

AUBURN, CA, EVACUATION PLAN

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ABSTRACT:

Auburn is a small but famous gold mining and railroad town in the Sierra Nevada Mountains of Placer County, California. The city has seen recent and historically reoccurring wildfires. In 2021, 1.5 million acres burned in the Sierra Nevada Mountains, a new record. Auburn consists of three (3) nonadjacent and nonoverlapping sections or parcels of land. The three (3) centroids of each section of Auburn are identified and used in three (3) evacuation scenarios: First, Auburn is evacuated away from the three (3) centroids. We look at how far evacuees can reach in 5, 10, 15, and 30 minutes using emergency vehicle travel times, so signal lights, one-way streets, etc., are ignored. Second, we evacuate away from the three (3) centroids while also avoiding previous burn areas. Third, we evacuate Auburn toward the only area hospital, a structure likely to be defended from fire by first responders. Also, some evacuees might require medical attention. Future work includes looking at how far emergency vehicles from places like fire stations can reach in 5, 10, 15, and 30 minutes, providing a coverage area for first responders.

1. INTRODUCTION

While discussing our current project with the class a suggestion was brought up to try to adapt our current project to encompass the area of Auburn, California. This area has been affected previously with wildfires and is in a zone that has the potential to have additional wildfires. Professor Hilton provided a great deal of useful links (which are in the Reference section of this paper). Auburn, California, should be a great area to begin to analyze and we plan to incorporate a future analysis after this current project is complete. We have begun to work on the Auburn area in ArcGIS Pro and will have some initial plans and possible preliminary results in the coming weeks. One of the links provided by Professor Hilton goes over the Isoline app. Its purpose is to provide isolines (isodistances and isochrones) to be used in geographic analysis. There were also links for some other polygon tools, some to calculate driving time and distance and others to calculate in the service areas which roads can be reached within a given distance or drive time. Along with that there is also the ability to often show response time for emergency vehicles which could prove very valuable. We will be working on these in the next few weeks and hope to at least have a mockup prototype by the end of this class.

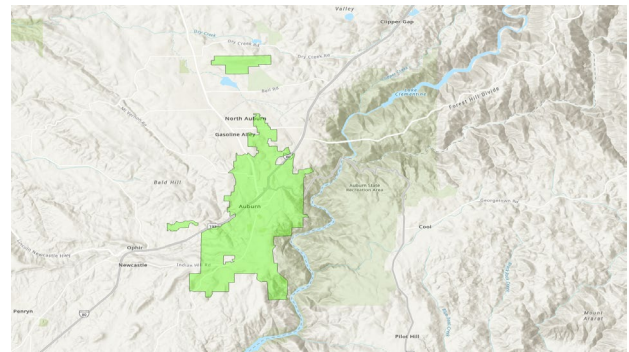
2. MATERIAL AND METHODS

Upon initially thinking about this project, I was not sure about how to begin. However, I found a great resource online that provides information in the GIS format for the Placer County area where Auburn is located, [Geographic Information Systems \(GIS\) | Placer County, CA](#). The link shows quite a few important data points. We are not yet sure on which ones to use yet, but I am going to be using some of them. See below list.

1. Parcels and Addresses
2. Environment
3. Planning and Zoning
4. Boundaries and Districts
5. Transportation
6. Infrastructure

3. CASE STUDY

I began by pulling from the planning and zoning link. I used it to isolate and create a boundary around the Auburn area (see below screenshot).



