Wildfire

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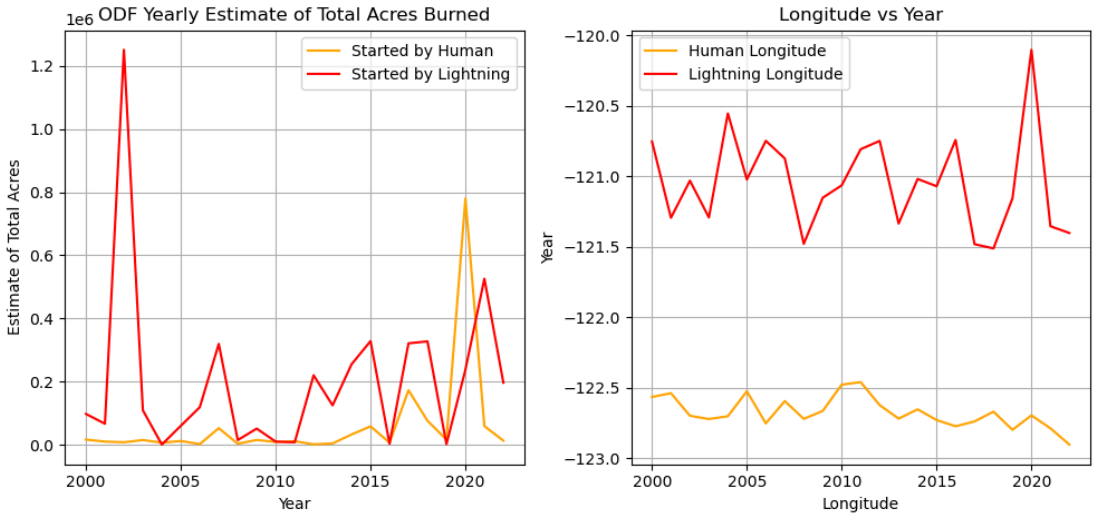
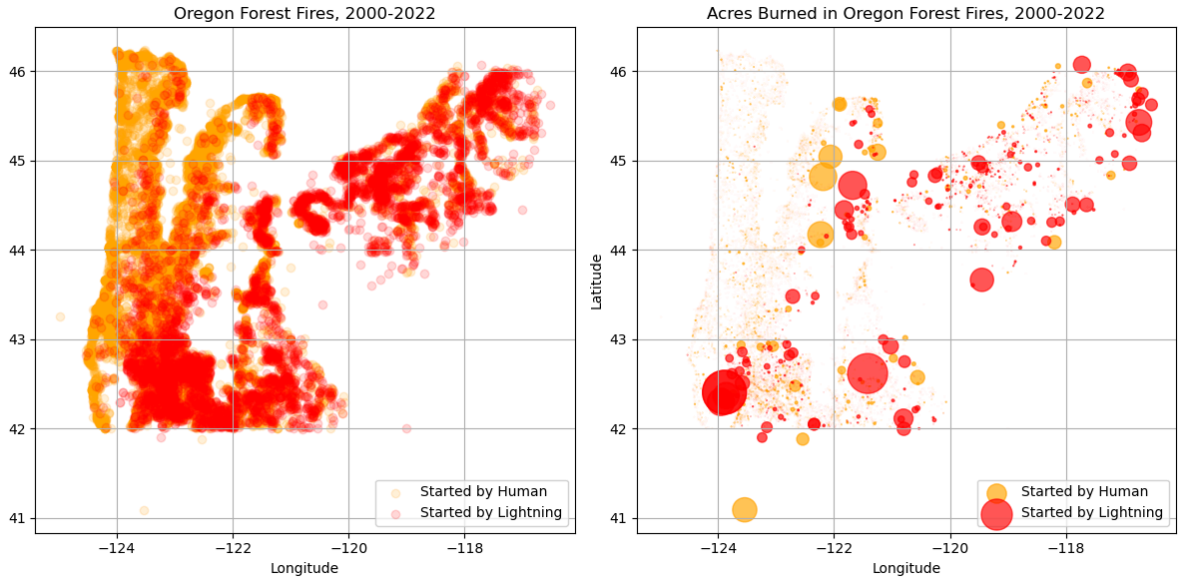
My final project is a continuation of my work with ODF (Oregon Department of Forestry) data of Oregon wildfires from the years 2000 to 2022. Initially, I found a clear distinction in the data between wildfires which were started by humans as compared to those which were started by lightning. This led me to create new tables which distinguished between the two types of fires, as well as a line graph of these two fire types over the given years, which identifies the estimated total acreage burned for both groups. In my original sonification I kept time with the X-axis and explored two parameter mappings with the Y-axis (frequency and amplitude).



