CALIFORNIA POLYTECHNIC STATE UNIVERSITY

Wildland Urban Interface Assessment of San Luis Obispo, California

Senior Project

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Executive Summary

The purpose of this report is to provide a wildland fire hazard assessment of communities in the city of San Luis Obispo, California, and to identify prescriptions designed to prevent property damage and loss of life in the event of a wildfire. These prescriptions are adopted from established Shelter-In-Place communities who practice fire wise community wildfire prevention.There are eight communities that were identified as being fire prone. Each community had its own set of fire hazard, for example, flammable vegetation against a home, tall dead grass behind structures, or overhanging trees that would prevent an engine from passing. Once the problems were identified, prescriptions for each community were developed and should be followed to prevent any structure loss or life loss. Also provided in this report are vegetation maps of these communities, fire hazard severity zone maps, ingress and egress routes maps, flame length maps, and rate of spread maps. (All located in the Appendices). This report is to help prevent structures and residence from being affected from wildfires and to keep these communities safe.

Introduction

This report is a wild land fire hazard assessment of communities in San Luis Obispo (SLO), California and contains fire wise prescriptions to keep the communities fire safe. These prescriptions have been adopted from successful Shelter-In-Place communities that practice active fire prevention and have showed increased prevention of property and life loss in the event of a major fire.There are homes within San Luis Obispo that are very close if not abutting grasses and other fuels that may catch fire. These homes have a very high risk of catching fire and causing major structural damage. Our group has identified eight communities in SLO, each having their own fire hazard concerns if faced with a wildfire. These problems range from a lack of fire resistive construction in homes, overgrown vegetation close to homes, inadequate defensible space and other fire hazard s that put properties and their owners at risk. If these problems are not identified there could be a high chance of a large structure and life loss in San Luis Obispo.

San Luis Obispo is not known for having very big fires within the city. However, this could mean there is only a matter of time before one actually happens. The most recent fires within the county are the Diablo Canyon Fire (2007), Creston Fire (2005), Cuesta Fire (2003), Parkhill Fire (2003), and Highway 58 Fire (2002). By acres burned the Highway 58 Fire was the 17^{th} largest fire in California with 106,668 acres. In wildland areas that go long periods of time without fire the vegetation starts to grow and accumulate causing the fuel loads increase. Fires with large amount of fuels to burn can become very large and pose the biggest threat to structures.

The areas in San Luis Obispo City we focused on were the communities located in Wildland Urban Interfaces (WUI). WUI are “the areas where structures and other human

development meet undeveloped wildlands and their flammable vegetation" (Carle, 145). These communities in San Luis Obispo are located on the border of the city limits. Areas in the center of the city are mostly suburban and do not have any real threat of a wildland fire. Our group found eight communities in San Luis Obispo to be in High Fire Hazard Severity Zones, which means they have the most potential to be greatly affected by a wildfire. A fire severity zone map of each community is located in Appendix II.

The location of San Luis Obispo is on the central coast of California in between Monterey and Santa Barbara Counties. The nearest cities are Pismo Beach and Los Osos. The coordinates of San Luis Obispo are 32.27 N, and 120.66 W.

One of the biggest influences of wildfires is weather. Certain months in San Luis Obispo do have temperatures and precipitation levels that support wildfires. High temperatures, low precipitation and low relative humidity are conditions that pose the biggest threat for wildfires. June, July, August, and September are the four months that a wildfire would most likely occur in San Luis Obispo. The highest average temperatures in San Luis Obispo are June (73°), July (76°), August (77°), and September (77°). July and August also have the lowest precipitation levels with .02 inches and .04 inches. Relative humidity (RH) is how much moisture is in the air. A low RH means the air is dry and this causes fire to spread rapidly. Fortunately, SLO has a high RH average with around 38% being the lowest average. As compared to some parts in California this is fairly high. This is due to the fact the city is located near the coast. The closer to coast a city is the higher moisture is in the air. San Luis Obispo has the climate conditions to support wildfires so if there are long periods of hot and dry days people must be aware of the potential fire threat.

Another very large influence on wildfires is the vegetation and the fuel moisture of the vegetation. Below is a list of the vegetation of San Luis Obispo that our group identified in the WUI:

- Chaparral
- Perennial and Annual Grasses
- Eucalyptus
- Coast live oak
- California sage
- Cactus
- Redwood
- Leather oak
- Coulter pine
- Coyote brush
- Tanoak
- Manzanita
- Knobcone pine
- Monterey pine

The chaparral and the grasses pose the biggest threat in the WUI communities. During the summer month they will dry causing their fuel moisture to decrease significantly and this helps to promote large wildfires. The larger vegetation like the coulter pine, redwoods, and coast live oak cause the most damage if they were to catch fire. A way to prevent these trees from fire is to get rid of ladder fuels, which are vegetation that could carry the fire from the ground into the canopy of larger trees, like brush and chaparral. The biggest threat to the structures isn't so much direct contact with flames, but rather the embers released from the vegetation. The larger trees produce the most embers and those embers usually travel the furthest from the head of the fire making structures up to a mile away (depending on the wind gusts) a potential threat from the fire. A vegetation map for each of the eight communities is located in Appendix I.

Topography is another aspect that influences how fast a fire can spread. SLO has a substantial amount of large peeks and steep slopes. Mission Mountain has an elevation of 1,929 ft, Bishops Peak is 1,546 ft., and Lookout Hill is 1,500 ft. These three peaks are the largest within San Luis Obispo. Some of the communities we are addressing in this report are on or near these slopes which put the homes at a high risk of burning. However, most of the homes are located at the base of the hills making their chance of catching lower because wildfires spread faster uphill than downhill.

What does San Luis Obispo need in order to protect these homes? This project's goal is to provide San Luis Obispo with a fire assessment of communities located within WUI and provide recommended prescriptions adopted from established Shelter-In-Place communities in order to prevent any structure loss to homes within or near the SLO city border.

Goal

Our goal is to identify all Wildland Urban Interface zones within San Luis Obispo City and recommend Shelter- In- Place modifications within high hazard areas to reduce loss of life and property in the event of a wildland urban interface fire.

Objectives

- Use Arc Map to determine areas of interest where wildland fuels meet housing developments.
- Survey wildland areas of interest on foot for fire hazard severity by identifying the type, amount and proximity of fuels to homes and other physical features, such as topography and aspect that could affect fire behavior.

- Survey residential areas of interest for home construction, vegetation management and plant selection to determine the survivability of homes in the event of a wildland fire given the wildland conditions present.
- Identify other hazards present, both wildland and residential, that could increase risk of starting wildfires, spreading fire or cause injuries and delays during evacuation.
- Research historical and current weather conditions to determine potential average and extreme wind speeds, wind directions, high temperatures and low relative humidity that would increase fire behavior.
- Research fire history of San Luis Obispo City
- Run Flam Map using the identified fuel, topography and weather conditions of each area of interest to determine potential fire behavior.
- Develop Shelter in Place recommendations based on our findings of potential fire behavior, structural survivability and other hazards to reduce loss of life and property in the event of a wildland urban interface fire.

Procedure

In order to accomplish our goals, there were six steps we had to take:

1. Use programs such as ArcMap and Google Earth to determine all Wildland Urban Interface (WUI) regions that are significant Areas of Interest (AOI's) in San Luis Obispo.
2. Go into the field and observe and analyze the AOI's and assess each area according to criteria previously established (see METHODOLOGY).
3. Use ArcMap to digitize AOI's into maps.

4. Research each AOI's composition and history and add findings to maps created using ArcMap.
5. Develop prescription in reference to a Shelter-in-Place program.

Methodology

In order to provide an assessment of the high-risk communities in San Luis Obispo, we first had to identify which communities were high-risk. We looked at aerial images of the city to identify the areas that had large concentrations of vegetation and were adjacent to residential communities on the border of the city. Once we had identified these areas, our next step was to go out and individually assess each area in specific features pertaining to fire risk. Our assessments included the types of fuels, what kind of loading these fuels had, the proximity of these fuels to the houses in the residential areas, the style and materials used in the construction of each house, the prevalent weather conditions for each area (most importantly wind direction and intensities), possible staging areas and evacuation points, available firefighting resources, and all possible ingress and egress routes.

After assessing each area according to these criteria, we created a recommended prescription for each area that is designed to reduce and minimize the fire risk to each residential community, adopting our recommendations from Shelter-In-Place communities so as to prevent any structure loss to homes.

Results

From our results, we determined that eight communities in San Luis Obispo are at risk of wildfire. We came to these results by using ArcGIS maps of San Luis Obispo and finding

communities located near wildland areas. Once the areas were located, we went into the field to the communities locations and made observations and took photographs of vegetation, structural materials, street width, aspect, slope, and other fire hazards. Then all the notes and pictures were compiled for each community and a hazard write up was given to the eight communities. Once all the hazards were determined we gave each community prescriptions to follow in order to keep the residence and their homes safe. Maps of the community locations are located in the discussion section. For maps of vegetation in the wildland areas, ingress and egress from the communities, fire hazard severity zones, rate of spread in the wildlands, and flame length are located in the Appendices. For rate of spread and flame length we used Fire Family Plus and Flam Map 3, but the only data we had was for communities 5-8. However, these three communities have the highest risk from a wildfire and provide an example for possible fire behavior in communities 1-4.

To simulate fire behavior within the fire prone areas, Fire Family Plus and Flam Map 3 were used. Fire Family Plus was used to determine 1hr, 10hr, 100hr fuel moistures, woody fuel moisture, herbaceous fuel moisture, minimum relative humidity, max wind speed and max temperature during the months of June through September. In addition, both average and extreme weather conditions were looked at to show changes in fire behavior. These months were selected because they contain the periods of hottest and driest weather conditions that are most conducive to fire ignitions and fire spread. The data that was input into Fire Family Plus was retrieved from Historical Gridded Data located at the RAWS website (http://www.wrcc.dri.edu/fpa/). The weather conditions that were used came from the Arroyo Grande weather station. This data was used because there was no data available for San Luis Obispo and Arroyo Grande presented the most similar weather conditions (See Figures 1 & 2).

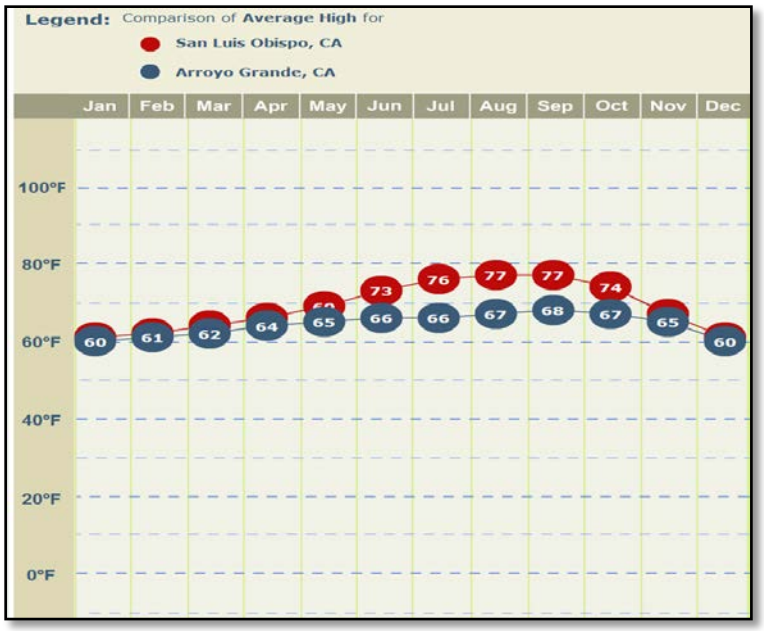

Figure 1. Average high temperatures of San Luis Obispo and Arroyo Grande

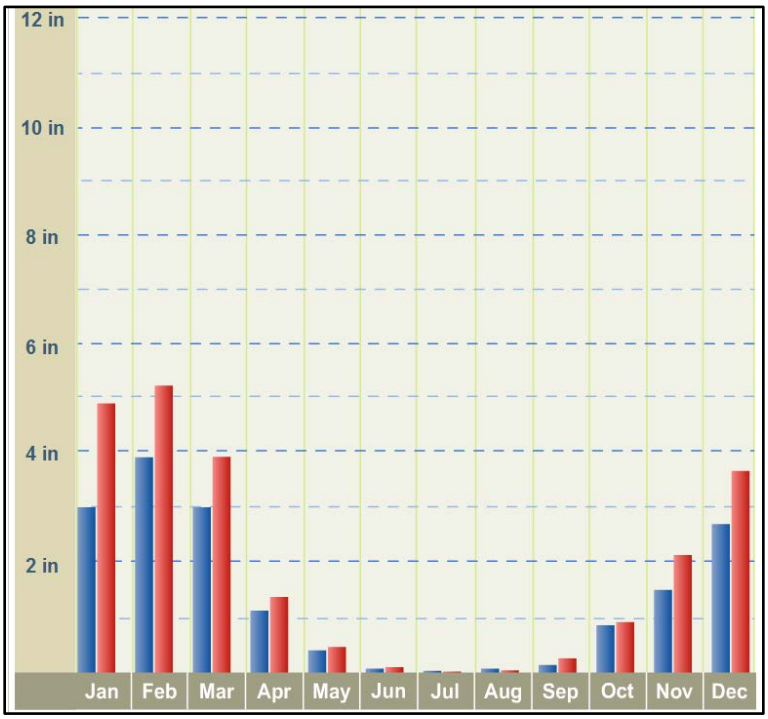

Figure 2. Average precipitation of San Luis Obispo (red) and Arroyo Grande (blue)

The next step consisted of imputing the Fire Family Plus outputs for fuel moistures and weather conditions into Flam Map 3. A landscape file with all of the known fuel models of San Luis Obispo was loaded into Flam Map 3 and provided the background for the fire spread

simulations. Once the fuel moisture and weather inputs were entered, multiple simulations were run to show flame length and rote of spread for both average and extreme weather conditions. GIS maps of the simulations for flame length and rate of spread are located in Appendix IV & V.

Discussion

This section provides an analysis of the hazards within the eight communities we identified in San Luis Obispo City (Figure 3). At the beginning of each fire prone area analysis is a map of the location of the area. Then a write up of our observations followed by pictures of the areas and a prescription of what should be done to keep the communities safe.

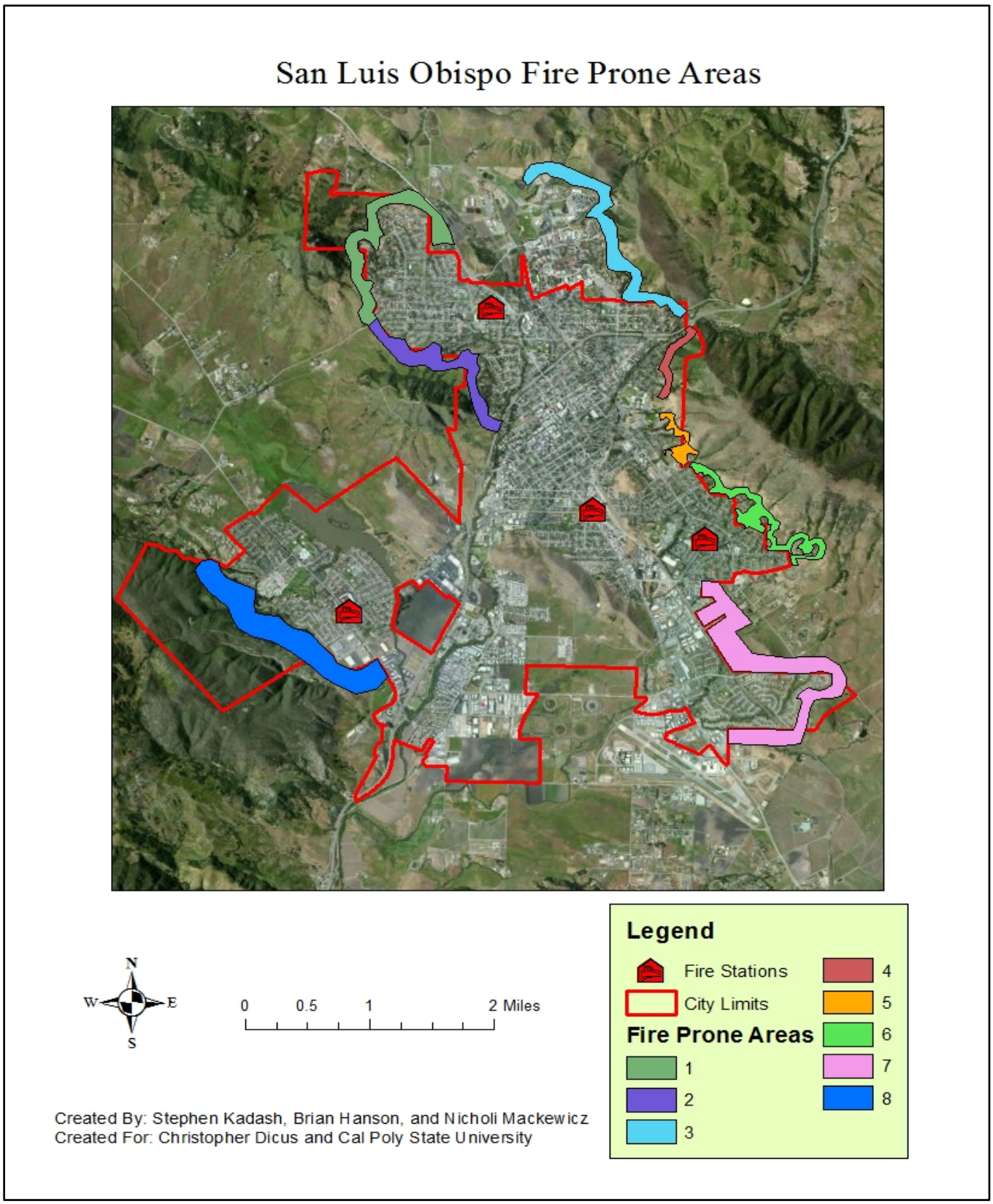

Figure 3. Fire prone areas of San Luis Obispo

Fire Prone Area 1

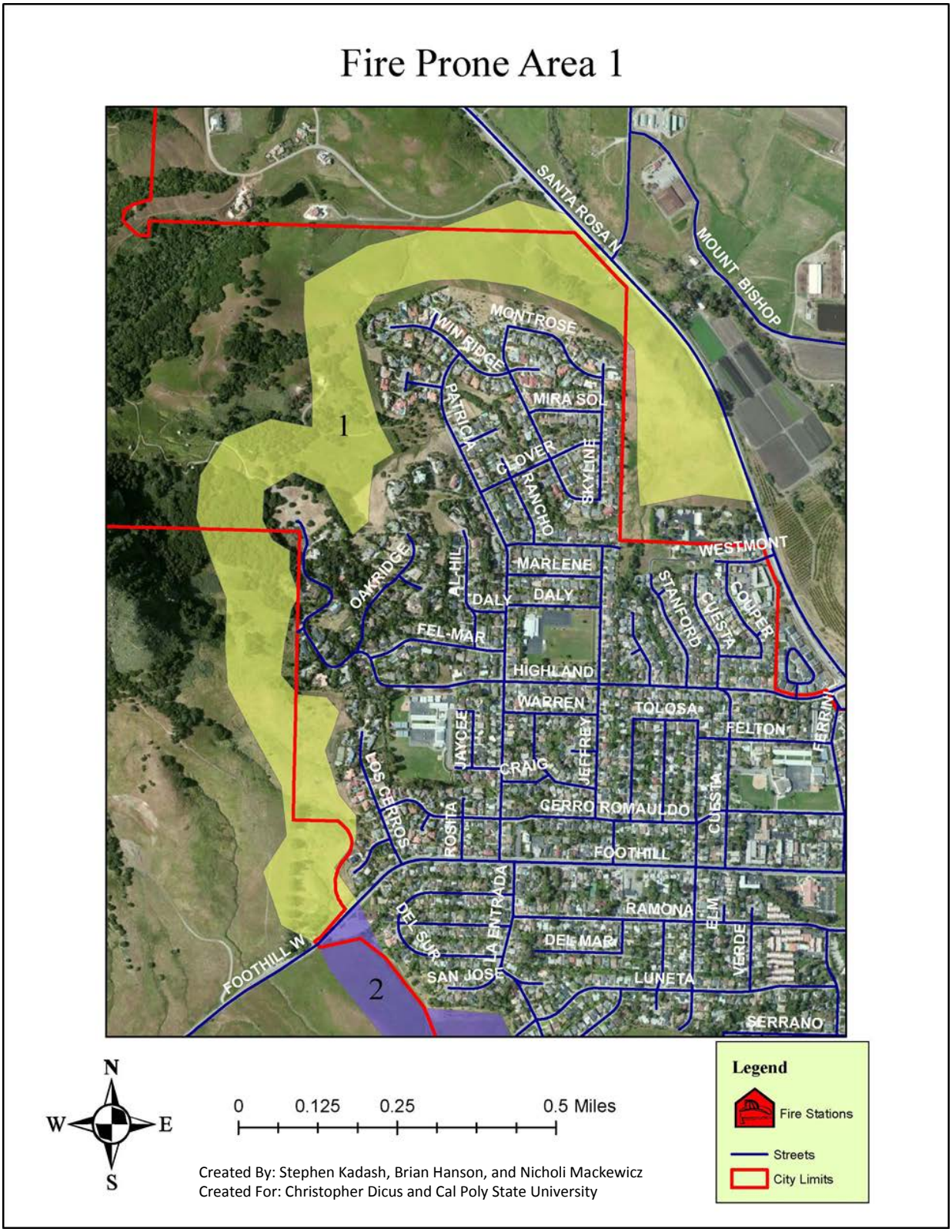

Figure 4. Fire prone area #1

This wildland interface community lies to the north of W. Foothill Blvd. and extends out just south of HWY 1 and Paseo De Caballo. Bishop's Peak resides within this area contains a mix of short to long perennial grasses, Coast Live Oak, and many chaparral species on moderate to steep slopes. A major concern for this area is the accumulation of vegetative fuels running the length of the various natural drainages that extend down into the community (Figure 5). Another potential concern is the number of hikers who frequent the area who may intentionally or un-intentionally start fires that could quickly spread downslope in the lighter grass fuels. However, most of the homes are of modern construction and exhibit fire resistive features such as stucco siding, chimney screens, and tile roofs (Figure 6). Most of the homes also showed adequate defensible space, but some had heavy fuel loading in the form of large pines close to structures which could act as a receptacle for burning embers in the event of a fire. In addition, a secondary, post fire concern is the unstable slopes at the top of some of the hills (Figure 7). Loss of vegetation due to fire with heavy post fire rains could result in mudslides and damage to downslope homes.

