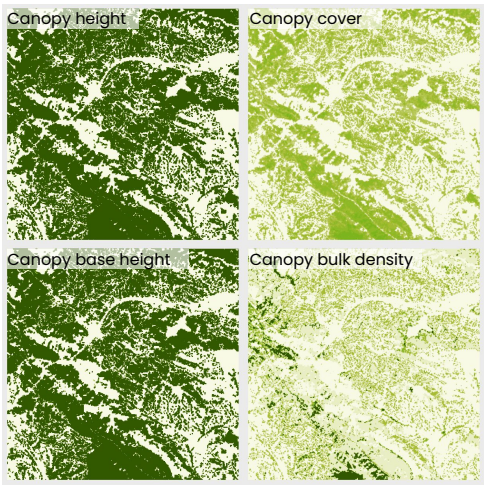
California Forest Observatory

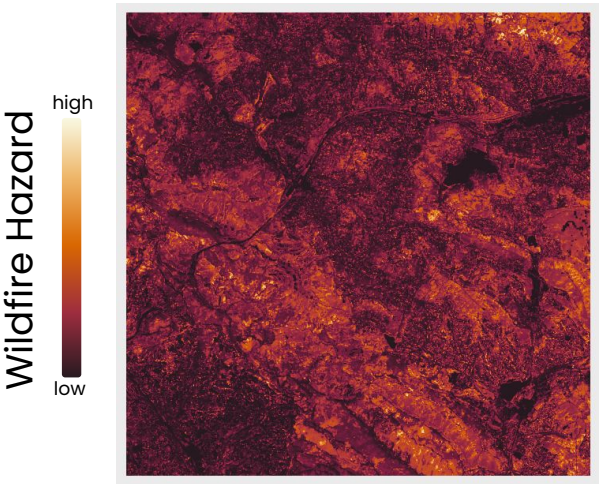
WILDFIRE RISK TO COMMUNITIES

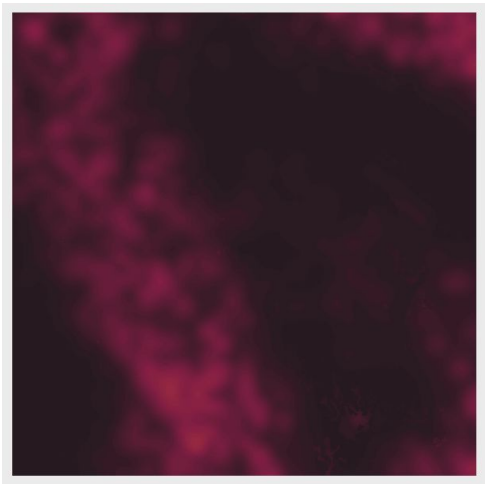




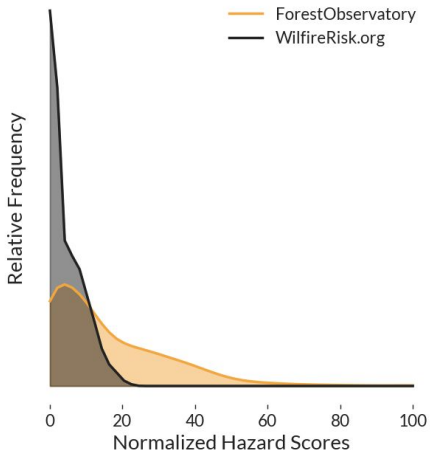


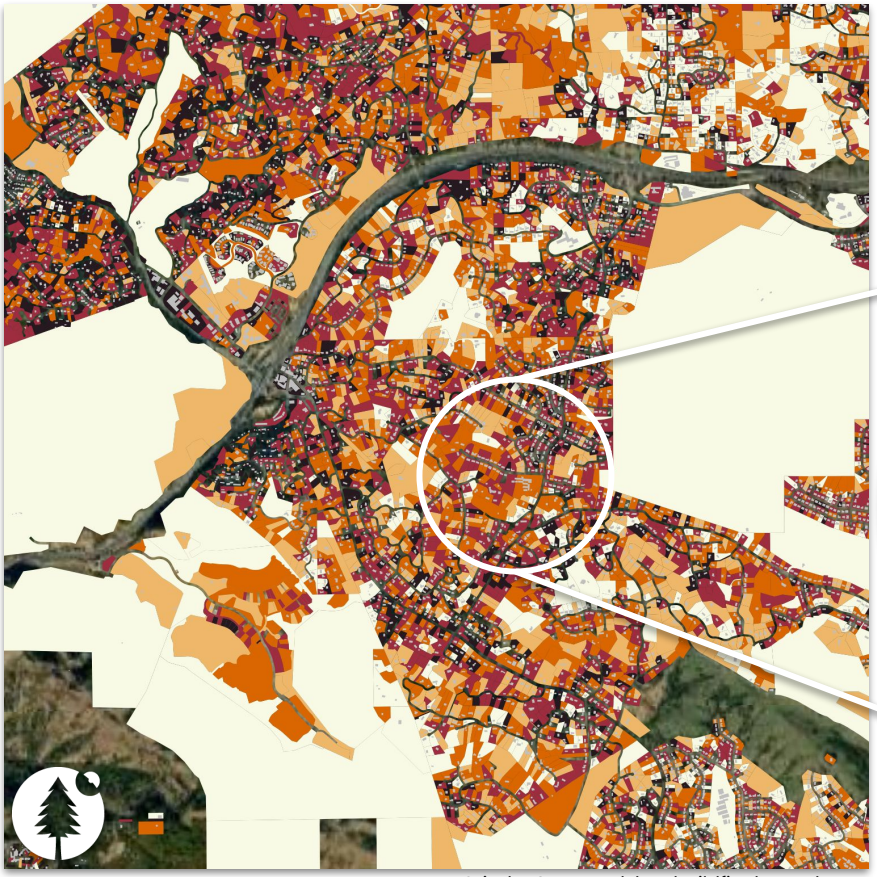




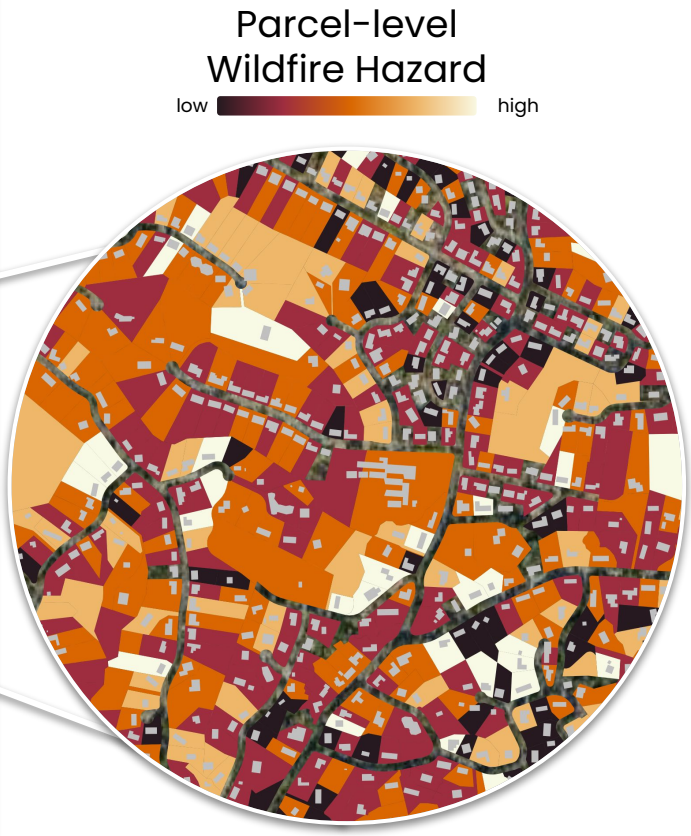


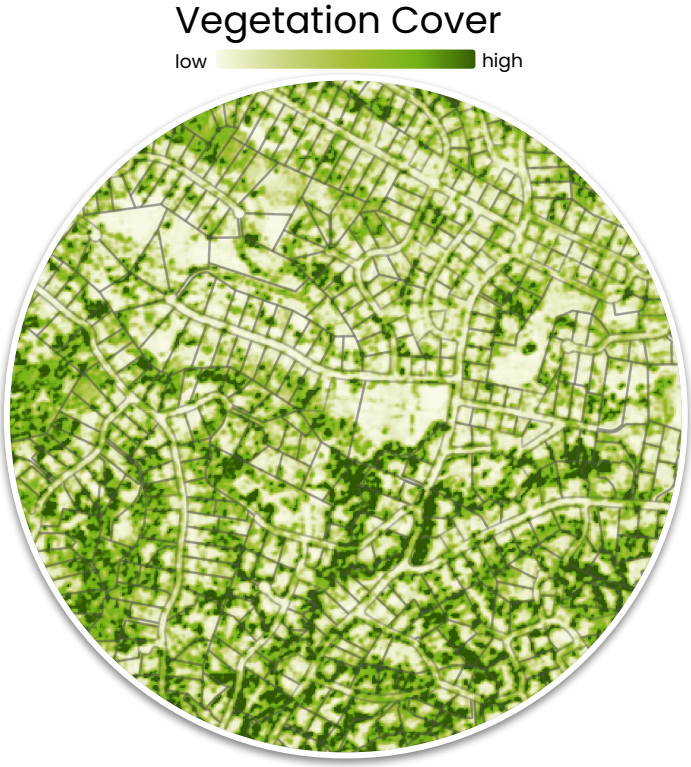
Hazard (percentile)		
Average	11	2
Range	0–46	0–5
Burn Prob. (scaled %)		
Average	0.0009	0.0018
Range	0.0–0.0021	0.0010–0.0032
Flame Length (ft)		
Average	3	4
Range	0–14	2–8





Orinda, CA parcel-level wildfire hazard map





High-resolution vegetation fuels data permits parcel-level modeling and analysis of wildfire hazard.

Compared to Wildfire Risk to Communities, our data finds **489% higher parcel-level hazard** on average.

Far **more granular analysis** of home and building exposure to wildland fire is now possible (top-right).

Conduct **fine-scale defensible space and fuels treatment planning & monitoring** when wildfire hazard maps are paired with our high-resolution vegetation maps (bottom-right).

Methods and Data

