

The wildfire risk landscape is changing.

Wildfire has become a predominant hazard in the United States, with each year seeming to bring more serious events across the country. The West, and California in particular, has suffered devastating fires in recent years, and concerns are already building for the 2021 season due to current drought conditions.

California vineyards & the evolving threat of wildfire

Peak peril season occurs primarily in the summer, with fires most likely to drive losses between May and October. However this risk period can vary by state and be influenced by particular seasonal trends that can lead to longer and less predictable wildfire seasons. Take for example 2021 so far, where 700,000 acres have burned in the U.S. while the West deals with severe drought conditions.



Descartes collaborates with brokers around the world to insure grape growers, wine producers, cooperatives, distributors, & investors against wildfire exposure, through a unique data driven approach.

A decade of ever larger & more destructive wildfires

Between 2015 and 2020 more than 50,000 wildfires burned each year across the country.

2020 was a particularly devastating year with:

10.1 million
acres
burned
across the United States.

Resulting in -

\$16.5 billion in
damages



In addition to drought, wildfire ignition, intensity and propensity to spread are heavily influenced by winds, high heat, low humidity, lightning, and even human activity. Such factors are further compounded by climate change, making these weather conditions a more regular occurrence.

While wildfires ignite in states throughout the US, they tend to be larger and more destructive along the West Coast. Notably Western states, such as California, Oregon and Washington, also have far more property at high risk from wildfires.

In 2020 alone, 4.2 million acres burned across the state.

These recent events have been particularly devastating for the wine industry and grape growers in the region. With losses increasing and weather conditions continuing to deteriorate, parametric insurance can offer flexible protection in an ever tightening market for the sector.

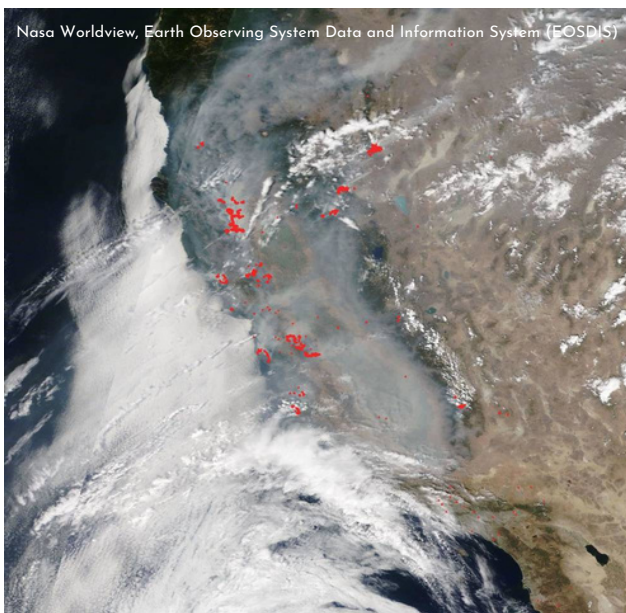


Image from NASA's Terra Satellite capturing multiple wildfires burning simultaneously across Northern California, including the LNU Lightning Complex and SCU Lightning Complex Fires on August 24, 2020

6 of the **10**

most destructive
and costly wildfires in
US history occurred in

California
in 2017 & 2018

Vineyards & producers at the forefront of wildfire risks

California, and increasingly Oregon and Washington, are well known for their wines. In fact, California represents the leading wine producer in the country and 4th largest producer in the world. There are over 635,000 acres of wine grapes grown in California, with 5,900 wine grape growers coming from 49 of the 58 counties. These vineyards comprise 4,200 wineries, many of which are multi-generation family owned businesses. The estimated retail value of the industry is \$43.6 billion in U.S. sales, amounting to \$1.36 billion in exports. Needless to say, recent wildfires and continued exposure conditions pose a real threat to the region and industry.

Wildfires have brought devastating damage to the region. In October 2017, a series of 250 wildfires simultaneously burned across the state of California in what became known as the Wine Country Fires. Ultimately, 245,000 acres were burned, resulting in \$14.5 billion in damages affecting 23 wineries across Napa, Sonoma and Mendocino counties. In October and November of 2019, the Kincadee Fire caused extensive evacuations from Sonoma County and destroyed or severely damaged several wineries in the area when it burned 77,758 acres.



