



# SVI CASE STUDY

## The Camp Fire

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# Acknowledgements

I would like to acknowledge the community of Paradise for allowing us the privilege of sharing in their rebuilding journey. Now more than ever, we are relying on communities like Paradise to help us pave the new path forward with wildfire.

I would also like to acknowledge Lucy Walker and her production team for “Bring Your Own Brigade.” To me, it demonstrates the human complexities we often overlook when talking about wildfire and the best ways to prevent it.

## Financial Disclaimer:

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## Section I. Context and Timeline

### A. Context

The following case study was conducted on the 85 fatalities that resulted from the Camp Fire, which burned the town of Paradise, California on November 18th, 2018. Over 18,000 structures were destroyed, and 153,336 acres burned, reducing the town's population from 26,218 (2010) to 8,285 (2023).<sup>1</sup>

### B. The Camp Fire Timeline

It is important to note that this timeline was taken directly from The Camp Fire Public Report: A Summary of the Camp Fire Investigation, published by the Butte County District Attorney's Office on July 16, 2020.

- ❖ “On November 8, 2018 at 6:15 a.m., the PG&E Grid Control Center (GCC)<sup>3</sup> in Vacaville documented an “interruption” on the energized Caribou-Palermo 115kV transmission line in the Feather River Canyon.”
- ❖ “At approximately 6:20 a.m. on November 8, 2018, a PG&E Hydro Division employee driving eastbound on Highway 70 observed a “bright light” above a ridgeline as he approached the Pulga Bridge. Initially the employee believed the bright light to be the sun rising behind the ridgeline; however, as he continued driving, he realized the source of the bright light was a fire underneath the PG&E transmission lines on a ridge on the north side of the Feather River. The employee noted the fire appeared to be at the base of a transmission tower. In that area of the Feather River Canyon cell phone service is not available. The employee used his PG&E radio to contact PG&E employees at the Rock Creek Powerhouse and reported the fire. These employees then called 911 and were transferred to the Cal Fire Emergency Communications Center (ECC) in Oroville. The 911 call from the Rock Creek Switching Station was received by Cal Fire ECC at 6:25:19 a.m.”
  - While cell phone coverage continues to be a challenge in rural areas where cell phone coverage can lead to delays in ignition reporting, it is important to note that there has been a significant rise in utility-placed wildfire sensors throughout California and in other areas of the west, such as Colorado.

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<sup>1</sup> Paradise town, California; United States. “QuickFacts.” [United States Census Bureau](https://www.census.gov/quickfacts/fact/table/paradisetowncalifornia,US/PST045223). Access: <<https://www.census.gov/quickfacts/fact/table/paradisetowncalifornia,US/PST045223>>.

- ❖ “At approximately 6:30 a.m., an employee of the California Department of Transportation (Cal Trans) arrived at the Cal Trans Pulga Station for work. While in the parking lot of the Pulga Station he observed a fire under a PG&E transmission tower northeast of the Pulga Station and took a photograph of it. The photograph showed a fire emanating out from under transmission Tower :027/2225 (Tower 27/222) of the Caribou-Palermo 115kV transmission line (Caribou-Palermo line).
- ❖ “At 6:29:55 a.m., the initial Cal Fire notification went out to Captain Matt McKenzie at the Concow/Jarbo Gap Station. By 6:35 a.m., two Cal Fire engines from the Concow/Jarbo Gap Station were on Highway 70 headed eastbound toward Pulga. Captain McKenzie and his firefighters first observed the fire just before reaching the Pulga Bridge. The two engines continued on Highway 70 to the Poe Dam to assess the fire and formulate a plan of attack. From above the Poe Dam on the south side of the Feather River, at 6:44 a.m., Captain McKenzie observed that the fire was burning under the electric transmission lines on the ridge on the north side of the Feather River. Based upon the location of the fire as well as the high wind speed and direction, Captain McKenzie concluded there was no available route to attack the fire. Captain McKenzie immediately realized that the community of Pulga was in danger and dispatched his second engine to evacuate the residents of that community. From his position on Highway 70, Captain McKenzie took measure of the fire and requested additional resources be deployed to the west to stop the fire at Concow Road. During his initial report to the ECC, based upon his observations of the fire, the topography, and the wind, Captain McKenzie warned, “this has the potential of a major incident.” (An hour later, at 7:44 a.m., the fire reached the Town of Paradise, a distance of approximately seven miles.)”
  - One of the most important take-aways from the Camp Fire was that the behavior was so intense it took only an hour for it to rage through 7 geographic miles of heavily timbered forest before it reached the Paradise WUI.
  - One of the things that stood out about John Vaillant’s 2023 novel, “Fire Weather,” was just how close the Fort McMurray Fire had to get to the town before evacuation orders were actually called. According to the novel, the fire got as close as a mile before the orders were finally made.<sup>2</sup> However, due to the nature of the town they had a very low SVI rate, which allowed residents to escape with enough time.
  - Obviously, in the case of Paradise, the fire moved too quickly for there to be enough time for a proper evacuation order. The Fort McMurray Fire had been going on for multiple days. Still, a case can be made that evacuations are being ordered earlier when fires begin to exhibit concerning behavior, it is still important to remember the earlier the notification the better.

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<sup>2</sup> Vaillant, John. “Fire Weather: A True Story from a Hotter World.” Chapter 10. First edition. New York, Alfred A. Knopf, 2023.

- ❖ “At approximately 6:48 a.m. fire watch cameras on Flea Mountain and Bloomer Hill recorded a plume of smoke east of Concow and west of Pulga. Cal Fire monitors initially attributed the plume of smoke to the Camp Fire. Later Cal Fire monitors and investigators determined the smoke plume was not associated with the Camp Fire and was caused by a separate and unrelated fire. Utilizing mapping tools Cal Fire investigators determined the plume of smoke had arisen from an area near the intersection of Concow Road and Rim Road in eastern Concow. The fire was named the Camp B Fire.”

The remaining timeline was accounted for by the Butte County Office of Emergency Management Camp Fire Response County-Wide After Action Report, published in August of 2020 and completed by Constant Associates.

- ❖ At 6:54 AM, firefighters radio requests for resources and evacuation.
- ❖ By 7:07 AM, the fire reached the community of Concow.
- ❖ At 7:13 AM, an evacuation order was issued for Pulga and announced via Twitter.
- ❖ At 7:15 AM, an evacuation order was issued for Concow.
  - It is important to note, according to the timeline, that the fire reached the community of Concow before the evacuation order was called. It wouldn't be the last time that day, but it again speaks to how quickly emergency response resources became overwhelmed by the fast-moving fire.
- ❖ At 7:46 AM, an evacuation order was issued for the Eastern quarter of Paradise (announced via radio notice).
  - Section III of the study breaks down fatality locations in further detail. However, one of the key takeaways from this study was that a high volume of fatalities occurred in the eastern areas of Paradise.
- ❖ By 8:00 AM, reports of fire had reached the community of Paradise. At 8:02, evacuation orders continued to go out for Paradise.
- ❖ 9:00 AM - The Sheriff's Office activated a staging area and the first shelter opened.
- ❖ At 9:15 AM, evacuation orders were initiated for Magalia.
- ❖ 9:30 AM- Law enforcement established an incident base command at Butte College.
- ❖ By 10:00 AM, the National Guard arrived with a team and 10 trucks of emergency supplies.
- ❖ At 10:06 AM, evacuation orders were extended to the Butte Valley area, and the Butte Creek area at 10:22 AM.
- ❖ At 13:02, SO recaps overall evacuation orders (announced via Twitter).

## C. Pertinent After Action Review (AAR) Findings

### Evacuation Orders

- ❖ According to the Butte County Camp Fire Response AAR, “On the morning of November 8, the lead staff member from the BCSO responsible for the mass notification process received a call from BCSO dispatch with a request to push out an evacuation order for the Community of Pulga due to fire threat. That message was sent out at 7:13 AM.<sup>1</sup> Faced with limited staffing support, the same individual remained at the helm and pushed out over two dozen alert notifications during the initial 16 hours of the Camp Fire response.”
  - To further complicate matters, less than 40% of residents in the fire-affected area had signed up for the emergency alert systems. Overall, of the 52,000 people evacuated, only 7,000 received alerts from CodeRed (Butte County’s Alert Notification System).
- ❖ The AAR further found that Butte County had not practiced a “worst case scenario” test with its mass notification system prior to the fire. Specifically, the report states,

“ It was explained, during a stakeholder interview, that in October 2017, the County had switched its primary mass notification software from Airbus to CodeRed, largely based on CodeRed’s ability to seamlessly integrate with and simultaneously push out messages through IPAWS. This decision to switch systems was prompted by a series of Vesta Communicator message failures the County had experienced with Airbus in February 2017 during the response to the Oroville Dam Spillway incident.

While the County was proactive in switching its primary mass notification system, it did not dedicate the time and resources necessary to also ensure that the new software would support the mass notification needs of a large-scale, complex incident. In addition, the County did not leverage the system onboarding period as an opportunity to bolster its mass notification staffing capacity by training existing and new staff members in system use.”

### The Importance of Capacity

- ❖ In this new normal, having staff and resources that have experience with large wildfire incidents can be monumental for creative problem solving and mitigating significant loss of life during fast-moving wildfires. According to the Camp Fire AAR, “Butte County staff had extensive experience in EOC operations from previous disasters to include the recent Oroville Dam Spillway incident, which also necessitated a mass evacuation. Employees had developed mutual trust and the ability to quickly mesh together as a team in support of a common mission. These factors contributed to the speed and efficiency

with which the EOC activated, organized, and became functional, even in the face the catastrophic events surrounding the Camp Fire.”