In development from my prior work, I am more intentional about the duration, spatial location, and timbres in my sonification of the yearly data. The sonification is 22 seconds long, with one year being represented by one second. I created an additional line graph which represents the average longitude of where these fires occurred each year. Spatially, the sonification pans each line according to its longitudinal data. Because the panning location was determined by an average of all longitude values for fires in that year, it may be interesting to see how this varies with other representations of center, like median values. Given the dense (human) populations which live further West in Oregon, it is unsurprising that human fires are on average further West than those started by lightning. While the sine and saw waves were clear and intentional enough for a beginning iteration of the project, choosing samples which are closer correlated with my topic adds an aesthetic element to the piece. I found a sample of human clatter to pair with the human line, and a sample of the sound of fire to pair with the lightning line. Using these samples allowed me to personify one line and keep the other more naturally rooted, which I think enhances the piece.

I was interested in developing this project further, though. Taking an average of the longitude was insightful, holistically, but what about the individual fires themselves? Regardless of time, how can we solely

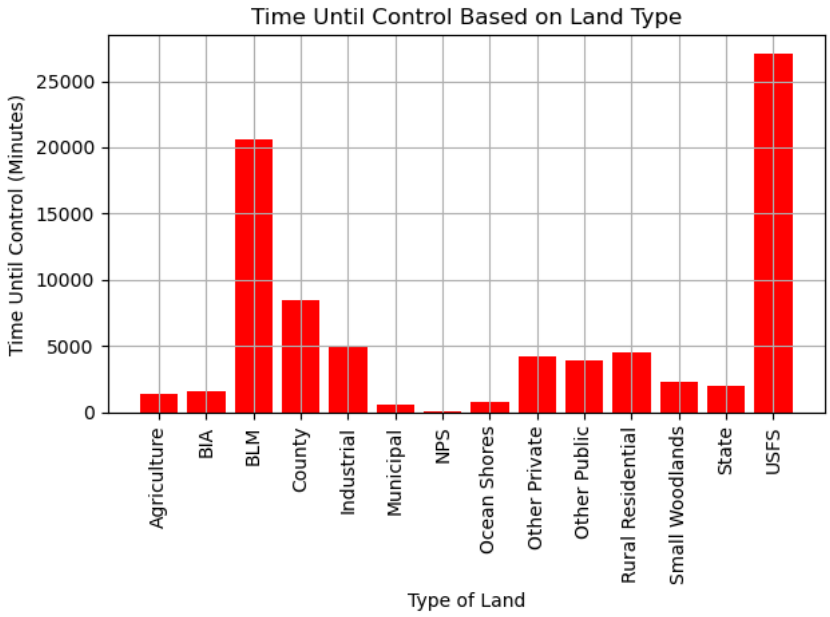
visualize spatial location and impact of damage? This led me to a second iteration of the project, which is a locational representation of these Oregon wildfires.



I still divide my dataset based on whether the fires were started by humans or lightning. However, rather than grouping these two datasets by year, I take consideration of both the latitude and longitude values given for each fire. The figure at left is a scatter plot which solely visualizes longitude vs latitude values for each fire, colored by fire type. It was striking when creating the visual how closely the data resembles an outline of the state of Oregon, demonstrating how widespread these fires are across the entire state. Visually it is still apparent that the human started wildfires tend to populate along the west coast. Lightning started fires have what appears to be a wider spread, densely covering both the southern and northeastern portions of the state. The figure I created at right is still a locational scatterplot which visualizes the coordinate location of each fire, yet now it additionally takes the damage of each fire into consideration. The size of each point in the scatter plot represents the estimated total acres burned by each fire. Visually we can see that while a majority of human started fires occur on the west coast, most of them are not nearly as large as the fires started by lightning. The human started, mid-size fires which did occur also appear to have taken place in central oregon.

