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The Growing Economic Cost of Wildfires

In this article, we use Weather Source daily and hourly data, available on S&P Global Marketplace, to examine climate conditions that resulted in both *Camp Fire* and *Woolsey Fire,* which resulted in $8.47 billion and $2.93 billion in losses, respectively. In addition, we use S&P Global Trucost Physical Risk asset data to identify commercial assets in wildfire-prone areas, as well as utility companies that may have higher wildfire risk exposure than others.

Wildfires in the wilderness are part of the ecological cycle. Wildfires in 'not-so-wild' places are not, however, and are called Wildland/Urban Interface (WUI) fires. These have been increasing in both frequency and intensity. For example, 2018 was the most destructive and costly fire season in California history. As shown in Table 1, the state's top three wildfires that year exceeded $10 billion U.S. in financial losses.[1]

Table 1: Fires in California in 2018

	Total Structures Lost (#)	Residential Structures Lost (#)	Commercial Structures Lost (#)	Total Loss ($mil U.S.)	Residential ($mil)	Commercial ($mil)
Camp Fire	1,820	1,077	743	$8,400	$7,400	$1,000
Woolsey Fire	1,500	670	830	$2,930	$2,660	$236
Carr Fire	1,079	1,079	22	$890	$850	$30

Source: National Fire Protection Organization, NFPA.org.

In order to help mitigate fire risks and stabilize utilities financially, in 2019 California created a wildfire fund by enacting Assembly Bill 1054. This fund not only facilitates the payment of wildfire-related liabilities, it also requires participants, such as utilities, to: a) earn safety certifications, b) tie executive compensation to safety performance, and c) implement wildfire mitigation plans.

Camp Fire: The Worst Fire in California History

Unfortunately, the town of Paradise was burned to the ground as a result of Camp Fire in 2018. This fire was first reported at 6:30 am on November 8th near Poe Dam, a *dam* on North Fork Feather River in Plumas National Forest near Paradise. Due to an ongoing drought in the area, coupled with windy conditions, the fire quickly swept through the town of Paradise, making it the costliest wildfire in U.S. history. Figure 1 below presents a map of the fire-affected area (shaded area), commercial asset locations listed by Trucost (yellow dots), transmission nodes identified by Trucost (purple), and weather observation locations presented in Weather Source (blue dots).

[1] "Wildfire insurance losses from November 2018 blazes top $12 billion", California Department of Insurance, www.insurance.ca.gov/0400-news/0100-press-releases/2019/release041-19.cfm.

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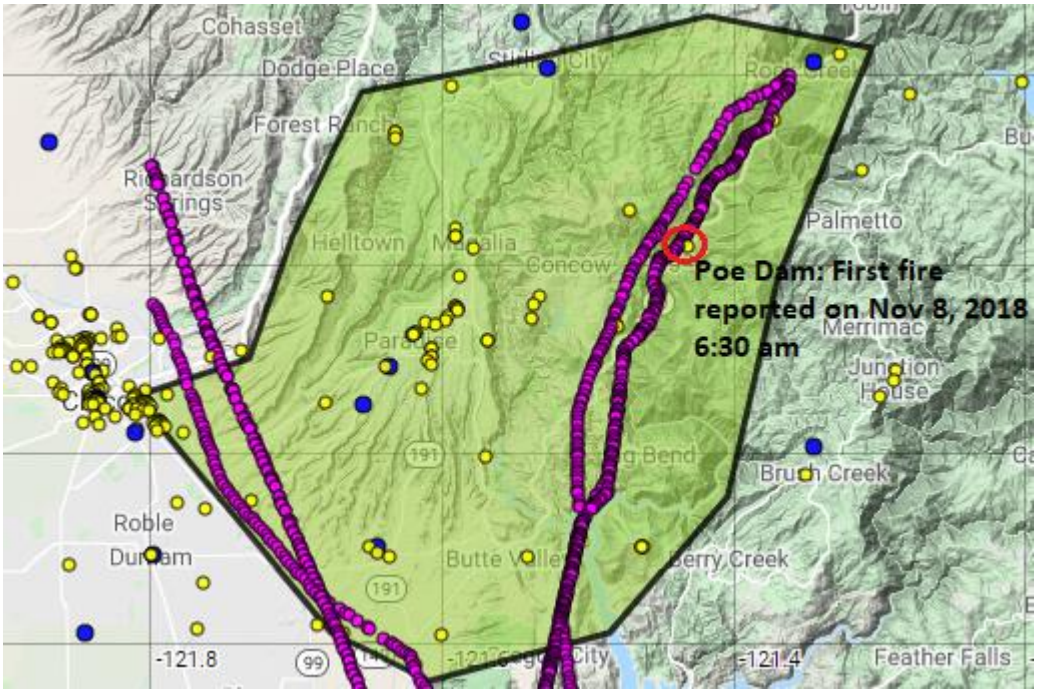
Figure 1: Fire-Affected Area



Source: Trucost Physical Risk data, Weather Source data, and nfpa.org data. For illustrative purposes only.