- And, “The widespread and dynamic nature of the Camp Fire overwhelmed the same standard plans, processes, and procedures that had worked for Butte County in response to previous disasters. Creativity and innovation were required to successfully meet the unpredictable needs presented by the Camp Fire.”
- ❖ One of the main findings for Areas of Improvement was the need for being properly equipped with the technology and resources to properly accommodate the scale and severity of the incident. The AAR specifically states, “The size and layout of the County EOC, while adequate for past emergencies, was not fully sufficient to support a large-scale, multi-jurisdictional, multi-operational period, and complex response such as the Camp Fire. In addition, the EOC was not equipped with the appropriate technology to support an efficient and effective response by the County. For instance, given the widespread and dynamic nature of the Camp Fire and all of the information it produced, there was no feasible way to adequately display critical incident-related information in support of a common operating picture in the County EOC. Informational displays within the EOC meant to project the common operating picture were inadequate, which hindered situational awareness.”

## Relevance to the SVI

These findings are relevant to the overall objective of this study because it further demonstrates the need for increased wildfire prevention and response capacity in rural and economically disadvantaged areas. Section VI of this study compares the evacuations between the Camp Fire and the Marshall Fire (2020, Colorado). Specifically, it provides evidence for correlation between the amount of resources available for response during the most critical times- at the beginning of an incident.

What the Camp Fire demonstrated was a need for a more comprehensive wildland and general emergency management workforce at the community level that is capable of responding to incidents capable of reaching this scale and severity.

## Section II. Social Vulnerability Breakdown

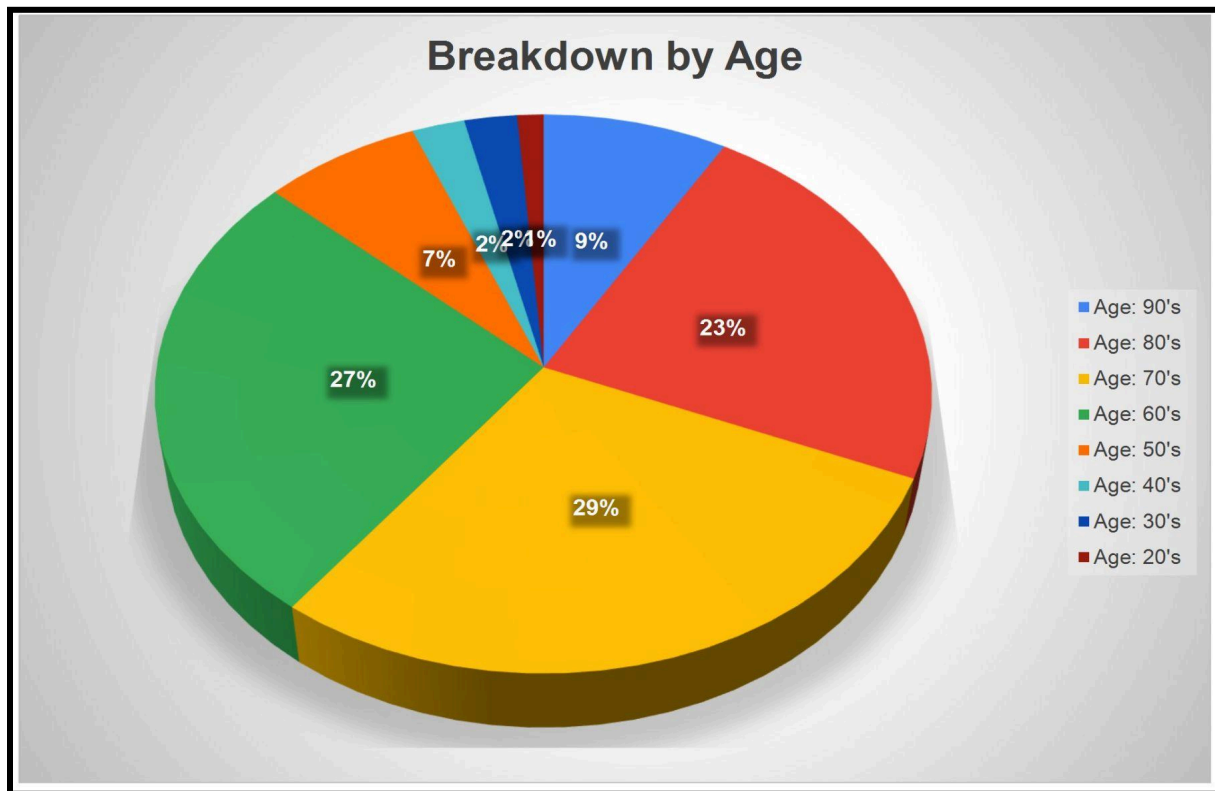


Figure 1.

### A. Age

- ❖ According to the research, approximately 86% of the fatalities were over the age of 60. However, it is important to note this statistic was based on 84 victims, given the 85th victim remains unidentified.
- ❖ Fatalities under the age of 60 were mostly made up of two categories:
  - Had a disability and/or limited mobility
  - Was caught in a common area where several victims were found, suggesting the fire overtook them because it was moving so fast.
- ❖ As you can see by the breakdown in the chart [above], victims in their 60's, 70's and 80's represented the largest population of fatalities.

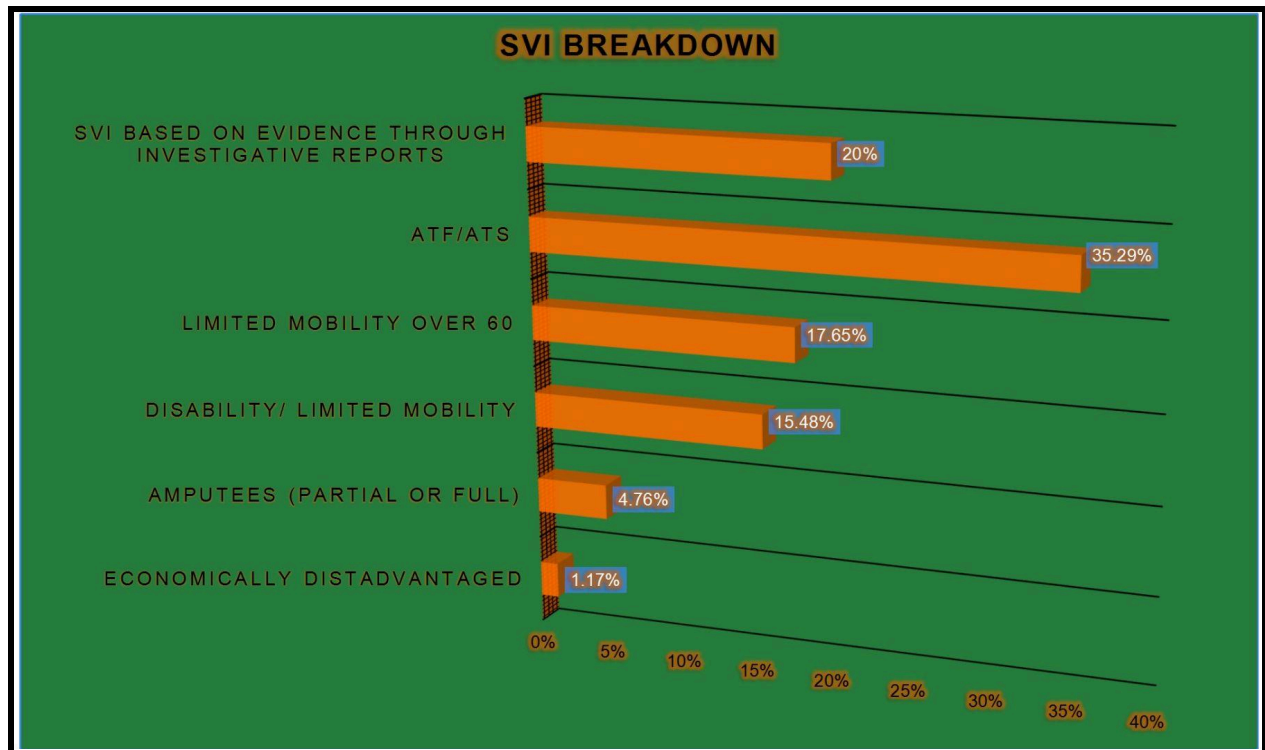


Figure 2.

## B.Limited Mobility and Amputees

This category represents fatalities where partial or full-amputations were noted in the investigative report as evidence. Most correlated with ATF/ATS.

- ❖ Four of the total victims were partial or full amputees.
- ❖ Thirteen of the total fatalities, most references in the official incident report claim the majority of these fatalities had limited mobility, but even more limited resources.
- ❖ Calculated against 85

## C.Economically Disadvantaged

This was one incident specifically tied to economic disadvantage: A 39-year old was unable to flee because he did not have a vehicle. Although technically the majority of the victims could be counted as economically disadvantaged, it is worth pointing out because it's worth thinking about. How many residents in your county don't have vehicles? What is a way we could possibly mitigate that?

- ❖ Calculated against 85

### D. Attempt to Flee (ATF)/ Attempt to Survive (ATS)

Attempting to Flee (ATF), Attempting to Survive (ATS): This evidence includes fatalities where evidence showed they either were trapped while attempting to flee. Attempting to survive includes fatalities that made attempts to shelter-in-place by getting into a bathtub or shower; and/or they had made documented calls to caregivers to ask for help.

- ❖ 30 fatalities were classified under ATF/ATS
- ❖ Accounted for 35.29% of the fatalities, calculated against 85

### E. SVI Based on Evidence through Investigative Reports

This was based on fatalities that had no other information besides "Found in Residence." This suggests that these victims were limited in resources and capacity to leave, and/or did not have any documentation from friends or family the morning of the fire.