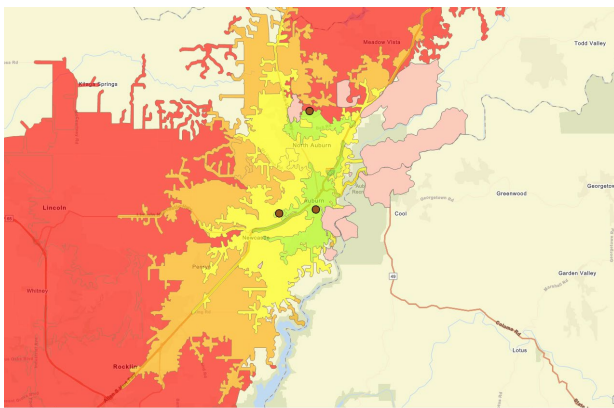
Map 1. Auburn, California

4. RESULTS

For the next portion of the project, we met with Professor Hilton and discussed possible next steps and went through some instruction on creating closest facilities and a feature to point. We began by creating a central point on the map. Auburn city has three separate portions of the city, so the central point feature created three separate points at the center of each section. Once the central point was added we then used a tool “make service analysis layer.” From there I was able to select the “mode” for emergency travel time, this causes the application to disregard things such as traffic lights and one-way roads, etc. We felt that this would provide a more accurate account of an escape route as you would want to flee and not worry about those variables. We then selected the away from facilities function and had timings of 5, 10, 15, and 30 minutes. These thresholds allow the analysis to place colors based on the distance you can travel in the time increments we established. Different colors show the distances and allow users to pick a particular path.

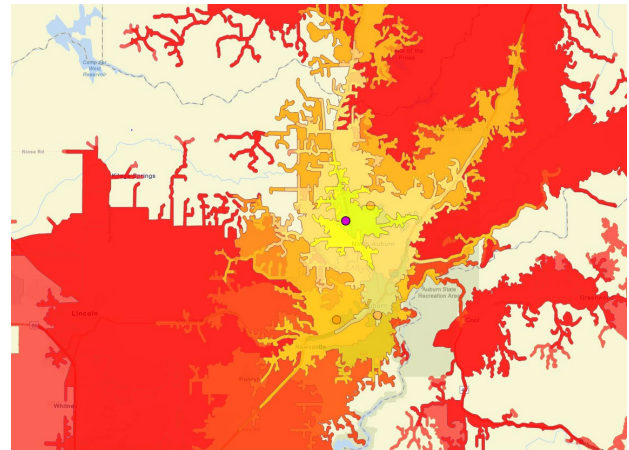
From here we decided to find some previous fire data and apply some polygon boundaries to the map. Professor Hilton provided a great data resource which listed out the previous burn areas in the Auburn area and within a certain threshold. After loading the data into ArcGIS Pro, I created a polygon barrier with about 10 of the previous burn areas. Doing this would then allow me to run the away from analysis again but this time it would avoid those areas we had designated with the polygon barrier. In ArcGIS Pro I turned off all other layers, then turned on the service area layer and turned on the feature points which created a central point in each portion of Auburn City. This central point as stated earlier would allow the tool to run the away from analysis from each central point.

The results were very interesting and although I was expecting the escape routes to go around the polygon areas some of the results were very unexpected. Below is the newly generated map. The green is the 5-minute escape area, yellow is the 10-minute area, darker yellow/brown is the 15 minute, and the red is the 30 minute. The next task in mind will be adding hospitals and then fire stations to create time to travel “TO” these facilities from the central points.



Map 2. Evacuating away from the 3 centroids (green = 5 minutes, yellow = 10 minutes, brown = 15 minutes, red = 30 minutes)

The next step in the process was to add hospitals, data was provided by Professor containing all hospitals. I imported the data into ArcGIS Pro and then proceeded to view the local hospitals, however the Auburn area only has one hospital that is anywhere close to the area. We then proceeded to create a feature point for the one hospital as an analysis point. I then ran another service area analysis with the same 5-, 10-, 15-, and 30-minute routes. This time the route however was towards the one hospital. See below screenshot of the new hospital Service analysis.



Map 3. Evacuating toward the only area hospital (similar color scheme)

5. LIMITATIONS/DISCUSSION

I was limited in the most part by my knowledge of ArcGIS Pro, however the professor proved to be an extremely huge help with all the work we needed and provided many data sources. Another limitation was the GIS data that was available for the Auburn area such as hospitals / fire stations, etc. We were able to bypass this by loading in data that contained all the hospitals in the state, etc.

6. CONCLUSIONS/FUTURE WORK

This was a very fun project, there were a lot of things that I learned about both fires and ArcGIS Pro and GIS in general. Future work includes adding points of interest such as fire stations and previously burned areas to create escape routes based on the added criteria. Combining these elements to see how the routes change and how much is affected by traveling to the hospitals, fire stations and other points of interest while avoiding the previous burn areas.

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