According to the National Fire Protection Organization, 90% of the properties lost in Camp Fire were residential. Table 2 shows top 10 entities with their commercial assets located in the affected area identified by Trucost, excluding the transmission nodes.

Table 2: Commercial Assets Affected by Camp Fire

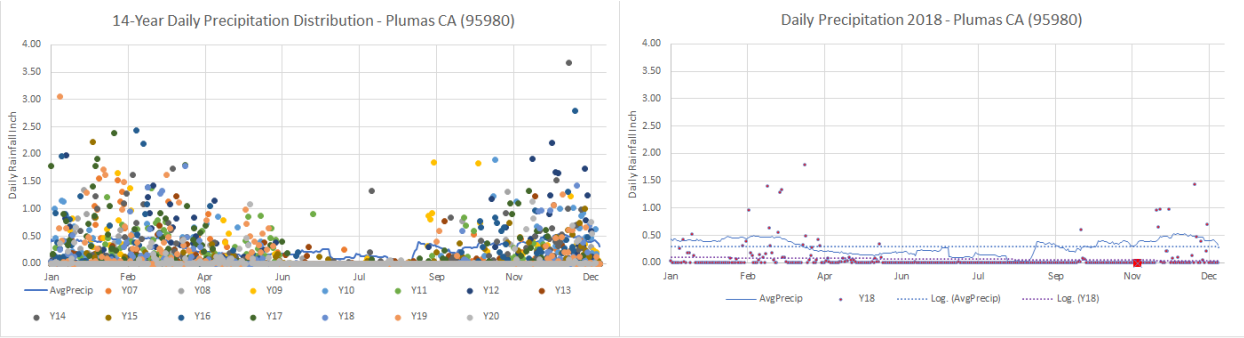
Parent Company	Number of Assets
PG&E Corporation (exclude transmission line)	7
TriCo Bancshares	6
JPMorgan Chase & Co.	4
Rabobank, National Association	3
Wells Fargo & Company	3
California Department of Water Resources	3
Dollar Tree, Inc.	3
Walgreens Boots Alliance, Inc.	2
Yum! Brands, Inc.	2
U.S. Bancorp	2

Source: Trucost Physical Risk dataset. For illustrative purposes only.

Next, we examine three key weather conditions at Rock Creek/Storrie (Plumas, CA 95980), a few miles upstream from the origin of Camp Fire.

Camp Fire Daily Precipitation: Two scatter graphs shown in Figure 2 compare daily precipitation in the Storrie area between 2007 and 2020 (left graph) to illustrate the rainfall tendencies, and that of daily record in 2018 (right graph). The 14-year tendency is clear — precipitation is likely in the fall-winter-spring months, then things dry out in the summer. These conditions were exacerbated in 2018 due to a prolonged drought in California. Camp Fire started on the day marked with a red square in the right-hand graph, which followed months of drought conditions.

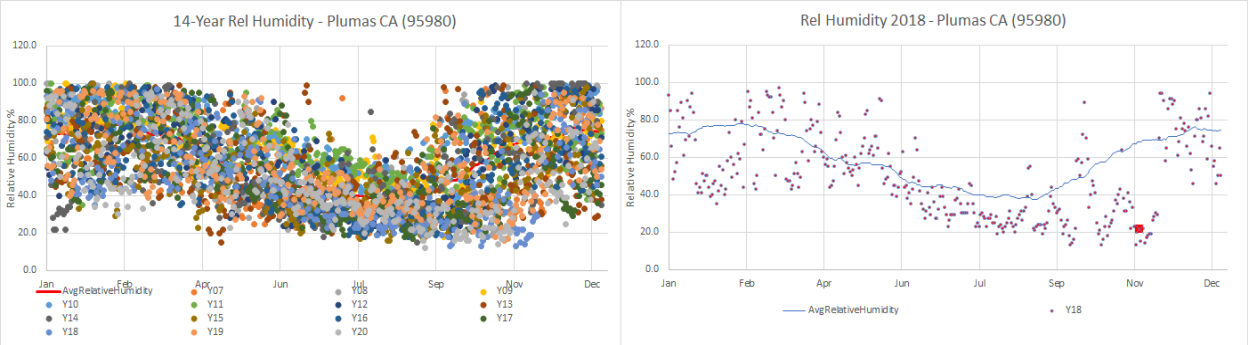
Figure 2: Daily Precipitation Distribution Graph



Source: Weather Source daily data. For illustrative purposes only.

