

## Final Project

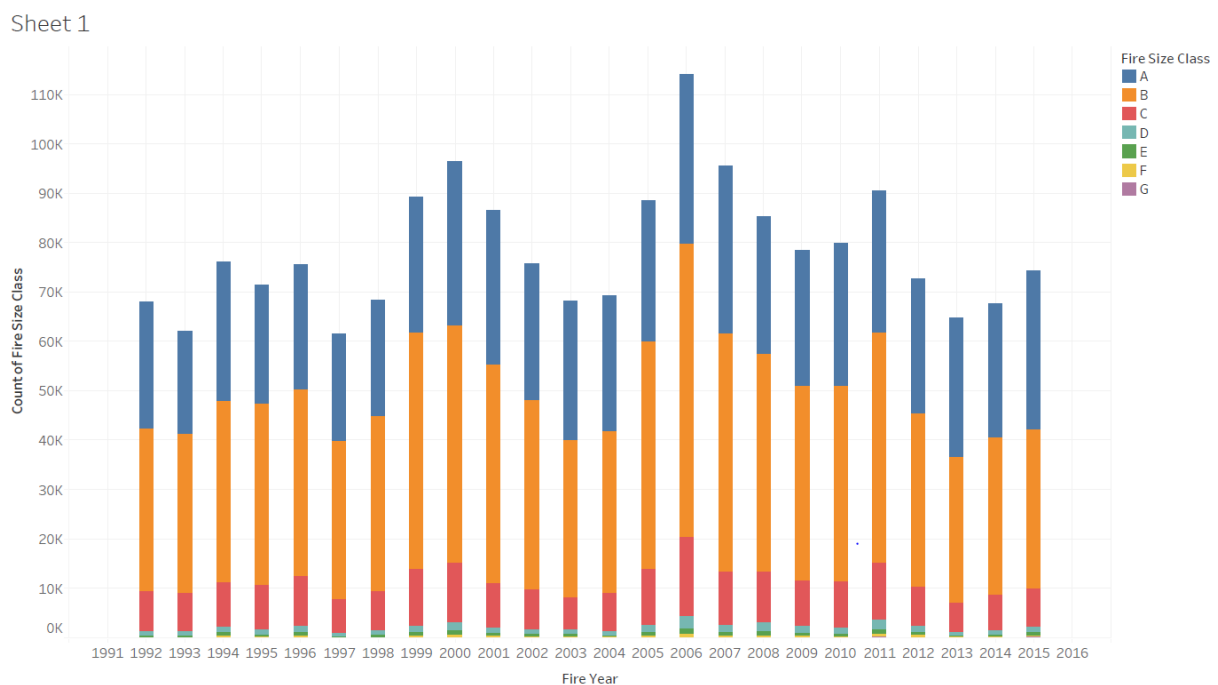
The word tolerance springs up an idea of destruction in my brain almost immediately because tolerance/intolerance in a lot of cases leads to destruction. One example is the destruction from wildfires which was increasingly on the news in early 2020 and showed people the environmental impact these events have. Surprisingly, state and national governments did very little to try and stop these wildfires, which brought up the question of how tolerant are the US government and US people to wildfires?

An idea I had was to model wildfire data to see how different states tolerance for wildfires has changed over time. Are we witnessing more fires now or ten years ago? How have the average sizes of the fires and causes of fires changed in different areas of the United States? By exploring the data, we can see whether there is a clear increase or decrease in wildfires and whether this increase/decrease has to do with a specific problem in the US. Taking this a step further, we can understand whether a nationwide solution to end wildfires is possible or whether different states need different solutions.

I used a 759mb Kaggle database that includes tens of columns and thousands of rows of data from 1992 to 2015 which I reduced through SQL and Python to create a compact data file that includes the following columns: state, fire year, fire size, and fire cause. This is a large dataset from a reputable source that will allow us to understand trends across the entire United States. Reducing this dataset introduced me to storage and efficiency challenges that emerge from using big data in Tableau and D3.