Figure 5. Vegetation growing up to community

Figure 6. Example of good construction and defensible space

Figure 7. Unstable slopes

Prescription

- Add additional fire warning signs along paths
- Trim the limbs of overhanging trees that come within 10 feet of homes
- Thin vegetation along drainages 100 feet away from homes
- Reduce height of perennial grasses
- Plant native vegetation on bare slopes or place other means of erosion prevention

Fire Prone Area 2

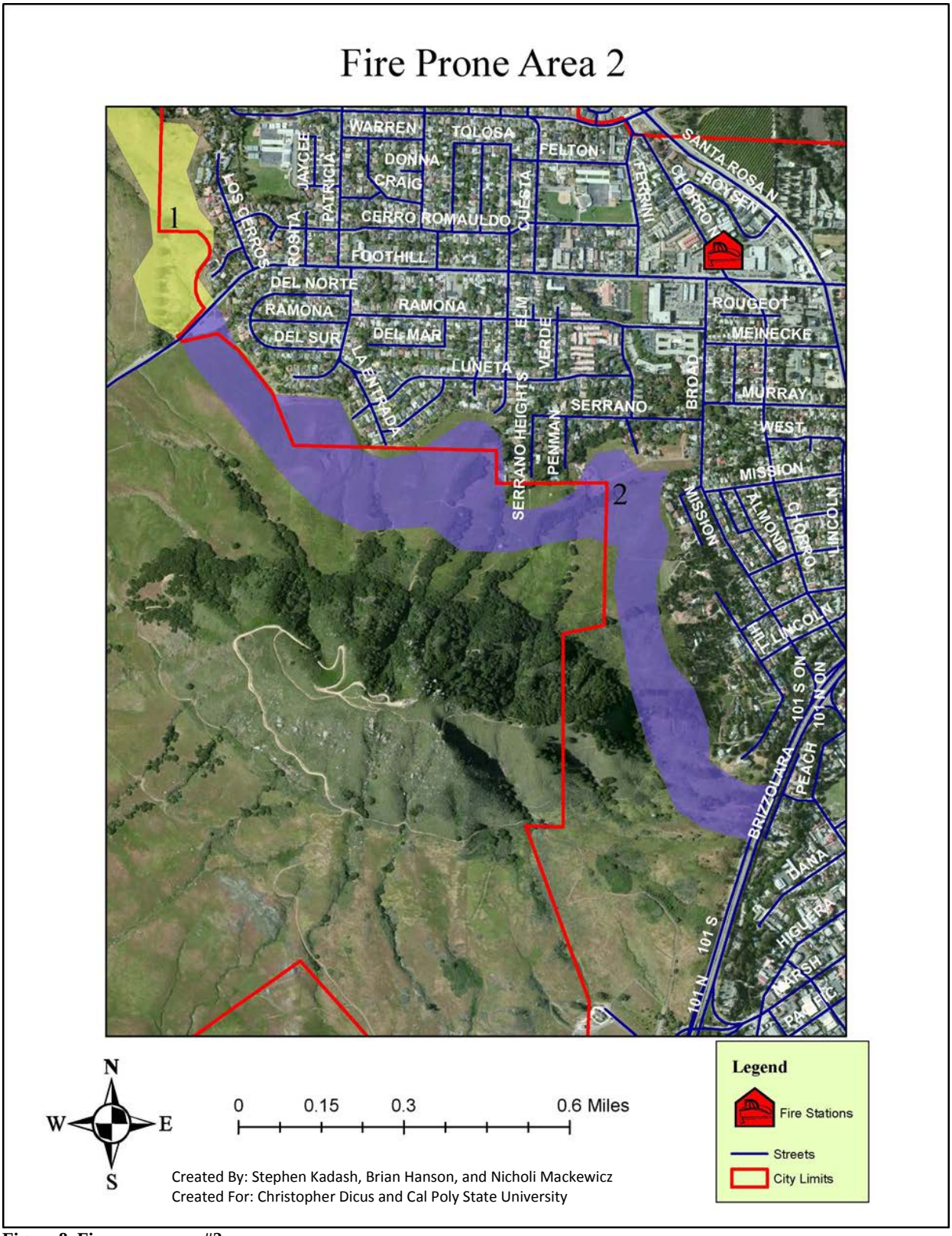

Figure 8. Fire prone area #2

This area is located south of E. Foothill Blvd. and extends to the west side of HWY 101 and Broad St. Similar to Area 1, this community lies at the base of a hillside and contains moderate to heavy levels of chaparral species, Coast Live Oak and low lying perennial grasses. However, the majority of the area at the base of the hill is covered with the low lying perennial grasses (Figure 9), reducing potential for fire spread into the community. Most homes exhibit appropriate fuel modifications given the low fuel density surrounding their homes, but some are of older construction and lack some of the modern fire resistive construction. For example, some homes in the area are built with wood siding, wood shake shingle roofs, and do not have fire screens on their chimneys. This type of construction is a concern due the placement and lack of maintenance of high flammable tree species. Many of the homes were seen with cypress and pine trees placed very close to the home and various species of palm trees with inadequate palm frond trimming (Figures 10&11). In the event of a fire in the surrounding hills it would be unlikely that the fire would cause damage due to direct flame impingement, but there is concern for burning embers igniting the dense and overgrown trees within the community causing rapid spread to the homes of older construction. In addition, due to the presence of above ground telephone and electrical wires, the over grown trees could cause issues with sparking and creating ignition from within the community.

Figure 9. Grass growing directly up to a property

Figure 10. Example of wooden roof underneath pine trees

.

Figure 11. Example of un-pruned palm tree

Prescription

Short Term:

- Remove or move Cypress and Pine trees at least 10 feet from homes
- Thin overgrown trees and branches at least 10ft way from homes and power lines
- Remove all dead or dying vegetation in tree canopy (palm fronds, branches, leaves)
- Remove all vegetation off of roofs and clean out gutters

Long Term:

- Retrofit older homes with fire resistive roofing materials
- Retrofit older homes with fire resistive exteriors
- Add fire screens to chimneys

Fire Prone Area 3

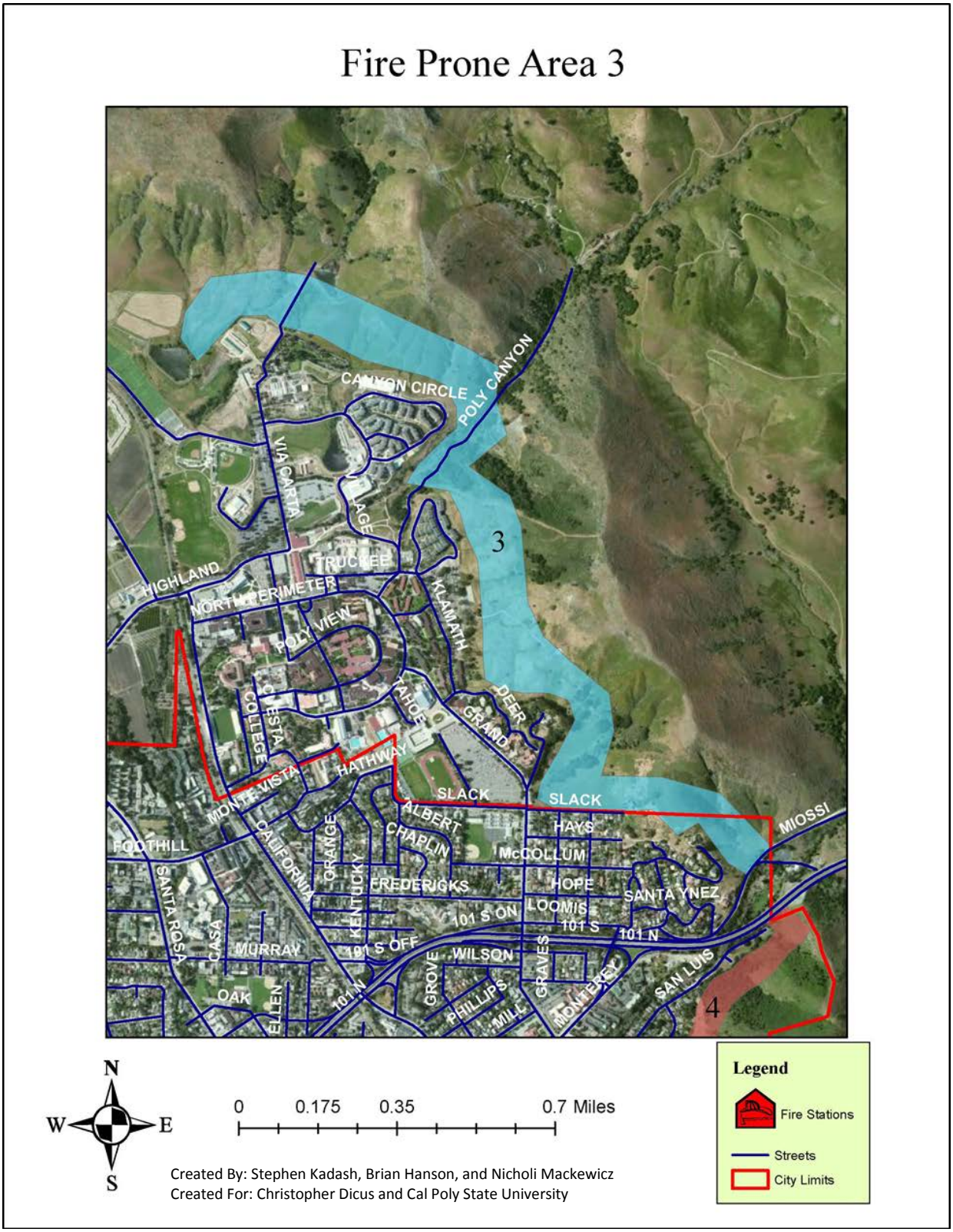

Figure 12. Fire prone area #3

This area runs from the northwest side of Miossi Rd, behind Cal Poly Campus and just past the end of Via Carta. Much of the area contains low lying perennial grasses that reside on steep slopes, which by itself is not a major issue (Figure 14). However, this area's primary fire concerns are the dense pockets of California chaparral and eucalyptus groves at the edge of campus (Figure 13). Ignitions in the light flashy grasses could easily spread into the brush and tree litter, acting as ladder fuels, and cause fire spread within the canopies of the large trees. Although there is risk for high intensity canopy fires, nearly all of the construction along the perimeter of the Cal Poly Campus is of masonry construction or more modern, fire resistive construction (Figure 15). Therefore, risk of fire spread into campus is minimal. Another concern for this area is the amount of students who frequent the trails and vegetated areas at the perimeter of campus. Signs drinking and smoking behind vegetative pockets, suggests that there could be increased risk for ignitions in this area (Figure 16). Also, to the south east portion of this area lies an older community south of Slack St. Direct flame impingement is not a major concern due to the road barrier, but airborne embers pose a serious threat to the homes that lack fire resistive construction (Figure 17). Many of the homes in the community are constructed of wood siding, wood shake shingle roofs and exhibit poor eave construction (Figure 18). Coupled with the amount trees placed closed to homes and lack of vegetative maintenance, embers could easily land in trees and ignite structures (Figure 19).

Figure 13. Example of thick pockets of chaparral with road fuel break

Figure 14. Example of grass fuels on steep slopes

Figure 15. Example of student housing building showing fire resistive construction

Figure 16. Example of potential ignition source from student activities

Figure 17. Example of Slack St. as road fuel break


Figure 18. Example of wood shake shingle roof

Figure 19. Dead tree behind home and within 10 feet of the structure

Prescription

Short Term

- Post fire warning signs behind the dorms
- Reduce ladder fuels bellow Eucalyptus groves
- Remove or trim trees to be least 10 feet away from homes

Long Term

- Retrofit homes with fire resistant roof materials
- Retrofit homes with fire resistant siding

Fire Prone Area 4

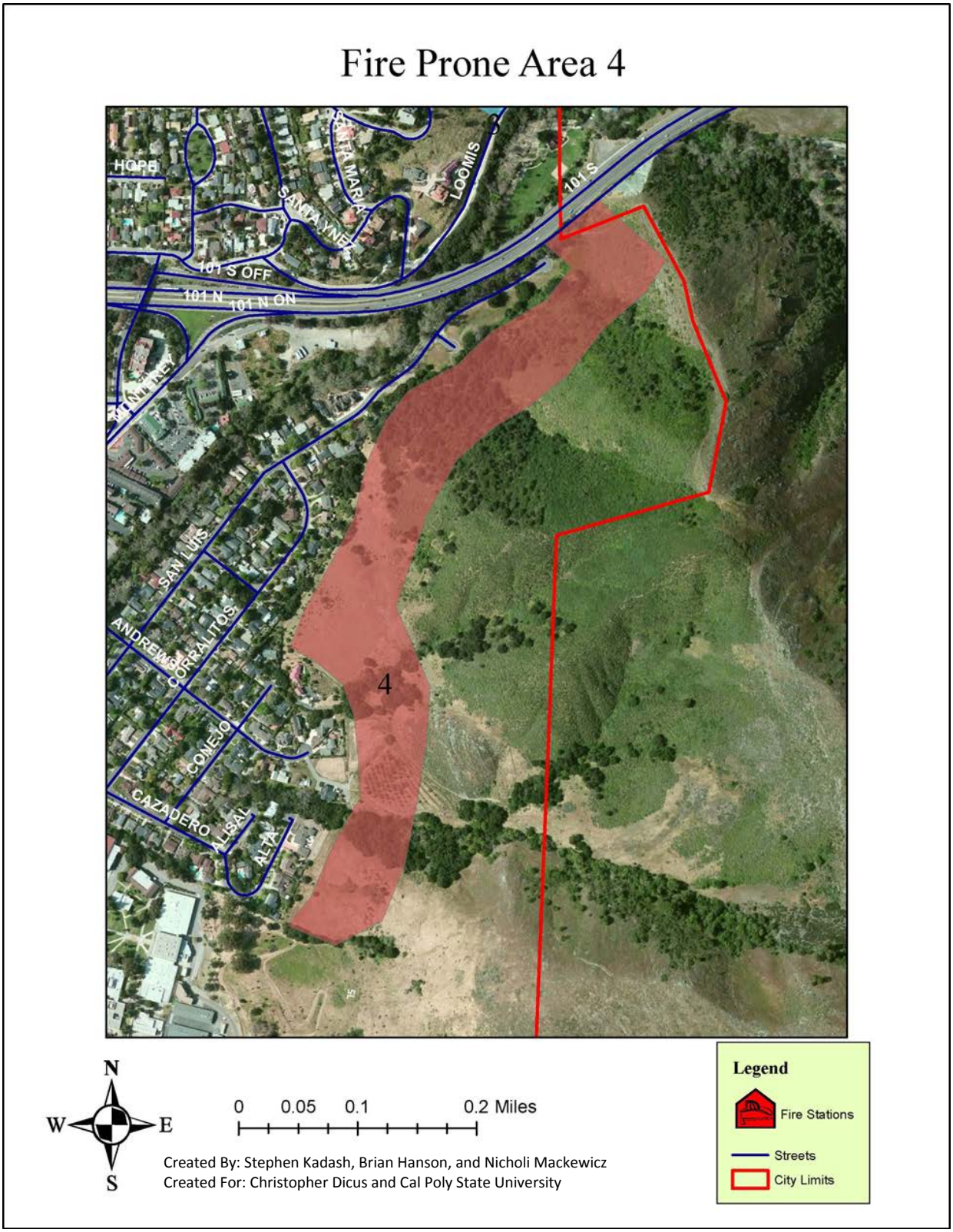

Figure 20. Fire prone area #4

This area is located near Highway 101 along San Luis Street, north of San Luis Obispo High School. This community's biggest threat is tall perennial and annual grasses behind the homes on the hillside. Along with the grasses there is also eucalyptus lining some of the streets and large hanging coast live oak. There is brush under some of the coast live oak that could ladder into the trees making this area susceptible to a canopy fire (Figure 21). East of the community are steep slopes, but fortunately all the homes are at the base of the slopes. There is a low chance of a high intensity fire coming into direct contact with the homes. However, there are homes in this community that do have wood shingled roofs with some having a lot of tree litter on top of them. This is a hazard that could result in a structure loss and would pose a threat to homes within a close proximity. Another observation was a lot of homes had flammable vegetation very close to them (Figure 22). Cypress was the most predominant close vegetation and these plants light very quickly and cause very high intensity flames. One of the residences on Andrew Street had a large wood pile in their front yard which could be a potential start to a fire in the community (Figure 23). The pile was also located next to dry grasses so the fire would spread quickly if the pile were to ignite.

Figure 21. Ladder fuels with grasses and coast live oak along San Luis St.