At a Glance -

2020 Wildfire Impacts on California Wine Country

- **\$2B** in insured losses suffered in Napa, Sonoma, Yolo and Lake counties during the LNU Complex Fires in August & September
- **26** vineyards damaged in Napa & Sonoma during the late September Glass Fire
- **\$2.9** billion in insured losses incurred as a result of the Glass Fire

After considerable impacts in 2017 and 2019 to the wine industry, 2020 again brought multiple fires to the region. In August and September of 2020 the LNU Complex Fires tore through Napa, Sonoma, Yolo and Lake counties severely affecting harvests and causing \$2 billion in insured losses. What made this fire more devastating in comparison to the previous ones is that they occurred at the beginning of the grape picking season as opposed to the end of the harvest. Vineyards were faced with the choice of picking their grapes early when they weren't perfectly ripe or risk losing them entirely to fire. Then in late September of 2020, the Glass Fire damaged 26 vineyards in Napa and Sonoma, causing \$2.9 billion in insured losses.

Beyond material damage:

How wildfire impacts vineyards & producers

The losses incurred by vineyards range from property damage to total loss of structures, including tasting rooms and production centers. During a wildfire event, years worth of wine supply aging in barrels or bottles on the property can be completely destroyed, resulting in significant disruptions to the supply chain for years to come. Often during wildfires, utility companies shut down the power to curb fire spread, leading to further losses for vineyards. Without electricity for more than a few days, grapes ready for harvest will go unpicked and often rot, and any grapes in the fermentation process could be left at undesirable temperatures changing the flavor profile and financial value of the wines. Even vineyards with on-site back-up generators often have to choose between powering crush or tasting facilities, ultimately affecting a portion of their yield.

Wildfire Exposures for the Wine Industry

NON-DAMAGE BUSINESS INTERRUPTION

- Power shutdowns affecting harvest or fermentation operations
- Smoke taint
- Loss of tourism/tasting room revenue - often accounting for a majority of the vineyard's direct revenue stream
- Supply chain disruptions due to closed roads, delays, or infrastructure damage

PROPERTY DAMAGE

- Direct combustion of vines, facilities, equipment, outdoor fittings
- Loss of supply (potentially several years of harvest)

HEAT & COMBUSTION

A fire event within a vineyard can damage plants through heat or combustion. In some circumstances, heat only causes leaf damage or burnt bark for the vineyard, mitigating any long lasting effects. In other cases, vineyards can suffer complete heat destruction of the flower bud, resulting in total crop loss. In the worst case scenario, if a fire is slow moving and very hot, it can cause complete vine death which takes 3-4 years to replace and grow. Even without vine death, damaged vines can cause subpar growth for 2-3 years. Both scenarios impact a vineyard's harvest and ability to produce the same quality and yield produced before the fire event.



SMOKE TAINT

The reality is that burned or not, every vineyard can be impacted by wildfires in the region. Take for example the most destructive fire in the state's history. While the 2018 Camp Fire - which burned 153,336 acres, destroying 18,000 structures and causing \$16.5 billion in damage - didn't directly burn in wine country, vineyards were still impacted due to smoke taint.

Notably vineyard exposure to smoke taint isn't driven by the proximity to fire, instead it's the density and duration of smoke exposure that causes the most damage. The longer the smoke lingers in a certain area, the higher the risk of smoke taint. Smoke taint can permeate the grape skin and bond with the sugars inside, translating in a significant increase in volatile phenols such as Guaiacol and 4-methylguaiacol, meaning that smoky notes may be released while the wine is in the barrel or bottle making process.

Thus, the true impacts of smoke taint are harder to predict early in the wine making process. Grapes tested for smoke taint receive negative results and can then later test positive after being fermented. This leaves wine producers unsure of their total losses until well after an event, sometimes years later.

As of today, smoke taint represents an exposure not yet fully captured by insurance products.



Each year, California's wine country draws

23.6 million visitors,

constituting **\$7.2** billion in tourism revenue for the region

LOSS OF TOURISM REVENUE

Lastly, the non-damage business impacts of wildfires on tourism are another challenging exposure for the wine industry. California's wine region draws 23.6 million visitors annually, constituting a \$7.2 billion slice of the region's economy through retail wine, hotels, restaurants and venues. The loss of tourism during and following wildfire events can prove catastrophic for wineries that derive a large portion of their revenue from tasting room, subscription, and direct sales. As the influx of tourists diminishes or disappears and events are postponed or cancelled due to fires, wineries also stand to lose orders from the local restaurants and event caterers they may supply. With wildfires occurring more regularly in or near the region, this strain can be felt by vineyard owners and operators year over year.



Evolving weather and wildfire trends - Beyond the current 2021 fire season

California has always been prone to wildfire. But under the pressure of climate change, drought and warmer temperatures, wildfires have become a year-round danger in the state. The number of dry and windy autumn days has more than doubled in the region since the 1980s. Hot air from droughts or heat waves removes moisture stores from soil and vegetation, reducing the ignition barrier of the environment and helping fires spread more easily. Climate change is also affecting seasonal rain and snow patterns. Snow is melting earlier than previous decades, giving plants and soil a longer spring season to dry out. Between 1970 and 2012, 70% of areas burned occurred in places that had experienced a reduced winter snowpack and an early snow melt.

