



# Spring Mountain Community Evaluation

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**February, 2023**

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## **A. Introduction**

Fire hazard is a special concern in the Spring Mountain area in western Napa County. The area is located in the interface between wildlands and developed areas where fires spread from wildlands to the homes, damaging structures or even threatening lives. Conversely, wildlands are subject to increased ignition potential from elevated levels of human activities. Most fires in the coastal mountains are human caused<sup>1</sup>.

This evaluation serves as a platform for recommendations for projects to: minimize threat to life safety and damage from wildfire to homes and natural resources. It is based on a review of the terrain, weather, fuels and fire history of the area, compared to the values at risk, and likely scenarios of fire ignition and spread.

The Spring Mountain community boundary covers 10,571 acres in western Napa County. It is an organized Fire Safe Council (FSC) sandwiched between the Diamond Mountain FSC to the north and the Mt Veeder Fire Safe Council to the south. The city of Saint Helena (also an FSC) is to the southeast. The Spring Mountain FSC area of interest is bounded by Highway 29 to the east, Bothe-Napa Valley State Park to the north, and the Sonoma/Napa County boundary to the west (for the most part).

Within this area, data records show approximately 259 parcels and 463 structures. Elevation ranges from 230 feet on the Napa Valley floor to over 2,600 feet at the Napa County border. The area includes geographic features such as Heath Canyon and White Sulphur Springs in the south and York Creek, Mill Creek, and Richie Creek in the north, with prominent topographic knobs such as Buckeye Knoll, and rolling terrain throughout. An unnamed ridge north of Spring Mountain Road helps define the terrain in the area.

The pattern of access is few through roads, and several spur roads. The main roads that bisect the area include State Highway 29/St Helena Hwy ("Highway 29"), and Spring Mountain Rd, with significant spur roads including White Sulphur Springs Rd, Langtry Rd, Sulphur Springs Ave, Rockland Dr/Tychson Hill/Byrd Hill, Madrona Ave, Bale Grist Mill Road.

Much of the Spring Mountain community boundary shares the county boundary between Napa and Sonoma Counties. While there are many rural residents within the Spring Mountain community boundary, there are no incorporated or informally recognized cities or towns within its boundary. The city of St Helena borders the area to the east. While the majority of the Spring Mountain is privately owned, it also includes lands owned by the following public or non-profit entities: California Department of Parks and Recreation, Save the Redwoods League, and the City of Saint Helena.

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<sup>1</sup> <https://www.nps.gov/articles/wildfire-causes-and-evaluation.htm>

More details on each will be presented in the following sections.

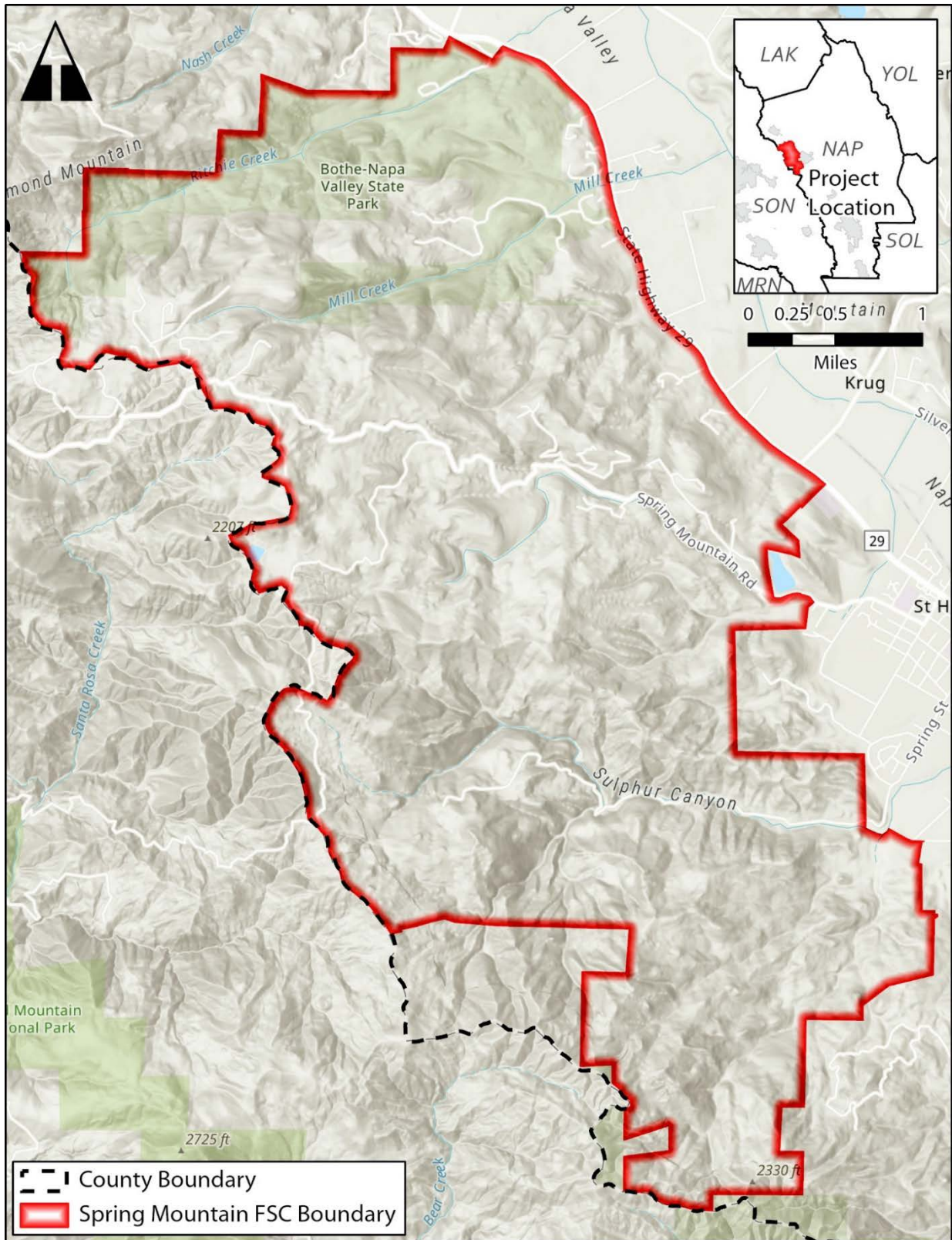


Figure 1. Area of Interest – Spring Mountain community boundary (shown in red)

## B. Values at Risk

The most important values at risk are life safety, then improvements to property (residential structures, wineries and vineyards), then natural resources. Because many of the evacuation routes are long and involve poor road conditions, the threat to human life is significant.

Homes in the Spring Mountain area are at risk from wildfire for a number of reasons. Structures are generally older, dating before the requirement for ignition resistant construction. Most roofs are less flammable, however, wood siding, decks, and unprotected vents that are part of most homes all make the buildings prone to ignition.

**Homes:** Residential structures are mostly made of wood because of their age. They have wood porches and decks, though wood fences are a rarity. The presence of ignition-resistant construction is closely related to the age of the structures; structures built after 1996 have features that prevent ignition such as non-flammable roofs, double-paned windows, and stucco siding. Many older structures have been destroyed in the Glass Fire, or remodeled and a few property owners have installed personal fire suppression systems involving various water sprinkler strategies.

Structures are located primarily along Highway 29, however, there are a significant amount of structures located along Spring Mountain Rd and White Sulphur Springs Rd (shown in black on the adjacent map).

In 2020, the Glass fire burned through the entire Spring Mountain area. Twenty five percent or 115 structures within the area were destroyed (per CAL FIRE post-fire assessment, greater than 50% damage). An additional 14 structures were affected. Most of the structures lost were off Highway 29, or up Spring Mountain Rd and White Sulphur Springs Rd.

*Table 1. Structure data from the Spring Mountain area. Structures provided by Napa County open data. Structure loss data provided by CAL FIRE (2020).*

	Number	Percent
<b>Total Number of Structures/Buildings</b>	463	
<b>Structures Lost in GLASS Fire (2020)</b>	115	25%

**Landuse:** The Napa County parcel database shows that the Spring Mountain is dominated by agricultural lands (vineyards) and vacant lands. Agricultural lands account for 40% of the lands within the Spring Mountain area. Most of the agricultural lands are along the valley bottom nearest Highway 29. There are a few large agricultural parcels in the west along the Sonoma County boundary. The next largest land use category is Vacant, also at 40% of the area. These lots are located in the central portion where unmanaged vegetated hills exist.

