

Research Paper: Forest fires in California

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Summary:

The costly interactions between humans and wildfires throughout California demonstrate the need to understand the relationships between them, especially in the face of a changing climate and expanding human communities. Although a number of statistical and process-based wildfire models exist for California, there is enormous uncertainty about the location and number of future fires, with previously published estimates of increases ranging from nine to fifty-three percent by the end of the century. *Our goal is to demonstrate whether enough aid is present for the frequent occurring wildfires in this state. We also want to assess the role of climate and anthropogenic influences on the state's fire regimes . We want to culminate the counties which always serves as an origin for most forest fires and we want to show the spatial relation between them as to why the same county when already aware of the situation is not able to mitigate the upcoming wildfires.* Historically, we find that anthropogenic influences account for up to fifty percent of explanatory power in the relation. We also find that the total area burned is likely to increase, with burned area expected to increase by 2.2 and 5.0 percent by 2050 under climatic bookends. Given the strength of human-related variables in some regions, however, it is clear that comprehensive projections of future fire activity should include both anthropogenic and biophysical influences. Previous findings of substantially increased numbers of fires and burned area for California may be tied to omitted variable bias from the exclusion of human influences like fire due to

emission from fuel plant etc. As such, the failure to include anthropogenic effects in many models likely overstates the response of wildfire to climatic change.

Data:(Primary data sources for analysis)

The data being used is from the state's here, California GIS clearing house specifically the FRAP mapping demonstrating all kinds of fires occurrences and the plan of action set in place. This is the link for all the data collected for base map; <http://frap.fire.ca.gov/data/frapgisdata-subset> . The project geographic co-ordinate system is NAD 83 California (Teale) Albers (meters).

The data used for base layer is California County Boundaries -Metadata. I have tried to put together some other data layers on the map. One of them is demonstrating the fire fighting facilities available through out the state. It is followed by the 35 fire protection plan put in place by the government after the last forest fire which left the state in distress and finally the map layer showing the threat distribution of forest fire over the whole state.

Question:

There are some questions which one wants to analyse such as; Why are forest fires of recurring nature in this state? What is the prime reason for a forest fire in these counties? *Is there necessary aid being provided to the fire department by the government? How are the localities been treated during and after the disaster? What amount of vegetation coverage is at risk or is at loss every time a fire occurs? Is there anything done by the forest department to replace the lost flora and fauna? What can be done to prepare for the disaster or prevent them altogether?*

I believe we can answer and justify the above questions with maps through preliminary analysis of the acquired datasets.

Analysis Strategy:

The datasets for the preliminary analysis has been acquired from the California GIS clearing house, mostly the FRAP website. The data is explained above in the “Data” section of this paper. In order to answer the above stated questions , firstly I portrayed the level of threat of forest fires in the state, and then placed the fire fighting facilities over the state to see whether there are enough facilities for the counties which are under immense threat of forest fires (Fig-1). The recent forest fire in California enabled the government to initiate the emergency plan, where FERPA got funds from the government to come up with emergency contingency plan which are about 35 in number and have been placed throughout the state. So I mapped that layer to establish the over all wildfire display in the state and to see if they have been placed in the correct location or not. (Fig-2)

Initially I was confused as to using random effects spatial modelling or using spatial econometric as the main question that we are trying to answer is that whether necessary aid is being provided to the fire department by the government? How are the localises been treated during and after the disaster by the department? Basically I wanted to make these layers amalgamate and then I wanted to join their tables and foster my specific condition or the conditional statement which might help me to come up with the required map for the analysis question. But I changed my course of analysis because relate and joins were adding bogus data and we did not need to map all of that, hence I shifted to “Select by expression tool” which helped me justify all my analysis questions. I selected the specific counties prone to wildfires and then added the government layout of all the aids given to the locations by this tool and I was able to answer my first question laid before me (Fig-3). Initially

I had thought of drawing the vegetation line boundaries to assess the loss of vegetation due to the wildfire but I improvised it and using the raster implementation tool, I was able to demarcate various areas in the state which comes under the governance of various organisations and hence then I used Select by expression tool and bookmark in order to highlight the area which was the most burnt vegetation (Fig-4). I had thought of including the anthropogenic factors by mapping all the fuel wells and factories nearby these forests which usually result in such forest fires, so that we can come up with strategies to avoid them or distance them from the threat areas but to my dismay I was not able to find good datasets. Lastly, I had decided to map all the aid centres which are active during this disaster so that we could know which areas were getting the best of it and which ones were exempted from all of the help, I added to it by using the query builder I mapped those aid centres and hospitals which were directly under the range of 1 km of active fires and highlighted them using raster tool-euclidean distance, so that localities could know which hospitals to avoid (Fig-5). Just to get a gist of the future prospects of wildfire I used symbology (Quantities) to plot the state of wildfires through line graph where every colour demonstrates the intensity of the fire high, moderate and so on (Fig-6).