- ❖ 17 fatalities were classified under this category
- ❖ Accounted for 20% of all victims, calculated against 85

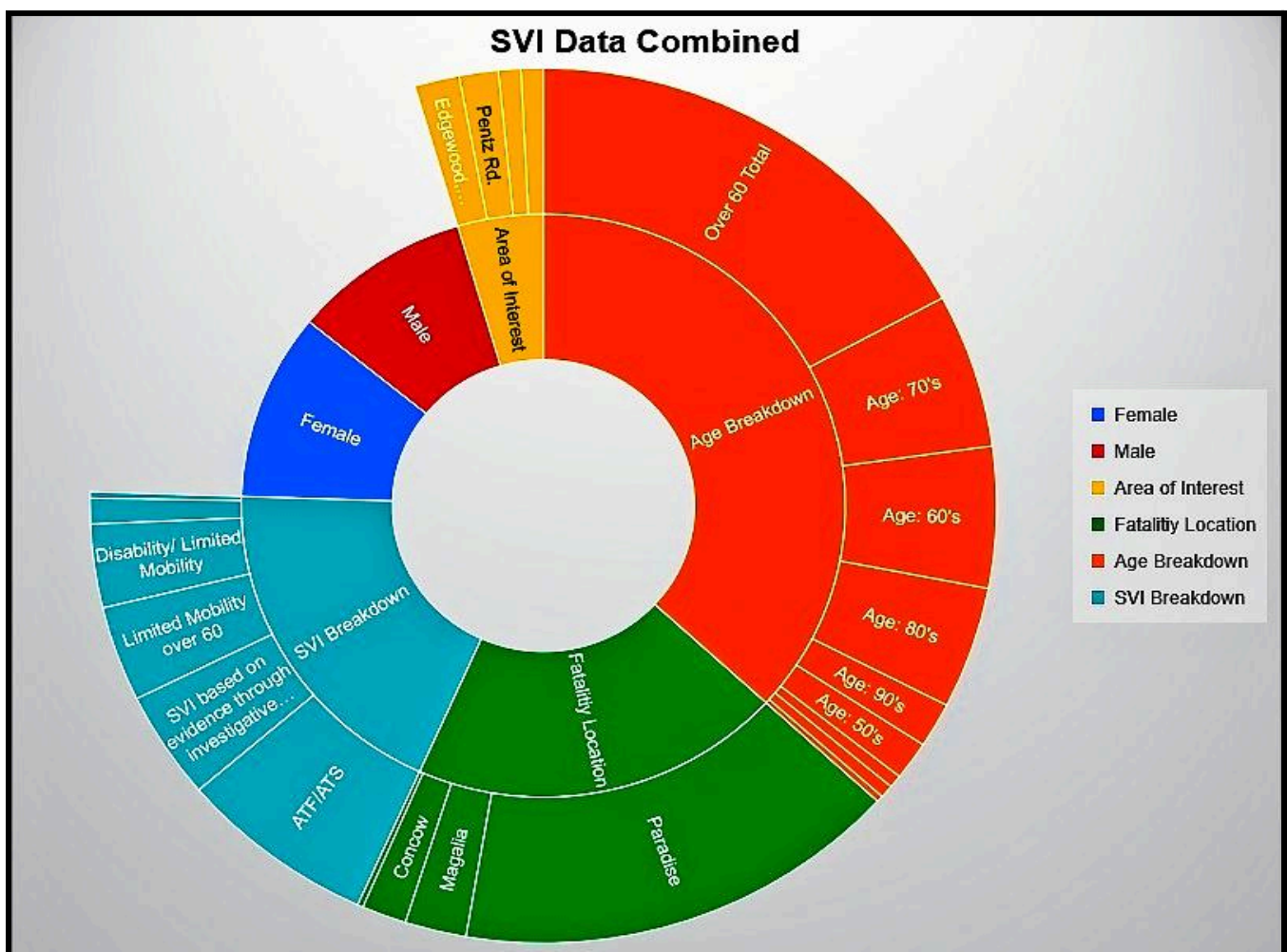


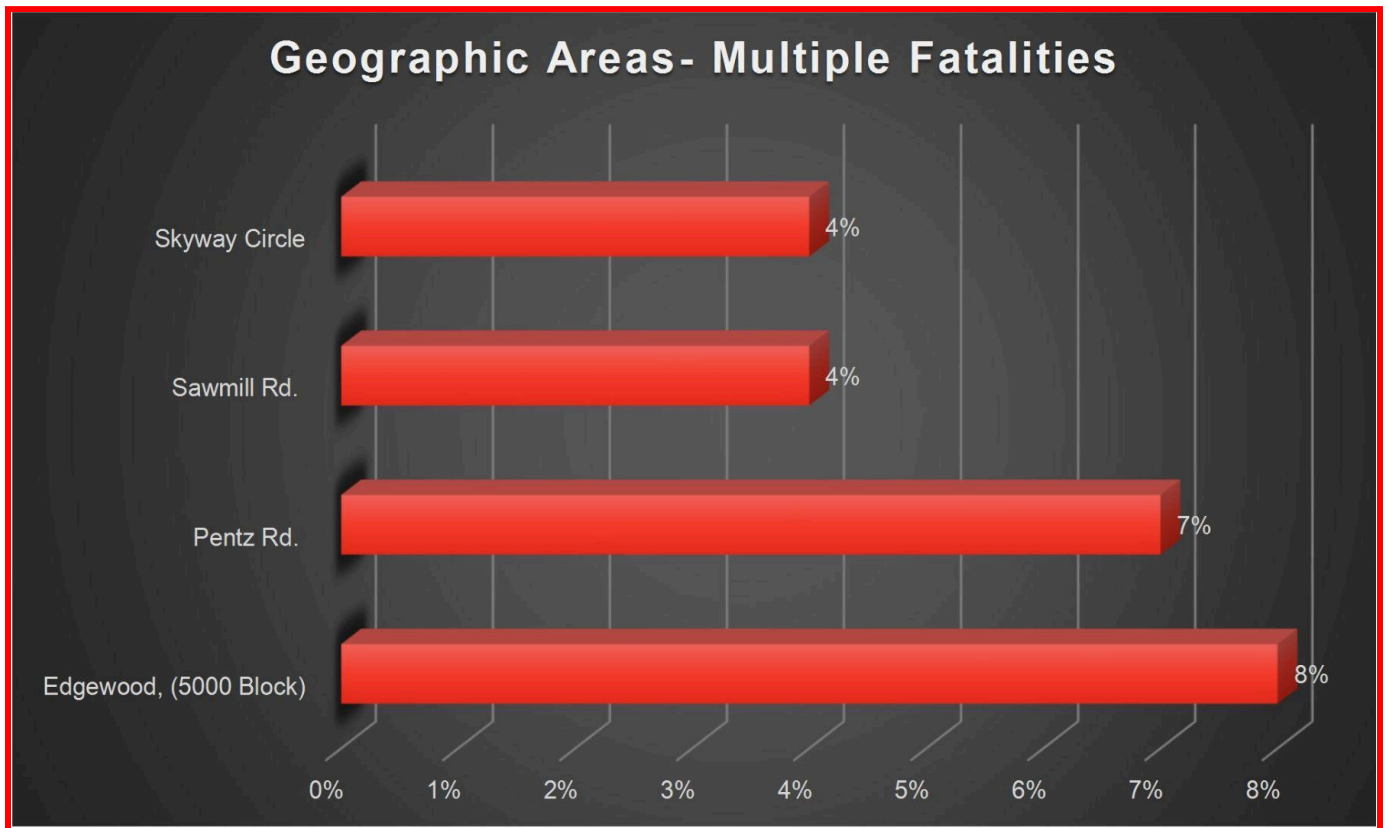
Figure 3.

## Section III. The Map Data

**Resource:** [Link to Gaia GPS Map](#)

**Considerations:**

- It is important to note that the map only accounts for 82 of the 85 victims. One victim was unidentified, and two victims' locations were not specified.



**Figure 4.** Represents the percentage of fatalities based on a single road. This was completed before the geospatial data was completed.

### A. Area of Interests

Through prior research, I was already aware that Sawmill Rd. was considered an area of interest because of its location in the WUI. However, I was surprised to see how many fatalities surrounded the roads listed above, along with their proximity to one another. I lumped these areas together to see what the results were. The area layer can be found in the Gaia Map Folder, along with the other references and data points.

Area of Interest [Grouped]: S. Libby Rd., Sawmill Rd., Edgewood Lane, Pentz Rd.  
This area accounted for the highest number of fatalities, at 30.59%, accounting for 26 total victims, and calculated against 85.

## B. Original Area:

- ❖ The perimeter of the area is 5.87 miles.
- ❖ The area covers 1,084 acres.
- ❖ Mapped west from South Libby Road to .29 miles east of Pentz Rd.
- ❖ Mapped north from Pearson Rd. just beyond Malibu Lane (S) and .3 miles south of Sunny Acres Rd, on Edgewood Lane (S.)