Wildfire ignition factors -

Long-term
Drought Conditions



Soil
Moisture



Proportion of Vegetation
Dry Enough to Burn



Snowpack/
Snowmelt



Proximity to
Wildland Urban Interface



New data insights -

Large Fire Potential Index (LFP)

New data sources combining satellite imaging and on-site measurements provide a unique wildfire risk insight referred to as Large Fire Potential index or LFP.

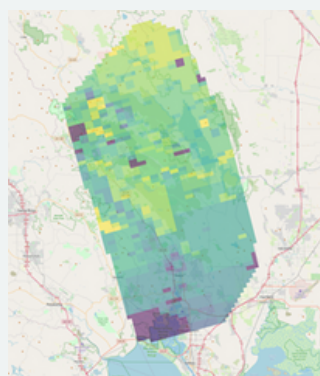
This composite metric takes into account soil moisture, long term drought conditions, and the estimated proportion of vegetation that is dry enough to burn. LFP data is published by USGS (United States Geological Survey) on a daily basis.

As observed in the visualizations to the right: the mean value for Large Fire Potential over a region alone isn't sufficient to forecast and explain the propagation of large fires - accurate inference of wildfire risk requires additional expertise and analysis.

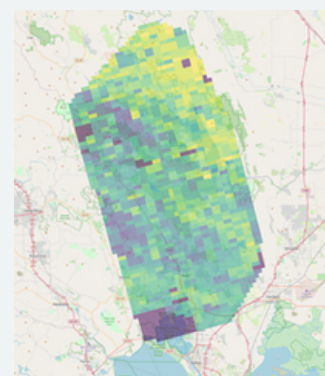
For example in the Napa Valley region, 2017's Large Fire Potential index was higher on average than the mean Large Fire Potential of 2020. Yet the geographical distribution of high Large Fire Potential in 2017 remained contained to well defined areas.

On the other hand, 2020's conditions facilitating the occurrence and spread of wildfires were distributed all throughout the region.

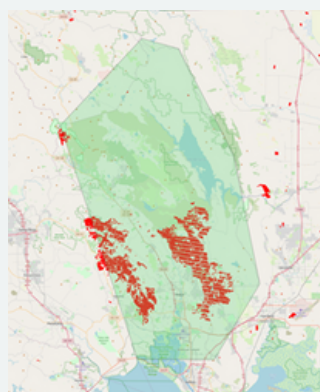
Subsequently it was observed that the 2017 wildfires only impacted Napa Valley to a small and contained extent while the wine region suffered more extensive damage during the 2020 wildfire season.



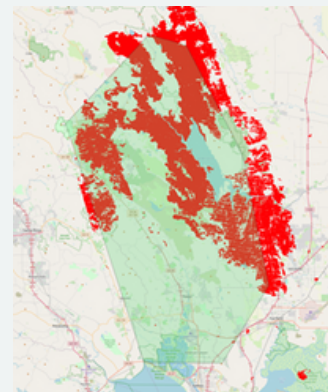
2017 Large Fire Potential
Napa Valley



2020 Large Fire Potential
Napa Valley



2017 Season Burn Scars
Napa Valley



2020 Season Burn Scars
Napa Valley

Wind conditions also play a role in wildfire risk. Winds in the region normally flow from the west carrying cool humid air from the ocean onshore. However, the Diablo, Mono and North winds in Northern California and the Santa Ana winds in Southern California reverse this pattern and blow northeast with gusts up to 75 mph. These phenomena develop from high and low pressure cells and are common in the fall, tending to follow the autumn drought typical of the California climate and exacerbating severe fire conditions. These winds have been associated with some of the most catastrophic fires in the area, including the Tubbs Fire of 2017, and cause more destruction as the wind conditions drive the fires directly through densely populated areas.

Seasonal patterns key to fire exposure are also shifting. The occurrence of an early and warm spring acts as an extension of the summer drought season, and across California, autumn has also gotten longer, resulting in higher temperatures and less winter rain. The 20% increase in the number of fall days has a direct impact on the risk of fire burning days. The seasons and weather patterns have changed so much that Cal Fire now considers the entire year to be wildfire season. Taken together, climate change, changing weather trends, and population growth are all contributing to a higher probability of large wildfires occurring, leaving the wine industry with increased exposure in the years to come.