I believe all of this together might help us reduce forest fires to the least possible and come up with better after disaster plans so that the loss is nadir.

Conclusion:

As the emergency bases are restricted only to the northern and central part of the state, like emergency helipads, interagency contact base, emergency convention centres etc. I believe they should focus on all the areas equally , it should be established in all parts of the state. For some reason Los Angeles has been given undue importance whereas there are loads of counties which need the same attention.Cal Fire needs to come up with ways to eradicate loss in vegetation , especially the western part of the state and although there are watersheds in the area they need more facilities to combat the wildfire and come up with solutions to mitigate them or replace the lost vegetation.They can ask the government or other rite organisations for help and should work towards replantation and come up with more programs like that. I believe the government should provide extra bases for shelters or temporary bases during a wildfire as we never know which area having an hospital may come within a range of an active wildfire.As I mentioned in my introduction earlier about considering the involvement of anthropogenic or human factors in theses wildfires , I believe we should not rule this out and if I had the relevant datasets which I did not, I would have mapped that too. For some reason I could not find the perfect layout of all the oil fields and factories in the areas . Hence, I would implore people to research on this factor and try to find a solution to these ever happening wild fires. Also I believe we can consider the ever changing temperatures in the United States of America mostly global warming, this climate shift can also be responsible for the air and dry winds which can cause wildfire. It is something which cannot be ignored and should be considered for future research.

References:

<https://www.wildlife.ca.gov/Data/GIS/Clearinghouse>
<http://frap.fire.ca.gov/data/frapgisdata-subset>

[https://enterprisecontent-usfs.opendata.arcgis.com/search?
downloadable=true&groupIds=d6d6c2c552334a269dad1c4e41f92813&tags=fire](https://enterprisecontent-usfs.opendata.arcgis.com/search?downloadable=true&groupIds=d6d6c2c552334a269dad1c4e41f92813&tags=fire)

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0153589> (Article on Effects of human activity and climate change on Fire activities in California)

Maps:

CALIFORNIA GIS :FRAP- Threat level of forest fires and fire fighting facilities

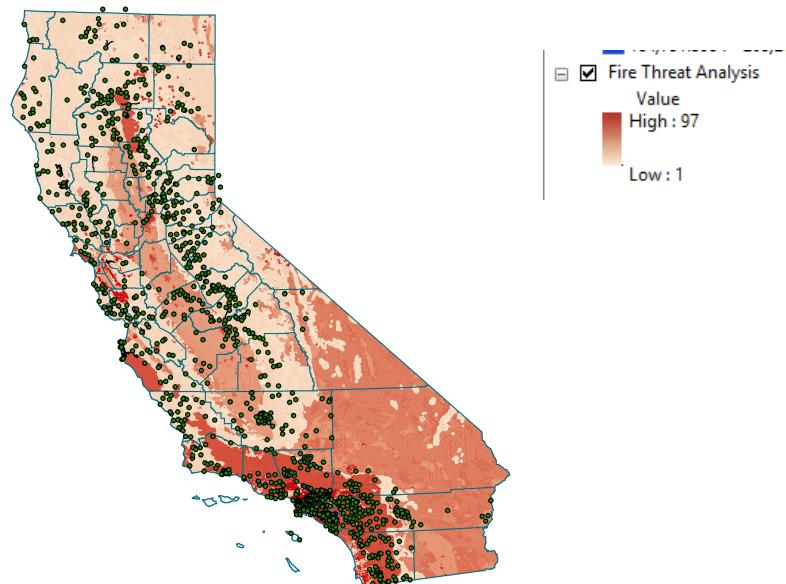


Fig-1

CALIFORNIA GIS :FRAP - Priority Projects¹

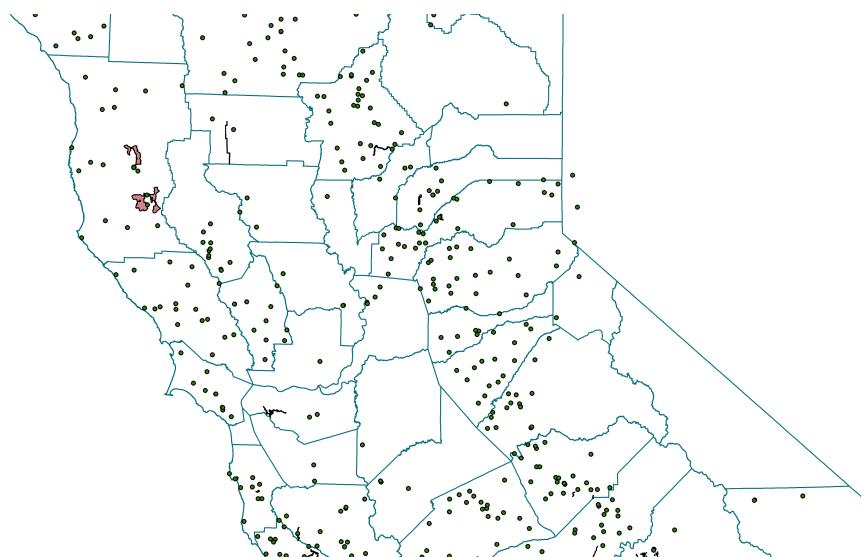


Fig-2

Layout of all the aids