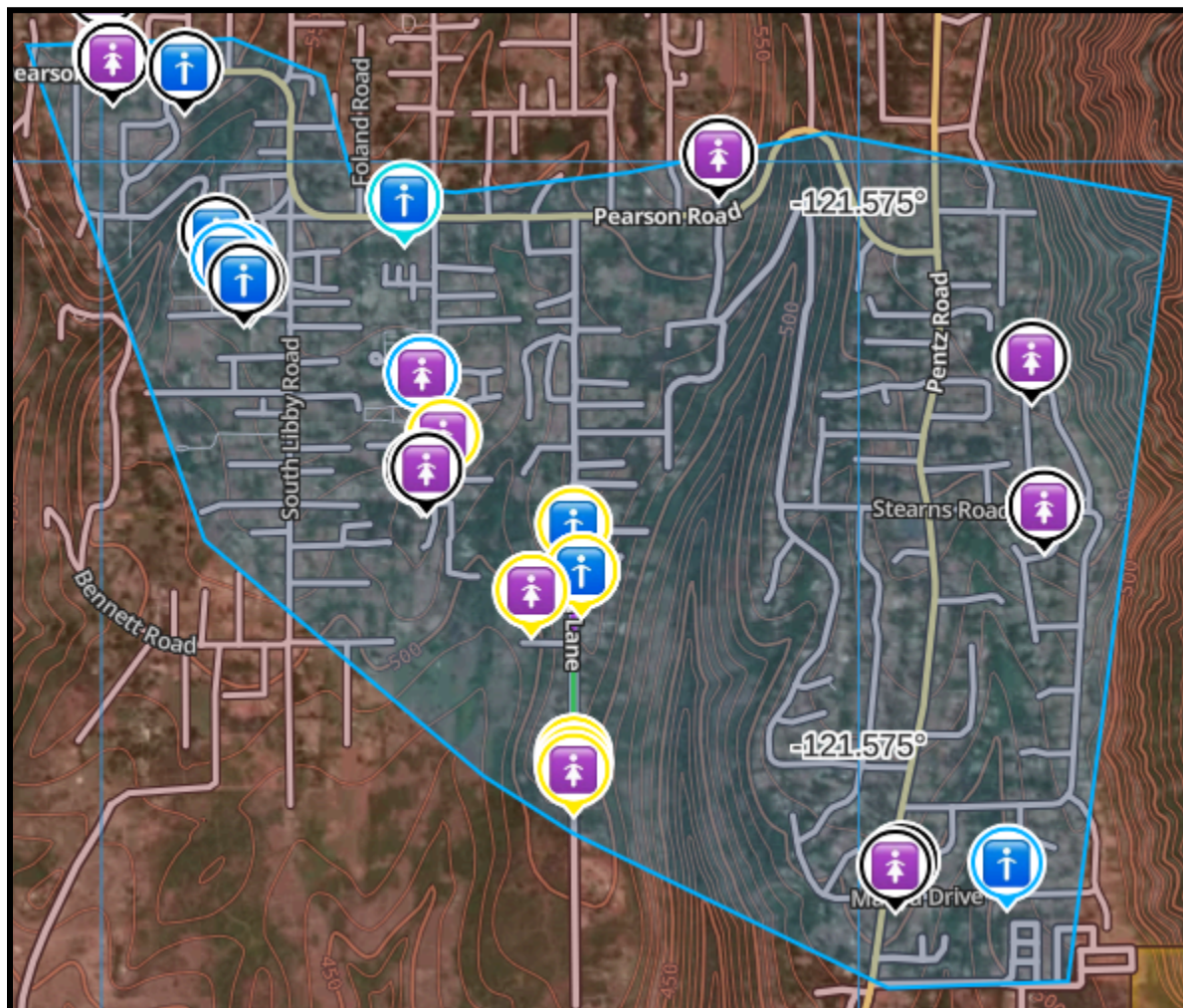


Figure 5. Represents the original area.

## C. Extensions

- ❖ Extending the area 1.15 miles west from Pearson Rd. to Skyway, with an ascent of 57 ft., would have included an additional 8 fatalities.

- ❖ Extending the area 1.14 miles to the north from Pearson Rd. to Billie Rd., with an ascent of 215 ft, it would have included an additional 12 fatalities.
- ❖ With those extensions , it would increase the rate to 54.12%.
  - With the new dimensions for the Area of Interest being a 10.6 mile perimeter, and an area that covers 4,306 acres.
- ❖ The ascension is a significant variable in this comparison, because any increase in slope can result in a faster rate of spread (RoS). This will be discussed further in detail in the next section.
  - In this case, there were additional fatalities in the extended area that saw a higher increase in ascension.

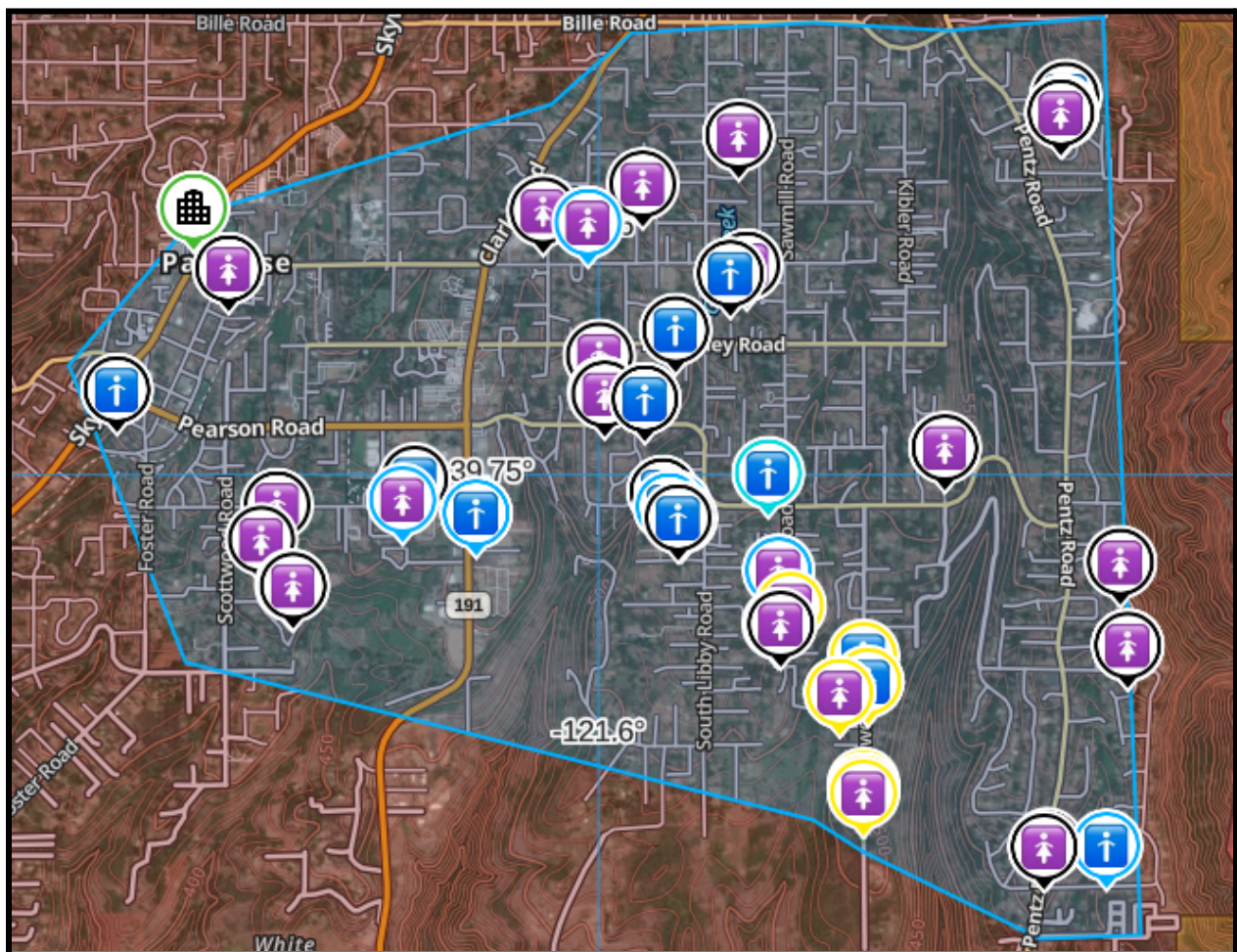


Figure 6. Represents the area extended.

## D. The 5000 Block of Edgewood

The most intriguing location was an area that was labeled as the 5000 Block of Edgewood, according to the investigative report. In this instance, 7 fatalities were found amongst 4 cars. These residents were listed as being .3 miles south of their dwelling units, a mobile home park, but they were facing north. Upon further inspection, there were no connecting roads south of their residence, begging the question, why did they decide to drive that way when the evacuation route was to the north?

One theory is that they saw how heavy traffic was to the north, and decided to try to find an evacuation route to the south. Considering the geography of the area, it is further possible they did not see the fire coming on from the south.

At some point, they either discovered there was no connecting route, or the fire was also approaching from the south. The fire overcame them after they had turned around to begin heading north.

Either way, this is a significant location to focus on because it demonstrates the need to establish primary and secondary evacuation routes that provide for multi-directional egress.

## Section IV. Topographical and Fire Behavior Contributing Factors

### A. Rate of Spread

The National Wildfire Coordinating Group (NWCG) defines Rates of Spread by the following, “The rate of spread is in chains per hour (ch/h) and is defined as the speed with which the fire is moving away from the site of origin. Wind, moisture, and slope drive the fire. The flaming zone, or fire head, moves away from the origin quickly with great intensity.”<sup>3</sup> Wind can be one the single factor that determines whether a fire remains a small, controllable fire or transitions into a big incident with the possibility of fatalities, injuries and structure loss. Wind, along with fuel loading, are the two sides of the Weather, Topography, and Fuels triangle that determines fire behavior.

A wildfire's forward rate of spread (R) can be estimated as follows:  $R = 10\%$  of the average 10-m open wind speed (e.g., for an open wind speed of 30 km/h,  $R = 3$  km/h). When the fire first began, winds were sustained at 35 mph. However, there were moments when the winds moved at 50-60 mph.