Figure 22. Wooden deck with vegetation underneath and tree against a home

Figure 23. Woodpile on Andrew St. in a residents front yard

Prescription

- Create a 30 foot fuel modification zone behind the homes that come next to the tall grasses.
- Remove or move the cypress trees located near the homes
- Remove all tree litter from the wood shingled roofs.
- Trim the limbs of trees that come within five feet of the homes
- Remove the large wood pile from the front yard on Andrew Street
- Trim the coast live oak up to at least six feet to prevent a ladder into the canopy
- Trim the shrubs that are beneath the trees as well as the grasses

Fire Prone Area 5

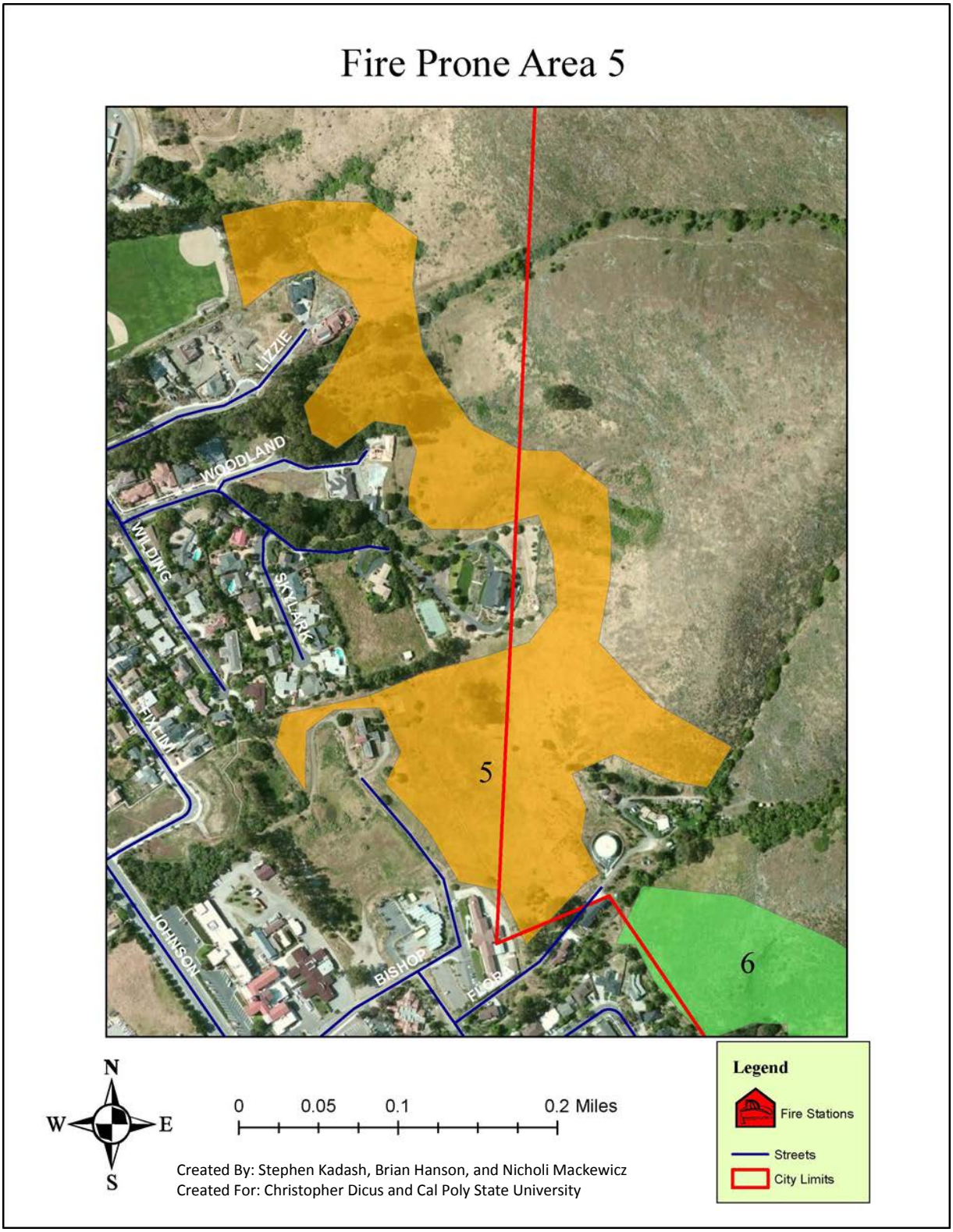

Figure 24. Fire prone area #5

This community is located in between Lizzie Street and Bishop Street running east, parallel to Johnson Street. This first observation was the new construction at the top of Lizzie Street could be a source of ignition for this fire season. The homes are surrounded by tall perennial and annual grasses that could catch an ember from power tools used during construction and start a fire (Figure 26). Trucks from the construction site were parked in fire lanes that would make it very difficult for an engine to turn around or even pass through this community (Figure 25). Vegetation was mostly grasses with cactus, sage, and eucalyptus. Some of the homes had wood shingles, but were clear of tree litter. A few homes did have vinyl siding which could melt in the event of a fire and which would open up holes in the siding for embers to enter into the homes. Homes on the border of the community had grasses come up against the side of the homes causing a direct flame threat. In the more wooded areas of the community there were very thin streets with trees over hanging the road. The low hanging trees would make it impossible for an engine to pass through and if the engine were to make it up the street there was no area for the engine to turn around.

Figure 25. Narrow street with overhanging vegetation

Figure 26. Home construction with dry grass adjacent to the site

Figure 27. Sign indicating high fire danger at the beginning of the Lizzie St. trail

Prescription

- A 30 foot fuel modification zone surrounding the eastern side of the community
- Spark arrestors on any power equipment used during construction of new homes
- At least a 13 foot clearance of trees overhanging the streets
- A turn around should be constructed in areas that have very narrow roads and no cul-de-sac at the end

Fire Prone Area 6

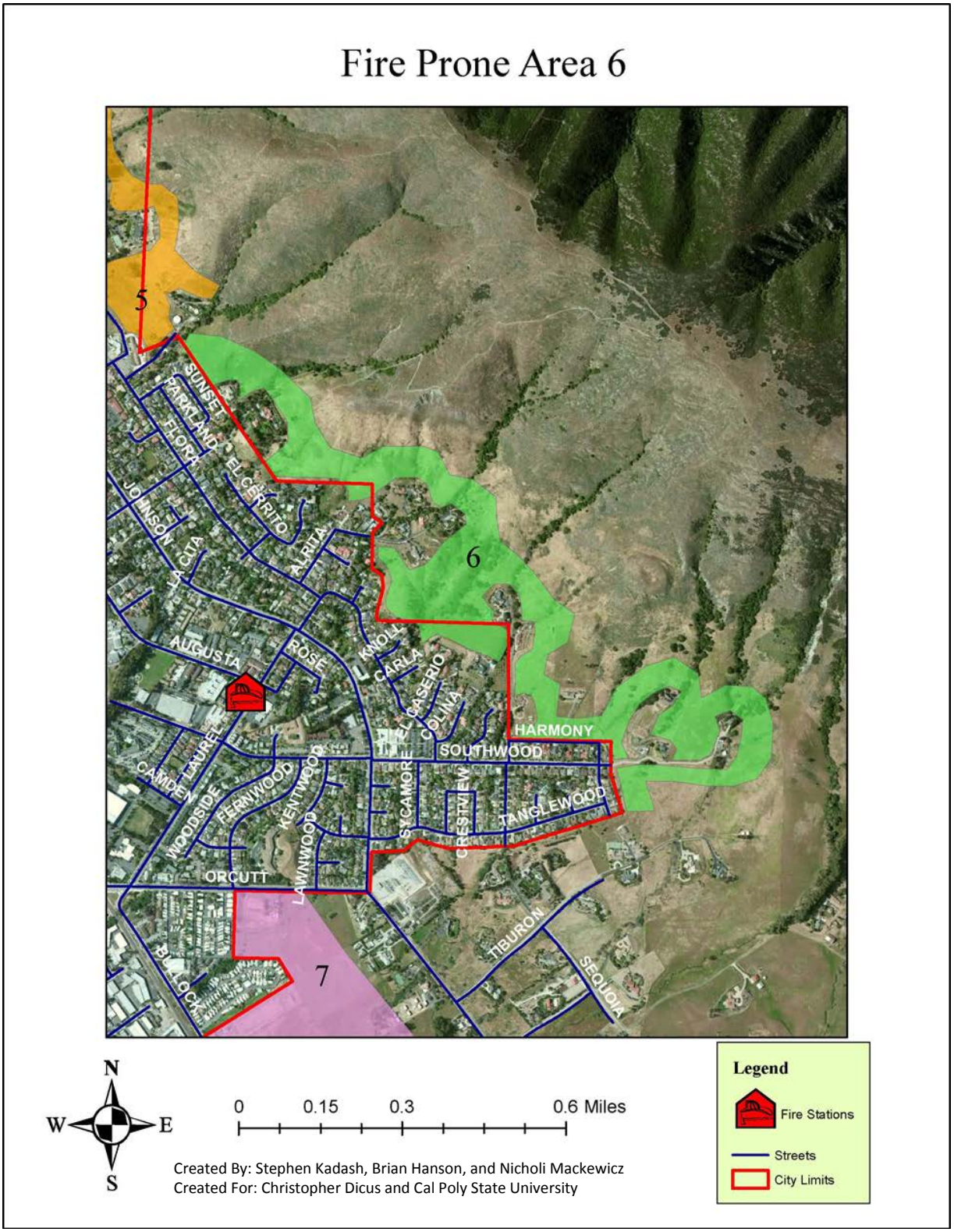

Figure 28. Fire prone area #6

Area six is located between Sunset Street and Tanglewood Street running parallel to Johnson Street. Many homes in this community were built before fire codes were established (Figure 30). Most of the homes use materials that are very susceptible to wildfire. These homes have wood siding, unboxed eaves, and wood shingles. If these homes were to catch fire the surrounding homes would be very susceptible and there is a high risk of large structure loss. Fortunately, the wind blows from the North West to South East so in the case a fire were to start in the older part of this community the wind would blow it away from the rest of the San Luis Obispo. Some areas also have a lot of flammable vegetation located on steep slopes with structures located above (Figure 29). Behind the community there are tall grasses and chaparral. The homes are located at the base of steep slopes. During the summer months these grasses will dry and make fire potential very high and if the grasses are not maintained then the fire will have a high intensity as well.

Figure 29. A house with flammable vegetation near the home and underneath the balconies

Figure 30. Older construction home with wood siding

Prescription

- A 30 foot fuel modification zone surrounding the eastern side of the community
- Fire resistant vegetation should be the only allowable plants used near the homes
- Removal of cypress and other highly flammable vegetation near the homes especially the older homes
- Sprinklers should be added to the older wood and vinyl siding homes to prevent the sides from catching fire from embers

Fire Prone Area 7

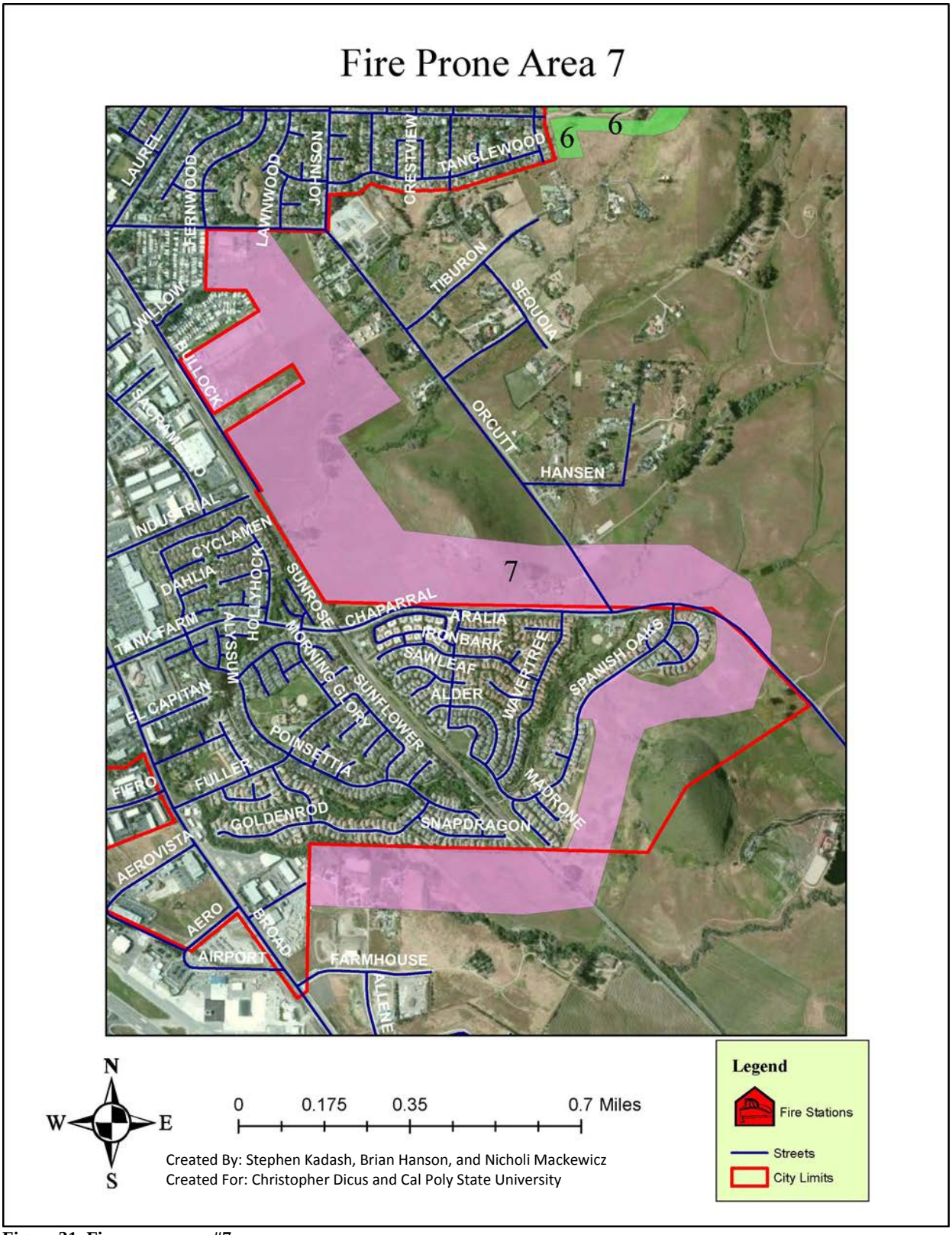

Figure 31. Fire prone area #7

This area is located near the intersection of Tank Farm Road and Orcutt Road, near Islay Hill. The vegetation ranges from chaparral to tall grasses to pastures (Figure 32). There are also several small clumps of planted trees, including eucalyptus and palm trees, which are mostly located around houses and yards (Figure 33). There are a few transmission lines that run across this area, and a power station located in the northeast corner of the area. During the day and evenings, there is usually a medium wind that blows west-east that could potentially help the spread of a fire. Many of the houses in this area are older homes that have wooden roofs, which could be susceptible to spotting in a wind-driven fire event. There are also a lot of modern homes that are surrounded by defensible space. In a few areas, the vegetation grows directly under and up to the transmission lines, which is a potential ignition source for a fire (Figures 34 & 35). There are several routes that could be utilized as both ingress and egress points, and plenty of large open areas that could be used as either evacuation points or staging areas (Appendix III). A few of the homes are accessible only via private roads that are only a single lane wide and run back up into the base of the surrounding hills. There are train tracks that are located near the edge of this area, at the base of Islay Hill and near the long grass and chaparral, as well as a eucalyptus stand. This could serve as another ignition point.

Figure 32. Vegetation around Islay Hill

Figure 33. Vegetation located around a house

Figure 34. Vegetation growing underneath an up to transmission lines

Figure 35. Un-pruned palm trees located under transmission lines

Prescription:

- Trim the trees surrounding each home so that they become minimal fire hazards
- Maintain clearance under and around transmission lines
- Update roofing materials to reflect fire-wise standards
- Trim eucalyptus and other trees up to ten feet to eliminate fuel ladders into crowns
- Prune heavy-litter trees such as palms and eucalyptus
- Cut back long grasses at the start of the fire season

Fire Prone Area 8

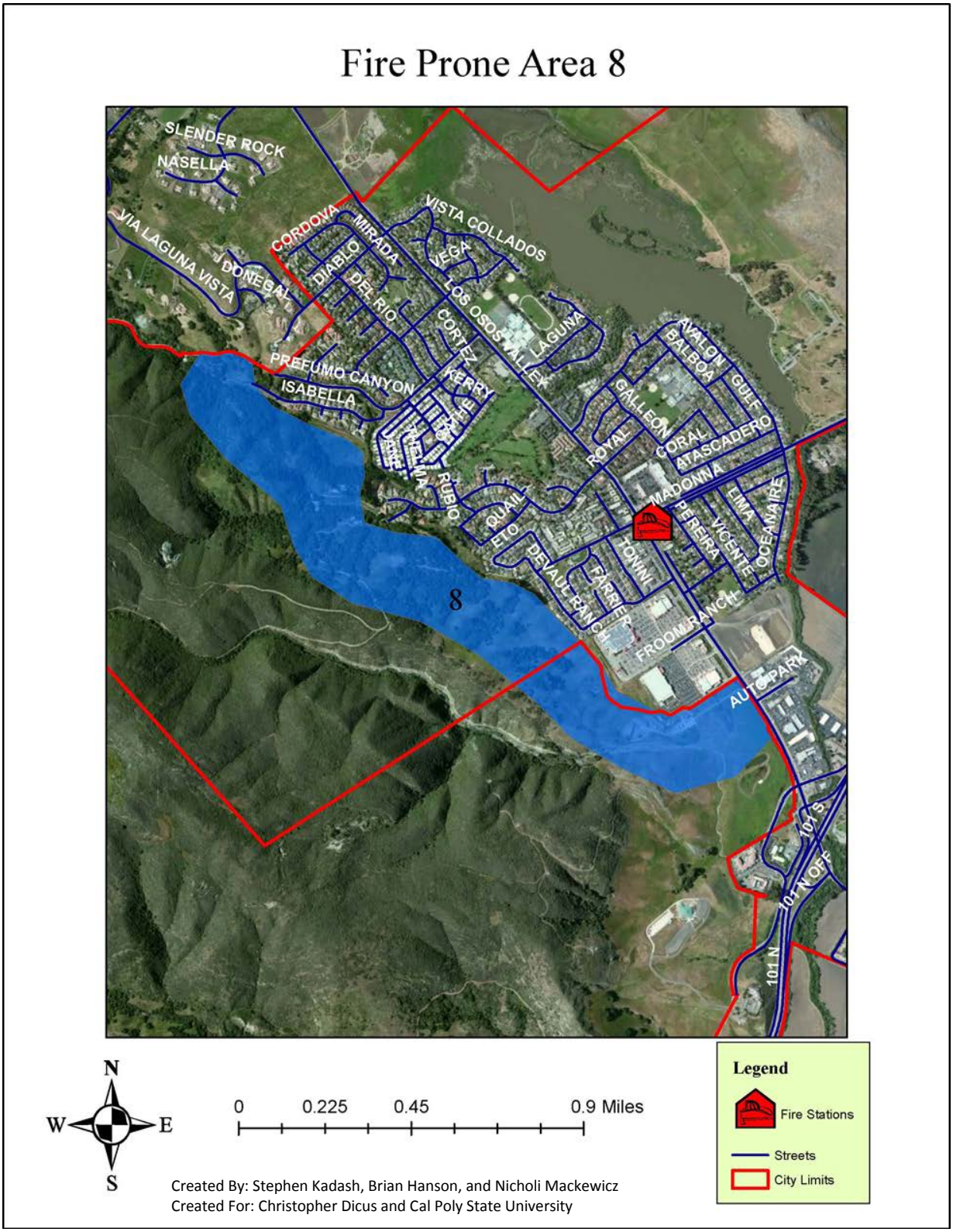

Figure 36. Fire prone area #8

This area is located in the Irish Hills area of the southern portion of San Luis Obispo, near the intersection of Los Osos Valley Road and Prefumo Canyon. The Irish Hills are composed of steep slopes with heavy vegetation comprised of coast live oak woodlands, tall perennial and annual grasses, and several planted eucalyptus stands that act as windbreaks. There is heavy brush under the coast live oaks, which could both carry a surface fire as well as provide a fuel ladder into the canopy. The tall grasses grow directly up to the eucalyptus stands, which are un-pruned and have heavy loads of litter at their bases, providing excellent fuel ladders for fire (Figure 37). All of the homes are located at the base of the slopes (Figure 38), but there are strong down slope winds that could contribute to fire spread. Some of these homes have been observed to have wood decking that is either too close to or abutting against the walls of the house. There are also several properties that have un-pruned vegetation growing either directly up against or hanging over houses (Figure 39), including one property that had dead palm leaves lying directly on top of a wooden roof, providing a perfect fuel ladder from the tree to the home (Figure 40). There are many hiking trails that cut through this area, which introduces a large human-caused ignition possibility. There are also transmission lines that run over part of this area, creating another potential ignition source. There are several large areas nearby that could be used as evacuation points or staging areas, such as a small park near the base of the hills, and nearby parking lots of businesses such as Costco and Home Depot

Figure 37. Example of ladder fuels at the base of Eucalyptus tree

Figure 38. Homes located at base of Irish Hills

Figure 39. Un-pruned vegetation growing directly up to home

Figure 40. Un-pruned palm tree overhanging wooden roof

Prescription:

- Trim the eucalyptus up to at least ten feet to prevent fuel ladders into the crown
- Prune such heavy-litter trees such as palms and eucalyptus that are close to houses
- Maintain clearance under and around transmission lines
- Update outdoor decking to meet fire safety standards
- Trim the shrubs that form the heavy understory underneath the coast live oak groves
- Maintain trail maintenance around hiking trails

Conclusion

This project focused on prescriptions that were developed from the fire hazards that were observed within each of the eight fire prone areas that were found in San Luis Obispo City. Areas that we designated as being fire prone should take the proper steps in keeping their homes fire safe. The first line of defense in these communities is the defensible space of at least 30 feet around the homes bordering the wildland areas. Flammable vegetation needs to be removed or continuously pruned if they are located near the homes. Roads and trails should be maintained in order to have a safe ingress for fire engines to travel and egress for civilians to evacuate. Piles of debris should be spread out or removed to prevent a large ignition sources. For older homes, the homeowners should be aware of the risk involved in living with less fire resistive construction and materials. In addition, they should consider retrofitting their homes with modern roofing and siding materials. The best way to keep these communities safe is to educate the public about

wildfires and living in WUI communities. More people are starting to move into wildland areas and they need to know what to do to keep themselves and their homes safe.