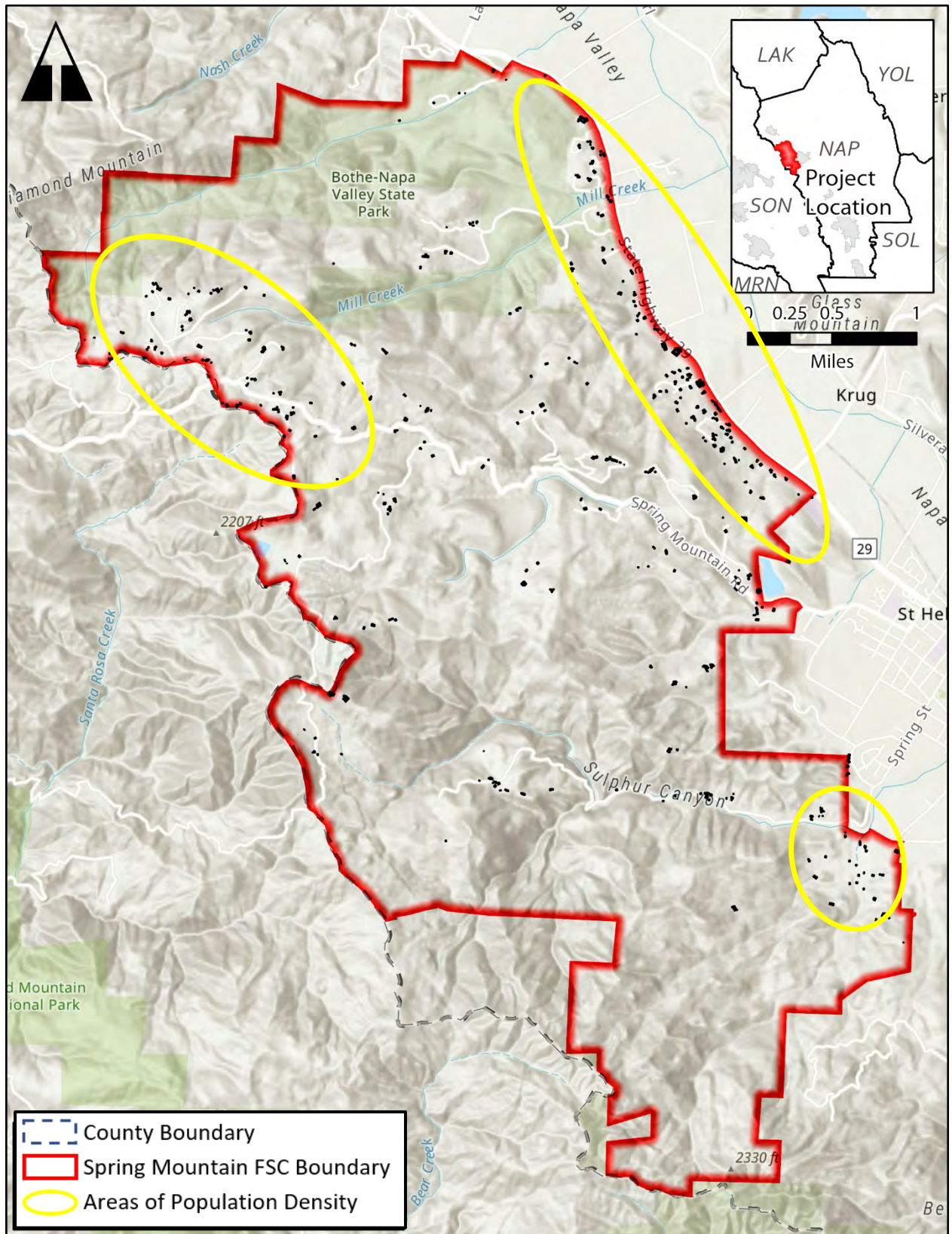


Figure 2. Structures (shown in black) within Spring Mountain community boundary and areas of Population Density (shown in yellow).

Parcels categorized as residential account for 10% of the area and are made up mainly of smaller lots, but there are large residential lots throughout the area. Eleven percent of the parcels are designated as Commercial (which includes wineries).

*Table 2. Number of parcels and county land use within the Spring Mountain area (Napa County GIS Open Data Portal, accessed in March, 2020).. (See Table 8 for more details.)*

<b>CATEGORY</b>	<b>PARCEL COUNT</b>	<b>AREA (ACRES)</b>	<b>PERCENT</b>
<b>AGRICULTURAL</b>	54	4,285.88	40%
<b>COMMERCIAL</b>	30	1,143.40	11%
<b>RESIDENTIAL</b>	83	1,080.41	10%
<b>VACANT</b>	92	4,325.63	40%

### **C. Topography**

Topographic features - such as slope and aspect (orientation with respect to sun and wind) and the overall form of the land - have a profound effect on fire behavior. Topography affects a wildfire's intensity, direction, and rate of spread. An area's topography also affects local winds, which are either "bent" or intensified by topographic features. Topographic features can also induce daily upslope and downslope winds. The speed, regularity, and direction of these winds (and other winds) directly influence the direction of wildfire spread and the shape of the flame front.

For example, fires burning on flat or gently sloping areas tend to burn more slowly than fires burning on steep slopes. This makes ridgetop positions more vulnerable than those at the bottom of a slope.

The area encompasses a broad range of slopes and aspects with almost equal representation of southwestern and northeastern facing slopes. Slopes range from zero at the bottom on Napa Valley and more than 400% along the upper reaches of Iron Mine Creek (south of Sulphur Canyon). There are no large peaks in the area. An unnamed ridge north of Spring Mountain Rd. is the most prominent ridge in the area other than the Napa/Sonoma County boundary, but there are numerous creeks and canyons that bisect the area in a roughly west to east direction. Some winters boast snow on the highest peaks in the surrounding area. Immediately outside the Spring Mountain area to the north, Diamond Mountain ridge runs in a west to east direction. To the south, many of the canyons run perpendicular to the dominant southwestern winds, that is, they run northwest to southeast.

There are several topographic knobs and knolls in the area, creating breaks in the landform; these can be significant flow-through passages for wind, as discussed in the following section of this report.

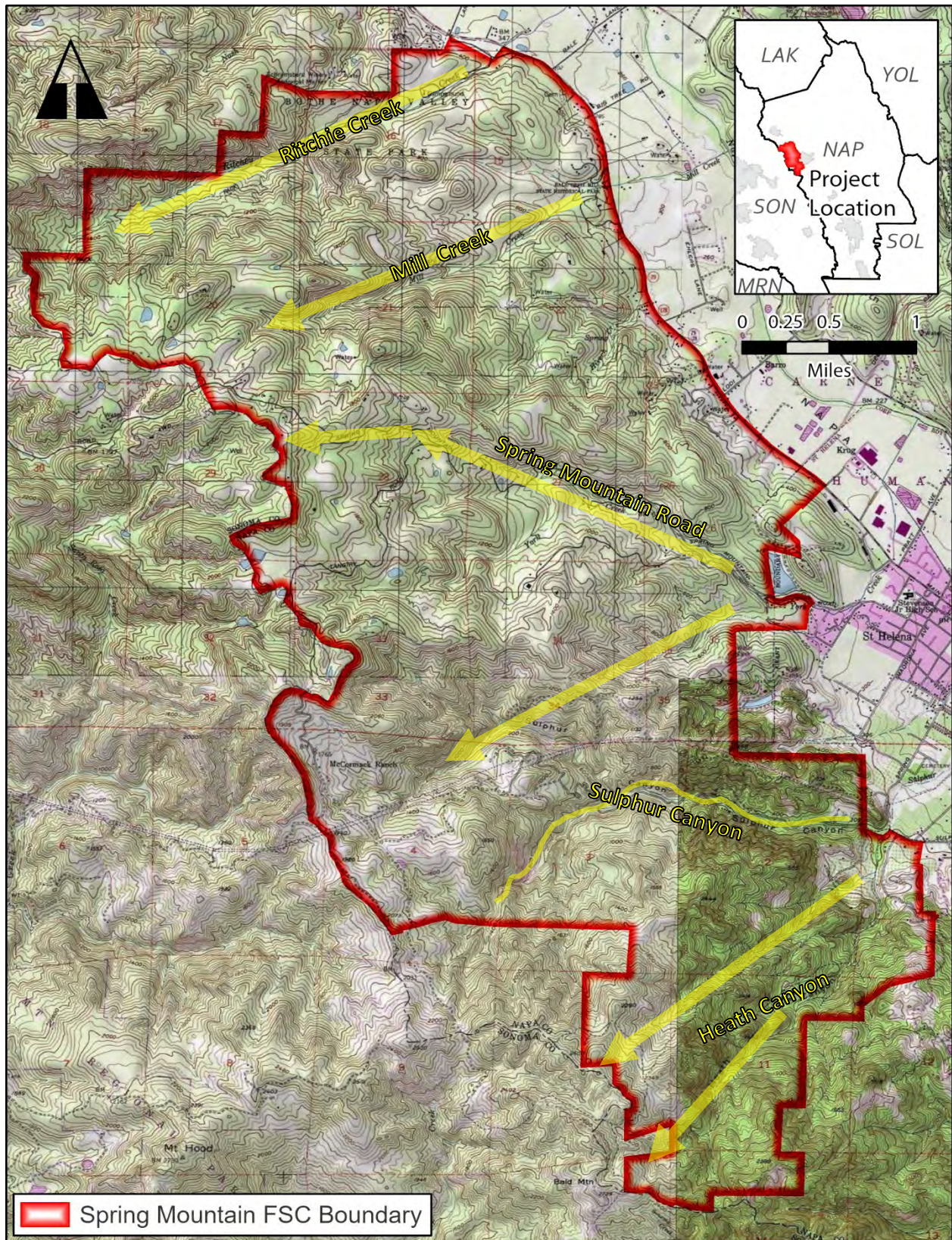


Figure 3. USGS Topographic map of the Spring Mountain area (boundary shown in red). Yellow arrows indicate general location of canyons that might facilitate wind flow.



## 1. Orientation of the Canyons

- Heath Canyon: This canyon runs from the southwest to the northeast, contrary to many of the canyons to the north and south of it. This direction is aligned with the predominant winds from the southwest and the more concerning Diablo winds from the northeast. Heath Canyon originates at the base of Bald Mountain on the county boundary. Some of the steepest slopes are in the upper reaches of this canyon.
- Sulphur Canyon: Iron Mine Creek and Sulphur Creek originate in the west and merge to form Sulphur Canyon. Again, the upper (western) reaches of these creeks have the steepest slopes in the region. While Iron Mine Creek maintains the orientation of Heath Canyon, the upper reaches of Sulphur Creek run from the west to the east. This may create erratic or unpredictable winds at the confluence of these two creeks.
- York Creek area: This area is less defined and is more characteristic of rolling terrain. There are no major ridges to halt or alter strong winds from the southwest or northeast, as was the case in the 2020 Glass fire. Many of the homes that were lost during that fire were within this area.
- Hirsh Creek area: This area has steep slopes along the sides of the Hirsch Creek area, particularly near the base where it meets highway 29 and density of homes is highest. This area was entirely burned during the Glass Fire of 2020, and has no easily discernable methods of providing fuel breaks as the ridge line on both the north and south side is not clearly defined and is amorphous. The only road through the area is a private, unmaintained lane (Bea Lane) that sits midslope and poses a risk for evacuation or any ingress by fire personnel.
- Ritchie Creek/Mill Creek area: The ridges and valleys within this area, which make up most of Bothe Napa Valley State Park, are again a bit amorphous and not particularly strong, with the exception of the prominent ridgeline that forms the Spring Mountain area's northern boundary. The orientation of the valleys is more aligned in the southwest to northeast direction. Again, as with Heath Canyon, this orientation provides a path for strong winds from the southwest (most common in the afternoons) and northeast (common during Diablo wind events). This area was also burned during the Glass fire of 2020.

