Fire Safety and Emergency Vehicle Accessibility in Sonoma County

Abstract

This report was created in response to the wildfires that caused a great deal of damage to Sonoma County in October 2017. Due to climate change and anthropogenic factors, wildfires are expected to become more frequent and severe. The intention of this report is to determine which locations in Sonoma County are occupied by humans and have the most potential to be burned in future fires. The purpose of this was to identify where fire roads should be placed to improve fire management. We conducted this analysis by finding residential, commercial, industrial, and public zones with "High" or "Very High" hazard risk and greater than 50% vegetation that are within 100 meters of an existing road. Improving fire road connectivity in these areas will aid in Sonoma County's wildfire management by increasing accessibility for fire vehicles, providing fire breaks, and helping to conduct prescribed burns.

Introduction

In October of 2017, a series of fires known as the "wine country fires" devastated Santa Rosa, California and much of Sonoma County. Over 7,500 buildings were destroyed and death tolls have exceeded 40 people (Krishnakumar, 2017; Kohli, 2017). The Sonoma region is at high risk for wildland fires mainly because of a buildup of dry vegetation, which acts as fuel for wildfires, and because of low precipitation during summer and fall. Sonoma's fire hazard risk is highest from May to October. Wildland fires in Sonoma and in many other regions are becoming more frequent and severe primarily because of a buildup of fuel caused by fire suppression and because of global climate change which is making the area drier and warmer (Sonoma County, 2017).

In response to these fires, and to increased risk caused by climate change, Sonoma County is working on strategies for fire response and hazard mitigation. One important aspect

of response for wildland fires is road accessibility for emergency vehicles. Emergency vehicles require adequate road systems to be able to reach critical areas, fight fires effectively, evacuate people, and get out of those areas easily.

GIS applications are useful for determining which areas are at high risk for future fire hazard and which areas are lacking in road accessibility. Through GIS, we can assess the Sonoma region and select areas that would benefit from the addition of new roads for emergency vehicle accessibility in response to wildland fires. New roads can also be useful in fire management because they act as fire breaks during fire events and allow for wider use of prescribed burns because greater road accessibility makes prescribed burns easier to control (Reid, 1994).

Figure 1 highlights the region our team focused on in this assessment. We focused on residential, industrial, commercial, and public zones in Sonoma County to determine which areas were most at risk for fire damage and would most benefit from the addition of new fire roads. The purpose of this report is to show the process by which we determined where new roads should be built and to show the location of those potential new roads.

Figure 1| Locator map representing Sonoma County which includes the full extent of analysis.

Methods

To complete the objective of determining which parcels could most significantly benefit from the addition of new fire roads and overall access, specific requirements were established for the final parcel selection. The parcel requirements include:

- Areas considered “High” or “Very High” hazard zones
- Parcels zoned for residential, commercial, industrial, or public use
- Areas with absolute vegetation cover greater than 50%
- Areas within 100 meters of an existing road.

Once these requirements were established, the appropriate data sets were downloaded from the Sonoma County website (Sonoma County Boundary, Sonoma Fire Hazards, Sonoma Zoning, Sonoma Roads, and Sonoma Vegetation). Quality assurance was done on the data and the few data sets that were in the incorrect spatial reference system (SRS) were projected to “NAD 1983 State Plane Cali II FIPS 0402 feet”. Once all the datasets were projected into the correct SRS, the spatial overlay analysis was done using various overlay processes along with structured query language comparisons which are displayed in ***Figure 2***.