San Luis Obispo has had wildfires in the past and will have more in the future. This area has the climate and fuels to produce large wildfires. If WUI areas are not maintained there is a very high chance for ignition and sustained fire spread throughout the fire prone communities if appropriate fire hazard mitigation is not practiced. Preparation for wildfires is essential for the survival of structures and their residence in the event of a wildfire. With these prescriptions the San Luis Obispo WUI communities will suffer less property loss and reduce the chance of injuries or fatalities. These plans and prescriptions should be taken into consideration by the governing agencies of San Luis Obispo and the homeowners themselves for the future safety of community.

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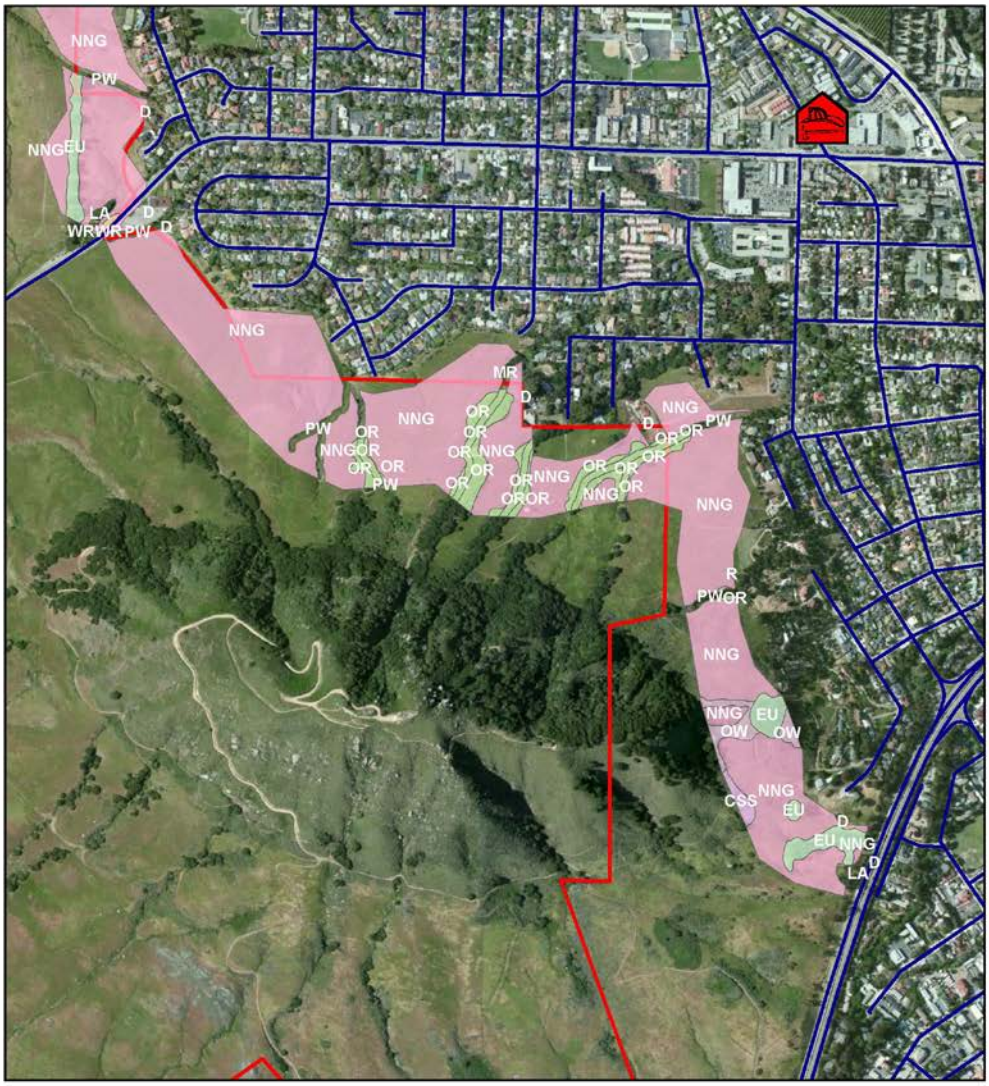
Appendix I

Vegetation in Fire Prone Area 1

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Vegetation in Fire Prone Area 2



0 0.125 0.25 0.5 Miles

N
W E
S

Legend

Bay-Oak Woodland	Eucalyptus Woodland	Oak-Sycamore Riparian	Serpentine Grassland
Cactus Scrub	Non-native Grassland	Ruderal	Sycamore Riparian
Chaparral	Oak Riparian	Serpentine Chaparral	Willow Riparian
Coastal Sage Scrub	Oak Woodland	Serpentine Coastal Sage Scrub	Willow-Sycamore Riparian

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Vegetation in Fire Prone Area 3

0 0.175 0.35 0.7 Miles

N
W E
S

Legend

Bay-Oak Woodland	Eucalyptus Woodland	Oak-Sycamore Riparian	Serpentine Grassland
Cactus Scrub	Non-native Grassland	Ruderal	Sycamore Riparian
Chaparral	Oak Riparian	Serpentine Chaparral	Willow Riparian
Coastal Sage Scrub	Oak Woodland	Serpentine Coastal Sage Scrub	Willow-Sycamore Riparian

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Vegetation in Fire Prone Area 4

0 0.075 0.15 0.3 Miles

N
W E
S

Legend

Bay-Oak Woodland	Eucalyptus Woodland	Oak-Sycamore Riparian	Serpentine Grassland
Cactus Scrub	Non-native Grassland	Ruderal	Sycamore Riparian
Chaparral	Oak Riparian	Serpentine Chaparral	Willow Riparian
Coastal Sage Scrub	Oak Woodland	Serpentine Coastal Sage Scrub	Willow-Sycamore Riparian

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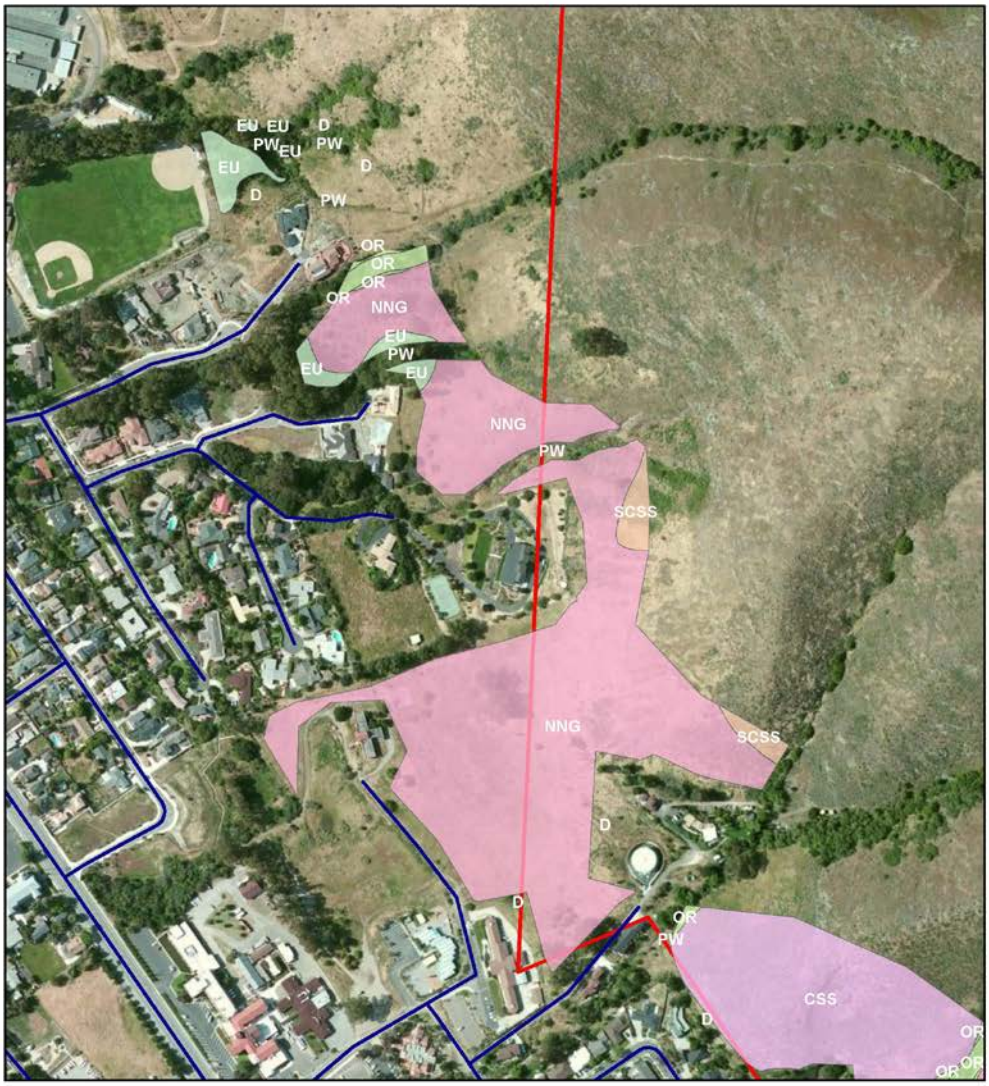
Created For: Christopher Dicus and Cal Poly State University

Vegetation in Fire Prone Area 5



0 0.05 0.1 0.2 Miles

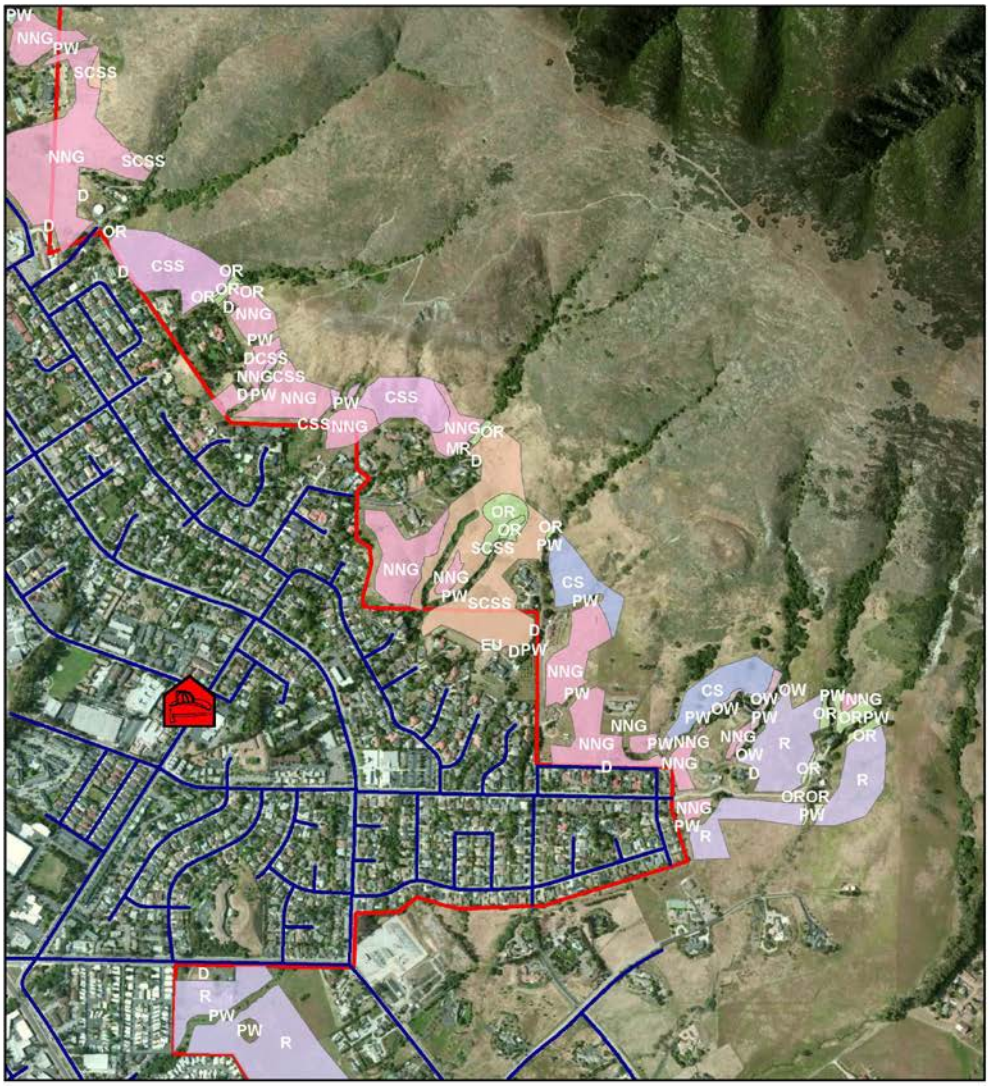
N
W E
S

Legend

Bay-Oak Woodland	Eucalyptus Woodland	Oak-Sycamore Riparian	Serpentine Grassland
Cactus Scrub	Non-native Grassland	Ruderal	Sycamore Riparian
Chaparral	Oak Riparian	Serpentine Chaparral	Willow Riparian
Coastal Sage Scrub	Oak Woodland	Serpentine Coastal Sage Scrub	Willow-Sycamore Riparian

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Vegetation in Fire Prone Area 6



Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Vegetation in Fire Prone Area 7

0 0.175 0.35 0.7 Miles

N
W E
S

Legend

Bay-Oak Woodland	Eucalyptus Woodland	Oak-Sycamore Riparian	Serpentine Grassland
Cactus Scrub	Non-native Grassland	Ruderal	Sycamore Riparian
Chaparral	Oak Riparian	Serpentine Chaparral	Willow Riparian
Coastal Sage Scrub	Oak Woodland	Serpentine Coastal Sage Scrub	Willow-Sycamore Riparian

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Created For: Christopher Dicus and Cal Poly State University

Vegetation in Fire Prone Area 8

0 0.2 0.4 0.8 Miles

N
W E
S

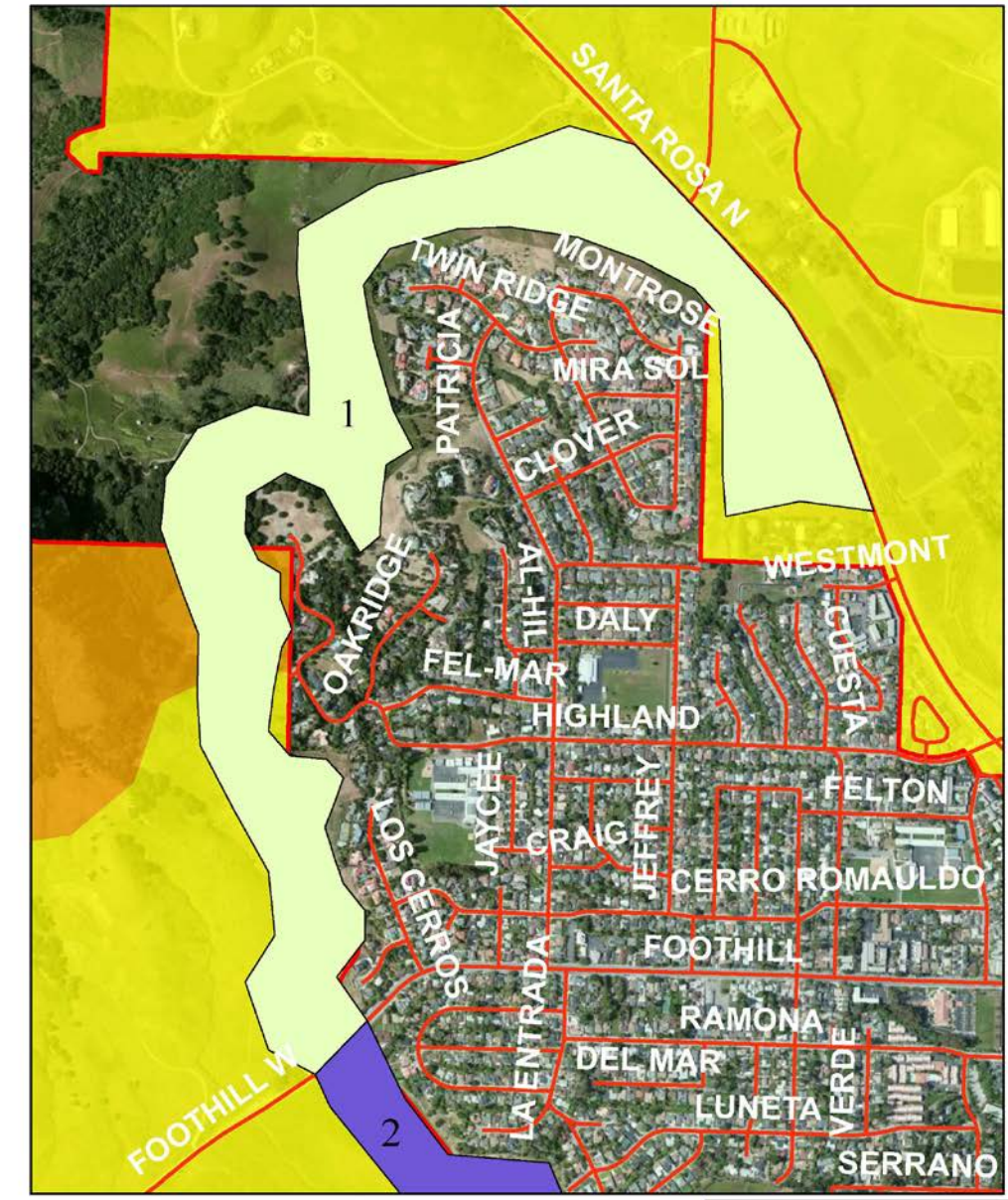
Legend

Bay-Oak Woodland	Eucalyptus Woodland	Oak-Sycamore Riparian	Serpentine Grassland
Cactus Scrub	Non-native Grassland	Ruderal	Sycamore Riparian
Chaparral	Oak Riparian	Serpentine Chaparral	Willow Riparian
Coastal Sage Scrub	Oak Woodland	Serpentine Coastal Sage Scrub	Willow-Sycamore Riparian