Wildfire spread model. We use the peer-reviewed, open-source ELMFIRE wildfire spread model as the core of our simulation system. This semi-empirical model is capable of accurately predicting the spread and intensity of individual wildfires at high-resolution (10-meter) in a computationally scalable manner. Please see peer-reviewed publications from Lautenberger (**2013**) and (**2017**) for more detail.

Data. Vegetation fuels data are current as of Summer 2020 before the onset of the fire season, and are produced at 10-meter spatial resolution. These data can be viewed at the **Forest Observatory**. Hourly weather and wind data is from NOAA's Real Time Mesoscale Analysis (RTMA) covering the 2020 calendar year, and is processed at 2.5-kilometer spatial resolution. Terrain maps are from USGS and were accessed at 10-meter spatial resolution.

Cloud simulation system. Our cloud-based simulation system ingests fuels, terrain, weather, and wind data and feeds this to the wildfire spread model, using a human ignition density probability surface to located each simulated ignition. Over 200 million individual fires were simulated to create our wildfire products.

Product Comparison

While the modeling systems used by the USDA/USFS (Wildfire Risk to Communities) and Salo Sciences deploy similar underlying wildfire spread models, the input data and simulation systems are dramatically different. USDA uses 30-meter vegetation fuels data from 2014 (LANDFIRE v1.4.0) and daily weather and wind data covering 1979-2014, which represent a fundamentally different wildfire regime than we find ourselves in today. USDA also relies on FSim, a wildfire simulator that does not computationally scale over large areas. This means they must model spread at very coarse spatial resolution (270-meter, ~900-feet) to be computationally feasible. Even at this coarse resolution, FSim can take months to complete a regional assessment.

We built our wildfire system to run at native 10-meter spatial resolution using current year vegetation fuels and weather/wind. As a result, we provide the only high resolution, up-to-date assessment of wildfire hazard available today, and have the capacity to rapidly update our outputs across regional to continental scales using our cloud-based simulation system.

For more information, contact **kyle@salo.ai**