The Spring Mountain area contains portions of the Heath Canyon watershed, York Creek watershed, and the Ritchie Creek watershed. Several creeks exist in the area. They include: Ritchie Creek, Mill Creek, Hirsh Creek, York Creek, Sulphur Creek, and Heath Creek.

More details of the terrain follow in the discussion of weather.

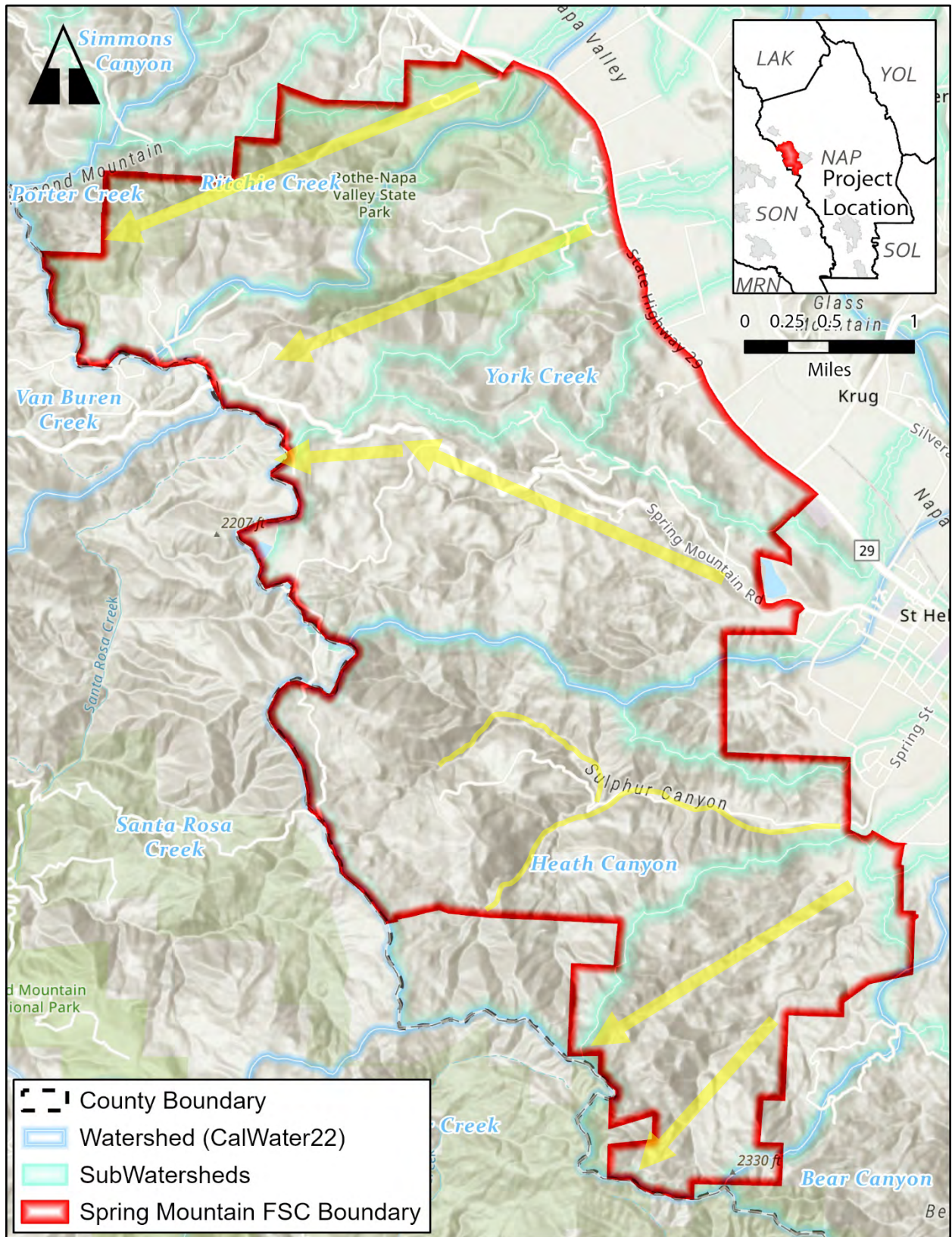


Figure 4. Watershed map of the Spring Mountain area (boundary shown in red). Yellow arrows indicate general location of canyons that might facilitate wind flow.

## **D. Weather**

Weather conditions significantly impact both the potential for ignition and the rate, intensity, and direction in which fires burn. The most important weather factors used to predict fire behavior are wind (speed and direction), temperature, and humidity.

### **1. Temperatures and Humidities**

Summer days are usually comfortable; temperatures normally range from lows in the 40's and to highs in the 90's, with an occasional high reaching a maximum of 105 degrees Fahrenheit. Humidities can drop to the single digits in the summer and fall.

Portions of the Spring Mountain neighborhood lie in a relatively protected area and would be subject to occasional episodes of stagnant air formed by stationary highs during summer months. This overall weather pattern -- characterized by continuous high temperatures and low relative humidities -- enhances the possibilities of ignition, extreme fire behavior and extreme resistance to fire control.

### **2. Winds**

The most important influence on fire behavior is wind. Wind can greatly affect the rate of fire's spread and the direction of a fire. Wind increases the flammability of fuels both by removing moisture through evaporation and by angling the flames so that they heat the fuels in the fire's path. The direction and velocity of winds can also control the direction and rate of the fire's spread. Winds can carry embers and firebrands downwind that can ignite spot fires ahead of the primary front. Gusty winds cause a fire to burn erratically and make it more difficult to contain.

Terrain plays an important role in wind flow. Wind will tend to follow the pattern of least resistance and is therefore frequently deflected and divided by landforms. Long, continuous slopes offer buffers from high elevation winds, but also direct the surface air flow upwards, which pre-heats and dries the higher elevation fuels. Breaks in the landforms, as in the knolls and unorganized terrain within Spring Mountain can result in swirling winds and resulting erratic fire behavior.

Pronounced canyon slopes produce pronounced daily up-canyon and down-slope winds caused by differential heating and cooling of air during the day. This occurs region-wide and on a local scale.

Regional southwesterly winds are slowed by the northwest-to-southeast aligned ridges that form the Spring Mountain area; however, strong winds from the northeast could produce strong up-slope and erratic winds.

The winds that create the most severe fire danger typically blow from the north, usually in October. Winds from the east and north bring low humidities and elevated fire danger and can wreak havoc on the forested and chaparral covered, causing fire to spread to the south. These winds are the same ones that blew during the largest fires in Napa County; an unnamed fire in 1939 follows the pattern of larger fires influenced by these northeasterly winds. Those larger fires include the C. HANLY fire in 1964 along with its companion fire in 1965, the P.G. & E. #10 fire. Again, in 1976 and 1982, two fires, the IDA CLAYTON fire and the SILVERADO fire also started under these conditions. More recently, the TUBBS and NUNS fire in 2017 and the GLASS fire in 2020 also followed this pattern and burned substantial parts of the Spring Mountain area of interest as well as surrounding lands.

These northeasterly events generally last from 15 to 35 hours, but in seven of the past twenty years, these events in October and November lasted for 5 to 14 days. This type of wind could “push” a fire from the upper eastern slopes on the other side of Napa Valley down across into the vineyards on the valley floor to the higher slopes to the west and beyond into Sonoma County.

Any southwestern-facing aspect of the Spring Mountain area can exacerbate its risk from the Diablo winds. This is because these foehn or subsiding winds accelerate with decreasing elevation.

## E. Vegetation

The 2016 Vegetation Map of Napa County<sup>2</sup> (updated from the 2004 version) was used as reference for this evaluation. Before the Glass Fire, there are seven main vegetation categories within the Spring Mountain area along with four non-veg types (rock outcrop, developed, water, unclassified). Even though most of the area burned, much of the vegetation will return to its original classification within five years. Forested stands of Douglas fir with high tree mortality are the exception. The major vegetation categories mapped are listed in Table 3.

*Table 3. Vegetation acres by major vegetation categories within the Spring Mountain area (Vegetation Map of Napa County).*

<b>Vegetation Major Category</b>	<b>Acres</b>	<b>Percent</b>
<b>Coniferous forest</b>	4,499.6	43%
<b>Oak Woodland</b>	3,284.1	31%
<b>Agriculture</b>	1,440.7	14%
<b>Shrubland</b>	671.5	6%
<b>Grassland</b>	285.7	3%
<b>Developed, with structures or pavement</b>	166.2	2%
<b>Riparian woodland</b>	136.4	1%
<b>Water</b>	33.0	0.3%
<b>Rock Outcrop</b>	20.7	0.2%
<b>Unclassified/Unknown</b>	0.4	0.004%

Along with the mapped vegetation is the landscaped environment surrounding buildings and homes.

Each vegetation type burns differently, based on the amount of biomass available to burn, the distribution of biomass in the vegetation, as well as the moisture and oil content of the foliage and dead material. A discussion on each major type follows the map on the next page.

Note: the tables and maps presented here reflect pre-2020 conditions.