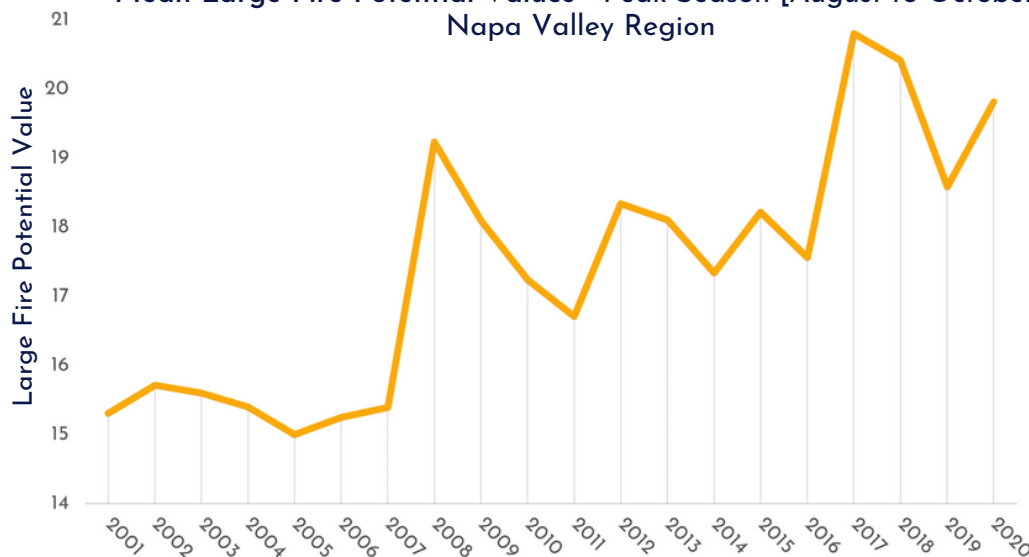
Beyond the current wildfire season -

The past decade has shown a steady increase in Large Fire Potential index, leading to favorable ground for the ignition and spread of wildfires in the Napa valley.

This graph shows the mean Large Fire Potential index values for the Napa Valley region during the peak risk season [August to October] over the past two decades.

Conditions have been deteriorating steadily since the early 2000s. Across Western States, the current season is too early to call, but current drought conditions are regarded as a major concern by experts.

Mean Large Fire Potential Values - Peak Season [August to October]
Napa Valley Region



**California vineyard & population expansion,
increasing exposure triggers in fire-prone regions**

125% growth of California's wine
growing footprint from 1998-2018

Notably regions seeing the highest growth are also regions where wildfire risks have escalated the most

Growth in California's wine country comes urban expansion and developments that include narrow roads, exposed power lines and inadequate water conveyance systems. Coupled with drought and dangerous wind conditions, these regions are ripe for uncontrollable wildfires. While the influx of new residents has brought prosperity, it also increases the risk of fires as most fires in this area are caused by human activity whether intentional ignitions or due to faulty power lines.

Wildfire risk & the insurance market -

Alternative solutions exist for this "uninsurable new normal"

If California wildfires are the new normal, it raises the question for wineries and producers on how to best mitigate this risk?

The insurance industry has paid out billions in claims from recent wildfire events, leading to a natural tightening of the market. Most brokers report capacity shrinking or wildfire risk exclusions being pushed onto policies, under the pressure of compounded losses and cost increases in the reinsurance market for wildfire coverage. This leaves policyholders looking for coverage in the traditional insurance market with higher premiums, increased deductibles, or cap payouts for wildfire losses. In this environment, alternative coverage solutions offering new capacities are being increasingly adopted.

Parametric wildfire insurance is customized to a clients' exposure and is structured using satellite imagery, long-term climate, and weather data. Utilizing historical wildfire data and a client's value per hectare, parametric covers provide a transparent structure that allows clients to be certain of the payments they will receive in the event of a wildfire without exclusions.

Rather than a claims process that can take months or years, payments are made within a matter of days or weeks. If a wildfire occurs, then the client will receive the full payout based on the number of acres burnt, as laid out in their policy structure.

Parametric insurance also offers the flexibility to cover any financial losses incurred from an event without restriction. If a vineyard loses tourism revenue from a tasting room burning down or loses a plot that produces a particular grape or wine, these would also be covered under the parametric policy. Parametric insurance offers balance sheet protection that allows vineyard owners and grape growers the ability to recoup their losses, rebuild, and continue their business operations in a matter of weeks after an event.



In an increasingly wildfire prone region, wineries and businesses can protect themselves from future losses by utilizing parametric insurance coverage.



Interested in learning more about
our parametric wildfire insurance?

Contact us!

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