

# **Economically Viable Methods for Wildfire Protection for Residential Homes in Santa Barbara County**

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Santa Barbara County experiences wildfires often, with fourteen major wildfires occurring in the last thirty years. Title 24, Part 9 of the California Building Code establishes the minimum building requirements for fire protection in residential construction, but there are many ways to protect a home from wildfires that go beyond the minimum requirements established in the building code. The goal of this paper is to assess the perceived increase in value to Santa Barbara County homeowners of wildfire protective measures for their homes, and to determine realistic methods for wildfire protection that are within the budget of these homeowners. This paper utilizes a survey sent to Santa Barbara County realtors to determine a realistic estimate for the amount of money that Santa Barbara County homeowners are willing to spend on wildfire protection. From the results of the survey it is determined that homeowners are willing to spend approximately \$25,000 on methods that exceed the building code requirements to protect their homes from wildfires. The most viable methods for wildfire protection that fit within this budget are fire retardant protection systems, home hardening techniques, and the creation of defensible space around a home.

**Key Words:** Residential, Wildfire, Protection, California, Wildland Urban Interface

## **Introduction**

The idea for this project comes from experiences had growing up in Santa Barbara County and involvement in the Construction Management program at California State Polytechnic University San Luis Obispo. Santa Barbara's notorious wildfires are a constant threat to those that live in high-risk areas both around the city of Santa Barbara and in more rural areas of the county. The Construction Management program offered a chance to think about this problem from a business-oriented perspective and to find a realistic solution. This paper looks to find the monetary amount that homeowners are willing to spend on upgrades to their homes that offer wildfire protection. From this perspective, it looks to find measures for protection that are within the homeowner's budget.

## *Purpose*

The purpose of this paper is to examine the possibilities for residential wildfire protection that are reasonable and within the budget of Santa Barbara County homeowners. This paper explains the current minimum state and county fire codes and provides additional protective measures that can be taken to further protect a property and home. The costs of each measure are taken into account and only measures that are within a reasonable budget are included.

This project benefits the construction industry because it analyzes the possibilities for the creation of a company that specializes in residential wildfire protection, and also provides homeowners with information on cost effective measures to protect their homes from wildfires. It is possible that there is the potential for the creation of a successful business with the ideas and methods discussed in this paper.

## *Introduction to Wildfires in Santa Barbara County*

Santa Barbara County is located in the coastal region of Southern California with San Luis Obispo County to the north and Ventura County to the south. The Santa Ynez Mountain Range surrounds the city of Santa Barbara on the north and east. These mountains are covered in chaparral, a dense mixture of oak and drought resistant shrubs that are notably prone to wildfires. Additionally, Santa Barbara County often experiences Santa Ana Winds, a strong dry wind that blows down the slopes of the mountains across the city (UCSB Geography and Chaparral Fires, 2020).

The mixture of these factors makes the city of Santa Barbara and its surrounding areas incredibly vulnerable to Wildfires. Since 1990, there have been fourteen major Wildfires affecting Santa Barbara County. The largest fire by acreage burned, the 2017 Thomas Fire, burned over 280,000 acres and destroyed 1,063 structures before being contained (History of Santa Barbara Fires, 2017).

## *Introduction to California/Santa Barbara Residential Fire Code*

Currently, homes in the state of California must conform to Title 24, Part 9 of the California Code of Regulations. This section of California building code establishes minimum safety requirements regarding all aspects of buildings in relation to fire safety in California. While the California Fire Code is incredibly vast in its scope, for the purpose of this report we will be taking a look at some of the minimum requirements for wildfire protection of residential homes as described by Title 24, Part 9.

For example, Chapter 49 of Title 24, Part 9 describes the requirements for wildland-urban interface fire areas. These areas are described by the code as areas where “conditions where a wildfire burning in vegetative fuels may readily transmit fire to buildings and threaten to destroy life, overwhelm fire suppression capabilities, or result in large property losses” (24 CCR 9).