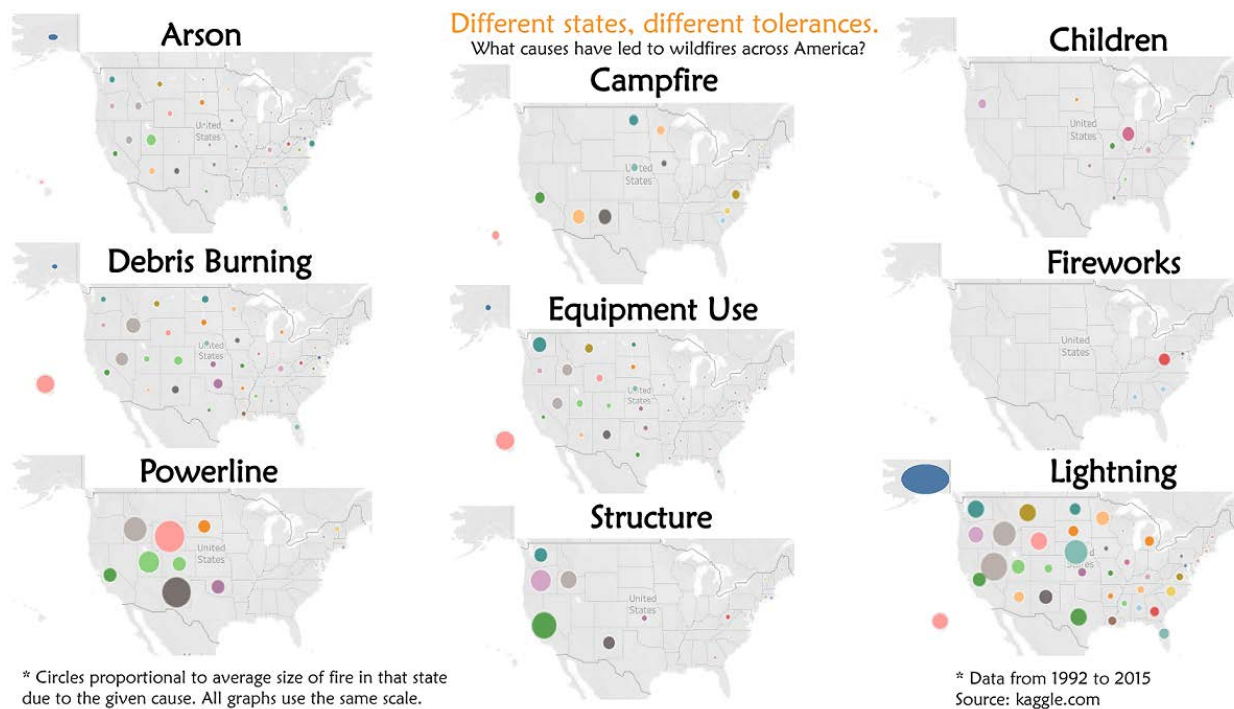
Visually, my strategy was to keep things very simple and clear. I wanted to use things like maps of the United States that all had the same scale to allow the eye to visually compare how different causes impact different states. Additionally, I wanted to create something that

takes another step and separates the data by year so that the temporal aspect of wildfires can be explored. Donut charts, pie charts and sunburst charts all came to mind. These types of visual charts allow us to compare not only how different states add to the problem but also how different causes are more pertinent than others. Lastly, I wanted to use an appropriate color scheme ... one that emphasized destruction. So, with my ideas in mind, I transitioned into Tableau.