Camp Fire Relative Humidity: This area of California typically sees a high level of humidity from the fall through to spring, according to Weather Source, as shown in Figure 3 that plots daily relative humidity levels between 2007 and 2020 (left graph). Of course, drought means less humidity, and a lack of precipitation in 2018 had taken any moisture out of the forest. By November 2018 (right, red square), the forest was experiencing a dangerously dry condition.

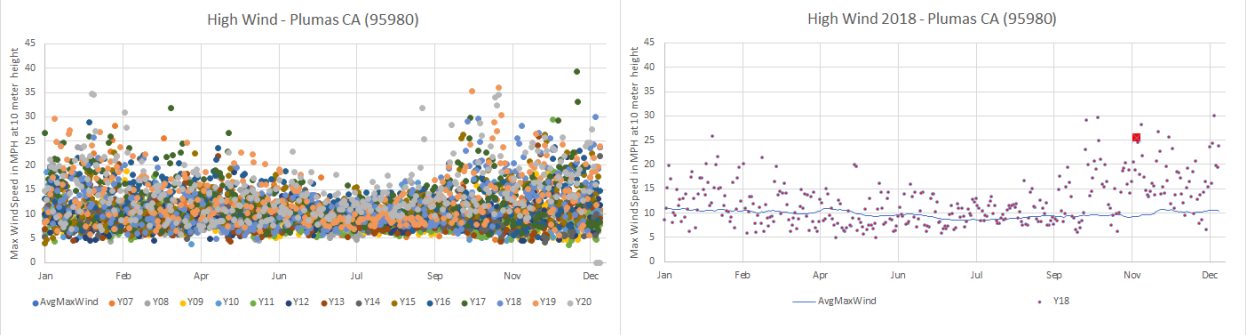
Figure 3: Relative Humidity Distribution Graph



Source: Weather Source daily data. For illustrative purposes only.

Camp Fire Wind Speed: Historically, this area is likely to get higher gusts in the fall months (left graph), and a tinder dry forest doesn't take much to light up. This area was under high wind conditions for days leading up to November 8, 2018 (right graph, red square). On this fateful day, the fire that started in the upstream Poe Dam area had raced downslope with the help of high winds in an extremely dry forest, causing the fire to reach Paradise in just a few hours.