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

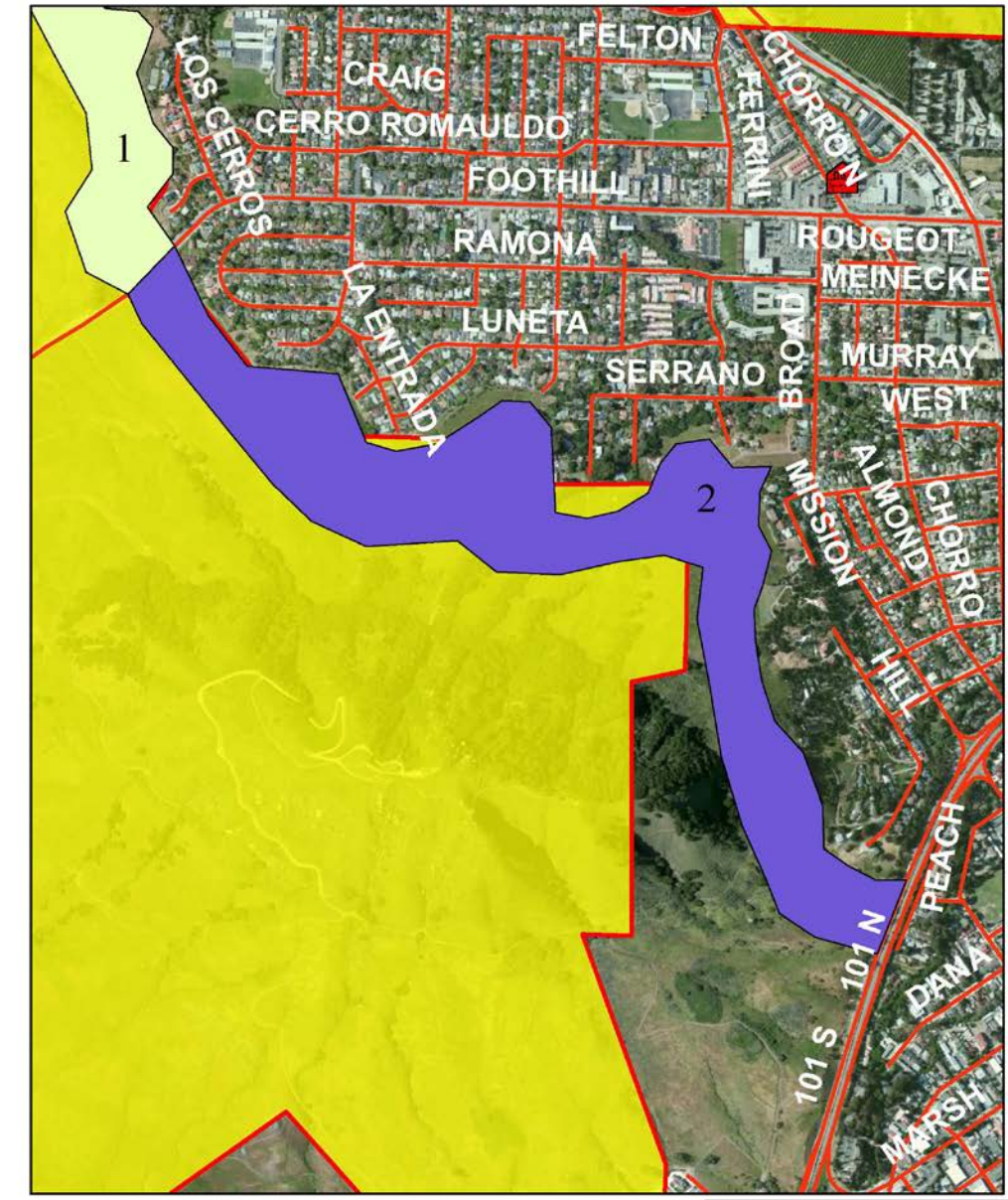
Appendix II

Fire Hazard Severity Zones in Fire Prone Area 1



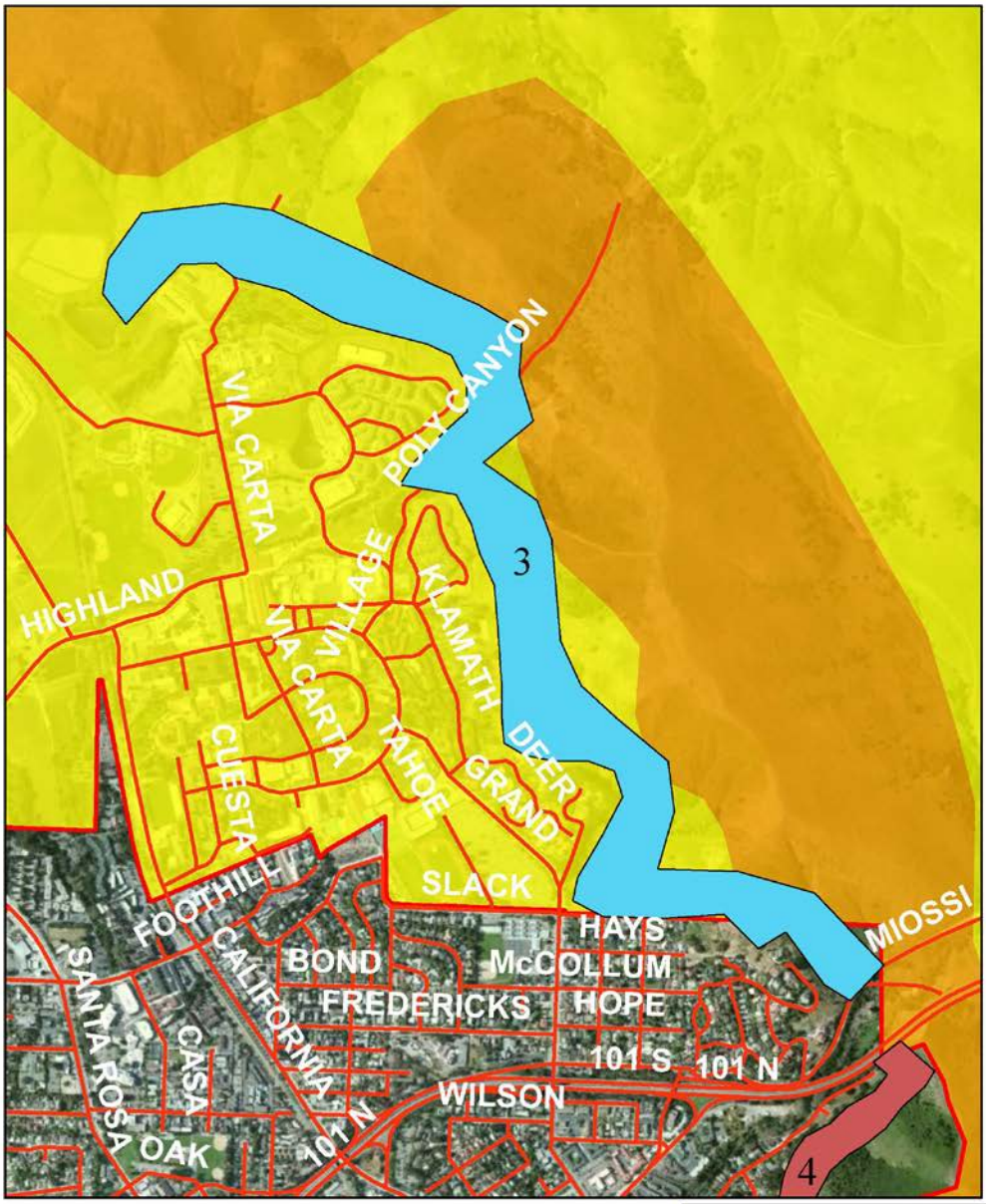
Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

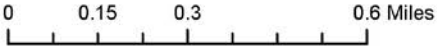
Fire Hazard Severity Zones in Fire Prone Area 2



Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Fire Hazard Severity Zones in Fire Prone Area 3





Legend

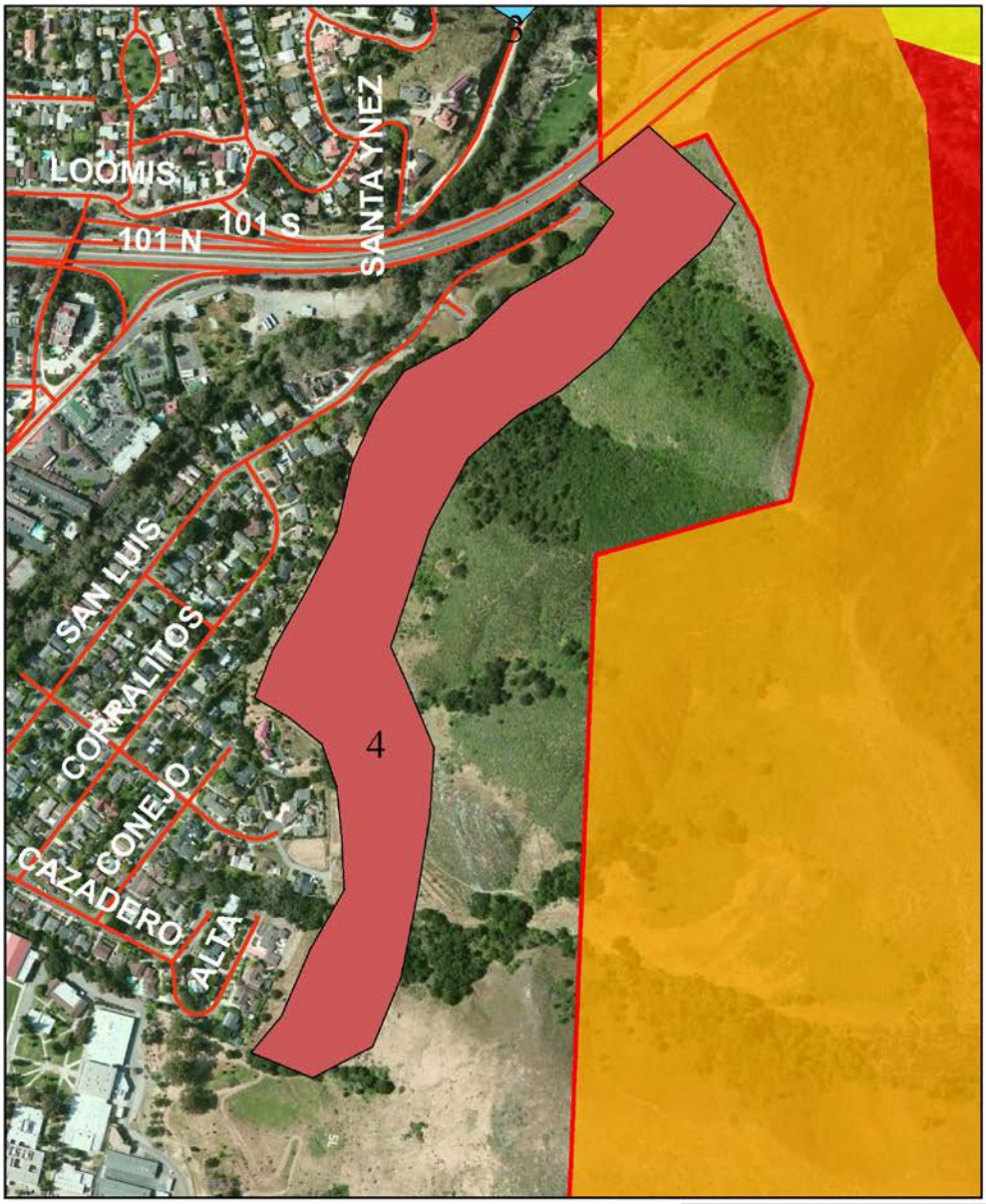
Fire Hazard Severity Zones

FHSZ

- High
- Moderate
- Very High

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Fire Hazard Severity Zones in Fire Prone Area 4



N
W E
S

0 0.05 0.1 0.2 Miles

Legend

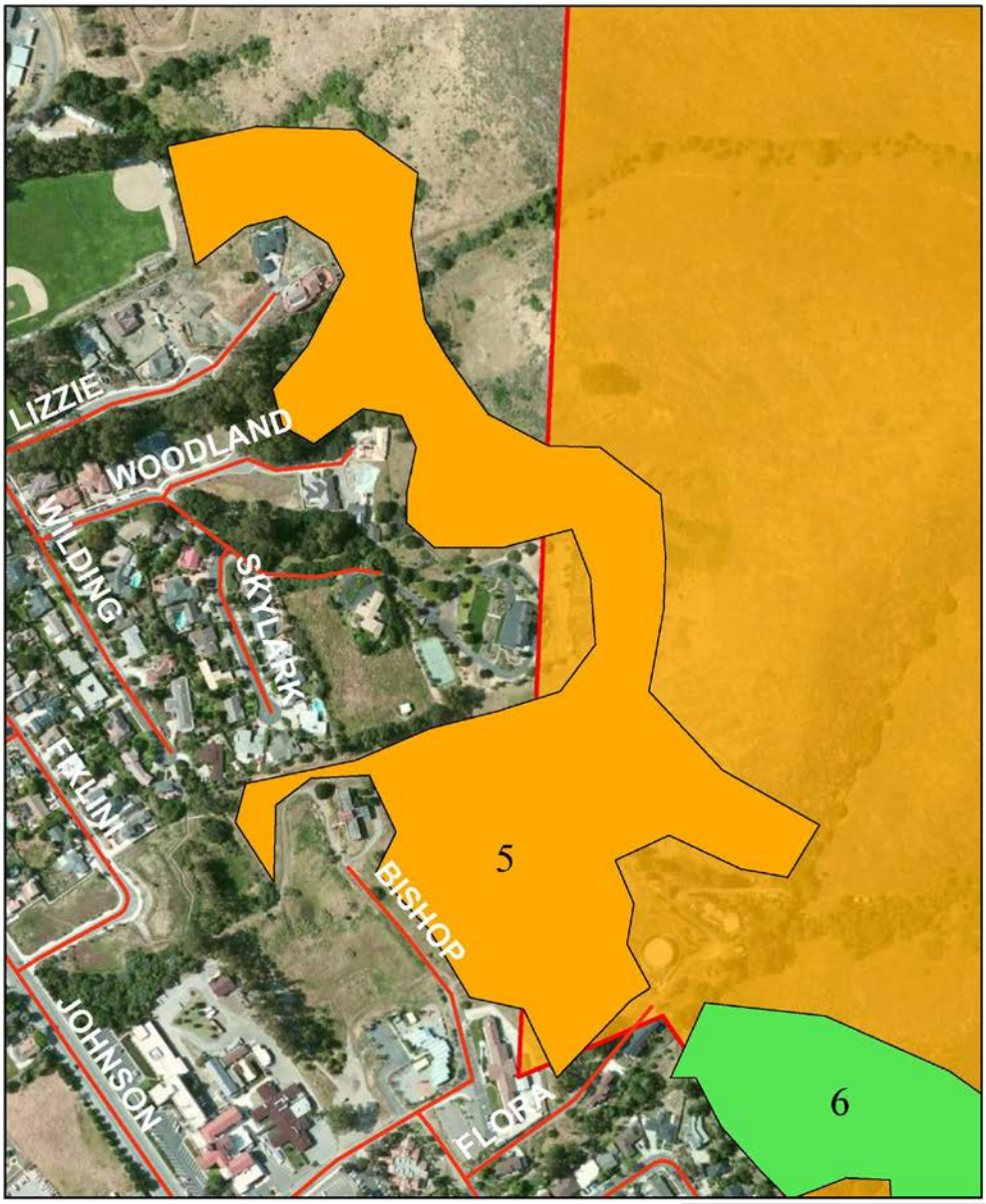
Fire Hazard Severity Zones

FHSZ

- High
- Moderate
- Very High

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Fire Hazard Severity Zones in Fire Prone Area 5



0 0.05 0.1 0.2 Miles

Legend

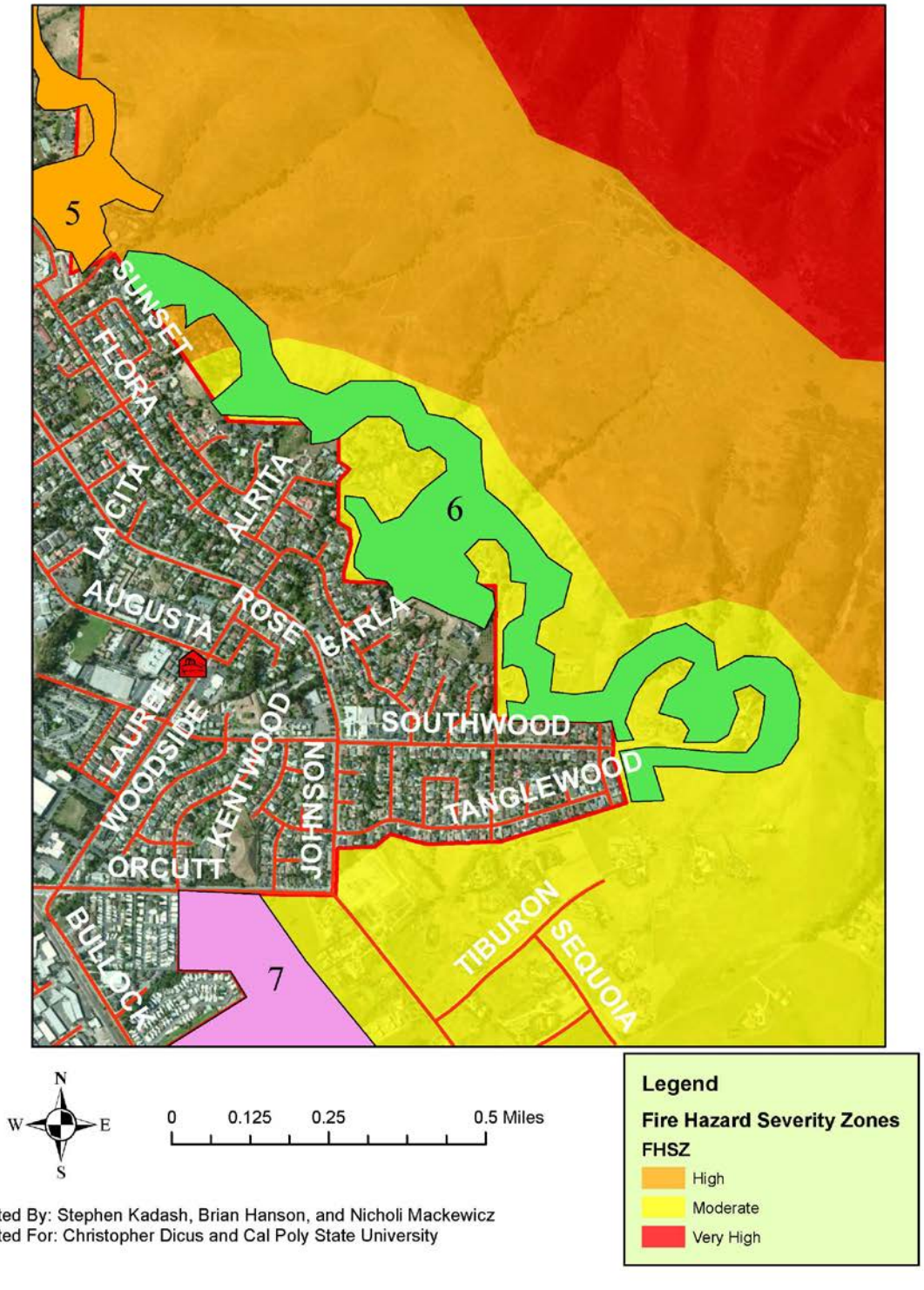
Fire Hazard Severity Zones

FHSZ

- High
- Moderate
- Very High

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Fire Hazard Severity Zones in Fire Prone Area 6