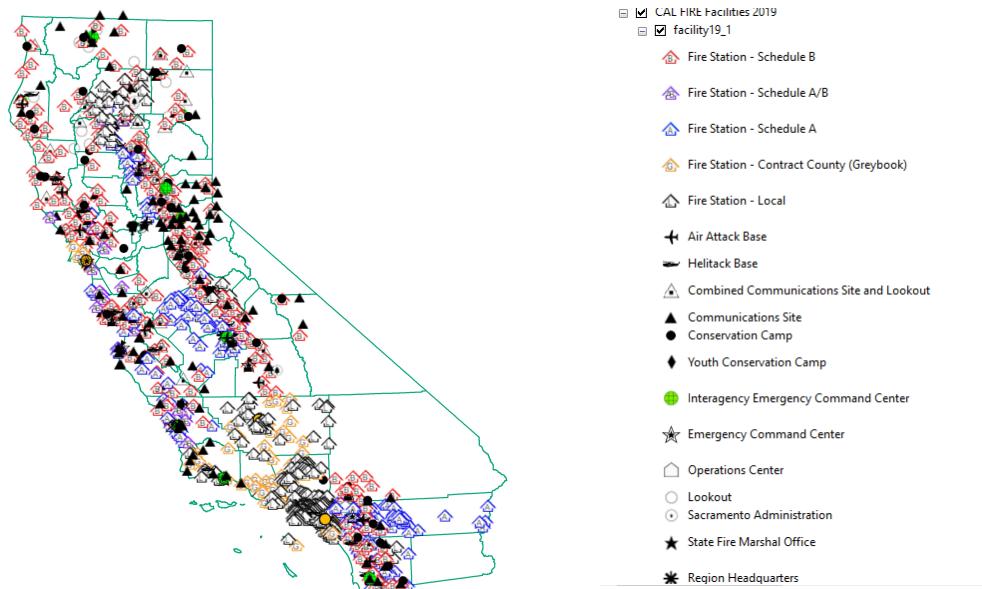


Fig-3

Vegetation under various organisations

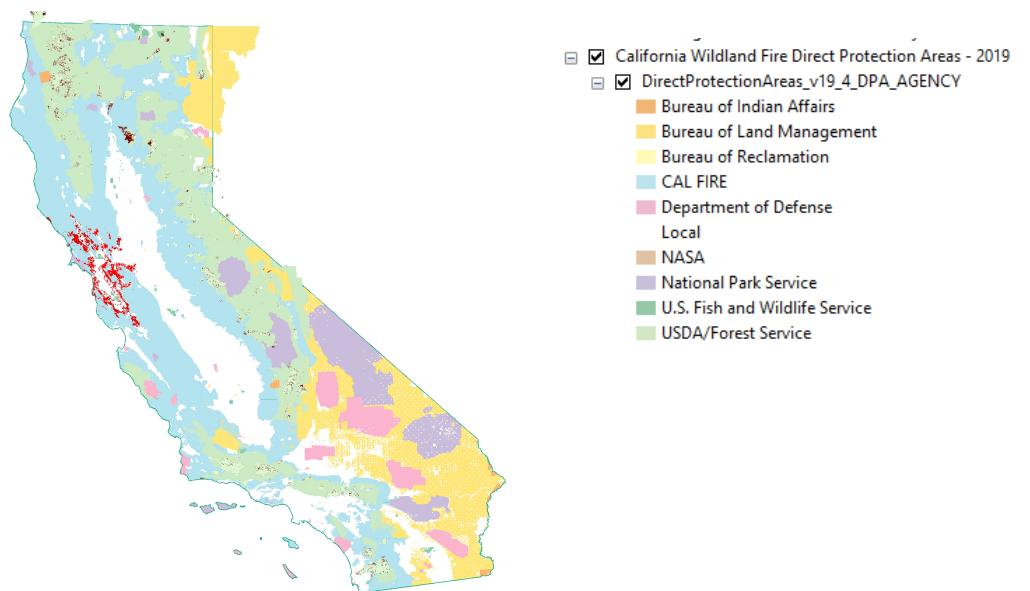


Fig-4

Hospitals to be avoided

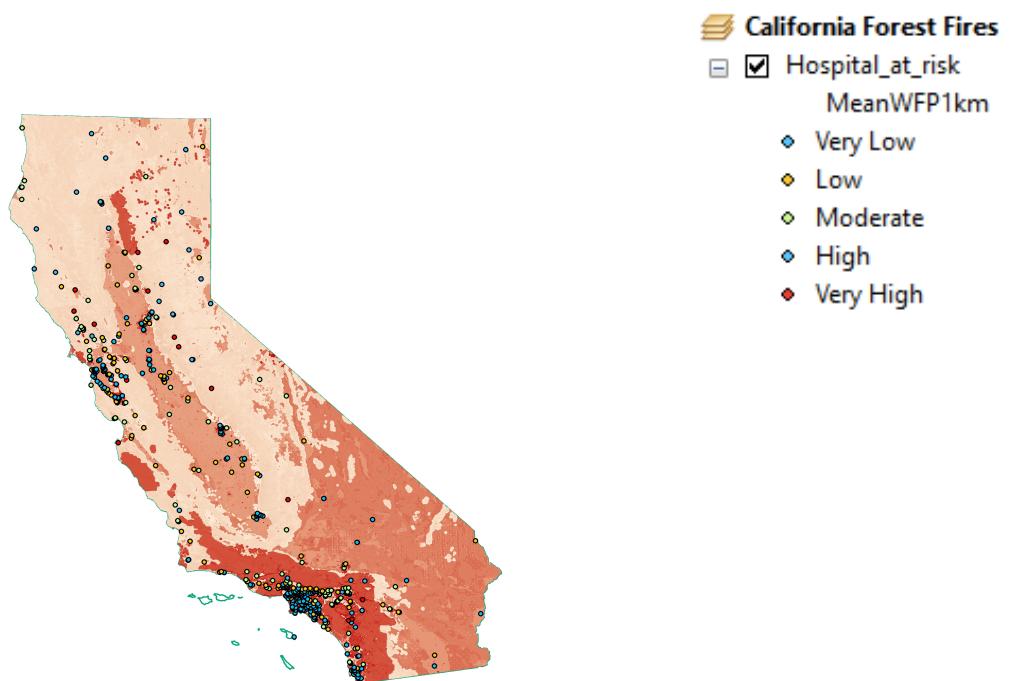
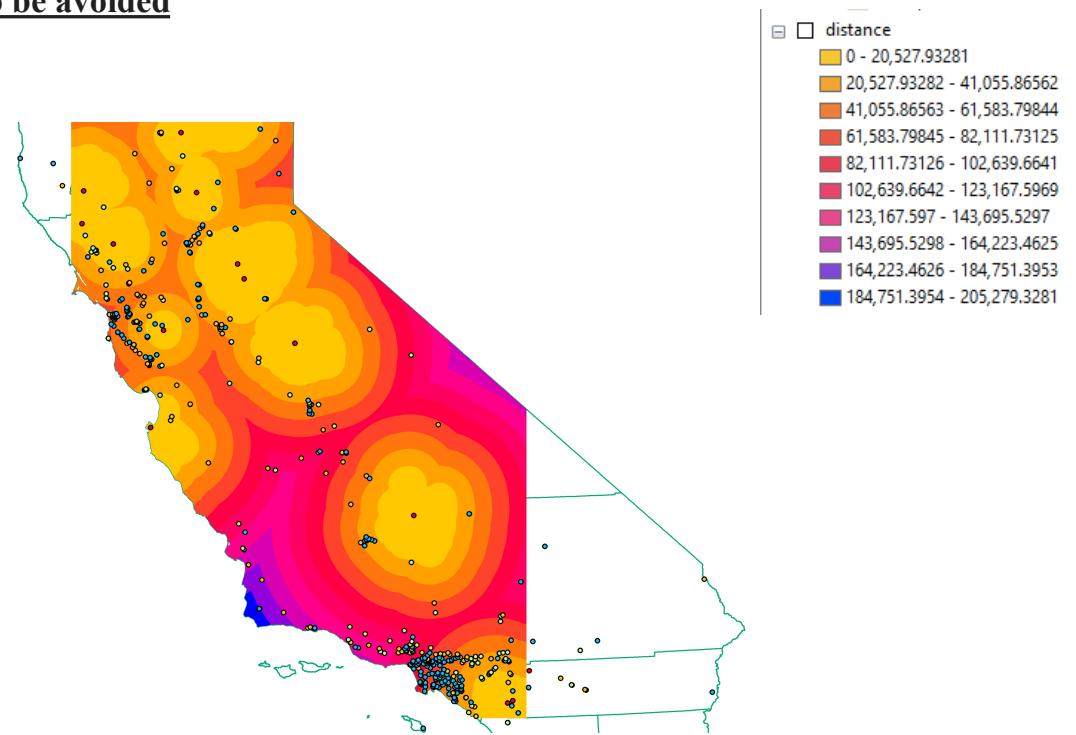