Figure 4: Maximum Observed Wind Speed Distribution Graph

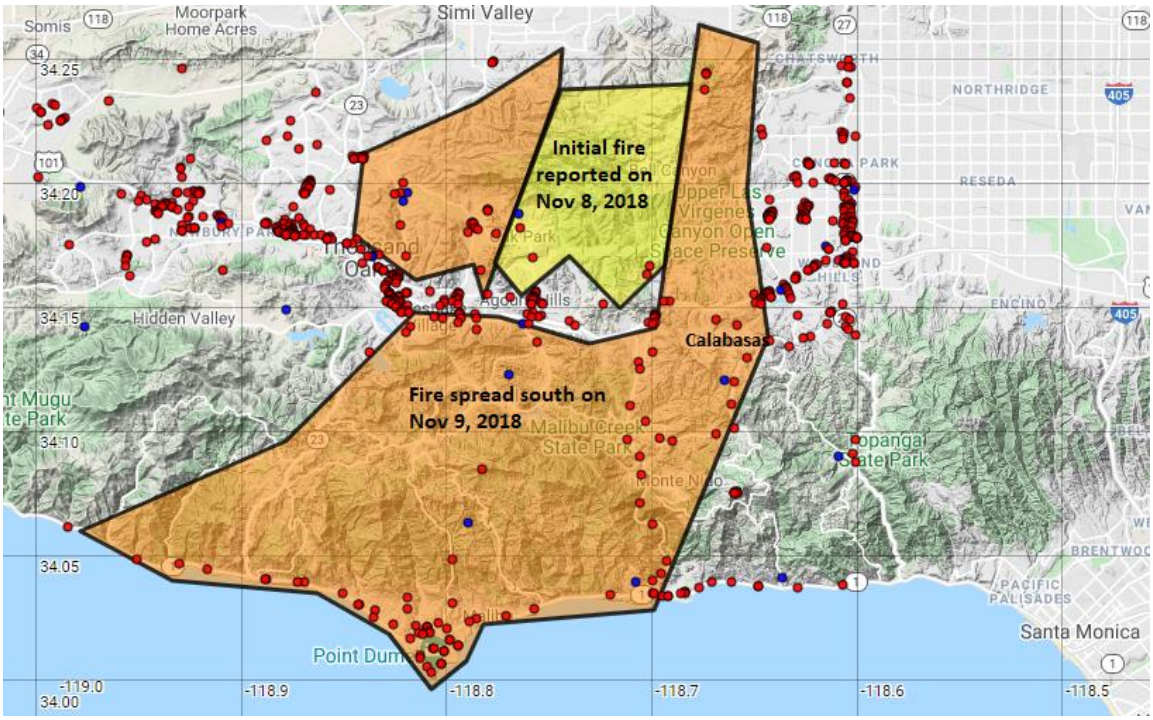


Source: Weather Source Daily Data. For illustrative purposes only.

Woolsey Fire: A Textbook Example of a WUI Fire

The Woolsey Fire started on November 8, 2018 in Simi Valley/Oak Park area, as shown in the yellow section of Figure 5. This was where Southern California Edison's circuit station was located. The fire quickly spread east and west, fanned by Santa Ana winds that were so intense that they grounded aerial fire suppression efforts. The fire then jumped the highway in Agoura Hills/Calabasas area, shown by the yellow/orange border, and raced toward the Malibu coastal area, shown in orange. Figure 5 also shows Trucost's commercial asset locations (red dots) and Weather Source observations (blue dots) that fell within, or near, the fire boundary.

Figure 5: Woolsey Fire



Source: Trucost Physical Risk data. For illustrative purposes only.

Woolsey Fire Commercial Assets Under Threat: Table 3 shows the top 10 companies with their commercial assets located within or near the fire, which included the entire town of Malibu. We linked these commercial assets to S&P Global Market Intelligence's data on ultimate parents. Other than residential mansions in Malibu, this area had a high concentration of bank branches, high-value real estate investment trust (REIT) properties, industrial complexes and laboratories, which explains why a WUI fire can become very expensive.

Table 3: Commercial Assets, Grouped by Ultimate Parent Company

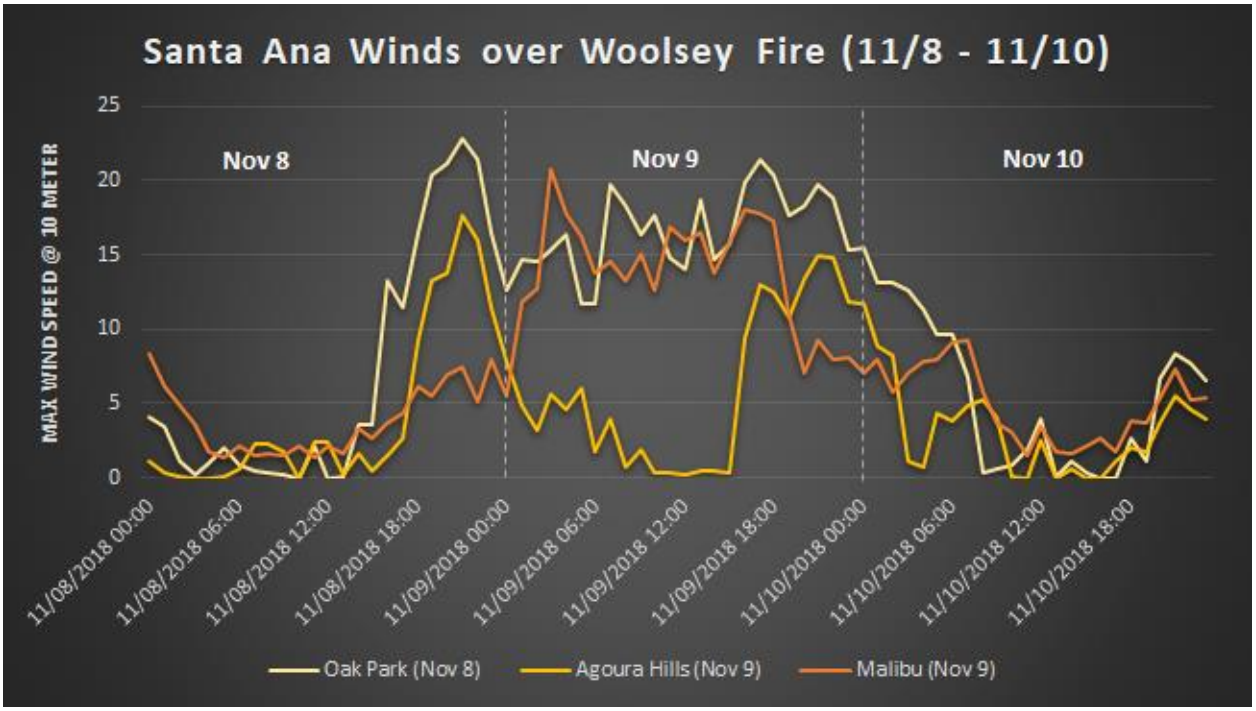
Parent Company	Number of Assets
JPMorgan Chase & Co.	34
Yum! Brands, Inc.	21
Wells Fargo & Company	19
BAC North America Holding Company	17
Bank of America Corporation	17
Seven & I Holdings Co., Ltd.	14
U.S. Bancorp	11
McDonald's Corporation	10
CVS Health Corporation	10
Citicorp LLC.	8