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<sup>2</sup> [https://data-cdfw.opendata.arcgis.com/datasets/b9855bea85c14190ab030da86441301c\\_0/explore](https://data-cdfw.opendata.arcgis.com/datasets/b9855bea85c14190ab030da86441301c_0/explore)

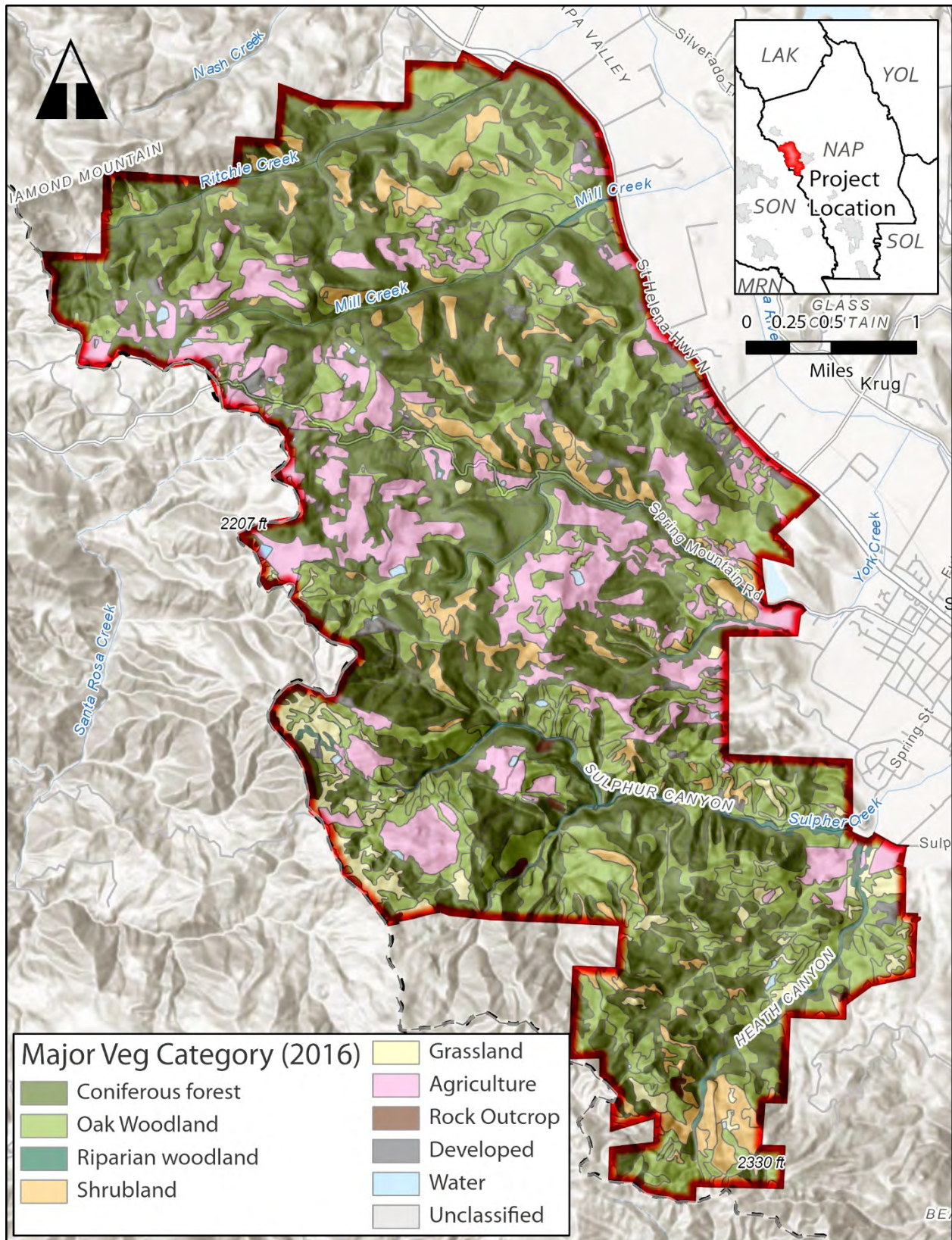


Figure 5. Vegetation map – Spring Mountain area (boundary shown in red) (Napa Vegetation Map, 2016).

**Conifer forest:** These areas include mapped Douglas-fir (3,346 acres), Douglas-fir with Ponderosa Pine (114 acres), Coast Redwood mixed with Douglas fir (811 acres), Coast Redwood (207 acres), Knobcone Pine (3 acres), and Foothill Pine (18 acres). These coniferous forests occur in large patches throughout the hills within the Spring Mountain area, particularly in the higher elevations and on northeastern slopes/draws. They constitute about 43% of the area.

These dense, conifer forests are often found on north-facing slopes and do not pose a significant fire hazard under normal conditions. However, when hot, dry weather occurs, these forests do offer a large fuel volume to burn and exhibit greater fire intensity. Of all the vegetation types in the Spring Mountain area, dense, coniferous forests are most likely to burn as a crown fire. When a fire reaches tree crowns direct firefighting is not possible and, embers are distributed throughout adjacent areas (including vulnerable residential areas).

**Oak Woodland:** 31% of the Spring Mountain area is mapped as Oak Woodland, which occurs on the lower flanks of hillsides throughout the area. Dense canopies typify these oak woodlands. Deciduous oak stands typically have grass and some shrubs under the tree canopy whereas coast live oak stands normally have leaf litter and shrubs under the tree canopy. The tree canopy in the lower reaches of the drainages is dominated by coast live oak, but also includes California bay, madrone, black oak, blue oak, Oregon white oak, canyon live oak, valley oak, interior live oak, Douglas fir and occasional pines.

Fire intensity, flame lengths, and scorch heights are usually low in oak woodlands. Slow-burning surface fires (approximately two-feet per minute) are carried in the compact leaf litter layer. Low flame heights (less than one foot) are the rule. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards in this vegetation type. Leisurely spread rates, combined with the relatively short flame lengths of the predicted fire behavior produce a manageable, moderate fire hazard.

However, when shrubs are allowed to develop under the hardwoods, these fuels could pose fire hazards under severe weather conditions, e.g. those conditions involving high temperatures, low humidities, and high winds. If the shrubs develop under oaks, torching is likely to occur because of the ladder fuels that allow a fire to burn from the shrub to the tree crowns. Foliage of both bay and coast live oak can be very flammable when fire reaches the crowns.

**Agriculture (Cropland/Vineyards):** 14% of the land in the Spring Mountain area is mapped as agriculture. These occur in large sections east of Sulphur Canyon and along Spring Mountain Road, as well as smaller patch along Highway 29. Most of these agricultural areas are vineyards.

Fires are sometimes benign in croplands or vineyards. In the case of vineyards, biomass is concentrated in live vines, with a mowed or bare soil surface. A fire can spread quickly through

the vineyard where there is a ground cover. Vineyards were instrumental in stopping the Howell Mountain fire in 1983, formed the edges of fires in the Tubbs, Nunns, and Kincade Fires, but were part of the contagion in the Cavedale Fire in Napa in 1996. Vineyards often have access roads on the perimeter and within the interior, further aiding containment. With all that said, however, in the Glass Fire of 2020, many vineyards were burned through.

**Shrubland:** The next largest mapped vegetation type occupies 6% of the Spring Mountain area and can be found at the lower hillsides transitioning between the conifer forests/oak woodlands to the grasslands at the valley floors. While these distinct areas were mapped as Shrubland, brush exists throughout and often contributes to other vegetation types described in this document. The specific mapped shrub alliances include:

- California Bay – Leather Oak (Mesic Serpentine),
- Chamise Alliance,
- Leather Oak – California Bay (Mesic Serpentine Chaparral),
- Leather Oak – White Leaf Manzanita – Chamise (Xeric Serpentine),
- Mixed Manzanita
- White Leaf Manzanita – Leather Oak (Xeric Serpentine).

Brush produces severe fire behavior, with flames longer than 20 feet in length. Intense, fast-spreading fires in chaparral burn the foliage as well as the live and dead fine woody material in the brush crowns. The foliage is highly flammable and dead woody material in the stands significantly contribute to increased fire intensity.

This fuel type constitutes the highest firefighting hazard. Direct attack is not possible, and containment efforts would need to rely on backfiring or suppression strategies other than line building because the perimeter of the fire is likely to grow faster than a line could be built. In addition, spotting is likely in chaparral which will present even more challenges to suppression efforts.

**Annual Grasslands (Herbaceous):** Accounting for only 3% of the Spring Mountain area, annual grasslands were mapped along the edges of shrublands or vineyards. Fire spread through grasslands can be quick, however, they are easy to spot and quick to put out.

**Landscaping/Developed:** (Landscaped areas -- being closest to homes -- may make the greatest impact on survivability of a house during a fire arising in wildlands. Landscaped areas either (1) are moist, thus will not likely burn; (2) contain large amounts of fuel which will burn with great intensity; or (3) are landscaped with fire resistant plants, and only burn slowly with little heat release.

While research results regarding fire resistance of landscape plants are meager, several important generalities have surfaced. For example, the overall volume of biomass as well as the



spacing and design of the garden is more critical than the species selected. Horizontal spaces between planting masses and the house are important components of a fire safe landscape. Similarly, vertical spacing between tree branches, shrubs, ground cover and the structure (particularly windows) are also part of a well-designed garden.

Maintenance of landscaped areas is necessary to remove dead material and to maintain vertical and horizontal spaces. Neglect of landscape maintenance can lead to a significant worsening of the fire hazard closest to the structure.

Landscaping in the Spring Mountain FSC is generally consistent with fire safety principles. A few residences in each neighborhood have abundant vegetation that can endanger adjacent and nearby residents if they are within a few hundred feet of each other.

## **F. Predicted Fire Behavior**

The distribution within an area of expected flame lengths can be predicted using public-domain software and data. FlamMap<sup>3</sup> was used to model fire behavior using a county-wide dataset developed from the Napa County Vegetation Map<sup>4</sup>.

Using post-Glass Fire fuel conditions, flame lengths are expected to continue to be high (more than 12 feet) because of the combination of heavy fuels, especially in the conifer, mixed forest, chaparral, and in especially dry conditions, in the redwood forests. Where a well-developed understory is present - or now, more likely, where a preponderance of the vegetation is scorched and dead - under the oak canopies, fires are also expected to burn with high intensity.

Fires can also be expected to burn fast when they are propelled by dry grass and chaparral. Vineyards can moderate both the fire intensity and fire spread, but would not provide good suppression opportunities for safe evacuation because they are small in comparison to the tracts of uninterrupted vegetation.