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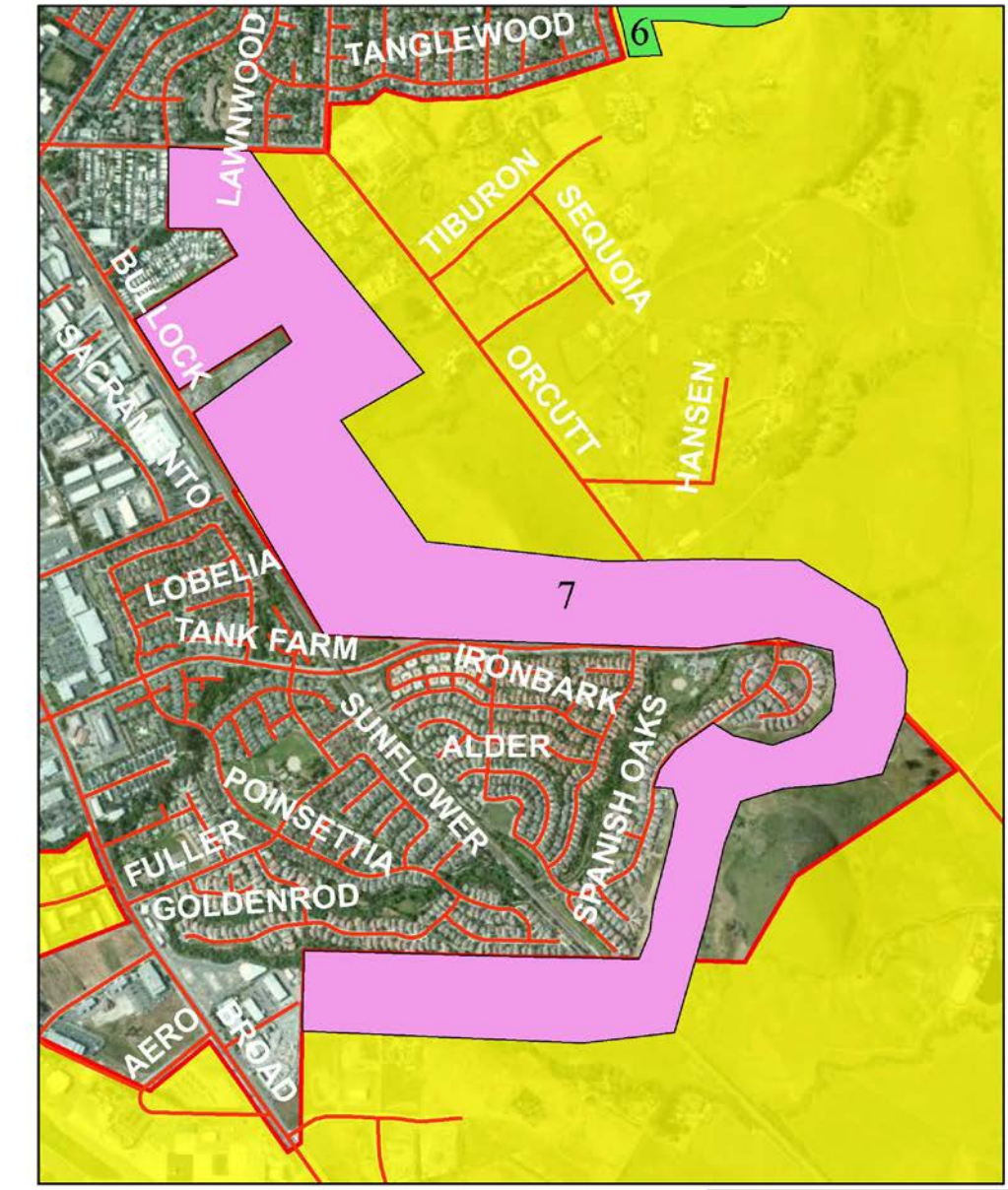
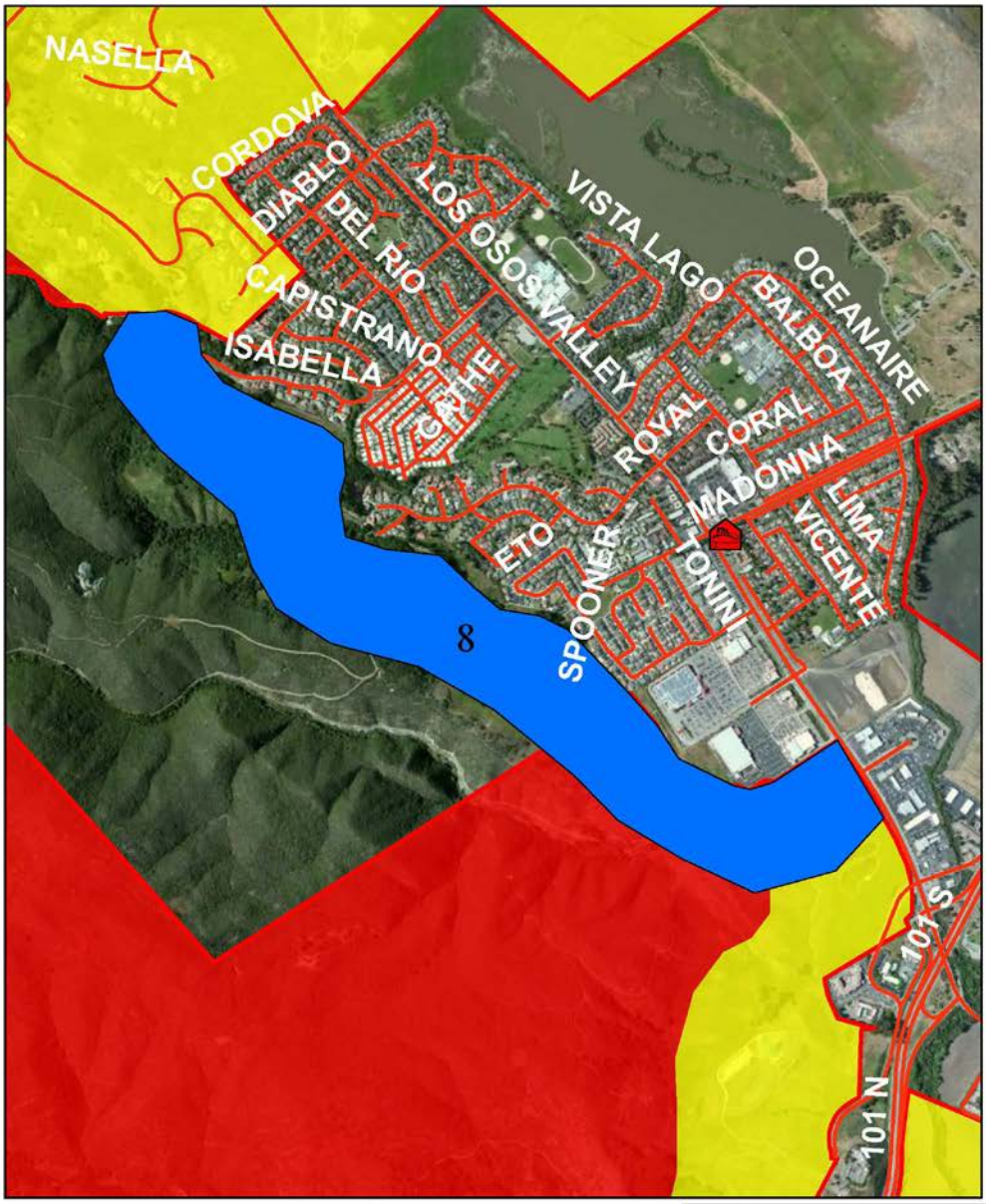
Created For: Christopher Dicus and Cal Poly State University

Fire Hazard Severity Zones in Fire Prone Area 7



Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Fire Hazard Severity Zones in Fire Prone Area 8



0 0.2 0.4 0.8 Miles

Legend

Fire Hazard Severity Zones

FHSZ

- High
- Moderate
- Very High

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Appendix III

Main Ingress and Egress Roads in Fire Prone Area 1

N
W E
S

0 0.125 0.25 0.5 Miles

Legend

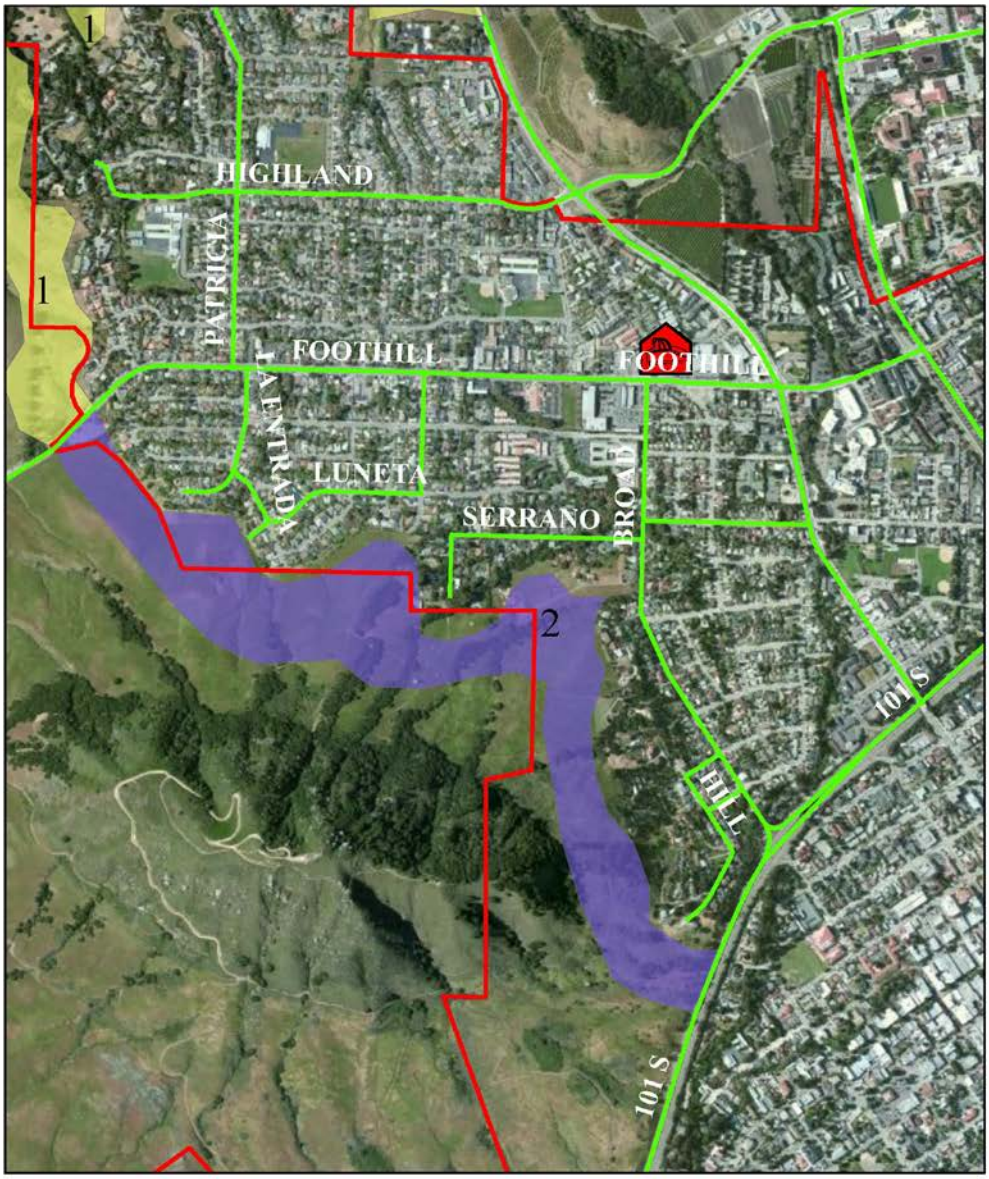
Fire Stations

Main Ingress and Egress

City Limits

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Main Ingress and Egress Roads in Fire Prone Area 2



0 0.15 0.3 0.6 Miles

Legend

- Fire Stations
- Main Ingress and Egress
- City Limits

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Main Ingress and Egress Roads in Fire Prone Area 3

N
W E
S

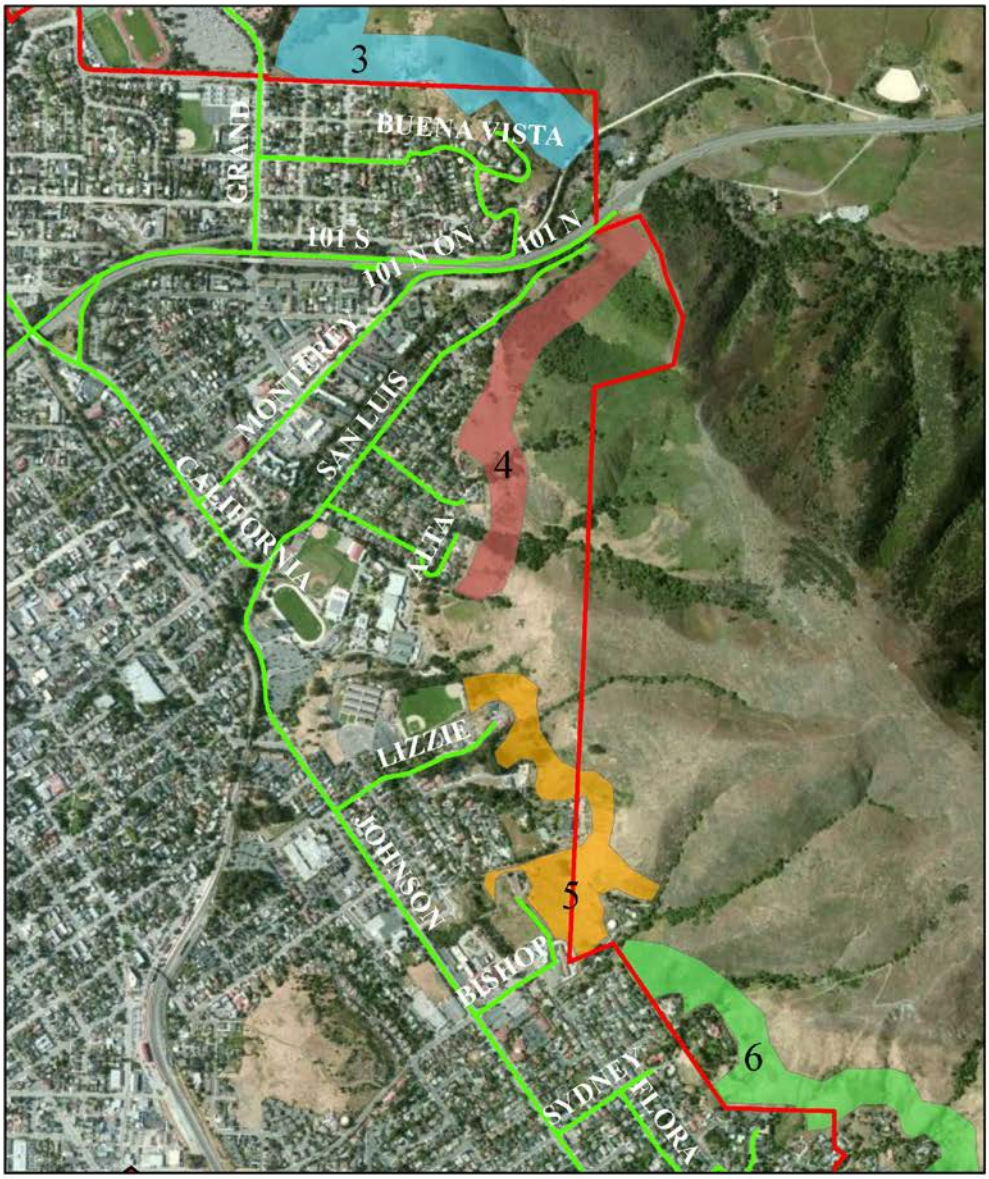
0 0.15 0.3 0.6 Miles

Legend

- Fire Stations
- Main Ingress and Egress
- City Limits

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Main Ingress and Egress Roads in Fire Prone Area 4 & 5



N
W E
S

0 0.15 0.3 0.6 Miles

Legend

- Fire Stations
- Main Ingress and Egress
- City Limits

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Main Ingress and Egress Roads in Fire Prone Area 6

N
W E
S

0 0.125 0.25 0.5 Miles

Legend

- Fire Stations
- Main Ingress and Egress
- City Limits

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Main Ingress and Egress Roads in Fire Prone Area 7

0 0.15 0.3 0.6 Miles

Legend

- Fire Stations
- Main Ingress and Egress
- City Limits

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Main Ingress and Egress Roads in Fire Prone Area 8