Source: Trucost Physical Risk data. For illustrative purposes only.

The Los Angeles Times also reported that the median market value of the homes destroyed was approximately $3.47 million, driving the total loss into the $3 billion range.2 All told, this fire became a textbook example of why WUI fires today tend to result in very high losses. How best to insure these assets in the future is under intense debate, pitting insurance underwriters against home owners.

Woolsey Fire Wind Speed: Wind gusts recorded by Weather Source hourly data for the three areas captured in Figure 6, show that the fire expansion clearly followed peaks of unfortunate Santa Ana winds.

Figure 6: Santa Ana Winds



Source: Weather Source hourly data. For illustrative purposes only.

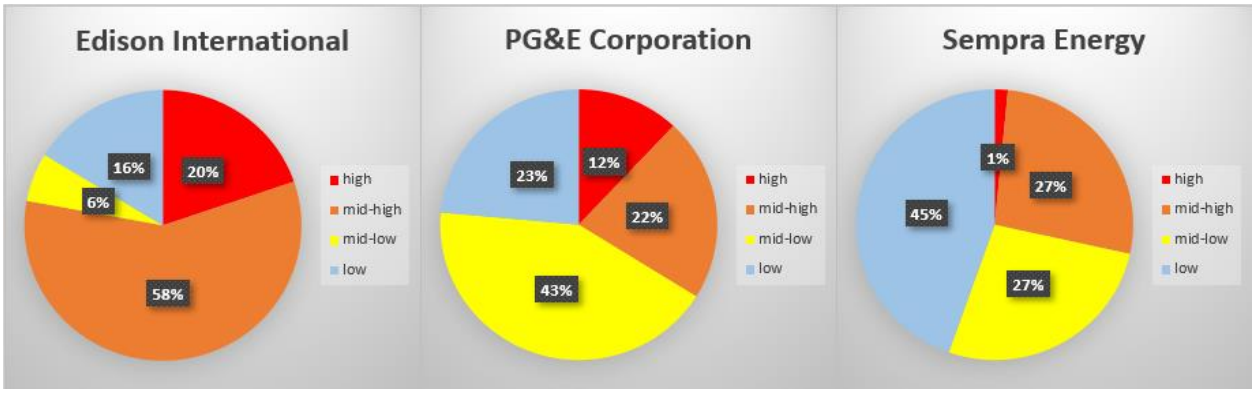
Wildfire Risk Scores in Trucost Physical Risk Data

Trucost identifies and calculates various climate risk factors on over 200,000 assets globally,3 of which 130,000 assets are located within the U.S. As shown in the above map, Trucost provides climate risk factors for over 450 asset locations among the top three utilities in California. Figure 7 shows the percentages of their assets that are grouped into four wildfire risk levels. According to this, Edison International, concentrated in and around the L.A. area and Sierra Nevada (yellow

[2] "Woolsey fire likely worst ever to hit Malibu, with home losses topping $1.6 billion", Los Angeles Times, Dec 3, 2018, https://www.latimes.com/projects/la-me-malibu-woolsey-destruction-map/
[3] Data as of January 2021.

dots in the map), has more of its assets proportionally located in the wildfire-prone locations, compared to the other two.

Figure 7: Percentage of Assets Grouped into Four Wildfire Risk Categories



Source: Trucost Physical Risk data. For illustrative purposes only.

Increasing Global Wildfire Risks

WUI fires are becoming more commonplace, not only in California, but elsewhere, as well. For example, there were three times more wildfires than usual in Portugal and Spain in 2017. Athens was under wildfire threats in 2018, which eventually killed at least 20 people. Bushfire all over Australia in 2020 had consumed the area equal to Vermont and New Hampshire combined. Losses due to wildfires are a global problem that will likely only get worse over time. While wildfires are inevitable, investors and consumers can be better equipped with physical risk information provided by Trucost, identifying commercial assets that are under wildfire threats. By combining this data with Weather Source climate data, we can better understand why fires happen and where financial damages may be most extreme.

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