### **1. Predicted Flame Lengths**

Flame length most directly relates to the ability of a firefighter to safely attack a fire; flames longer than eight feet prevent safe, effective direct attack. Flame length is also most closely related to structural damage – the higher the flame length, the more likely a structure could be lost. Long flame lengths can be expected in coniferous and oak forests where an understory or

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<sup>3</sup> <https://www.firelab.org/document/flammap-software>

<sup>4</sup> <https://ncff-cwpp-dms-usa.hub.arcgis.com/maps/b2de24b3562e4e27b0fbea2921e2c9e4/explore>

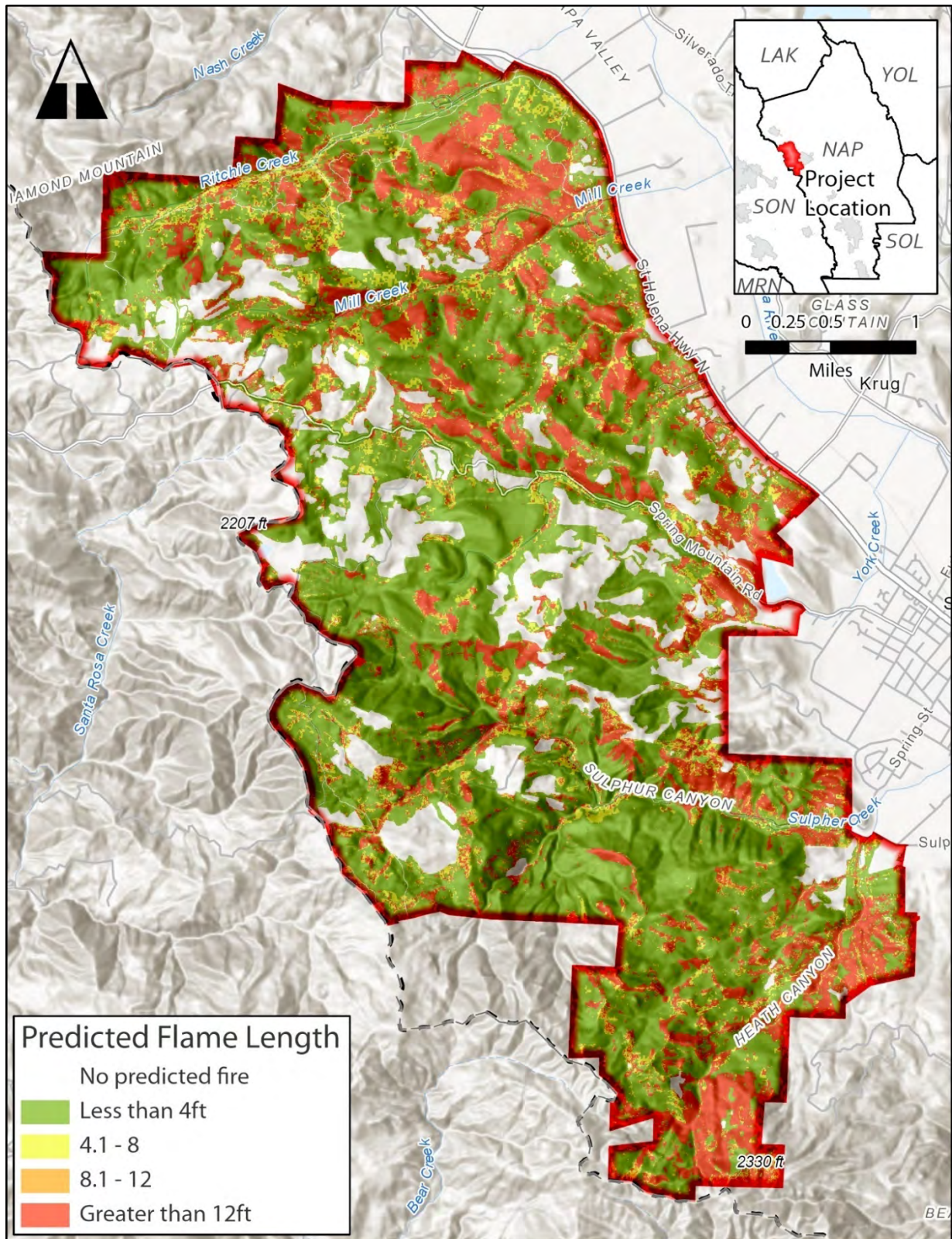


Figure 6a. Predicted flame length (feet) map (based on Napa Veg Map-based landscape version 2-2021 with a Northeast wind at 15mph with low fuel moistures). Spring Mountain area boundary (shown in red). This map is post-Glass Fire. The areas showing zero flame length are vineyards, other agricultural parcels, or developed areas, which are all mapped as unburnable.

dead material is present. Vineyards and areas of well-maintained defensible space can be expected to burn with low intensity even under the most extreme conditions.

Flame lengths longer than 8 feet now account for 22% of the predicted fire behavior. And more than 70% of the area is predicted to have less than 4-foot flame lengths. The higher flame lengths are concentrated at the bottom of Ritchie Creek and Mill Creek along with in the south in the upper sections of Heath Canyon. The lower flame lengths are located throughout the area and more importantly surrounding the vineyards (which no fire is predicted due to the limitations of the predictive software).

However, during the Glass fire, where these lower \*predicted\* flame lengths are located, the most homes were lost. Homes that were lost were located primarily in areas where our model does not predict. In addition to having flames near a structure, structure loss from wildfire is greatly influenced by the presence of flying embers and the design and construction materials used to build the structures.

Note that the no predicted fire category accounts for agriculture and developed areas that may indeed burn – as evidenced in the Glass fire of 2020.

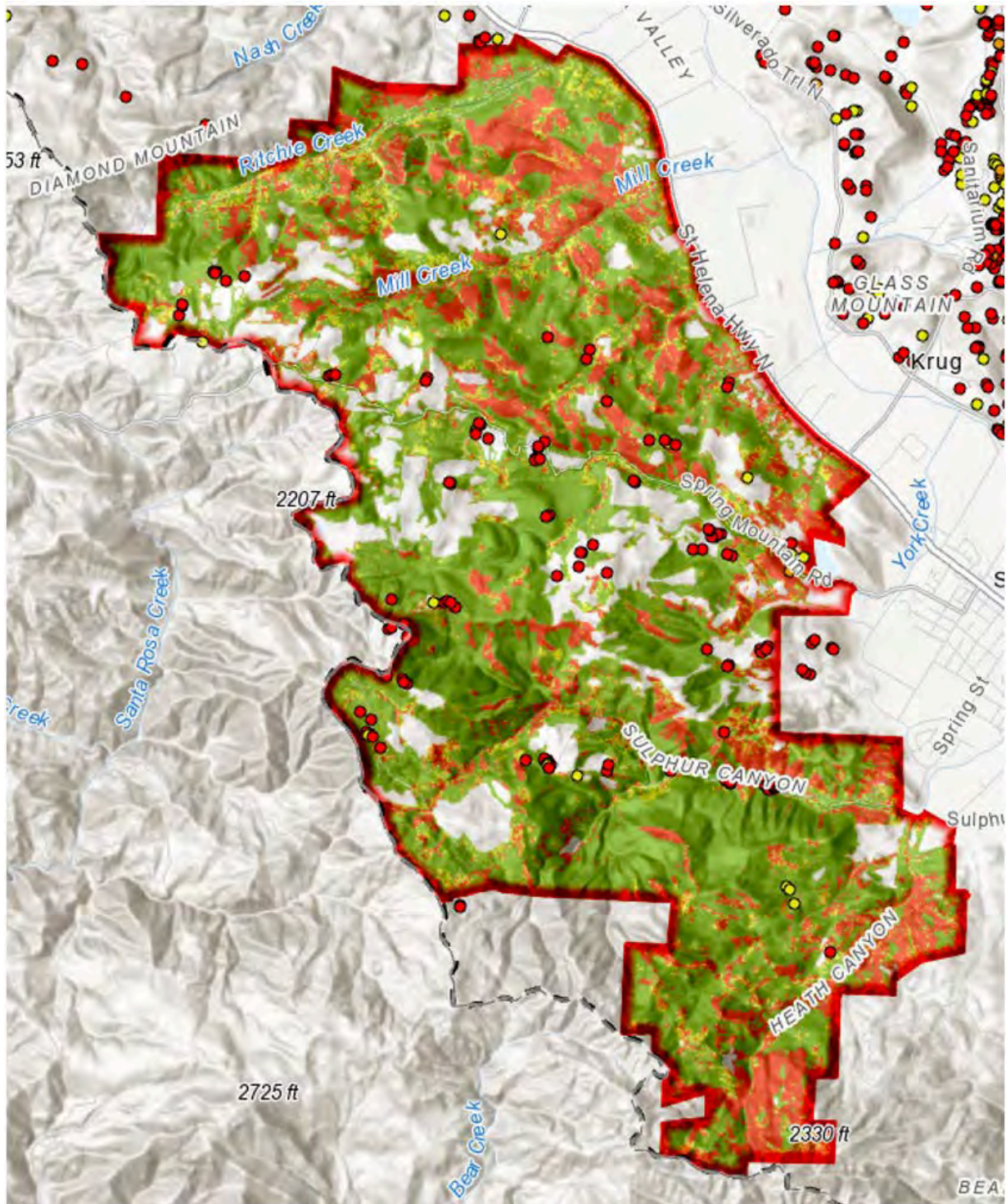


Figure 6b. Predicted flame length (feet) map showing destroyed structures from Glass Fire (indicated with red dots) and partially damaged structures (indicated with yellow dots). This map is post-Glass Fire. The areas showing zero flame length are vineyards, other agricultural parcels, or developed areas, all of which are mapped as unburnable.

Table 4. Predicted flame length by category and area (in acres) within the Spring Mountain area (based on Napa Veg Map-based landscape version 2-2021 with a Northeast wind at 15mph with low fuel moistures).

Predicted Flame Length	Acres	Percent
No predicted fire	1,607.59	15%
Less than 4 feet	5,908.30	56%
4 - 8 feet	712.14	7%
8 - 12 feet	259.76	2%
Greater than 12 feet	2,076.67	20%

## 2. Predicted Crown Fire Activity

While both the coniferous and oak forests can torch, hardwoods are less likely to have fire reach to the tree crowns, unless vegetation is burning underneath. Crowning potential is crucial. When fires spread into crowns, thousands of embers are produced and lofted into ignitable fuels, often overwhelming fire suppression personnel.

A relatively small area is predicted to have fire spread within the tree canopy (tree-to-tree), which is fairly rare and virtually un-heard of in hardwoods. Wide-spread torching emulates canopy fires, however, this type of crown fire is propelled into the tree canopy by a surface fire. Areas with higher density of coniferous forests are most at risk to torching and to crown fires.