N
W E
S

0 0.2 0.4 0.8 Miles

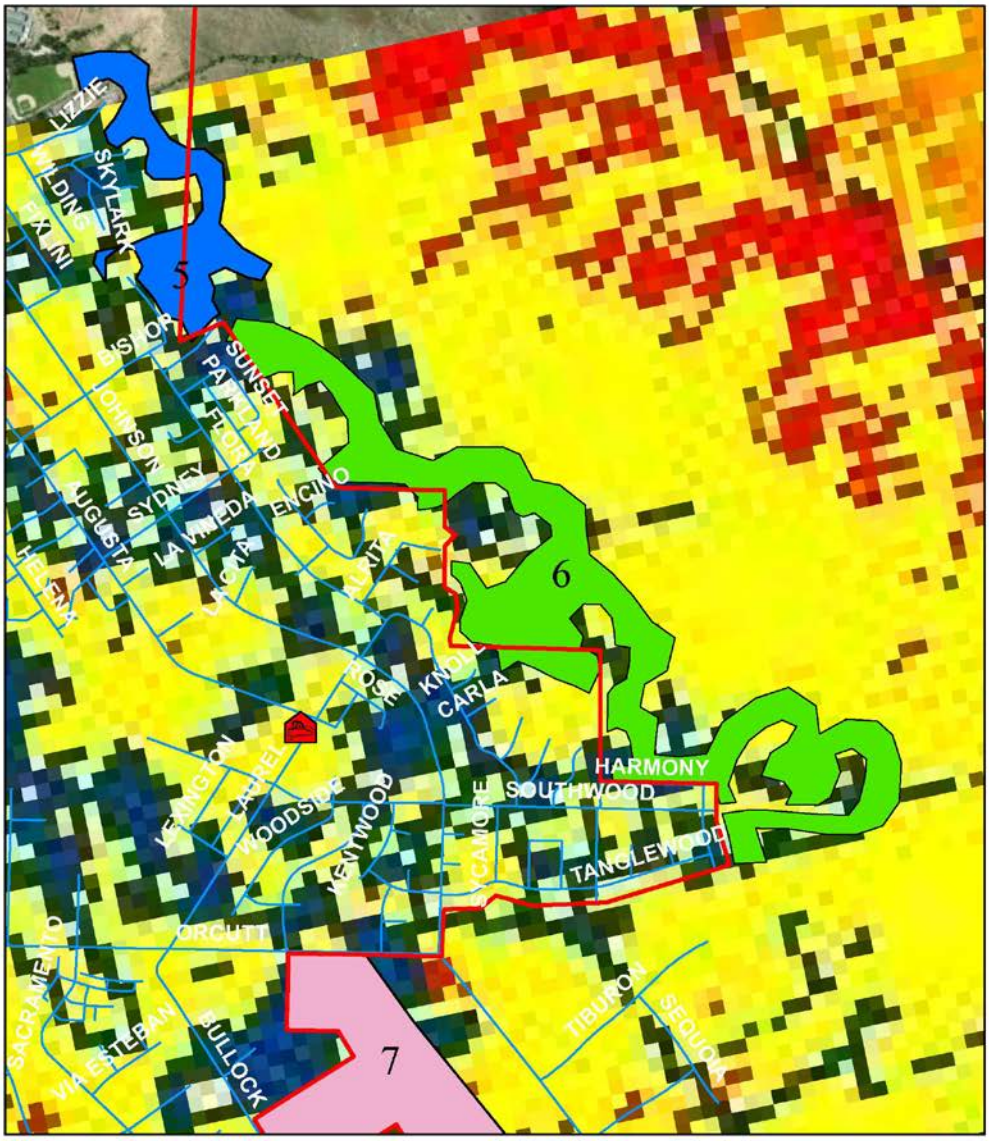
Legend

- Fire Stations
- Main Ingress and Egress
- City Limits

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Appendix IV

Flame Length Average Conditions in Fire Prone Areas 5 & 6



0 0.15 0.3 0.6 Miles

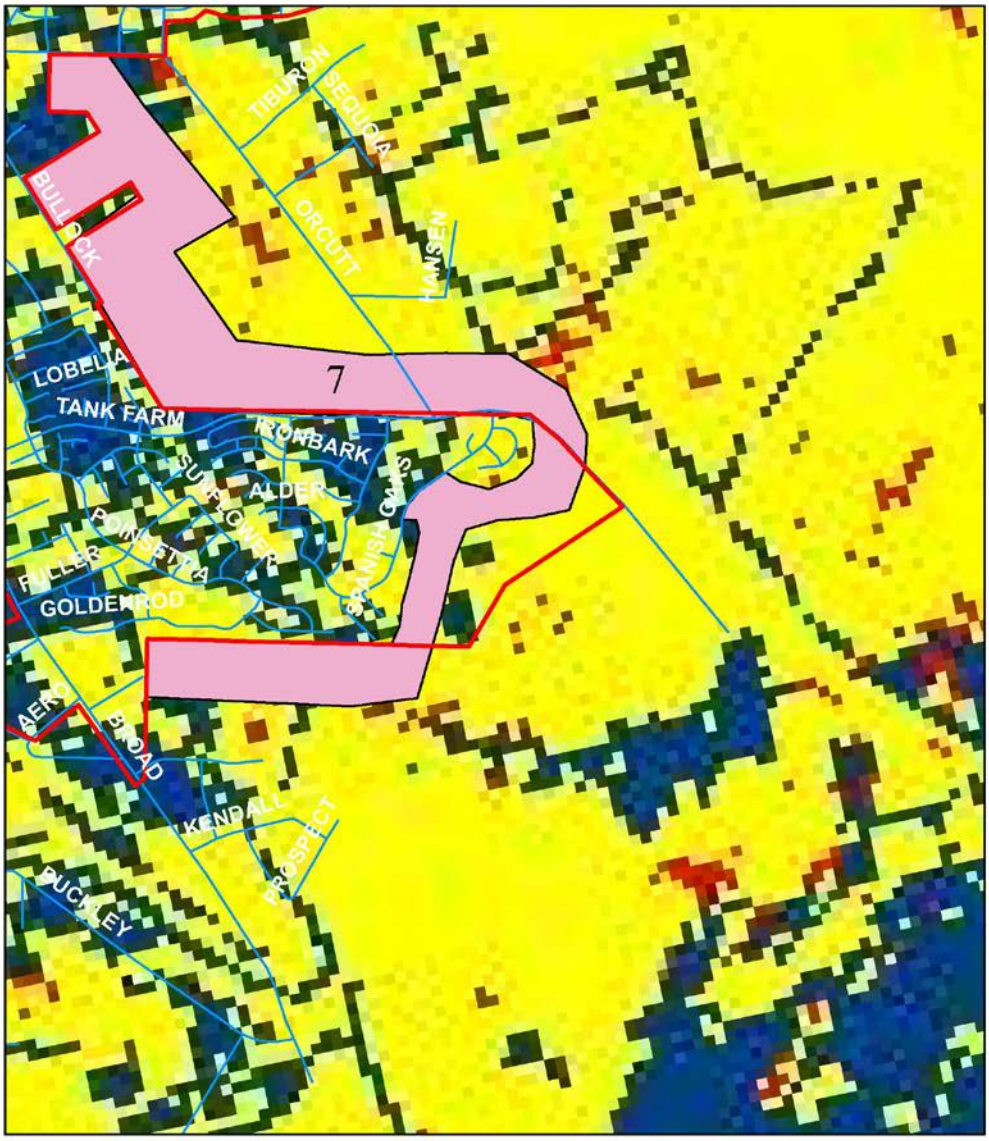
N
W E
S

Legend

City Limits | 0 | 11
Streets | 4 | 20
Flame Length (ft) | 8

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Flame Length Average Conditions in Fire Prone Area 7



0 0.2 0.4 0.8 Miles

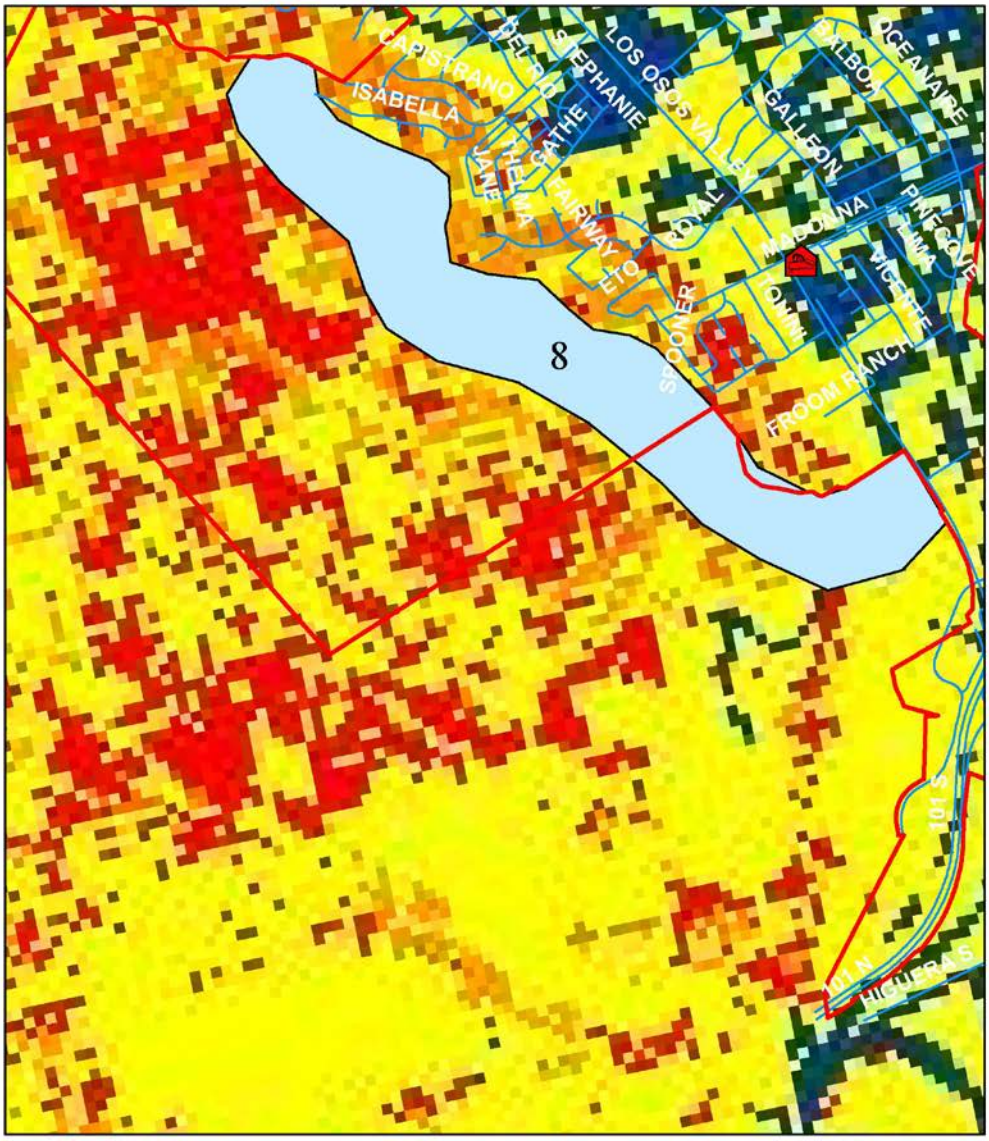
N
W E
S

Legend

City Limits
Streets
Flame Length (ft)
0
4
8
11
20

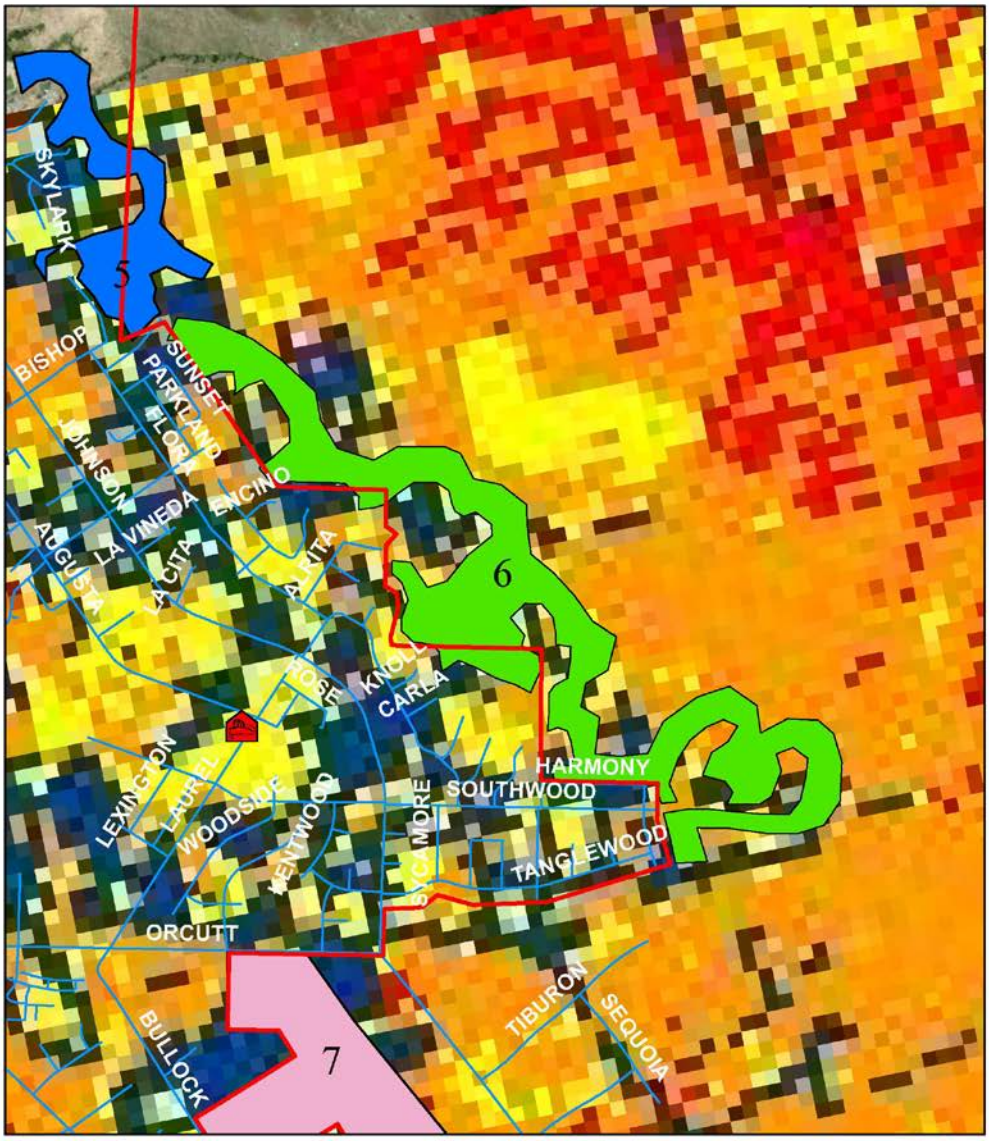
Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Flame Length Average Conditions in Fire Prone Area 8



Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Flame Length Extreme Conditions in Fire Prone Areas 5 & 6



0 0.15 0.3 0.6 Miles

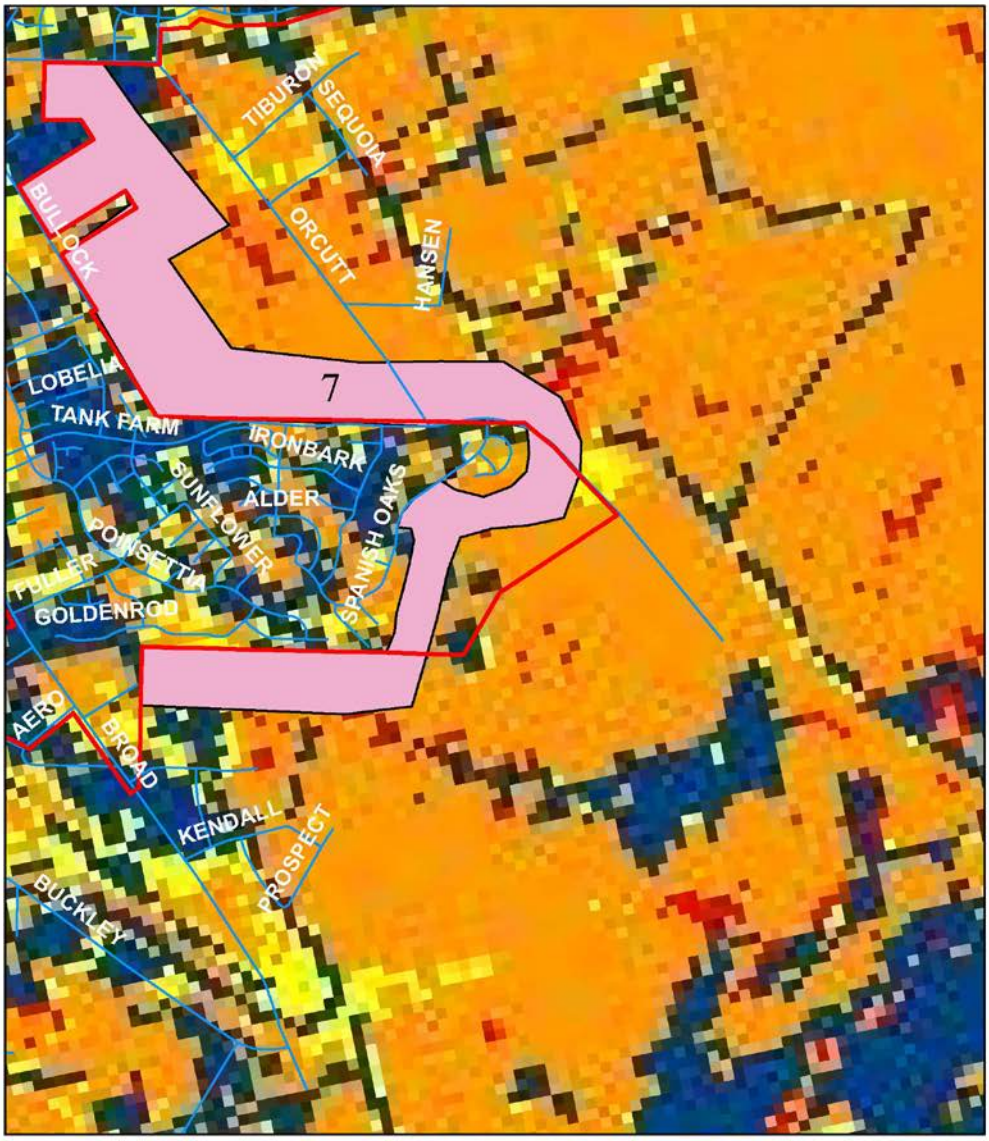
N W E S

Legend

City Limits
Streets
Flame Length (ft)
0 4 8 11 20

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Flame Length Extreme Conditions in Fire Prone Area 7



0 0.2 0.4 0.8 Miles

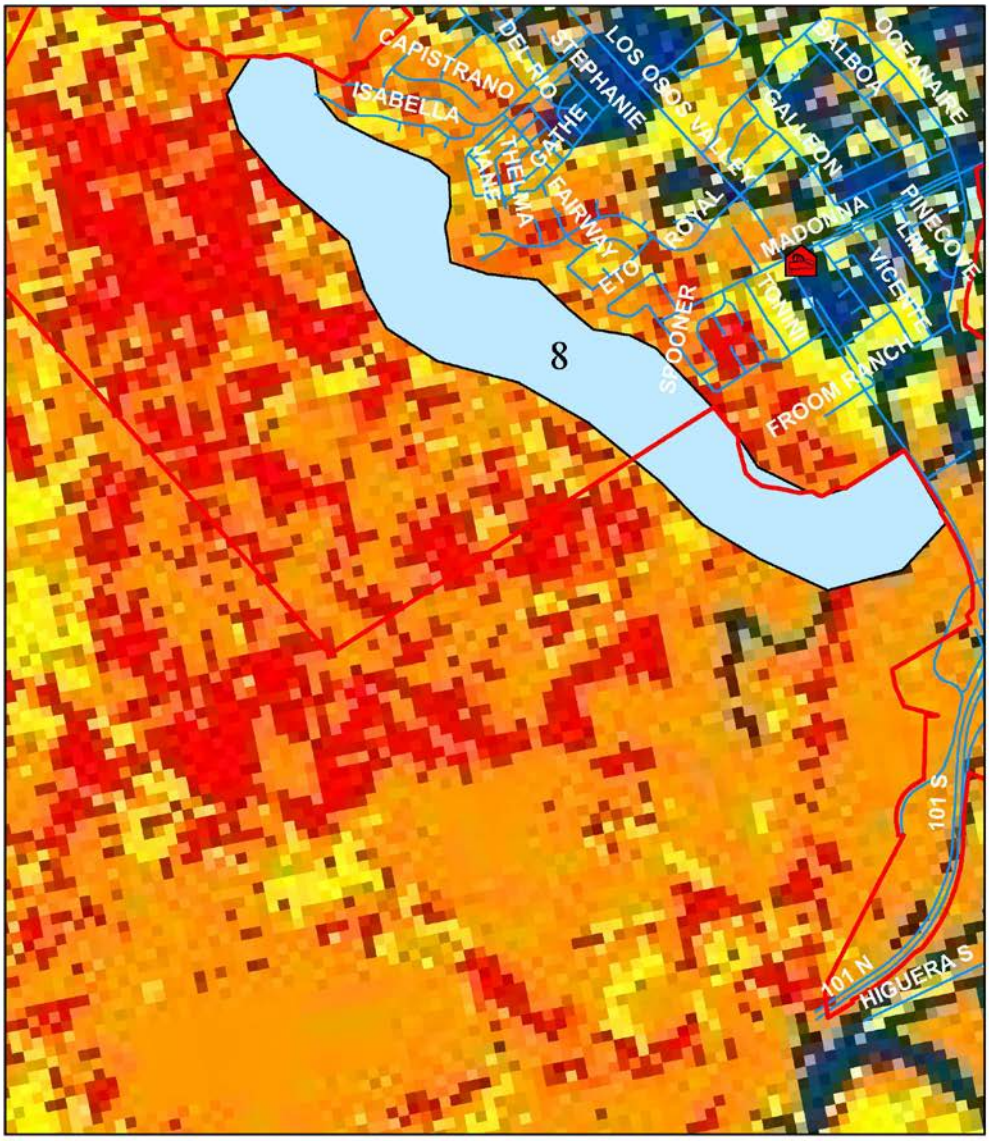
N
W E
S

Legend

City Limits
Streets
Flame Length (ft)
0
4
8
11
20

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Flame Length Extreme Conditions in Fire Prone Area 8