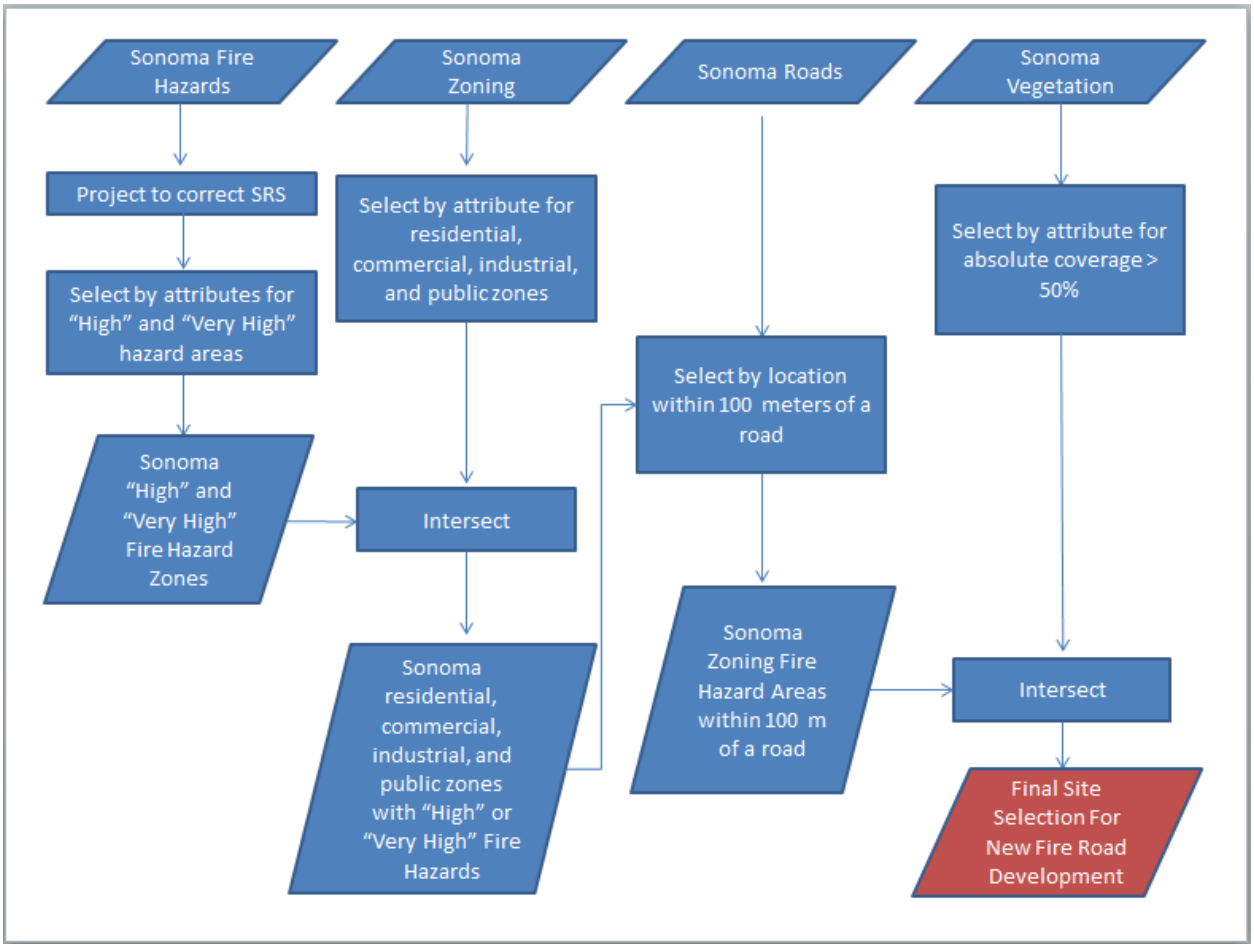

Figure 2| Workflow chart which shows the overlay processes used in the spatial analysis.

After the spatial overlay analysis was complete, the final sites for new fire road implementation were selected and are represented in ***Figure 3.***

Results

Once the analysis was completed, the most critical fire hazard zones were able to be identified by the various land use designations that have been deemed as the most economically valuable or highly populated **(*Figure 3*)**. Further analysis on the areas that were identified as the most critical fire hazard zones led to finding of the most feasible parcels to develop new fire roads **(*Figure 4*)**.

