Drought Intensity and Wildfire Extent in California 2006-2013

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INTRODUCTION

Over the last several years California has fallen into drier and drier conditions. Residents have expressed growing concerns about wildfires and have noticed significant changes in the timing of wildfires, as 'fire season' is increasingly a year-round concern (1). In 2013, the Rim Fire swept across the Central Sierras and into Yosemite National Park; ultimately it became the third largest wildfire in recorded state history (2). The Rim Fire was the second fire, in as many years, to make the top three fires by area. Were these two fires anomalous, coincidental, or have the drier conditions caused larger fires? This was the central question behind this project, which compared United States Drought Monitor values to the areas of wildfire recorded by CalFire. Further, this project carries importance for the future for California too, as drought conditions persist into the coming summer is there an increased chance of a big fire that will also set records?

Number of Fires per Drought Monitor Value: Areas Greater than 1,000 Acres

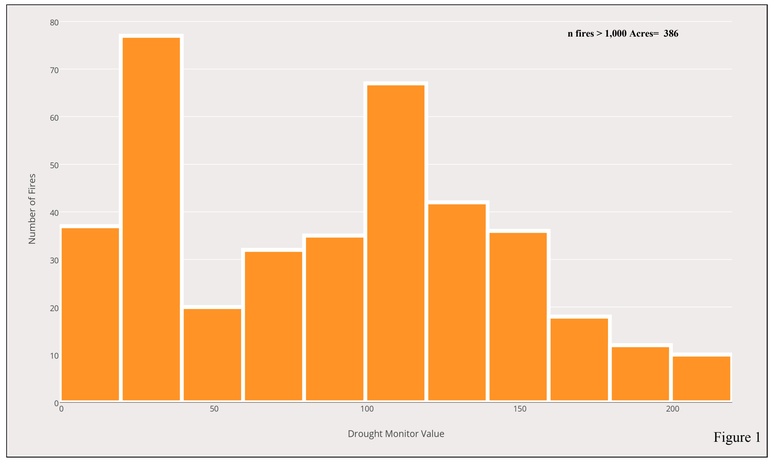
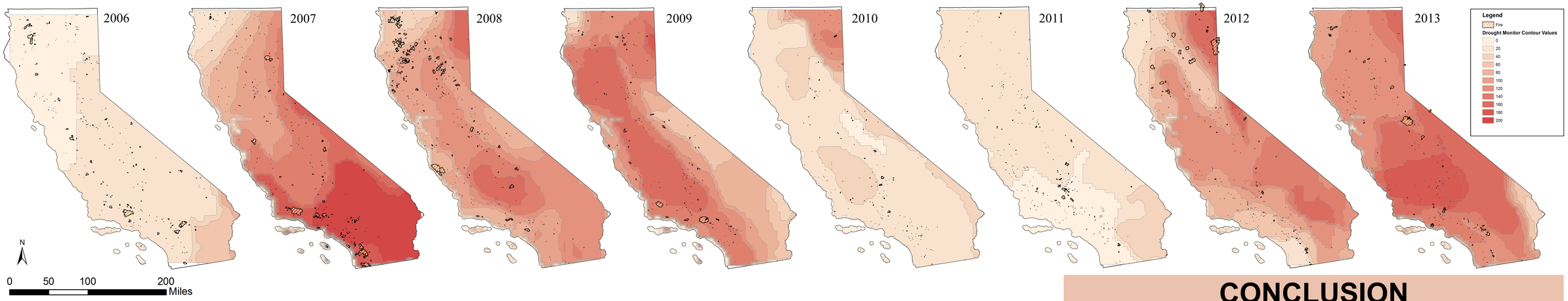


Figure 1

RESULTS

For 2006-2013 the drought monitor data show that there has been variation in the severity of drought in California. Figure 1 displays the number of fires that occurred in each drought value area, for all fires that were larger than 1,000 acres. The histogram is bimodial, with the greatest number of fires occurring between 20 and 40 drought intensity. Further, there is a small number of fire that occurs in higher drought monitor value areas. What Figure 2– displays though, is that the fires that occur in higher drought monitor value areas, tend to have a much larger extent. Several of the fires that occurred in the higher drought monitor areas were larger than 100,000 acres. However, overall the data indicate that there is very little correlation between high drought monitor value, and the number of fires that occur in these areas.



METHODS

Weekly drought data from 2006-2013 was obtained from the United States Drought Monitor. Fire record data was obtained from CalFire, and clipped by year. The drought data was clipped to the extent of California, and shapefiles were converted into rasters. For a few of the years being investigated, parts of California did not have measurable drought, and these no data cells were reclassified to have the value of 0, adding 1 to the other four classifications. With each raster cell assigned a numeric value, raster calculator was used to sum together rasters in order to generate annual summaries of drought values from the weekly data. In order to compare summary drought values to fire areas, the drought data needed to was converted to filled contours using the "Convert to Filled Contours" tool, this generated polygons. As the central question of the project was to see if higher drought monitor values corresponded to bigger or more fires, the contoured polygons and fire polygons were intersected using the "Tabulate Intersection" tool. Then the intersected table was joined to the fire attribute table. This enabled each fire to have an associated drought value, which enabled wildfire area to be graphed against drought monitor values. Fires larger than 1,000 acres were graphed against drought monitor values.

Acreage Burned by Drought Monitor Value– Represented by Year

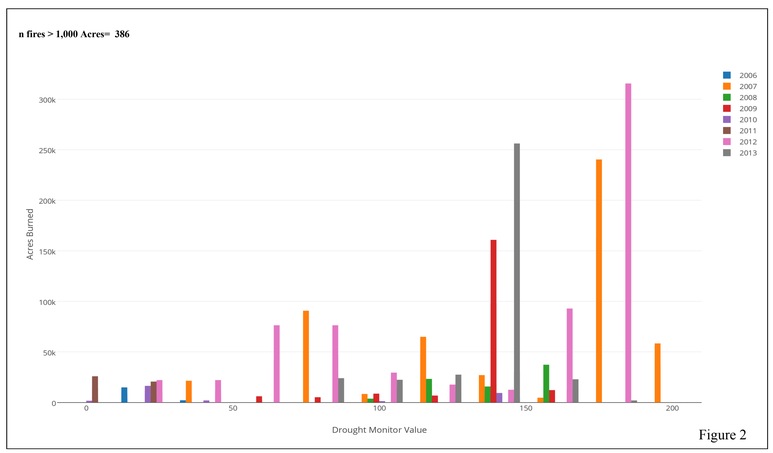


Figure 2

Figure 2– displays the size of fires for each drought monitor value. The fires are also classified by year in order to better relate the fires to the drought maps that they correspond to.

CONCLUSION

While more fires occurred in areas with lower drought monitor values, fires tended to be smaller. In higher drought areas, while there were fewer fires, fires tended to have larger areas. Further, it is important to note the increased drought monitor values across the state since 2011, and the latest drought monitor values for California (not pictured) show that 46% of the state is in the most severe level of drought (3). Thus, while there is an increased fear of fire in California as the state enters the fourth year of drought (1), recorded fire history does not indicate that there should be more fires in higher drought areas. However, it would be irrational to proceed as the drought progresses with the assumption that fires will not occur in high drought areas, and communities should be prepared for larger fires in drier areas.

Projection: NAD 1983_2011 UTM Zone 10N

Sources:

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- CalFire. State of California. http://frap.cdf.ca.gov/data/frapgisdata-sw-fireperimeters_download.php
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