0 0.2 0.4 0.8 Miles

N
W E
S

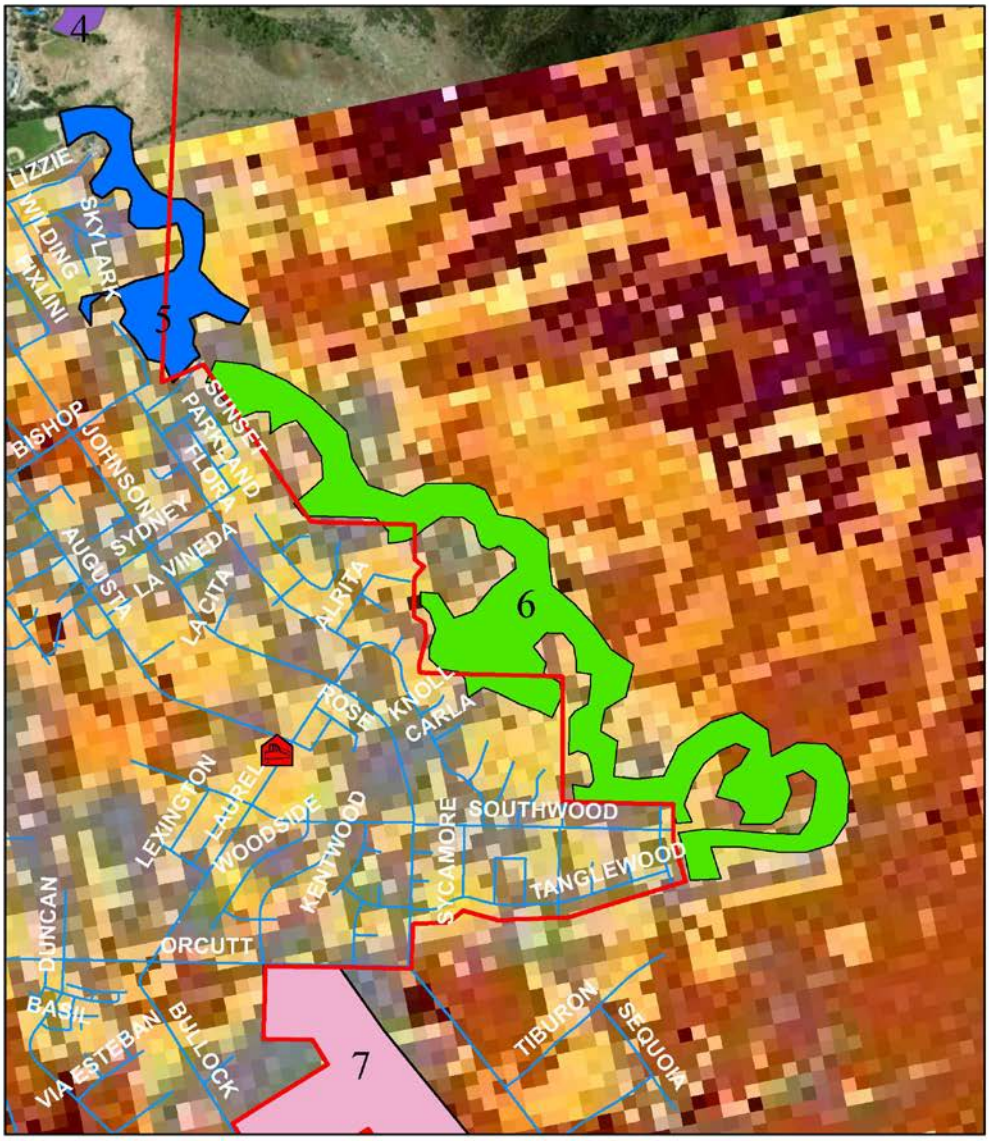
Legend

City Limits
Streets
Flame Length (ft)
0
4
8
11
20

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz
Created For: Christopher Dicus and Cal Poly State University

Appendix V

Rate of Spread Average Conditions in Fire Prone Areas 5 & 6



0 0.15 0.3 0.6 Miles

N
W E
S

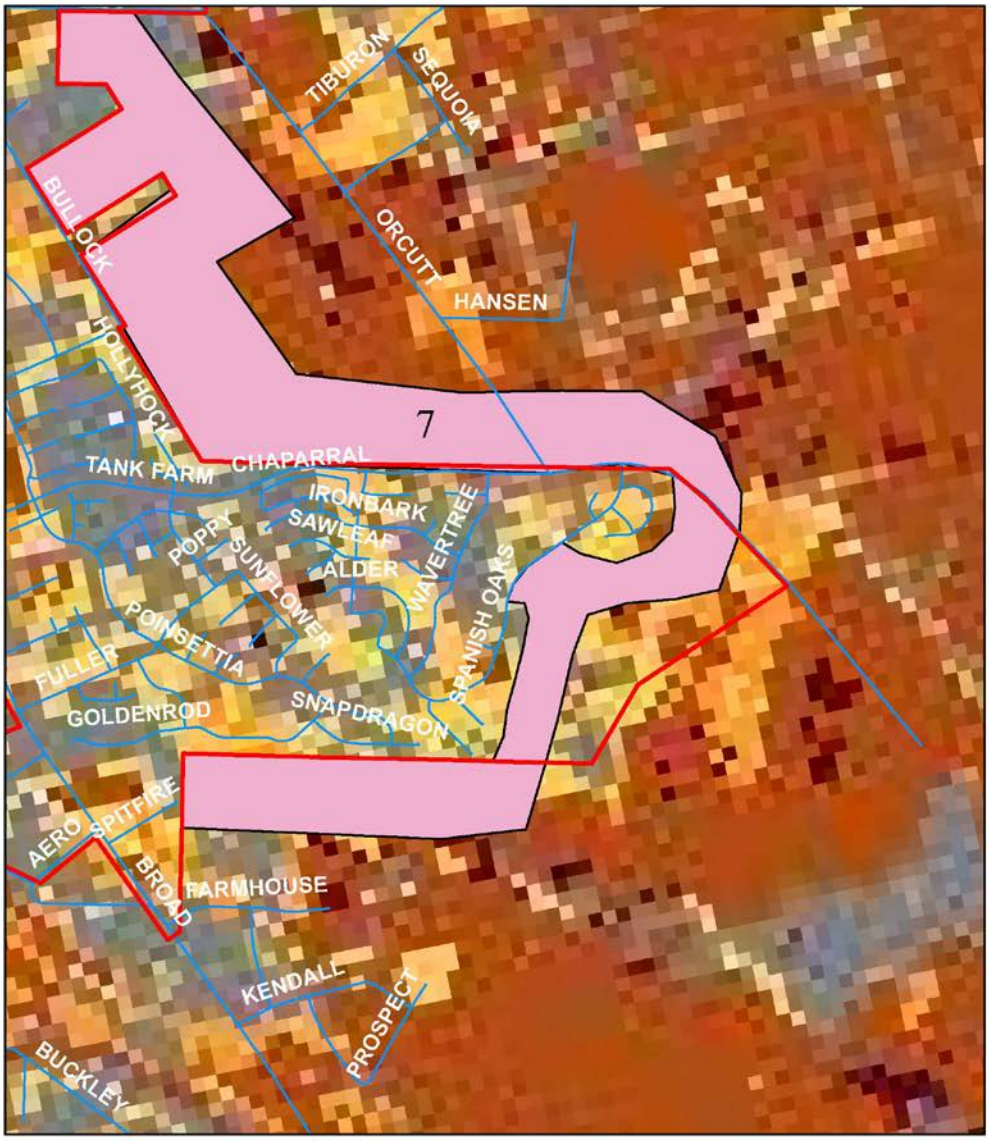
Legend

City Limits
Streets
Rate of Spread (ft/min)

1 5 10 20 40 80

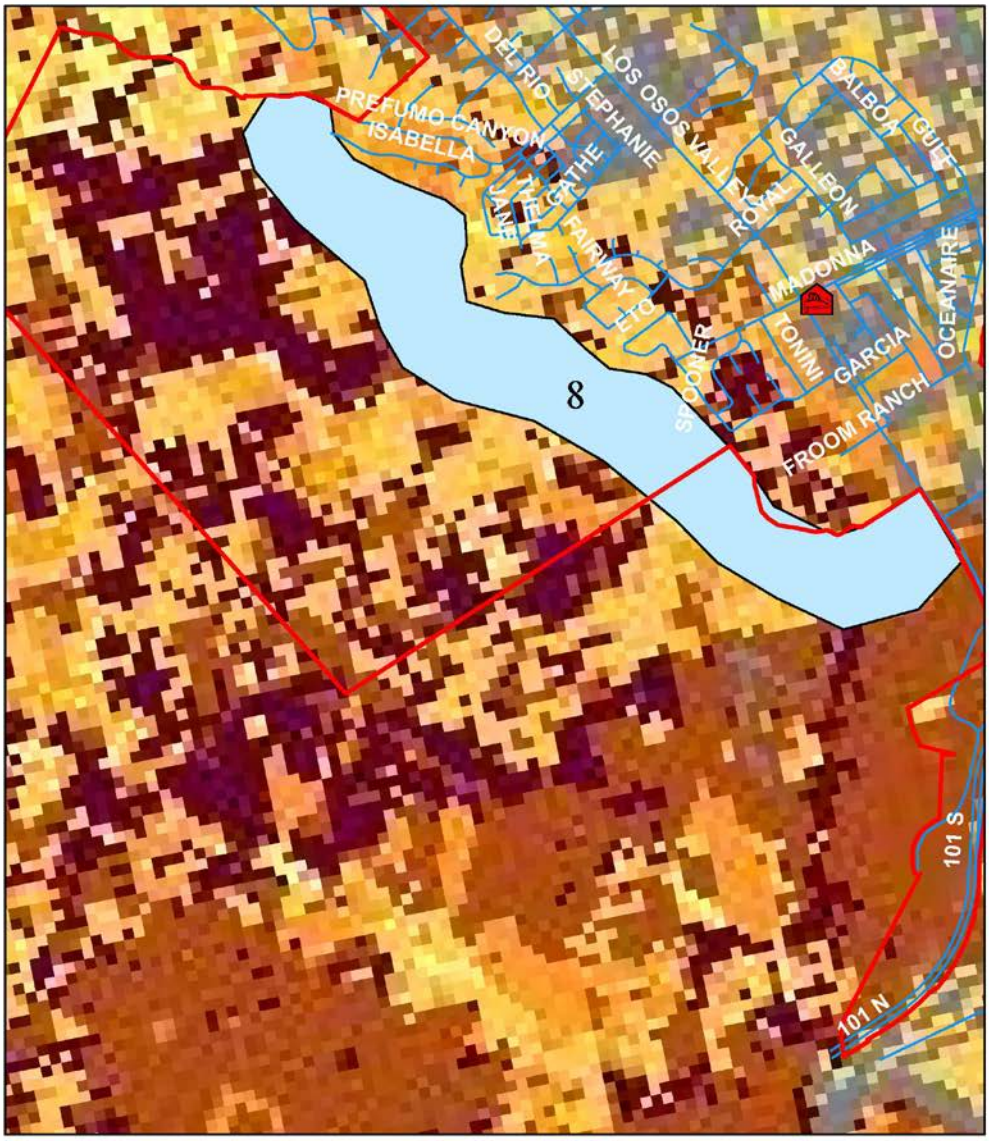
Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz

Rate of Spread Average Conditions in Fire Prone Area 7



Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz

Rate of Spread Average Conditions in Fire Prone Area 8



0 0.2 0.4 0.8 Miles

N
W E
S

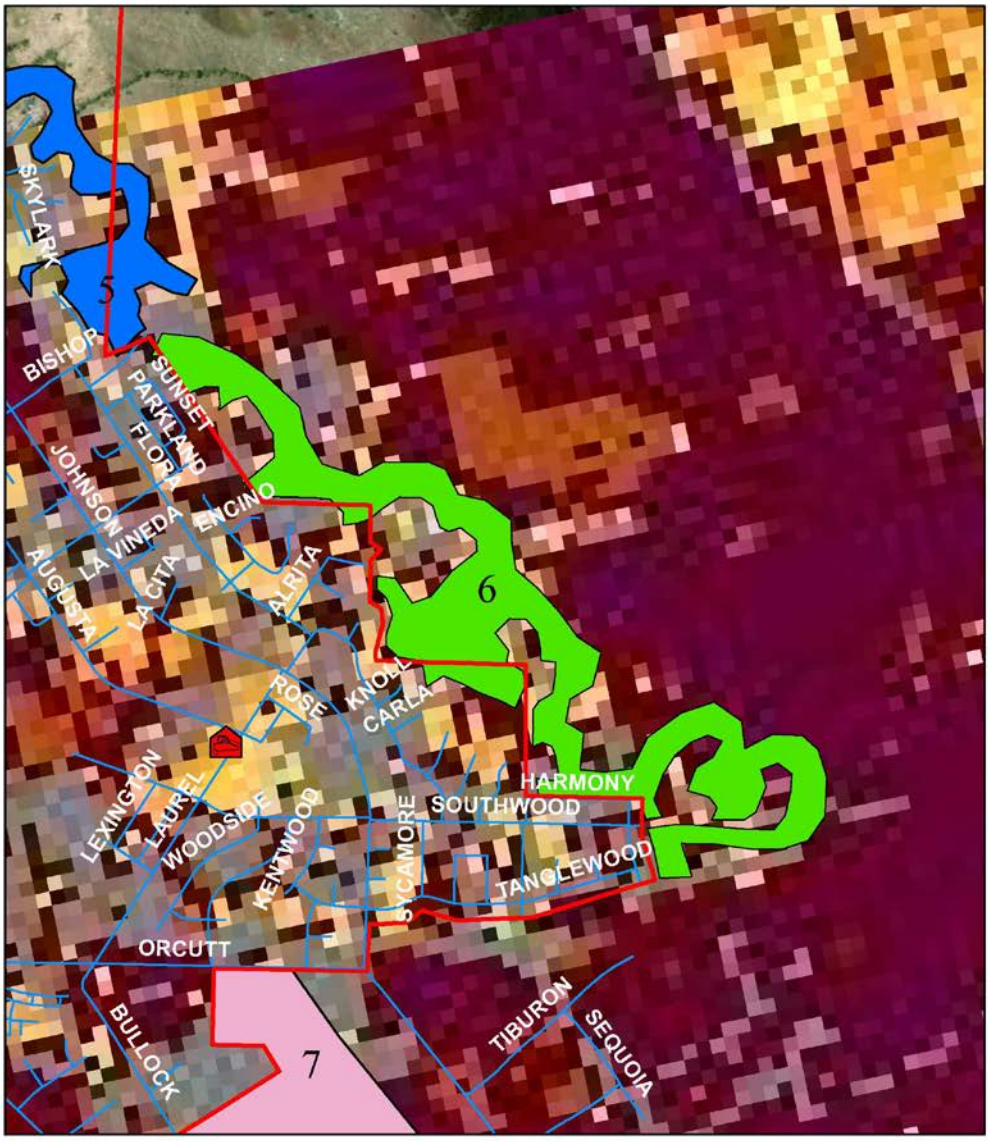
Legend

City Limits
Streets
Rate of Spread (ft/min)

1 5 10 20 40 80

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz

Rate of Spread Extreme Conditions in Fire Prone Areas 5 & 6



0 0.15 0.3 0.6 Miles

N
W E
S

Legend

City Limits
Streets
Rate of Spread (ft/min)

1 5 10 20 40 80

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz

Rate of Spread Extreme Conditions in Fire Prone Area 7

0 0.2 0.4 0.8 Miles

N
W E
S

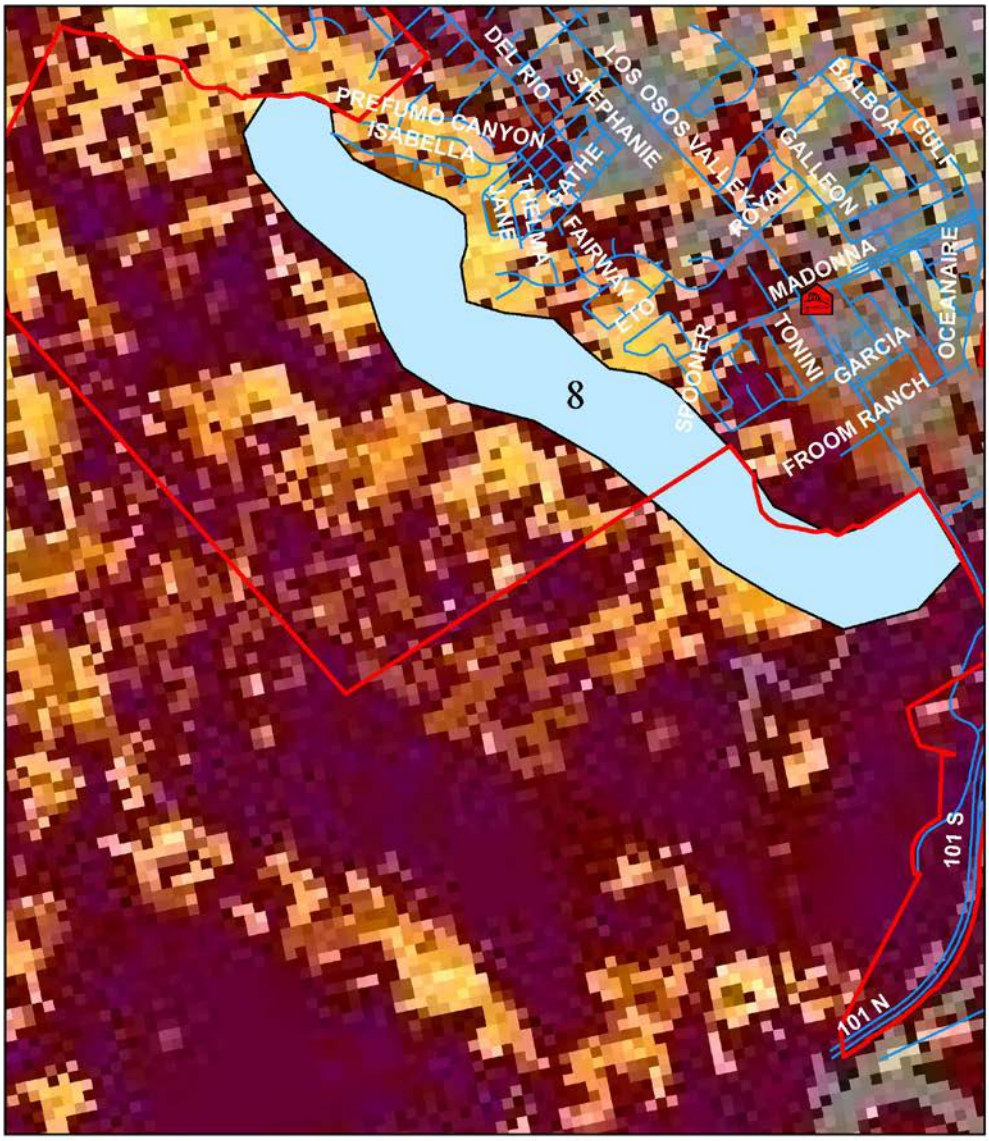
Legend

City Limits
Streets
Rate of Spread (ft/min)

1 5 10 20 40 80

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz

Rate of Spread Extreme Conditions in Fire Prone Area 8



0 0.2 0.4 0.8 Miles

N
W E
S

Legend

City Limits
Streets
Rate of Spread (ft/min)

1 5 10 20 40 80

Created By: Stephen Kadash, Brian Hanson, and Nicholi Mackewicz