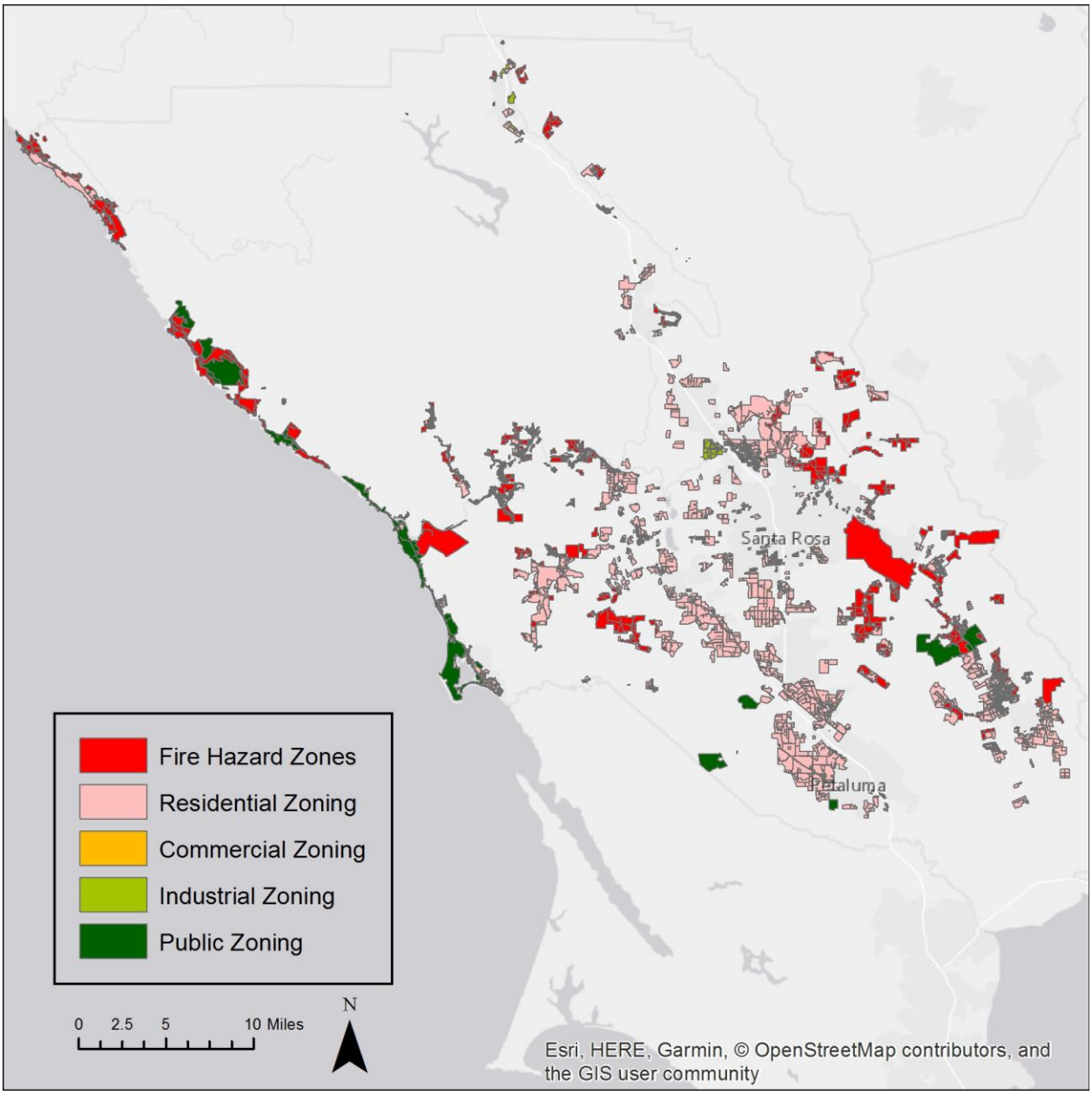

Figure 3| Zoning Fire Hazards: This map shows where the areas of "High" and "Very High" fire hazard areas overlay with residential, industrial, commercial, and public zones parcels.