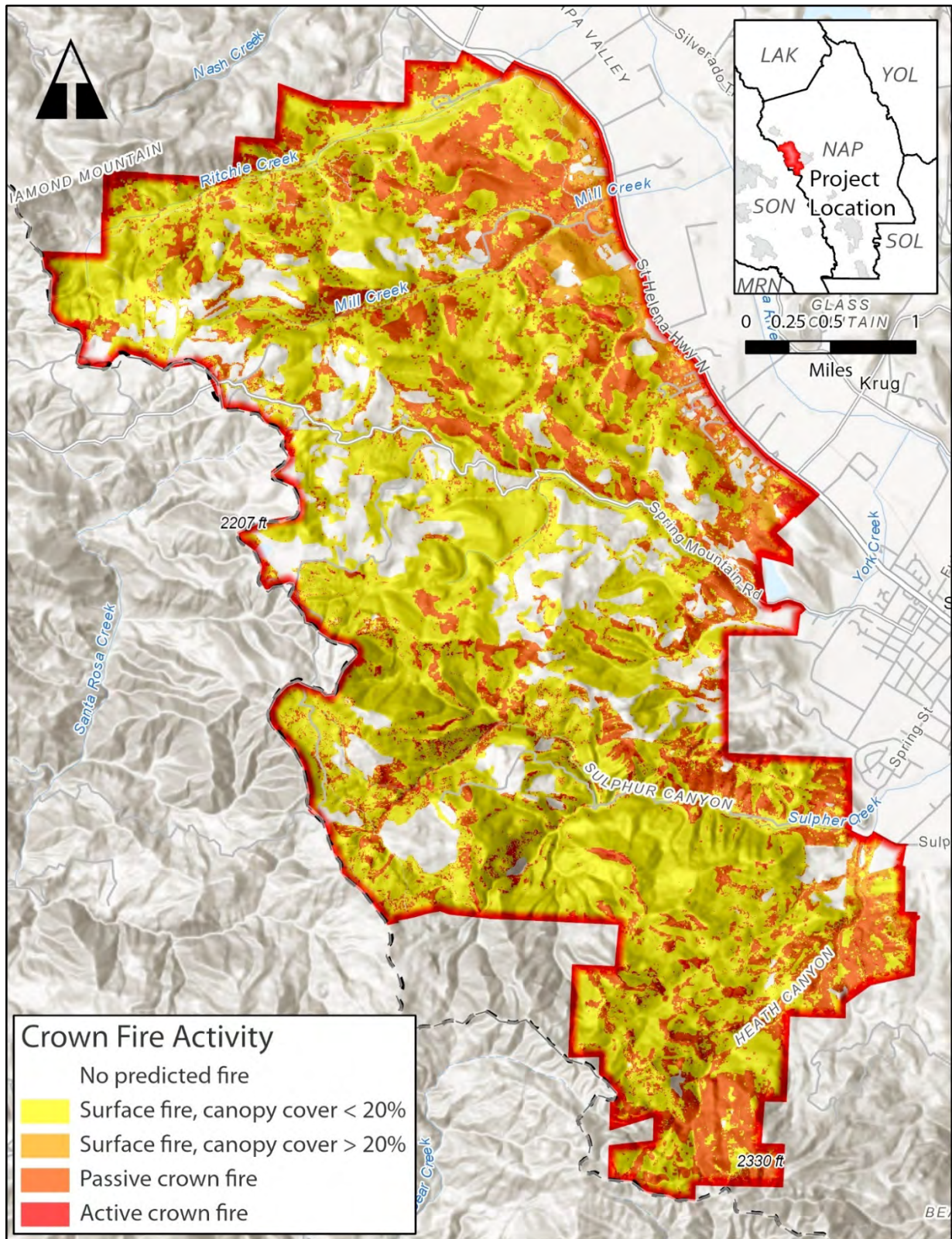


Figure 7. Predicted crown fire activity map (based on LANDFIRE landscape version 2.0 with a Northeast wind at 15mph with low fuel moistures). Spring Mountain area boundary (shown in red). This map is post-Glass Fire. The areas showing zero flame length are vineyards, other agricultural parcels, or developed areas, which are all mapped as unburnable.

Table 5. Predicted crown fire activity (or fire type) by category and area (in acres) within the Spring Mountain area (based on Napa Veg Map-based landscape version 2-2021 with a Northeast wind at 15mph with low fuel moistures).

Crown Fire Activity	Acres	Percent
Surface fire canopy cover < 20%	6,133.8	58%
Torching fire	2,318.6	22%
No predicted fire	1,607.60	15%
Surface fire with canopy > 20%	337.4	3%
Crown fire	167.1	2%

A combination of no predicted fire and surface fire accounts for approximately 73% of the Spring Mountain area. These areas are concentrated in the agricultural fields along Spring Mountain as well as in Sulphur Canyon where vineyards dominate.

Of the area predicted to have only a surface fire, we identified those areas with a higher canopy (over 20%) to highlight areas that do not torch but are likely to. These areas only accounted for 3% of the predicted surface fire. However, areas where torching and crown fire are predicted account for 24% of the area. These areas are predominately on mid-slopes and places where the vegetation is not protected from strong winds. They occur in the south in Heath Canyon the northern lower portion of Sulphur Canyon and the lower portions of Mill Creek.

In the Glass Fire, the effects of slope and its role in pre-heating fuels was evident. Areas above long slopes were especially prone to high intensity fire behavior. Another widespread phenomenon observed was the interaction between multiple fires due to widespread spotting. When fires meet localized intensity increased.

## G. Fire History

In the past sixty years, four fires have been recorded occurring within one mile of the Spring Mountain area. These include a small fire west of the boundary in Sonoma County called PG&E #24 (1994), a tiny fire that occurred in April of 2013 called the SUMMIT fire just north of the boundary at the foot of Diamond Mountain, the 2017 NUNS fire just to the south of the boundary that burned just over 55,000 acres, and then the recent 2020 GLASS fire that burned almost the entirety of the Spring Mountain area and surrounding locations for a total of approximately 67,000 acres. In addition, many more fires have occurred in the surrounding area in both Napa and Sonoma County, including the HENNESSEY, ATLAS PEAK, TUBBS, KINCADE, and more. In addition, numerous other fires preceded the ones mentioned above.

*Table 6. List of recorded fires within the Spring Mountain area (CAL FIRE, 2020).*

YEAR	MONTH	DATE	FIRE NAME	CAUSE	ACRES	COMMENTS
1939	Unknown	Unknown	Unknown	Unknown	212.78	
1946	Unknown	Unknown	Unknown	Unknown	781.73	
1959	June	6/27/1959	C. SAVIEZ	Unknown/Unidentified	205.40	
1964	June	6/25/1964	ROADSIDE #14	Unknown/Unidentified	230.77	
1964	September	9/19/1964	C. HANLY	Unknown/Unidentified	55,960.70	
1964	September	9/19/1964	NUNS CANYON	Unknown/Unidentified	9,807.69	
1982	September	9/11/1982	SILVERADO	Unknown/Unidentified	6,218.80	
1983			HOWELL MTN. FIRE	Unknown/Unidentified	2,353.55	
1994			PG&E #24	Unknown/Unidentified	1,275.54	
2003	October	10/29/2003	SILVERADO	Power Line	69.32	
2008	May	5/15/2018	TAR	Power Line	56.56	
2008	October	10/10/2008	DEER	Vehicle	233.10	Occurred during strong North Wind Event
2013	April	4/24/2013	SUMMIT	Power Line	2.20	
2016	June	6/17/2016	HILLCREST	Unknown/Unidentified	17.35	
2017	September	9/23/2017	CLOVER	Unknown/Unidentified	13.90	
2017	October	10/8/2017	NUNS	Unknown/Unidentified	55,798.20	Nuns, Partrick, Adobe, Norrbom and Pressley>Nuns
2017	October	10/8/2017	TUBBS	Unknown/Unidentified	36,701.98	
2020	July	7/26/2021	MOBILE	Equipment Use	1.12	
2020	September	9/27/2020	GLASS	Unknown/Unidentified	67,484.30	

A recurring history of large fires (over 10,000 acres in size), which typically burn for several days, has been well established in Napa County. The typical period between such large fires is approximately 20-30 years. Like much of California, fires in Napa County are almost entirely caused by human-caused accidental ignitions. With that said, in 2020, several lightning-strike fires burned nearby in Napa County and west in Sonoma County.

In the past, fires did not involve large numbers of structures because of the historic rural nature of Napa County; however, structure damage is now a common concern whenever wildland fires of any size occur.