This section of the code bases what materials and methods of fire protection are required on fire hazard severity zones (see figure 1). These requirements vary based on fire hazard severity designation by local cities and agencies.

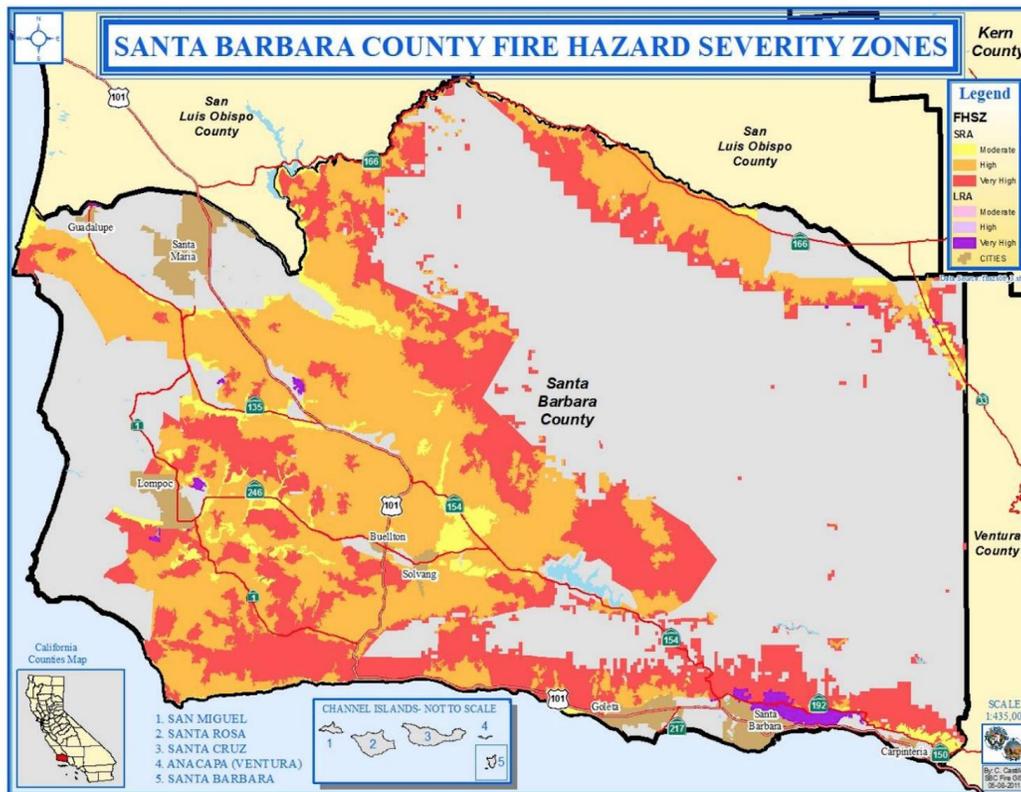


Figure 1: Santa Barbara County Fire Hazard Severity Zones  
 Source: California Department of Fire Protection

California Building Code 7A requires that homes in high fire hazard severity zones meet a standard of fire resistance by specifying a level of fire resistance in the materials used to construct a home. Fire-retardant-treated wood must be used to construct shingles and shakes of a home. Exterior wall sheathing, exterior windows, underside, and decking, all must meet a variety of standards for flame exposure. Code 7A also requires that roofing material, vents, exterior coverings, walls, and doors meet specific requirements for fire resistance. Additionally, Chapter 49 of Title 24, Part 9 lays out requirements for hazardous vegetation and fuel management and defensible space.

As shown in figure 1, the foothills of the city of Santa Barbara, where many homes are located, is placed in the very high fire severity zone, the zone that is most vulnerable to wildfire. Additionally, much of the rest of the populated areas in the county are in high or very high fire hazard severity zones. These zones are important because not only do they provide information on where wildfires are most likely to occur, but they also provide information on what building codes must be followed when building a home.