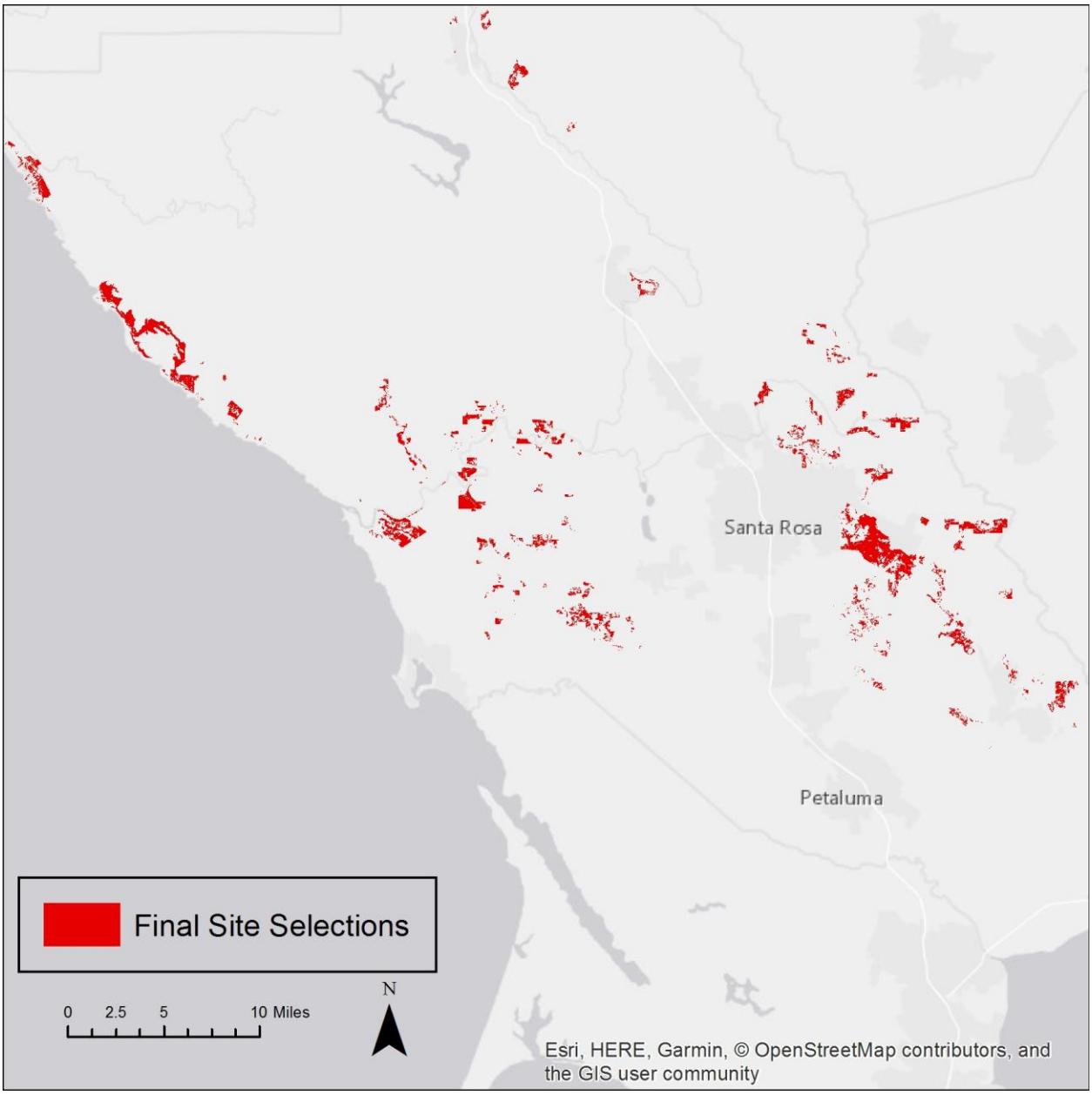

Figure 4| Final Site Selection: This map shows the final site selections for potential fire road development that have met the established requirements.

Conclusion

Wildfires in Sonoma County are becoming increasingly hazardous. Our goal in this report was to improve hazard mitigation in the region by identifying urbanized locations where the damage to humans and buildings has the potential to be severe. During the wildfires in 2017, many buildings were damaged or destroyed and human lives were lost. This analysis of

residential, commercial, industrial, and public zones that are at high risk for wildfire damage is useful for showing where accessibility for emergency vehicles should be improved. The addition of fire roads will increase accessibility and provide fire breaks, thus mitigating damage caused by wildfires in Sonoma County.

Literature Cited

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