Fig-5

Future layout of forest fires in the state (2010-2099) RCP : 4.5 to 8.5²

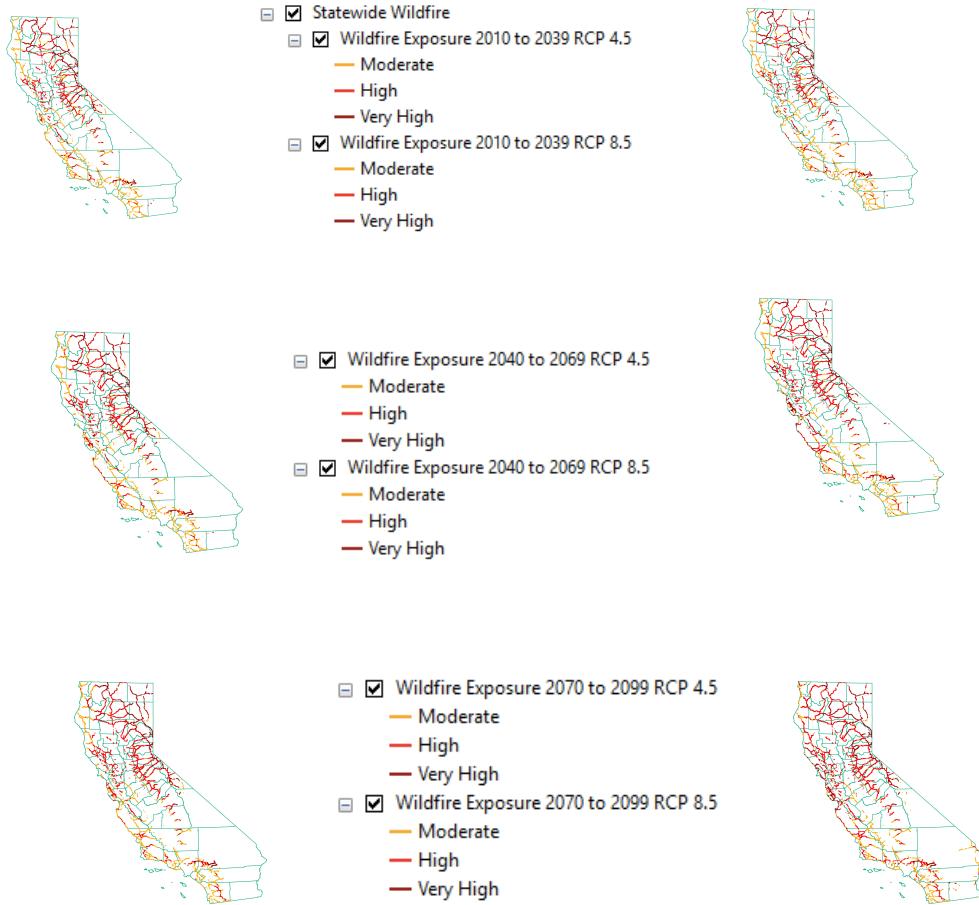


Fig-6