### Research Methodology

This project analyzes quantitative data. To collect this data, a survey was sent out to eleven Santa Barbara County realtors. The goal of the survey was to obtain an estimate regarding how much money Santa Barbara county homeowners would be willing to spend on systems and methods of construction

that would add wildfire resistance to their homes. Participants in the survey were asked questions about their length of time in the real estate industry, their familiarity with selling homes equipped with wildfire protection systems, and their estimates for how much homeowners would be willing to spend on these systems. The questions asked in the survey are shown in table 1.

Table 1 – Santa Barbara County Realtors Survey	
Question 1	How many years have you worked in the real estate industry in Santa Barbara County
Question 2	Has your company sold houses with wildfire protective measures (Ex: landscaping, roofing, sprinklers, etc.) in addition to the measures required by building code in the past?
Question 3	If so, on average how much more were home purchasers willing to pay for these additional protective measures?
Question 4	If you or your company has not sold houses with fire protective measures (Ex: landscaping, roofing, sprinklers, etc.) in addition to the measures required by building code in the past, how much more would you estimate that homeowners would be willing to pay for these measures?

The goal of this survey was to produce a realistic range of prices that Santa Barbara homeowners would be willing to spend. Once this data was obtained, these estimates were used in the rest of the report to determine which systems are economically viable.

### *Data Analysis*

This survey gathered responses from realtors at two separate real estate firms in Santa Barbara County. The respondents had an average of fourteen years in the real estate industry in Santa Barbara County. Each respondent said that the company they work for have sold homes in Santa Barbara county with wildfire protective measures in the past. One respondent indicated that in their past experience, Santa Barbara homeowners were willing to pay an additional \$10,000-\$25,000 for additional fire protective measures. The second respondent indicated that Santa Barbara homeowners were willing to pay an additional \$25,000-\$50,000 for additional fire protective measures.

These surveys establish an estimate of how much money some Santa Barbara county homeowners will be willing to spend on wildfire protection. By taking the median of these responses, it can be estimated that Santa Barbara homeowners looking for measures for wildfire protection are willing to incrementally spend around \$25,000. The next sections will include means and methods for wildfire protection that are around this price.

## **Research Results**

### *Fire Retardant Protection Systems*

One possible method for protecting homes against wildfires is self-contained wildfire protection systems. These systems use isolated water and power supplies to spray fire retardant products on the exterior of homes and the surrounding property. These systems can either be deployed manually while evacuating one’s home, or automatically using sensors and cameras, depending on the complexity of the system.

Colorado FireBreak, a company specializing in wildfire protection for buildings in Colorado, uses a system of this type. Their system is made up of wireless control panels, underground water storage tanks with pumps, protective flame retardant mixture, and nozzles installed on a home and at the perimeter of a property. As a wildfire approaches, the wireless control panel can be activated remotely. This triggers the pumps to turn on and the flame retardant mixture to be added into the water tank. The water and flame retardant mixture is pumped through the nozzles at the home and at the perimeter of a property, providing increased protection against the approaching fire (Colorado FireBreak, 2014).

The company states that this system is suitable for suburban homes as well as rural homes, and that the fire retardant mixture can be easily cleaned off of a home with water. The system starts at \$14,000 which is well under the estimated price range for Santa Barbara homeowners of \$25,000.

### *Home Hardening techniques*

Another possible method for protecting a home from wildfires is through home hardening. Embers that are blown onto homes often cause a home to burn in a wildfire. These embers can be blown into an attic or crawl space or accumulate on a roof or deck and ignite a structure (Preparing Your Home, 2020). A hardened home is a home that has been protected from flying embers through methods including fire resistant roofing and cladding materials, fire resistant vents, and any other exterior feature of a home that increases resistance to heat and embers.