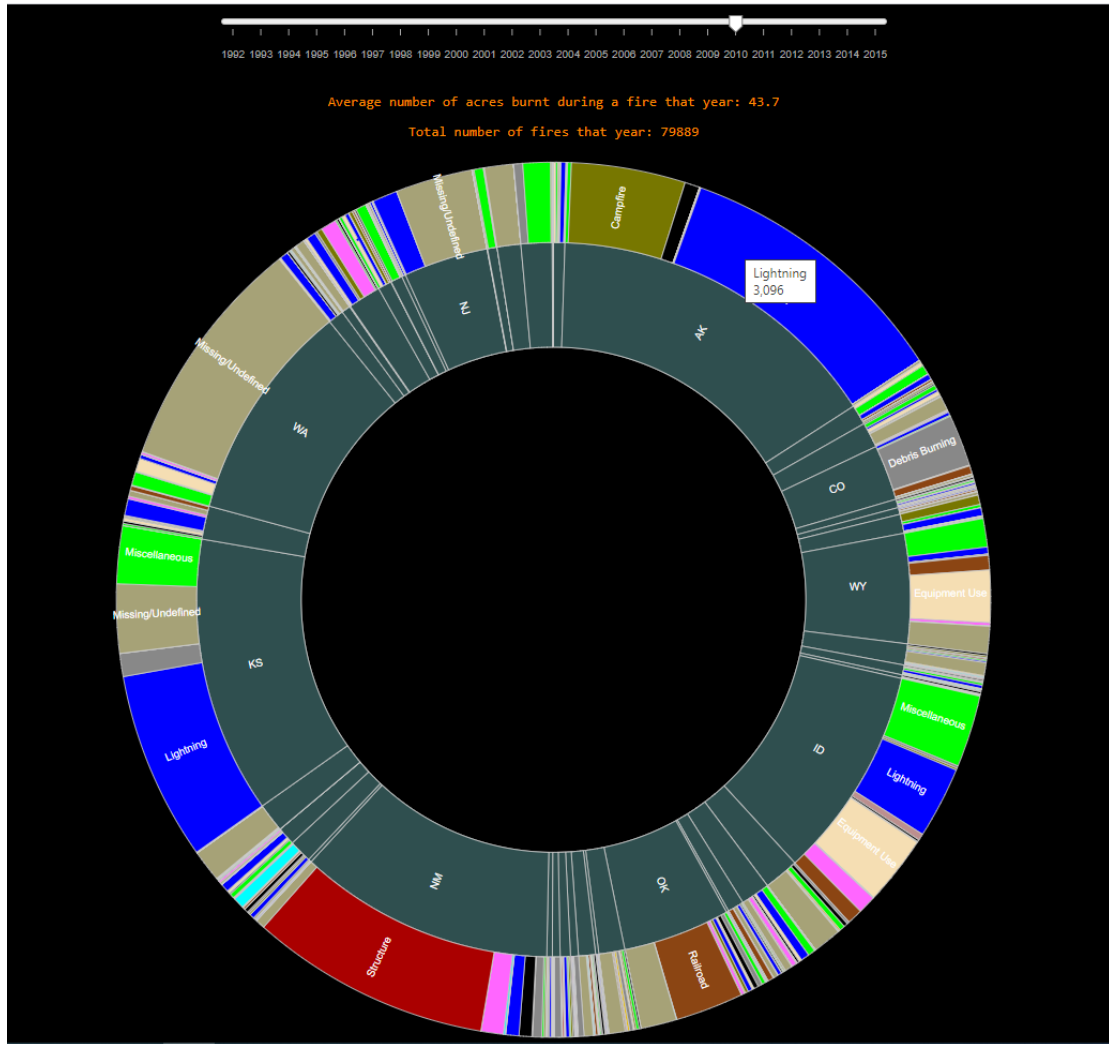


This first chart showed how very little has changed across the United States over the years. There are some spikes and troughs here and there but no overall trend. In fact, the trend looks almost like a sin wave which does not provide us with much information. So, I transitioned from looking at data of the United States as a whole, to data from each state. At first, I wanted to create one big map of the United States that had a trendline for each state layered on top. However, this would only show us how the number of fires has changed over the years, something my dynamic visual already accomplished. Therefore, I modeled the various impacts

of some of the causes of fires across the United States, something my dynamic visual did not fully accomplish.



The visual makes it clear that lightning, arson and debris burning affect the entirety of the United States. While other causes like fireworks, structure, and powerlines are distinct to specific regions within the United States. The static visual proved that just federal action is not enough. Different states have different issues and the state governments need to get involved. A national policy that helps decrease the number of wildfires caused by powerlines will in no way help Alaska but a national policy directed at decreasing the number of wildfires caused by lightning can help the entirety of the United States. Furthermore, lightning is the main cause of destruction across the entirety of the United States but is there anything that can be done to alleviate this? Or do we have to learn to tolerate wildfires caused by lightning? Unlike this visualization, the dynamic visualization (compiled in D3 for its capabilities) shows how tolerance has changed over the years.