Additionally, the NWCG provides, “An easy guide for approximately the ROS due to changes in slope is as follows:

1. The first tripling of slope roughly increases the rate of fire spread by a factor of 2.
2. The second tripling of slope increases the rate of spread by a factor of 4 to 6, depending on fuel conditions.”<sup>45</sup>

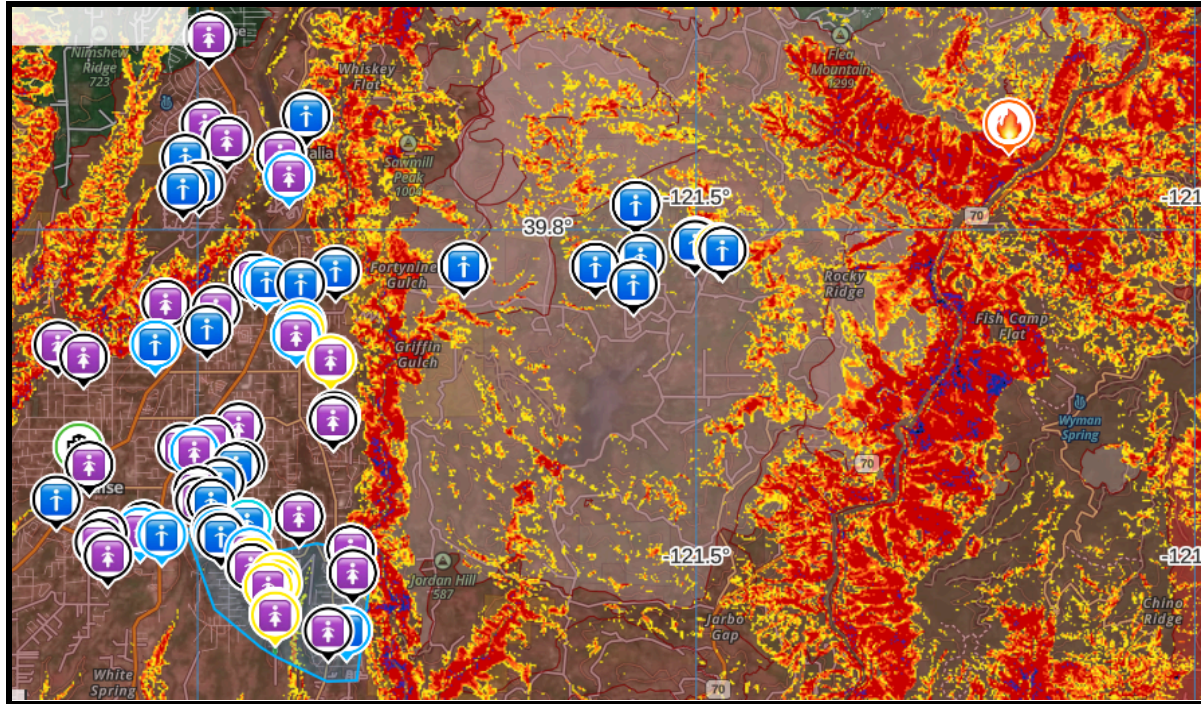
This data supports the problematic increase in rates of spread we are seeing that can severely complicate evacuation, suppression, and first responder safety.

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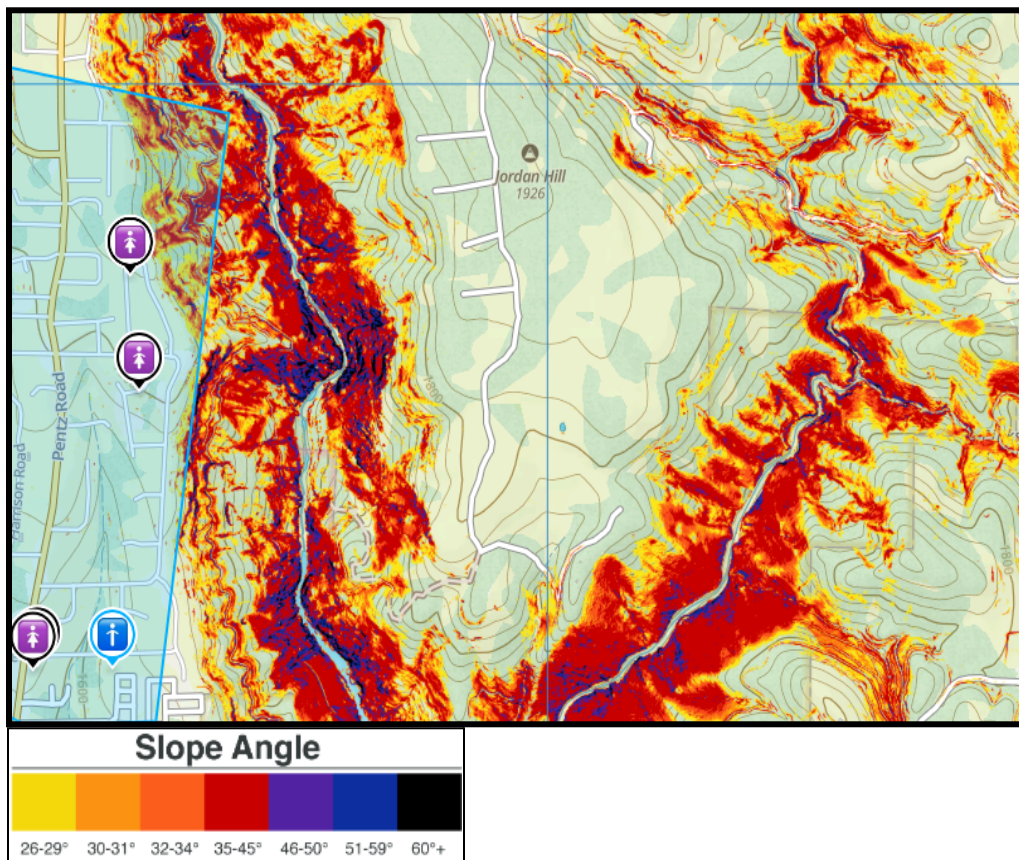
<sup>3</sup> S-190: Introduction to Wildfire Behavior. Unit 8, Lesson 3 “Rate of Spread.” [National Wildfire Coordinating Group](#).

<sup>4</sup> S-190: Introduction to Wildfire Behavior. Unit 8, Lesson 7 “Slope Effect on Rate of Spread.” [National Wildfire Coordinating Group](#).

<sup>5</sup> The ten years in between the 2008 fire siege and the 2018 Camp Fire allowed the forest floor to accumulate additional ground litter that helped fuel the fire’s front. Young tree plantations also had a significant role in combustibility.



**Figure 7.** Represents the slope that was present from the ignition to Paradise's edge. Slope can have a significant impact on Rate of Spread (RoS).



**Figure 8.** Demonstrates the slope of the two ridges the fire burned through before hitting the edge of Paradise.

As you can see, there are two ridges that have significant increases and decreases in slope, thus causing the fire to spread faster. Historically, downward slopes

would cause fire behavior to decrease. Unfortunately, our new normal is demonstrating that is no longer true.

By NWCG calculations, and focusing on that area, we know there are two areas associated with that last ridge that have slope increases of at least  $30^\circ$ . Combining 60 mph winds with significant increases and decreases in slope caused the fire to move at unimaginable speeds. Figure 9, below, demonstrates those areas. A fire that was already moving quickly continued to gain momentum anytime it encountered a slope.

In one instance, the rise in between fatality locations was only 50 ft. However, given the short run, it means that any slope can intensify behavior for a wildfire that is raging. Therefore, when focusing on areas to mitigate hazardous fuels, mitigating fuel loads surrounding slopes of any kind should be an essential priority for planning.