Replacing a home's roofing is one of the most important techniques for home hardening as it makes up a large proportion of the surface area of the exterior of a home and is typically flat or sloped which allows embers to accumulate on its surface. Roofing material is classified by fire resistance by standardized testing agencies as Class A, Class B, or Class C, with Class A being the most fire resistant and Class C the least (Hopper, H, 2014). The IBC and California building code requires residential homes to have either Class C or Class B roof coverings depending on the type of construction. Upgrading to a Class A roof covering may offer a significant improvement to a home's wildfire resistance. In some cases, homes in areas classified as wildfire-urban interface zones are already required by code to have Class A roofs, but many older homes may not meet these standards.

Replacing a home's roofing with Class A roofing is an economical way to increase wildfire resistance. Asphalt fiberglass roofing is an example of a Class A roofing material that is used to replace less fire resistant materials. On an average 1,700 square foot roof, this type of roofing can be installed for around nine thousand dollars (Roof Replacement Cost 2020, 2020). Homeowners may also choose from Class A rated tile or metal roofing materials which will add to the price of a roofing install but may be more aesthetically desirable.

Replacing or installing exterior vents at soffits, attics, roofs, and crawl spaces is another cost effective way to prevent embers from entering a home. California code requires vents with quarter inch openings, however vents with eighth inch or sixteenth inch openings have been proven to be more effective in preventing intrusion of embers in recent wildfires (Pohl, Kelly, and Quarles, 2020). Vulcan Vents, for example, is a company that specializes in fire resistant vents and offers vents from about fifteen dollars to one hundred and 30 dollars per vent.

## *Defensible Space/Landscaping*

Defensible space is the natural or landscaped area around a home that has been modified and maintained in a way that reduces the chance of wildfire spreading to a structure. Defensible space focuses on removing or decreasing the density of possible fuels for a fire near a home including vegetation, other structures, woodpiles, or anything else that is flammable.

Defensible space should initially extend 15-30 feet from a home, with removal of almost all flammable vegetation in this zone. Nonflammable groundcover, like gravel or decorative rock, is a cost effective means of creating an initial defensible space. Regular maintenance, like the clearing of leaves and other flammable debris, is important in maintaining defensible space.

Cost estimates for the creation of defensible space will vary greatly depending on factors like property size, aesthetic requirements of homeowners, and existing conditions. However, landscaping costs typically would not exceed twenty five thousand dollars unless on an exceptionally large or difficult home. In fact, one study claims that wildfire resistant landscaping would only increase the cost of a home to an owner by \$2,570 (Pohl, Kelly, and Quarles, 2020). Another consideration is the aspect of maintenance to maintain a defensible space. It is likely that many homeowners would be willing to pay for a landscaping service that provides monthly or quarterly maintenance of a defensible space.

## **Conclusions**

After gathering data from the realtors survey and researching currently available technologies and methods for protecting homes from wildfires, it can be determined that there are available fire protective measures that are within the budget for Santa Barbara homeowners. However, the three methods discussed in this paper are by no means the only methods available. This information serves as a basis for the possibility of the creation of a business that provides the service of wildfire protection to Santa Barbara homeowners, for both new construction and existing homes. This business would most likely be the most successful if it included a mixture of all the fire protective systems discussed in this paper, instead of focusing on just one. A business run in this way ensures that the needs and budget of each individual homeowner could be met.

## *Future Research*

The research and ideas discussed in this project should not be limited to only Santa Barbara County. Many homes in California, or even the rest of the country, are at risk for wildfires. The methods of protection may differ slightly based on location, but ultimately the concepts remain the same. However, one thing that may differ greatly based on location is the amount that homeowners are willing to pay for wildfire protection. The housing market in Santa Barbara is relatively expensive compared to the rest of California, and much more expensive compared to most of the rest of the country. If the ideas in this paper are applied to a different location, more research should be done to determine the amount of money that homeowners are willing to pay.

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