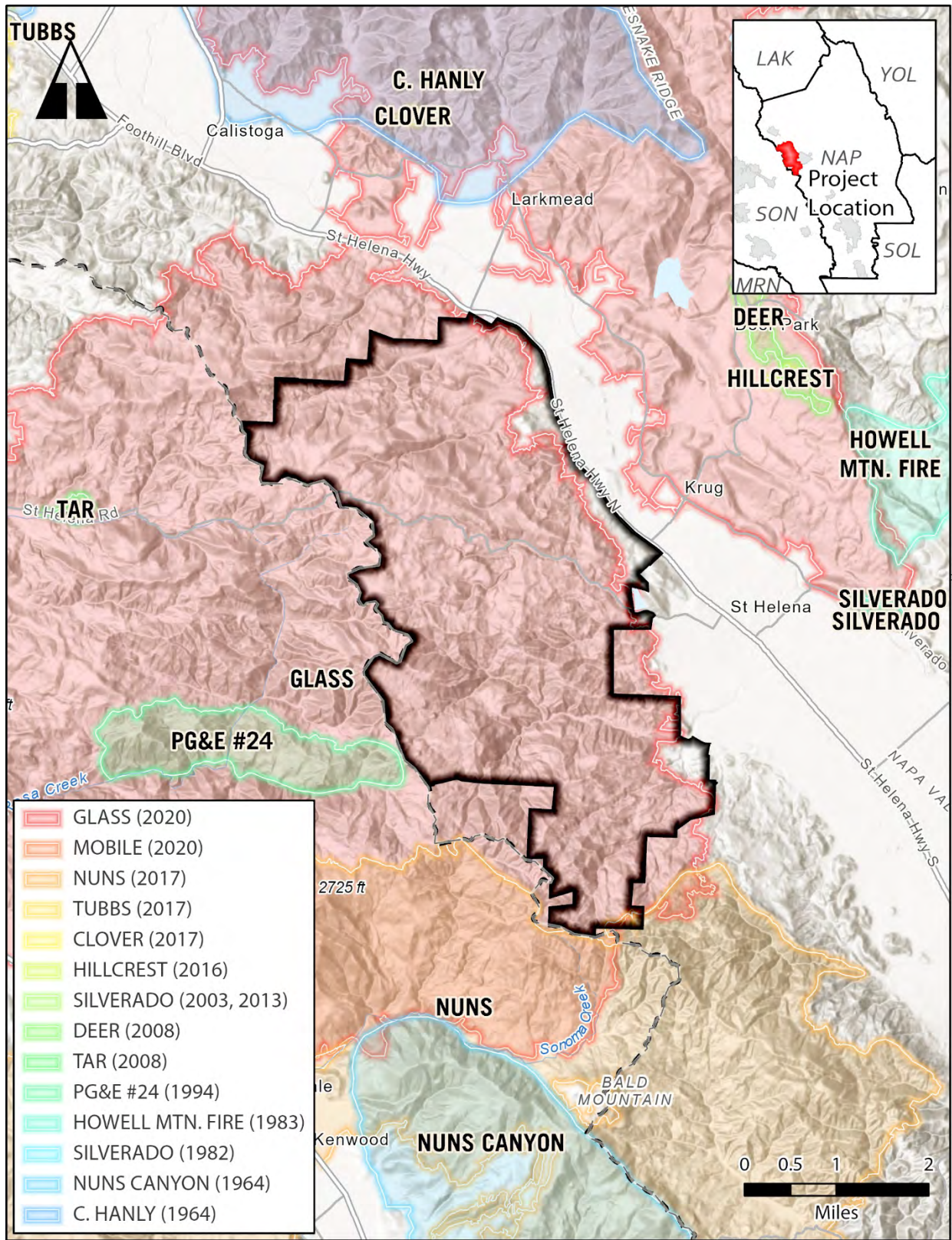


Figure 8. Fire perimeters/fire history map of Spring Mountain area (CALFIRE FRAP, 2019).

## **H. Access**

Spring Mountain Road travels east to west through the central portion of the area, turning into St. Helena Rd in Sonoma County. Langtry Rd forks off Spring Mountain Road and turns into Timberline Drive in Sonoma County, offering another means of egress. However, to the south and north of the area, access is very limited and is a concern. To the south, White Sulphur Springs Road has no outlet. And in the north, there is only a short park road into the Bothe Napa Valley State Park and only driveways into the Mill Creek area. All residential areas are mainly accessed from Highway 29 or the roads mentioned previously.

Most lengths of road are barely two lanes with no shoulders. Pavement (road surface) is generally in good shape, some curves are simultaneously sharp and steep. Driveways are generally long. Some residences are served by long shared driveways behind locked gates. Locked gates are common and can further delay emergency response. Locked gates also discourage/prevent inspection by local fire authorities. (we have Stockton and Mill Creek bridges—some general statement should be reworked here)

Regardless of the condition of the roadbed, access can be blocked by roadside vegetation. Trees can fall, blocking passage or vegetation can burn with such intensity that emergency response and evacuation cannot occur. Roadside vegetation along Spring Mountain Rd has been thinned, but is poised to regrow to abundance.

Other roadsides have abundant roadside vegetation. This vegetation could block the road while burning, and after, as trees fall (a common event during a fire). Roadside vegetation has not been maintained on many of the roads within the Spring Mountain area and could prove significant in the event of another fire.

See map on next page.

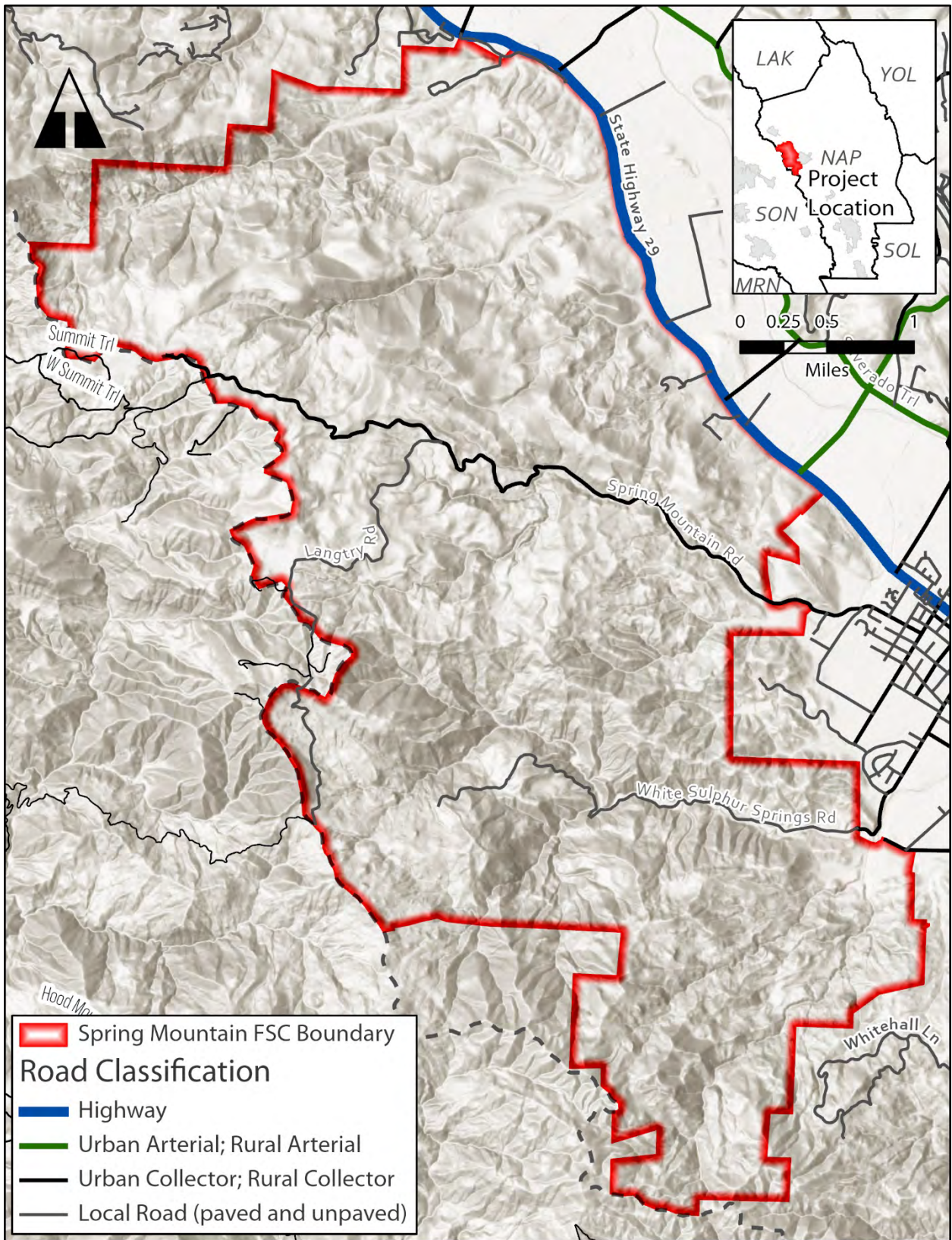


Figure 9. Access and street map of Spring Mountain area (shown with red outline).

## I. Hazard Ranking

Almost the entirety of the Spring Mountain area is within CAL FIRE’s State Responsibility Area (SRA). Only 1% is not within the SRA.

For the SRA portions of the Spring Mountain area where CAL FIRE determined a fire hazard assessment, they show 26% of the area is categorized as a **Very High Fire Hazard Severity Zone**. Much of the area was classified as High (68%) with small sections along Spring Mountain Road categorized as Moderate (5%). For Spring Mountain, 94% of the area is classified as High and Very High fire hazard severity. See Figure 10 on next page.

*Table 7. Fire hazard severity zone by area (acres) within Spring Mountain area boundary (CAL FIRE, 2007 – current version).*

Fire Hazard Severity Zone (CAL FIRE)	Acres	Percent
Moderate	498.50	5%
High	7,204.23	68%
Very High	2,788.90	26%
Non-SRA	79.38	1%

In November of 2022 CAL FIRE released a draft map of updated Fire Hazard Severity Zones, as depicted in Figure 11. The new statistics of this draft ratings have not yet been calculated.