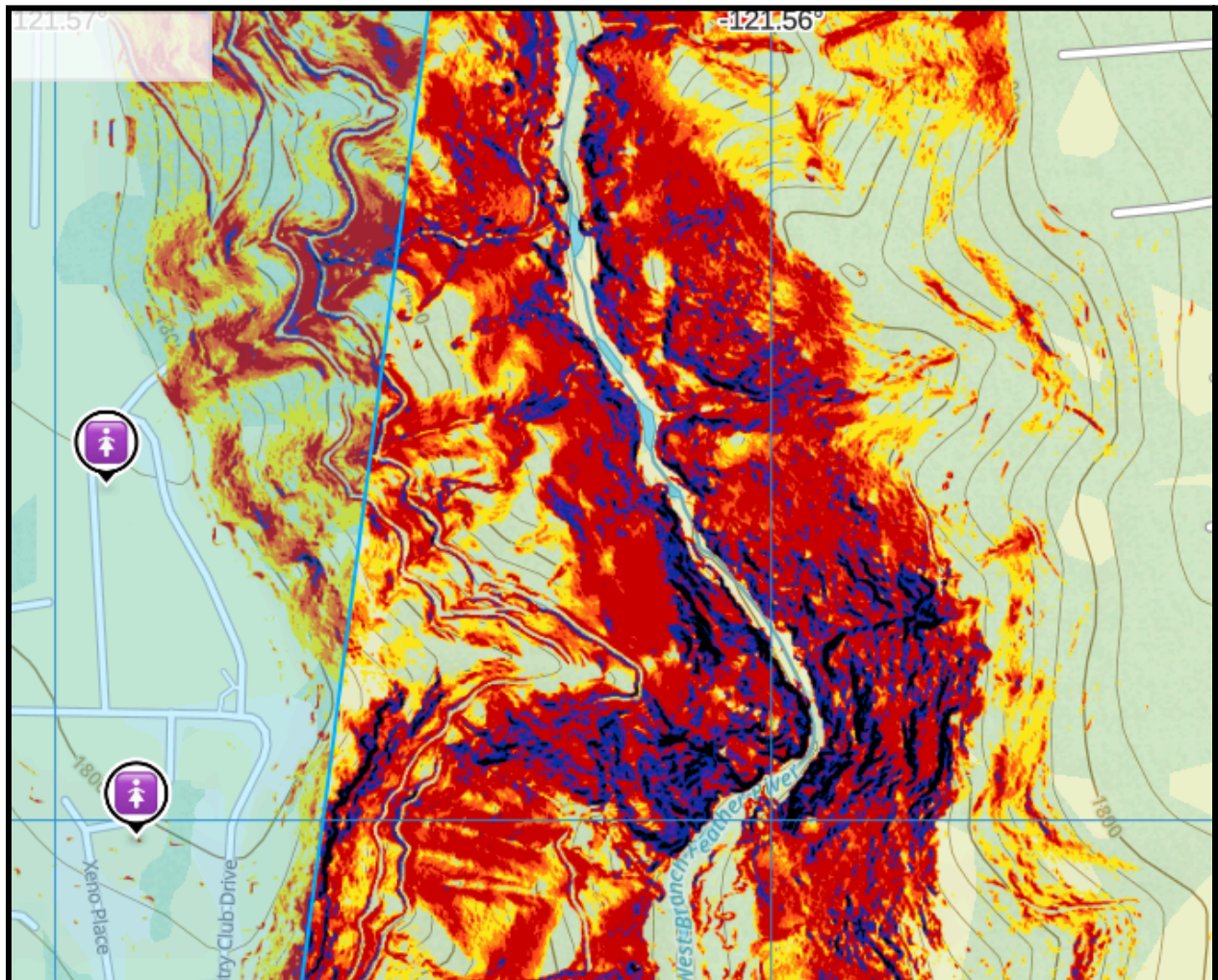


Figure 9. Zoomed in on that last ridge before the fire hit Paradise.

## B. Historic Wildfire Activity and Evacuation Planning

It's important to consider an area's prior history with wildfire. Looking at the map, this area has experienced more than its fair share of wildfires. According to the San Francisco Chronicle, "Fire has scorched about 40% of Butte County since 2000. The unburned 60% mostly sprawls across the Sacramento Valley floor."<sup>6</sup> Specifically, the following fires have burned through this area with the last 24 years:

- ❖ Storrie Fire (2000) - Burned 5,6076.3 acres.
- ❖ Highway 70 Fire (2001) - Burned 1,692.8 acres.
- ❖ Poe Fire (2001) - Burned 8,333.3 acres.
- ❖ Skyway (2002) - Burned 2,141.5 acres.
  - Burned on Skyway Rd, roughly 6.5 miles west of where the fatalities on Skyway Rd. were found in the 2018 Camp Fire.
- ❖ Butte Lightning Complex (2008) - Burned 49836 acres.
- ❖ West Fire (2008) - Burned 5,161.5 acres.
- ❖ Camp Fire (2008) - Burned 4,163.3 acres.
  - Perimeter of this is roughly 2.37 miles north from where the 2018 Camp Fire ignited.
- ❖ Humboldt Fire, also known as the June 2008 California Fire Siege. (2008)
  - "The fire burned 23,334 acres, destroyed 87 homes and 167 other buildings, and caused an estimated \$16.3 million in damages. The fire forced the evacuation of about 1,200 residents."<sup>7</sup>
- ❖ Flea Valley #2 (2008) - Burned 1,247.4 acres.
- ❖ Canyon Complex Fire (2008) - Burned 2,322.6 acres.
- ❖ French-Bear (2008) - Burned 1,066.1 acres.
- ❖ Lackerman (2008) - Burned 1,309.9 acres.
- ❖ Saddle Fire (2016) - Burned 739.6 acres.
- ❖ Camp Fire (2018) - Burned 153,335.6 acres.
  - California's deadliest fire to date.
- ❖ Claremont Fire (2020) - Burned 294,220 acres.
- ❖ Dixie Fire (2021) - Burned 963,309.4 acres.
  - California's largest fire to date.
- ❖ Park Fire (2024) - Burned 429,603 acres.
  - California's 4th largest fire.

Paradise and Butte County's history with fire is important to understanding why the events that took place on November 18th, 2018 were so significant. The Camp Fire occurred in an area that

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<sup>6</sup> Johnson, Julia. Devulapalli, Sriharsha. "'Just crummy': Why California's Butte County keeps getting hit by big wildfires." Updated 5 August 2024. Access: < <https://www.sfchronicle.com/california-wildfires/article/butte-county-fire-california-19613151.php>>.

<sup>7</sup> June 2008: California Fire Siege, Summary Report [Draft]. Various Authors. 28 January 2009. Accessed through PDF.

was extremely aware of its wildfire risk. In the Lucy Walker 2021 documentary, “Bring Your Own Brigade,” Walker interviews several officials and council members associated with the community of Paradise. In the film, one Cal Fire firefighter claims that he has been on every major wildfire in California since 1990, and he had “never been in a community that had that much meticulous planning.”

In the next frame, former Paradise Mayor Jody Jones says, “We had planned for fires. A fire very similar to this one happened in 2008, and we didn’t have a real good system for evacuation so we came up with a new plan.” For the new plan, the town and surrounding communities of Paradise are divided into zones and assigned an evacuation route.<sup>8</sup> The community also then practiced the plan regularly. According to former Paradise Vice Mayor Greg Bolin, that plan worked on November 18th and he was impressed with how quickly they were able to evacuate the community, despite the high number of fatalities.

Additional information provided by Incident Commander (IC) John Messina, reiterates the notion, albeit indirectly. In the film, Messina says, “What if we were sitting here talking about 3,700 fatalities? We were that close to having that type of incident. I think about that quite a bit.” While I was conducting the research for this study, I managed to track down John Messina via LinkedIn to ask him about the quote, and to do so as respectfully as possible. John responded to my questions, and reiterated that in the early stages of the fire, they were afraid that they were facing a mass-casualty incident.

The residents of Paradise would argue the effectiveness of the evacuation, claiming it felt like the town had left them behind. Recordings from 911 dispatches demonstrate that several residents were told that no one was going to be able to assist them and that they should evacuate immediately. However, Former Paradise Mayor Jones has a very sound response to that criticism, “What we didn’t anticipate was evacuating the entire town all at once. It is not possible to build a roadway system that will take your entire population all at the same time. No city has that.”

Jones brings up a very valid point, and one that communities should be paying heightened attention to. If wildland/vegetation fires are moving faster than we can evacuate, it is time to start considering how we can increase shelter-in-place efforts in addition to defensible space and home hardening.

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<sup>8</sup> When Foxfire WUI completed a site visit to Paradise, it noted signs posted with evacuation zones and route information in several areas around the community.

## Section V: The Aftermath

In the wake of any disaster comes the inevitable question, “who is going to pay for this?” This section dives into the aftermath of the fire and evaluates the impact litigation has had on the community and their ability to rebuild the town. While this started as an initial investigation to help determine what the Social Vulnerability Index is as it relates to wildfire, an argument can be made that we can’t really understand the full scope of that vulnerability until we look at the long-term effects of wildfire devastation.

### A. PG&E

According to legal documents, PG&E’s criminal negligence came down to a hook, purchased in 1919, on the oldest transmission line in the state. The part had never been replaced, and by the time an investigation was done, the gap between the hook and the fitting was wide enough to stick a finger through. The court documents further found faulty or missing maintenance records and inspections, indicating that the required time it took to properly inspect transmission equipment had been substantially reduced because of budget constraints.

This is not the only instance where criminal negligence on behalf of a utility company was found to be the cause of a disastrous or deadly fire. In fact, besides the Tubbs and Camp Fire, there are several fires that PG&E were found liable for (see Figure 10 below).

PG&E filed for Chapter 22 bankruptcy on January 29th, 2019 as a result of its liability for the 2017 and 2018 fires. The disclosure statement was approved just over a year later. As part of the reorganization plan, \$13.5 billion was put into a Victim’s Trust Fund to compensate victims. Per the agreement, PG&E would not be allowed to raise residential rates to pay victim claims.

While this was going on, PG&E was still being pushed to mitigate the risk of wildfire ignitions and restructuring their practices to be in compliance with new clean energy regulations. While they couldn’t raise rates to compensate victims, they could raise rates to address these additional obligations. Subsequently, utility bills in California have skyrocketed in recent years and have been attributed to be part of the reason the state is experiencing a mass exodus by some experts.

For the sake of considering the whole impact of wildfire on the socially vulnerable, litigation is important to evaluate because of the ripple effect it can leave on the community, along with the state. In 2025, Xcel Energy will begin facing lawsuits pertaining to the 2020 Marshall Fire that burned through Boulder, Superior and Louisville, Colorado. In a conversation with a representative from *Rebuild Paradise*, one of the unseen consequences of litigation was a lump sum of money at once with no financial advice or guidance.

More research will have to be completed to make accurate conclusions on the overall effectiveness of litigation after a disastrous wildfire. However, it is clear that it is an area that should be further explored.