I chose to sonify the visual at right, reading across its data from left to right. I sorted my data based on longitude in order to accomplish this. The sonification I created is panned based on this longitudinal position, starting panned at hard left and ending panned at hard right. The duration of the sonification is 25 seconds long, intending to roughly mimic the dimensions of the grid on the scatterplot (5 sec/2 longitudinal degrees). I map the Y-axis latitudinal position of each fire as frequency, with further northern fires associated with higher-pitched frequencies. Amplitude is mapped according to the damage each fire caused, which is, again, quantified by the estimated total acreage that the fire burned. I intended to keep the timbre of this sonification similar to my yearly mapping by using the samples of human and natural sounds. However, when I attempted to do this in Kyma, the timbre was quite piercing and unpleasant, I believe because of how many individual points

are being mapped in such a short amount of time. I think I could have extended the duration of the sonification in order to combat this, but instead I changed the timbres of the two types back to the sine and saw waves of the original iteration of the project. While this sonification does not at all factor in time, another insightful iteration of this locational sonification may be to sort by discovery date rather than longitudinal location. A longer sonication which pans between left and right, based on longitude, as discovery time maps as duration, could be another rewarding iteration of this project that I did not choose to explore here.



My last iteration of this visual and sonic investigation of Oregon wildfires is an exploration of the relationships between times that are recorded in our dataset. Taking the difference of the time each wildfire was reported and controlled allows us to determine roughly how long it took to control each fire. In other words, once we report the fire, how long on average does it take to get it under control? Does this amount of time differ based on what type of land the fire is occurring on?

Above is a histogram I created which depicts the average time it takes to control these fires, in minutes, based upon the type of land the fire occurs on. There are two clear peaks in the data, in BLM (Bureau of Land Management) and USFS (US Department of Agricultural Forest Services) lands. Perhaps wildfires that occur on lands with more human capital attached to them take less time to control. In my mind, I see this occurring for a variety of reasons, such as more urgency to eliminate risk to human life, less trees/brush for the fires to burn, easier routes for the firefighters to combat the fires, etc.

I sonified the above histogram in three different ways. Because my derived dataset was so small I did not use Kyma's DFE at all and simply hardcoded any values I chose. The initial way I chose to sonify the histogram was by representing the height of each bin as amplitude, and constructing harmonics based upon the bins. 'Agriculture' was mapped at 200 hz, and each bin to the right of it incremented by 200 hz. My second trial at the sonic histogram took my initial sonification but introduced panning, with each bin spatially located based upon where it is shown in the image ('Agriculture' panned hard left, 'USFS' panned hard right, etc). Lastly, I created

another sonification which mapped the vertical axis of each bin as frequency rather than amplitude. All bins had equal amplitude, but their frequency was equal to the amount of time it took to control the fire (mins * 0.1, scaled in order to more appropriately fit the range of human hearing). I again panned the data so that each bin had a specific spatial location based upon its presented position on the histogram. I did not intentionally arrange the bins in any way, but doing so may make this specific iteration more deliberate and impactful.

Further explanation/evidence of my work in each of these sonifications is available. I used Python, JupyterNotebooks, Numpy, and Matplotlib to clean the data for sonification and create visualizations. Parameter mapping for these sonifications was performed in Kyma. I also used Logic to combine two audio tracks (for human and lightning, separately), as well as to control levels in order to avoid distortion.

Source: “Information & Statistics.” Oregon Department of Forestry : Information & Statistics : Fire : State of Oregon, www.oregon.gov/odf/fire/pages/firestats.asREapx. Accessed 16 May 2024.