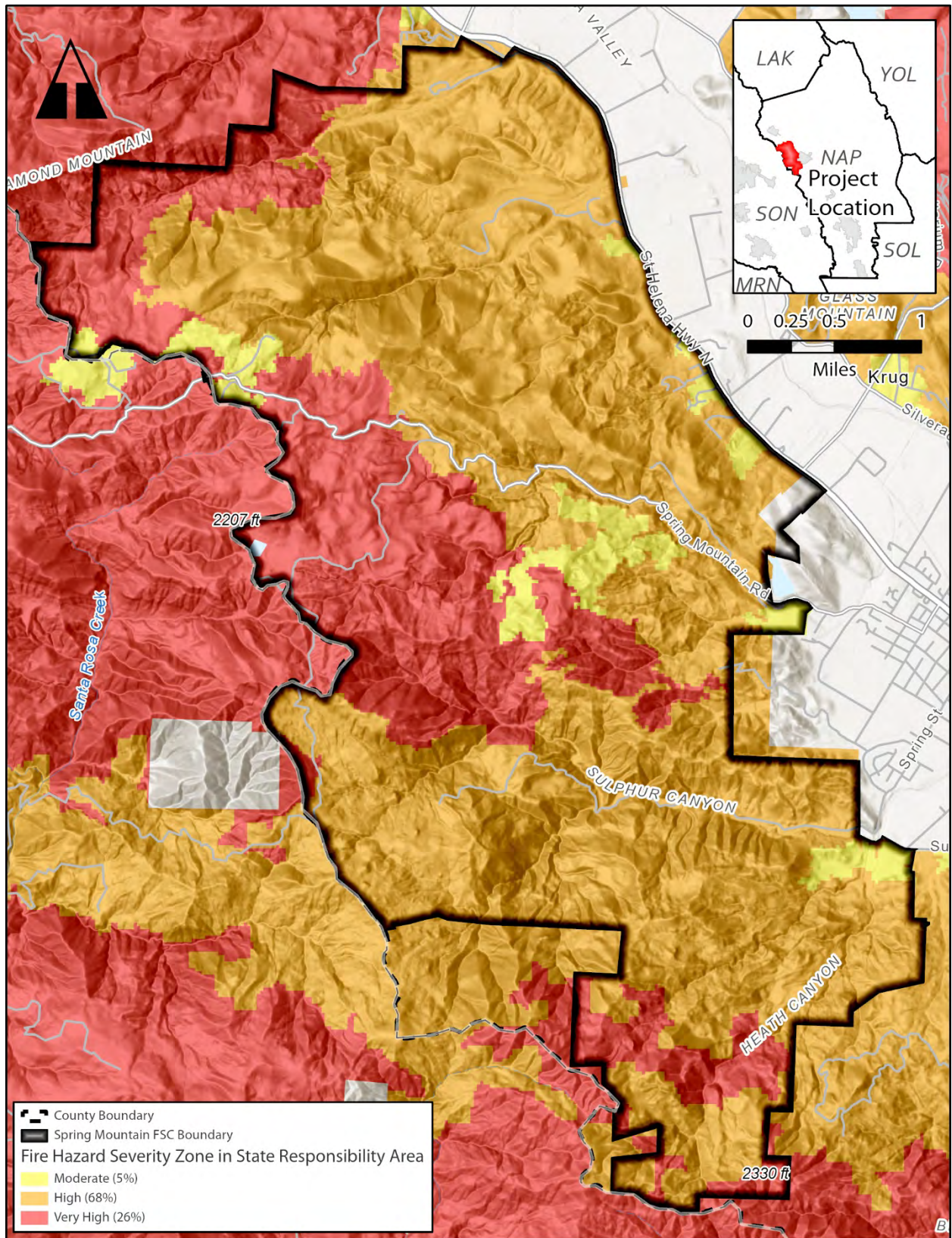


Figure 10. Distribution of Fire Hazard Severity Zones (CALFIRE, 2007).

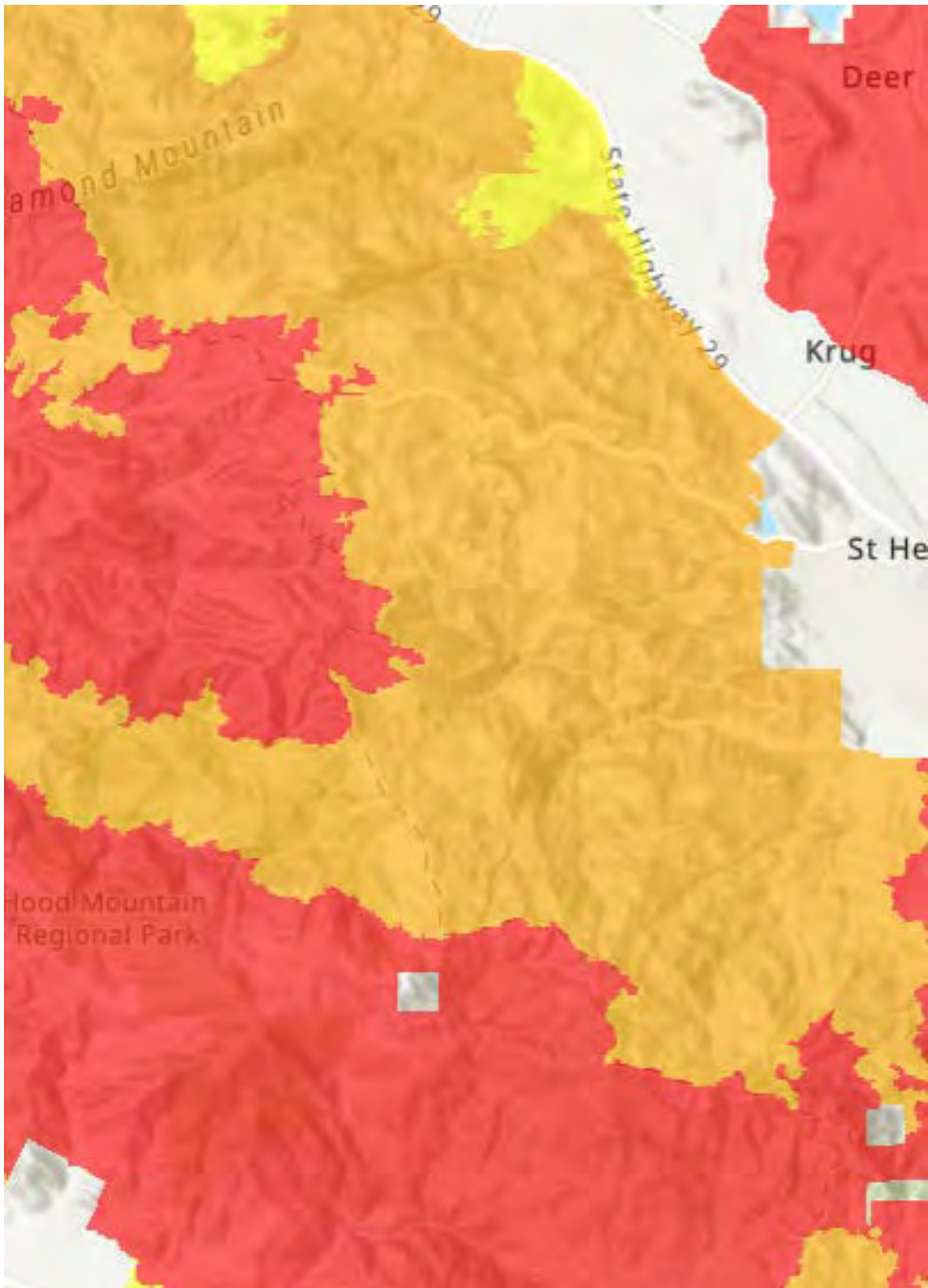


Figure 11. Distribution of \*New\* Fire Hazard Severity Zones (CALFIRE, 2022).

## J. Land Use Distribution and Neighborhoods

Residential development, on large lots is generally scattered following the winding road network. Vineyards are located among residences, and some are newly developed large lots on the edge of the community.

A large portion of the Spring Mountain area is comprised of land designated as Vacant. These parcels account for approximately 40% of the area.

Vineyards/Wineries (approximately 40%) account for most of the other areas within the Spring Mountain. These lands are adjacent to Vacant and Residential lands.

Residential parcels account for approximately 10% of the Spring Mountain area and are concentrated along Highway 29, Spring Mountain Road, White Sulphur Springs Road, Langtry Rd, and Sulphur Springs Ave. These lots are generally smaller than the Vineyard or Vacant lots.

Most lots with residential structures are large enough that the landowners can influence fire behavior to protect their structures; structures are rarely within 100-ft of the neighboring parcel. Neighborhoods in the Byrd Hill area are an exception; in these locations management practices and house construction type can either help protect or endanger neighboring properties.

Table 8. Acres by land use and percent of total within the Spring Mountain area. From the *parcel database in the Napa County GIS Open Data Portal, accessed in July, 2021.*

CATEGORY	PARCEL COUNT	AREA (ACRES)	PERCENT OF TOTAL ACREAGE
<b>AGRICULTURAL</b>	<b>54</b>	<b>4,285.9</b>	<b>39.6%</b>
CONTRACT VINE W/WINERY W/2 SFRS	1	492.0	4.5%
CONTRACT VINE W/WINERY W/3 SFRS	2	263.3	2.4%
CONTRACT LAND-VINEYARD	2	57.1	0.5%
CONTRACT VINEYARD W/1 RES	1	8.8	0.1%
CONTRACT VINEYARD W/2 SFRS	1	44.2	0.4%
CONTRACTS LAND-NON-VINEYARD	3	621.6	5.7%
VINEYARD < 5 AC W/1 RES	1	1.5	0.0%
VINEYARD > 5 AC W/1 RES	20	1,079.4	10.0%
VINEYARD > 5 AC W/2 SFRS	6	117.0	1.1%
VINEYARD > 5 AC W/3 SFRS	1	41.4	0.4%
VINEYARD > 5 AC W/4 SFRS	1	365.9	3.4%

-FINAL-

VINEYARD LAND < 5 AC	1	3.5	0.0%
VINEYARD LAND >5 AC	13	1,166.7	10.8%
VINEYARD LAND W/MISC IMPS	1	23.6	0.2%
<b>COMMERCIAL</b>	<b>30</b>	<b>1,143.4</b>	<b>10.6%</b>
COMMERCIAL IMPROVED	2	7.8	0.1%
MOTEL - B & B	1	45.6	0.4%
WINERY	2	70.3	0.6%
WINERY WITH VINEYARD	12	566.6	5.2%
WINERY/1 RES	1	10.6	0.1%
WINERY/VINEYARD/1 RES	7	248.9	2.3%
WINERY/VINEYARD/2 SFRS	3	38.4	0.3%
WINERY/VINEYARD/3 SFRS	2	155.2	1.4%
<b>RESIDENTIAL</b>	<b>83</b>	<b>1,080.4</b>	<b>10.0%</b>
MANUFACTURED HOME	1	2.0	0.0%
PARKS			
RURAL RES < 5 AC W/1 RES	40	77.1	0.7%
RURAL RES < 5 AC W/2 SFRS	7	20.6	0.2%
RURAL RES < 5 AC W/3 SFRS	1	3.9	0.0%
RURAL RES > 5 AC W/1 RES	20	596.3	5.5%
RURAL RES > 5 AC W/2 SFRS	12	295.2	2.7%
RURAL RES > 5 AC W/3 SFRS	1	42.0	0.4%
SINGLE FAMILY RESIDENTIAL	1	43.4	0.4%
<b>VACANT</b>	<b>92</b>	<b>4,325.6</b>	<b>39.9%</b>
IMPRVD LAND NON-TAXABLE	2	148.2	1.4%
VACANT LAND INDUSTRIAL	3	85.9	0.8%
VACANT LAND NON-TAXABLE	22	1,585.8	14.6%
VACANT LAND RURAL	60	2,238.7	20.7%
VACANT LOT RESIDENTIAL	1	19.1	0.2%
VACANT RURAL W/MISC IMPS	4	247.8	2.3%