Fire	Time	Acres Burned	Structures Destroyed	Deaths-Civil.	PG&E Legal Payout	CPUC Fines
Dixie Fire	September 2020	963,309	1,329		55 million (combined with Kincade)	45 million
Zogg Fire	September 2020	56,338	204	4	140 million	10 million
Kincade Fire	October 2019	77,000	347		55 million (combined with Dixie)	125 million
Butte Camp Fire	November 2018	154,000	18,000	85	522 million + 13.5 billion for claims	
Cascade Fire	October 2017	9,989	250	5	Lawsuit pending	
Redwood Valley Fire	October 2017	2,207	543	9		
Sulphur Fire	October 2017	8,417	162		415 million + 2.5 billion for claims	
Atlas Fire	October 2017	51,624	783	6	Part of above	
Butte Fire	September 2015	70,868	921	2	1 billion in claims, faced nearly 100 million of unresolved - filed for bankruptcy	

**Figure 10.** This table outlines the various lawsuits that led to PG&E filing Chapter 22.

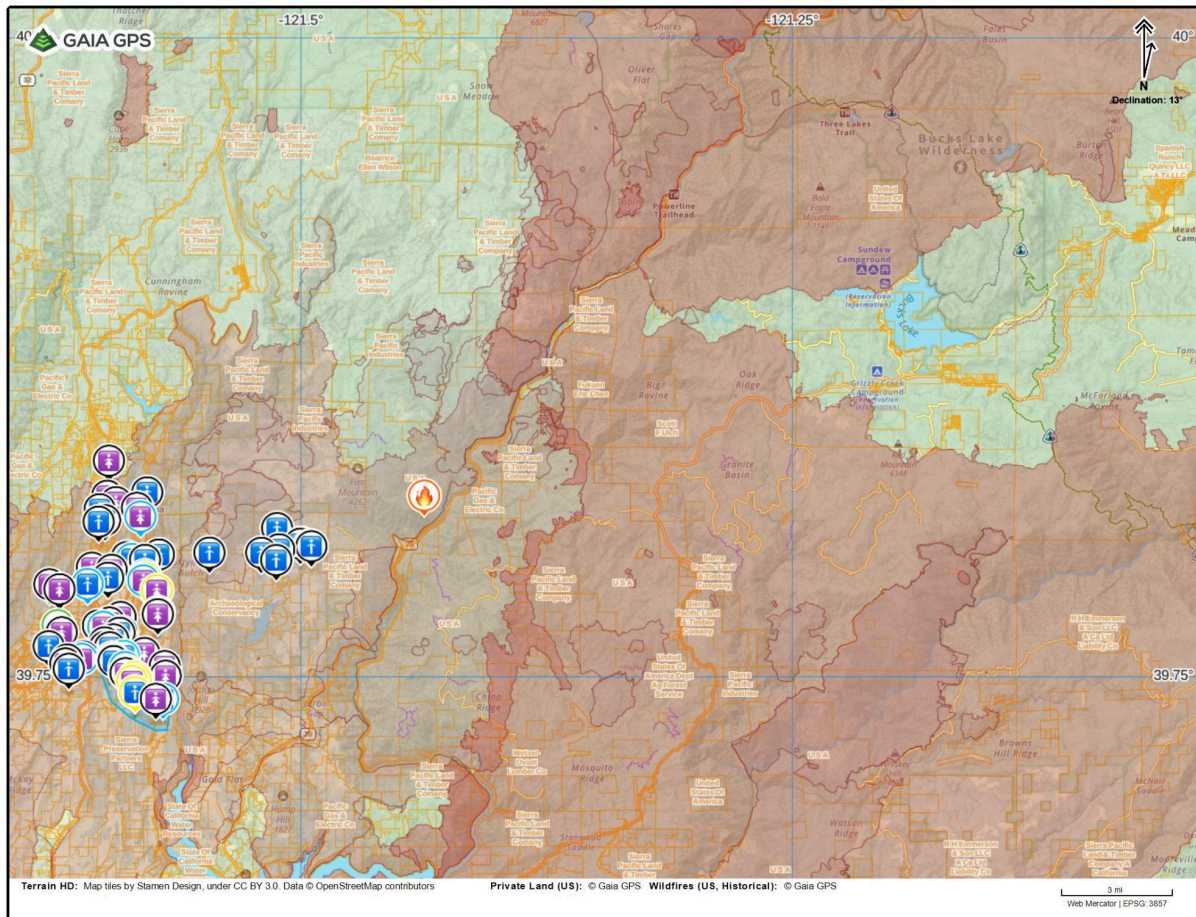
## B. The Logging Industry

There has been a lot of litigation surrounding fire ignitions. It is easy to assign blame to whomever started the fire, because it is fairly straightforward. However, little is mentioned about the factors that cause these fires to burn with the intensity we're starting to see. We are fire creatures. Every time we get into our car, we are igniting something. The problem doesn't come

with the spark, it comes with the environment the ignition is produced in. For example, dropping a match in a field in Michigan would not have the same effect as dropping one in a field in California. Considering that lengthy litigation battles rarely lead to beneficial outcomes for the actual victims of the fire, it might be time to have a conversation about more practical financial solutions for communities forced to rebuild in the wake of disaster.

In the case of the Camp Fire, specifically, the significant logging activity in Butte County was a dominant contributing factor for increased fire intensity. As you will see on the map of the next page, Sierra Pacific Logging and Timber owns a significant amount of land in Butte County. A lot of that land has burned multiple times in the last 24 years, producing the deadliest and largest wildfires in California history. It was discovered that the Camp Fire traveled through a young tree plantation shortly after it began.

As priorly stated, logging activity creates a ground and understory litter that allows the surface fire to carry through the forest. It also allows the fire to climb up into the canopy of the tree. As I was told when I first started the wildfire, once it hits the canopy there's no stopping it. This is especially concerning given reforestation guidelines that require double the amount that is taken to be replanted. This encourages unhealthy forest growth and overcrowding.



**Figure 11. This map shows how much of the land that has been burned in Butte County is owned by Sierra Pacific Timber and Logging.**

### C. Code Enforcement

“In 2008, the WUI design codes came into play. 51% of the structures built after 2008 survived. 9% of structures built before 2008 survived,” Judy Jones. “What that tells me is that those building codes make a difference.”

Having no prior knowledge of wildfire before making the film, Walker manages to capture some of the most nuanced obstacles that communities face when trying to reduce their risk to wildfire. One of them being defensible space and home hardening codes for residential dwellings. Of the structures that did survive the Camp Fire, #% of them that were built after 2008 with new fire safe codes survived. However, Paradise as a community did not have defensible space codes that could be enforced. In fact, a year after the fire, the community of Paradise shot down defensible space codes proposed by Cal Fire, even the ones that were free, such as the vital 5-foot buffer zone. Several councilmembers cited a lack of feasibility surrounding enforcement as their reason for voting down codes that could make their community safer. That was in 2019.

In 2023, Butte County received a \$6 million dollar grant from the United States Department of Agriculture (USDA), through the Community Wildfire Defense Grant (CWDG), for code enforcement. Seemingly, the county managed to navigate the obstacle of community resistance by prioritizing enforcement priorities at the county level.<sup>9</sup>

As more communities begin to understand and prepare for their own wildfire vulnerabilities, code enforcement is a conversation to get ahead. If your community seems resistant to wildfire prevention efforts, see if your county has any codes that could be enforceable. Collecting fees from violations is also a way to help generate program income for other prevention efforts, such as hazardous fuels reduction. Furthermore, it provides additional duties and tasks that wildland firefighters can be helping with during the offseason, or additional wildland-related activities that can be absorbed by traditional fire departments to help build their wildland capacity.

## E. Rebuild Paradise

Despite successful litigation and the establishment of the Victim's Trust, the community of Paradise is still struggling to rebuild. At the time of the fire, Paradise had a population of 26,532, according to the US Census Bureau. In 2019, after the fire, the population was reduced to 4,171. As of 2023, it was up to 8,252. Or at least, that is the most common assumption.

When I went to spend time in Paradise, I made that same assumption. However, after a conversation with Rebuild Paradise, a local non-profit dedicated to rebuilding its community, my supposition has changed. Given, there are still a lot of blank concrete slabs, and even tents, where residential homes used to be. But even I had no idea just what it would take for the community to rebuild after a massive wildfire.

According to Rebuild Paradise, 70% of their septic system was destroyed. Thus, having to include a new system in their rebuilding costs was yet another expense that a lot of the residents of Paradise didn't see coming. The question was whether or not the means justified the ends considering what the PG&E litigation did to the utility rates for residents of California became less relevant the more I learned. As priorly stated, without proper financial guidance or an understanding of how much it would cost to rebuild in Paradise, a lot of residents found themselves stagnant even after they were able to recover financial compensation. Put simply, the money wasn't enough.

In response, Rebuild Paradise was established with the objective of creating yearly grants that focused on providing homeowners with extra financial assistance with unforeseen rebuilding

