The 416 Fire: A Tale of Wildfire and Water

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ABSTRACT

The 416 Fire of 2018 burned between Durango and Silverton, Colorado for over a month. By the time it was contained it had reached over 50,000 acres, spreading across the Hermosa Creek and Animas River watersheds. The post-fire runoff was deadly, wiping out over 80% of the fish population in the Animas [1]. Accompanying journalistic stories with map visualizations of fires like the 416 Fire can help readers understand the magnitude of effects that wildfires can have on water supply well outside of the burn scar.

Keywords: Wildfire, Colorado, water, 416 Fire

1 INTRODUCTION

The relationship between wildfire and waterways is complex. Regular intervals of low intensity wildfire activity is healthy for riparian ecosystems. They maintain the canopies of wildfire adapted vegetation like aspen and pines along river banks, which provide valuable nutrients to aquatic organisms.

However, with a combination of poor forest management and climate change, fires are burning more intensely, and more often. These hotter fires are capable of entirely eliminating the canopy and suffocating aquatic organisms with ash, leaving vegetation devoid burn scars in their wake. As climate in the West continues to dry, "megafires" could pose a considerable threat to water supply for wildlife and humans.

The 416 Fire is just one such fire to have fatal impacts on the surrounding watershed. It's a good case study because its effects were so widespread- not solely constrained to the burn scar. For this project, I combined reporting work and visualizations to explain the timeline of events in the 416 Fire and how it impacted streams. These visualizations include a comparison to the Hayman Fire of 2002, which had water quality impacts that were felt for over a decade in the Cheesman Reservoir.

2 RELATED WORK

For this project, it was important to research both academic work and the work of journalists who have reported on wildfire impacts of water. Utilizing both informed how I wrote my article and what important parameters of the fire I focused on for the visualizations.

2.1 Academic Research

While wildfires have had known impacts on watersheds for many decades, a sense of urgency in the face of climate change has reinvigorated some of the academic scholarship on this subject in the west and southwest United States. In the description of a study by Aregai and Neary on wildfire water impacts in Arizona, one hope for the results is that they encourage local, state and federal government agencies to be more proactive in their approach to wildfires that could potentially impact water quality[2]. This research is awareness-raising, aiming to spur action on an issue that has long been prevalent and can only get worse. Writing a journalistic piece on this subject works with a similar purpose.

Though journalism often needs to simplify some of the scientific jargon in order to reach a wider audience, this doesn't mean that it should sacrifice accuracy to do so. That is why research on the term "burn severity" was important for this project, as I decided to use it as one of my parameters for comparing the 416 Fire to the Hayman Fire. There has been confusion and conflation between the terms of fire intensity, fire or burn severity. A concise definition of burn severity that is similar to what the Burn Area Emergency Response (BAER) program uses would be the loss of or change in organic matter aboveground and belowground [3]. This doesn't immediately include conclusions about postfire erosion, but provides valuable information that scientists can then use to make those conclusions.

The burn severity maps produced by BAER are where I drew the colors for my bubble maps from.

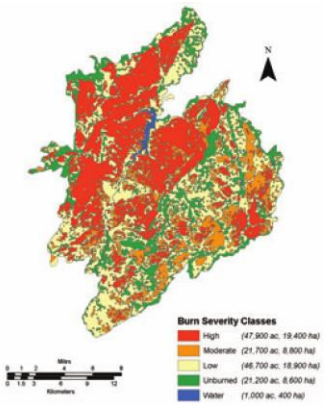

Figure 1: Burn severity map of the Hayman Fire developed by BAER [4].

2.2 Journalistic Works

Photography is a frequently used multimedia element in reporting on issues of wildfire and water. An article by Struzik succinctly covers how wildfires can degrade water quality in different ways for both wildlife and humans, with photographs of the smoke and wildfire debris to add a visual aspect to the piece [5]. A story by Whitman works in a similar fashion, using illustrations in addition to photographs as an educational tool displaying the difference between prefire and postfire runoff [6].

When stories about wildfires include visualizations, they may be very colorful and robust but static, like *The New York Times* article by Lai that used multiple static maps with satellite imagery of the Amazon Rain Forest fires [7]. Or, the visualizations could be interactive but lose some of the color and detail that the static visualizations have, as shown in the *San Francisco Chronicle's* California fire tracker tool [8]. This tool provides a good general overview of the current and recent fires in California, but it lacks some of that robust detail that Lai's static visualizations revealed.

3 Project Description

This project consists of five visualizations that are used to enhance and further the storytelling in a written piece on the 416 Fire. Four of the visualizations were created with Google Maps, while the last was created in Tableau.

The first three visualizations are all interactive maps of the 416 Fire perimeter at different times, each placed strategically within the story in points where they further the narrative. The visualizations are ordered chronologically, with each one showing the fire perimeter's growth and adding a new story element. For example, the map for June 21st shows the old perimeter in addition to the perimeter representing the growth on that date, and now also includes a marker representing the fish rescue that took place at some point in that time frame. Users can zoom in and out, click on markers in order to get more information and see a photograph that represents the information about the marker. There is also an option to change the map style to a topographical map in the advanced options tab on the left.

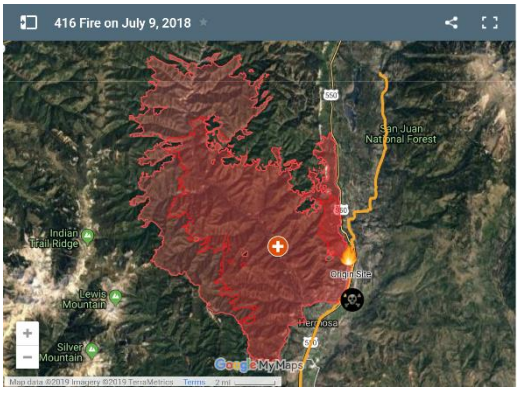

Figure 2: Topographical map option.

The fourth visualization is where the Hayman Fire is introduced. It is also an interactive visualization that allows the user to utilize all the aforementioned features, however it represents the Hayman Fire burn scar instead of the 416 Fire. Notable markers for this map include the pollution at Cheesman Reservoir and the origin site.

The final visualization is a static bubble chart that represents the burn severity for each fire. Each bubble represents a category of severity, with the colors based on the scheme that BAER used to visualize the severity of the Hayman Fire. The area of the bubbles corresponds to the percentage of the total burn scar that category makes up. Labels are included to indicate the severity category and the percentage.

4 Discussion

This project aims to combine some of the favorable elements from previous journalistic mapmaking attempts for wildfires. The interactive maps both supplement and carry the story: a reader should be able to get a good idea of key points of the article from them without reading it. And if they have read it, then the exploration aspect of the visualization is heightened. They *know* that there was extensive fish kill because they just read about it. But by looking at the map they can now actually see for themselves just how extensive it was by comparing the distance between the edges of the fire perimeter and the markers indicating fish kill.

Since the maps can zoom out and are draggable, this also allows the user to search for points of interest in relation to the fire that may not be an official map feature but are relevant to them, like their home or a favorite camp site.

The bubble map, while showing the unique burn severity differences between the 416 Fire and the Hayman Fire might encourage readers to have further questions and dig more into the subject. For example, the biggest bubbles for the Hayman Fire are low and high severity, with a much smaller bubble representing the moderate severity. While there isn't a definitive conclusion on why the severity pattern looks the way it does, it's possible that mixed practices of fuel treatments and fire suppression across the landscape came into play [9]. For example, an area that has had an unhealthy amount of fire suppression would be expected to burn much more severely than an area that has had prescribed burns.

References

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