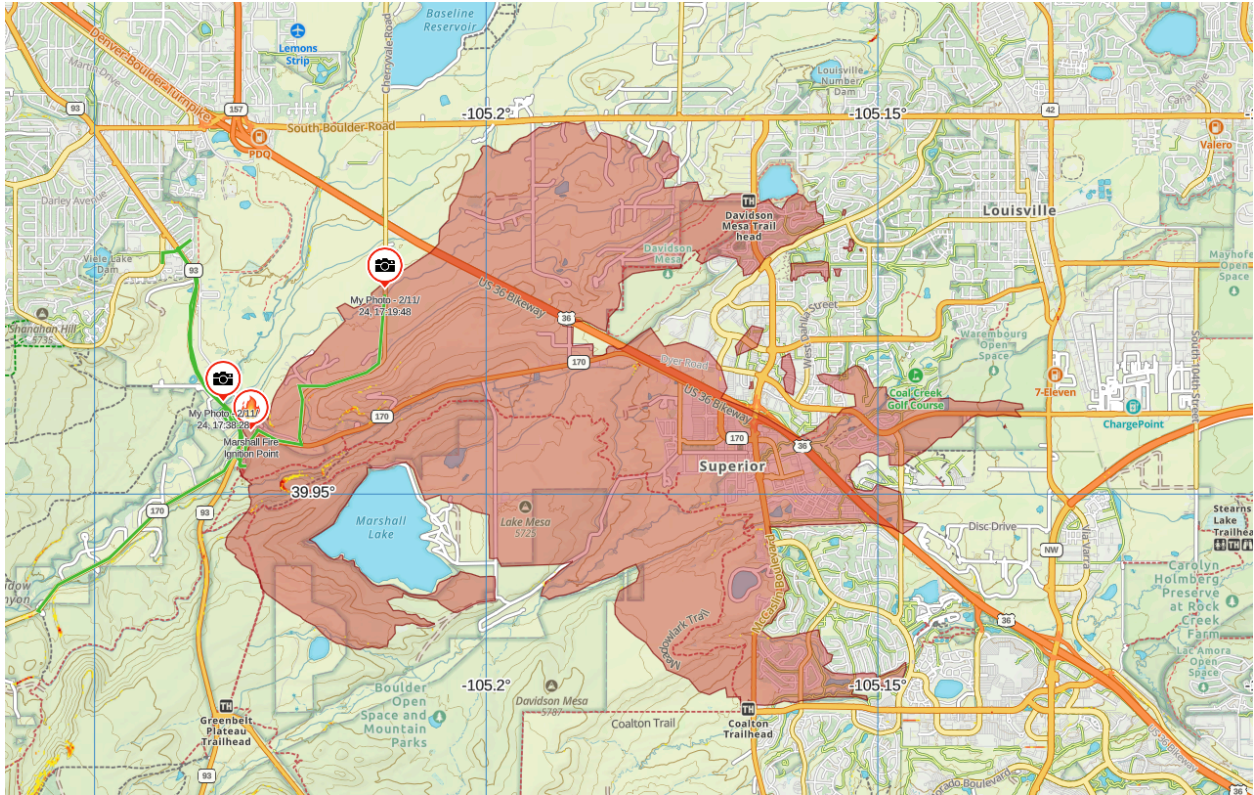
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<sup>9</sup> I have contacted the Butte County Code Enforcement Office and am working with them to gather data to determine if code enforcement contributed to a decline in structures lost in the Park Fire (2024), and other fires that burned in Butte County in 2024. This study will be updated with that information as soon as it becomes available.

costs, such as new septic systems. According to the organization, the grants change often and reflect the common obstacle the community is facing at the time. Similar to the response during the incident, the innovative collaboration and resilience demonstrated by the town is something that everyone involved in wildfire should be paying attention to right now.

While my conversation with Rebuild Paradise did not answer that question, it did provide me with more clarity on what could be better utilized going forward.

## Section VI: Evacuation Comparison- Marshall Fire vs. Camp Fire



**Figure 12.** The map above shows the perimeter of the Marshall Fire.

The Marshall Fire ignited on December 30th, 2021 and ran until January 1st, 2022. It was responsible for burning 6,026 acres, destroying 1,084 structures and killing two people. It is currently the costliest wildfire in Colorado history. The fire ignited in the rolling plains, just east of mountain foothills in Boulder County, Colorado. Despite the economic destruction caused, the loss of life was significantly low compared to the Camp Fire. Both were wind-driven, fast-moving fires.

The map above demonstrates multiple routes (primary and secondary) for evacuation helped mitigate the potential for loss of life. As previously mentioned in the Section III, a lack of egress options played a role in the ability to outrun the Camp Fire on November 18th, 2008. Out of all of the victims, only two of them were in their 30's. One was economically disadvantaged and did not have access to a car, nor could he be picked up in time; and the other was caught in the burnover along the 5000 Block of Edgewood. Thus, it is essential that evacuation successes are considered and compared to incidents that saw a higher number of fatalities; and can further be

argued one of the reasons the Marshall Fire did not see a significant loss of life was the access to multiple evacuation routes in all cardinal directions.

Besides multiple egress routes, the resource response that was able to focus on door-to-door evacuations also played a significant role in the success. According to the Marshall Fire After Action Review, 37,500 people were successfully evacuated (without fatality during evacuation due to being trapped or caught by fire) within a 3-4 hour timeframe. the resources on scene that day included:

- ❖ 300 law enforcement agents (SWAT) doing door-to-door evacuations
- ❖ 74 fire agencies and “hundreds” of fire personnel
- ❖ Several dispatch agencies, along with the Incident Management Team
- ❖ A large incident base in the urban interface, providing multiple access points to resources

As priorly stated from the Camp Fire AAR, the dispatch center was understaffed and the single dispatcher that was responsible for alerting the entire community was alone during the most critical minutes of the incident. Having quick access to resources that can help with evacuation efforts seems to be a key factor to mitigating loss of life in fast-moving fires.

## Section VII: Conclusions and Recommendations

### A. Other Significant Findings

- ❖ Fire was moving at 80 football fields a minute
  - Research sites on of the contributing factors to the speed of the fire was that it started in and burned through young tree plantations.
  - Logging plays a significant role in fire intensity.
- ❖ 22 students, 2 teachers, and 1 bus driver were stranded in gridlocked traffic. They were about to be burned over when a Cal Fire Dozer Operator heard about the bus over the radio and cleared a path for them in the nick of time.
  - The bus was carrying the students that were stranded at the school. They had not been picked up by guardians. The school they left was burned over.
  - We need to start including the education system in our planning conversations!
- ❖ “Carolyn Nava, who lived for years in Paradise and works in Chico at the Disability Action Center, pointed out that some elderly and infirm don't have smartphones and that cell service around Paradise is notoriously spotty. "If you weren't standing in a certain spot, facing the east with your foot pointing to the north, you wouldn't even have gotten wireless anyway.”<sup>10</sup>
- ❖ The Incident Commander felt that once the fire entered Paradise, it transitioned from a wildfire to a mass casualty incident. In the early stages, and until they were able to verify the location of the missing, they felt it was plausible that hundreds may have perished.

### B. Evacuation Alert Systems

Emergency management evacuation warning systems are still a work in progress for every natural disaster. Unfortunately, an increase in severity and occurrence has significantly increased and complicated that need. While there is a need to explore more shelter-in-place options, especially for the elderly and socially vulnerable, it will be interesting to see what kind of data comes out about the effect Watch Duty had on evacuation efforts during the 2024 fire season, along with the LA Fires of early 2025.

As we saw throughout 2024, social media became more prevalent for alerting community members about the threat of wildfire. Sole reliance on text messages and phone calls are not always liable because

- ❖ Residents may not be signed up through alert systems
- ❖ Phones are dependent on an emergency alert, where as Watch Duty uses a configuration of different technologies to alert residents in a wider area.
- ❖ Economically disadvantaged and elderly populations may not have access to cell phones

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<sup>10</sup> “Many of the dead in Camp fire were disabled. Could they have been saved?” The Sacramento Bee. 6 December, 2018. Access: <<https://www.heraldnews.com/story/news/2018/12/06/many-dead-in-camp-fire/7100366007/>>.

## C. Final Conclusions

With the wildfire grant season coming up, it's important to consider all the emerging and available research we have coming from the 2024 season. It will help highlight priority changes in hazard mitigation, which I believe is shifting. With that knowledge, combined with the research completed in this data dive, here are my top recommendations for protecting SVI populations in areas with high wildland and vegetation fire severity.

1. Have community members complete Residential Risk Perception Surveys that focus on:
  - a. Common misconceptions pertaining to safety and wildfire prevention/mitigation
  - b. The level of community involvement
  - c. An economic range that residents are willing to pay
2. Get a parcel risk assessment based on SVI vulnerabilities. You can get the information by doing the following:
  - a. Using word of mouth and Social Media
  - b. Talking to Fire and EMS Departments. They usually know exactly who these residents are and where they are located. Obviously, they will need to reach out to them to ask permission to include their parcel in the risk assessment.
  - c. Community health networks, mental health providers, and community non-profits are a similar place to find this information. However, the same requirements will have to be met and permission will have to be granted to include the parcels in the assessment.
  - d. Have community members download Watch Duty.
3. Once a parcel risk assessment has been completed, I STRONGLY recommend including an allotted amount of defensible space and fuels management treatments for private lots for the identified SVI population. SVI residents residing in the WUI are usually not able to complete the hazard fuels mitigation treatments, due to economic and/or physical restrictions. This will also be a competitive request for funding, I believe.
4. Besides fuels management treatment and defensible space treatments, home hardening techniques such as ember-resistant vents should be considered. These items can be requested in grants, and similarly be offered to SVI residents. They could also be given away to qualifying residents during a community outreach event. The installation fees will need to be included in the funding request.
5. For assisted living communities and apartments, heavy-utility sprinkler systems are highly recommended to help protect the structures and protect residents that are not able to evacuate due to limited mobility, elderly, economically disadvantaged, and otherwise socially vulnerable populations. Canada has used these systems in their megafires and have had successful results. However, they should also be coupled with hazardous fuels reduction and ember mesh vents. The priority should be creating shelter-in-place options that are also defensible.

6. Community Emergency Response Teams (C.E.R.T.'s) can also be an excellent solution for assisting the socially vulnerable in extreme natural-weather events. This team would work together with all of the organizations mentioned above to help SV residents make a plan and execute it.
7. Identify local and regional stakeholders that can help privately fund wildfire prevention objectives. Especially ones that have a financial stake in wildfire prevention.

## **Conclusion**

The biggest take-away from the Camp Fire, regarding the SVI population, is that the new fire behavior is moving too quickly to allow enough time for limited mobility, elderly, economically disadvantaged, and otherwise socially vulnerable populations to evacuate. With this knowledge, one of the most practical solutions may be for residents to be able to shelter in place. This is especially true in rural, mountain communities that don't have a lot of secondary evacuation routes that provide multiple directional options for escaping a wildfire. More research will have to be completed about the conditions inside the home.