The sunburst was the most appropriate visualization. Other methods like scatter plots and bubble charts just simply couldn't capture the complexity of the problem in an elegant way. The sunburst made it easy to see which causes were most tolerated and which states had the most tolerance for wildfires. Scrolling through the years allows us to find some interesting trends. Namely, states that have a high number of fires occur in a given year aren't necessarily the same states that contributed to the most destruction of land in that year. Additionally, the most pertinent causes of fires have changed from year to year. With structural issues and arson causing more of the most recent fires while lightning caused most of the fires in the 90's. Surprisingly, some of the early problematic states that caused the most destruction, like Alaska, Kansas and

Texas, are still problematic (Alaska and Kansas). While newcomers like California haven't always caused as much destruction as they do now. The overall trend in number of fires is not clear (resembles a sin wave) and it seems like the number of fires is evenly distributed across the United States and always has been. All of this information leads to several conclusions.

Firstly, focus on damage and not number of fires. Damage is more important and has very clear indicators and trends. While the trend in number of fires across the years isn't clear, the more recent years see more destruction and damage than ever before. While national interference might be helpful, states need to take matters into their own hands. Some states like Alaska and Kansas have always tolerated wildfires and have pushed the US statistics higher and higher. Exploring solutions in those states is important but also exploring the more recent upticks in states like California is crucial to stop them from joining the reigns of Alaska and Kansas. Additionally, understanding what states like Texas have done to end the wildfire issues they experienced in the 90's can help in finding a national solution. Lastly, the issues that have impacted the United States most recently should be tackled first. Even though it appears like we are tolerant to wildfires and the destruction they cause, intolerance in this case would much better benefit our planet.

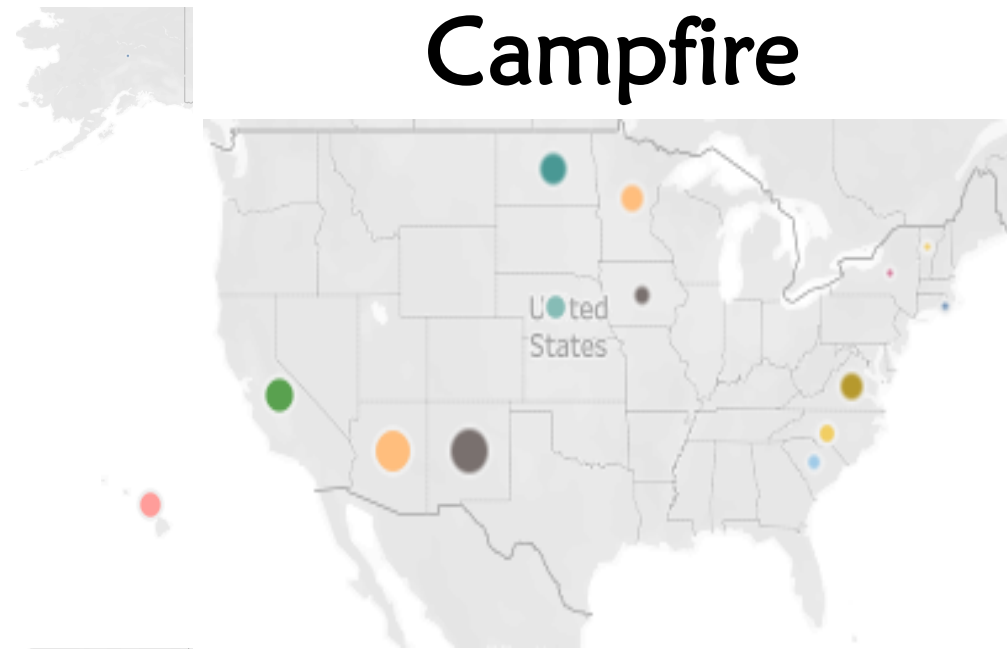
## Arson



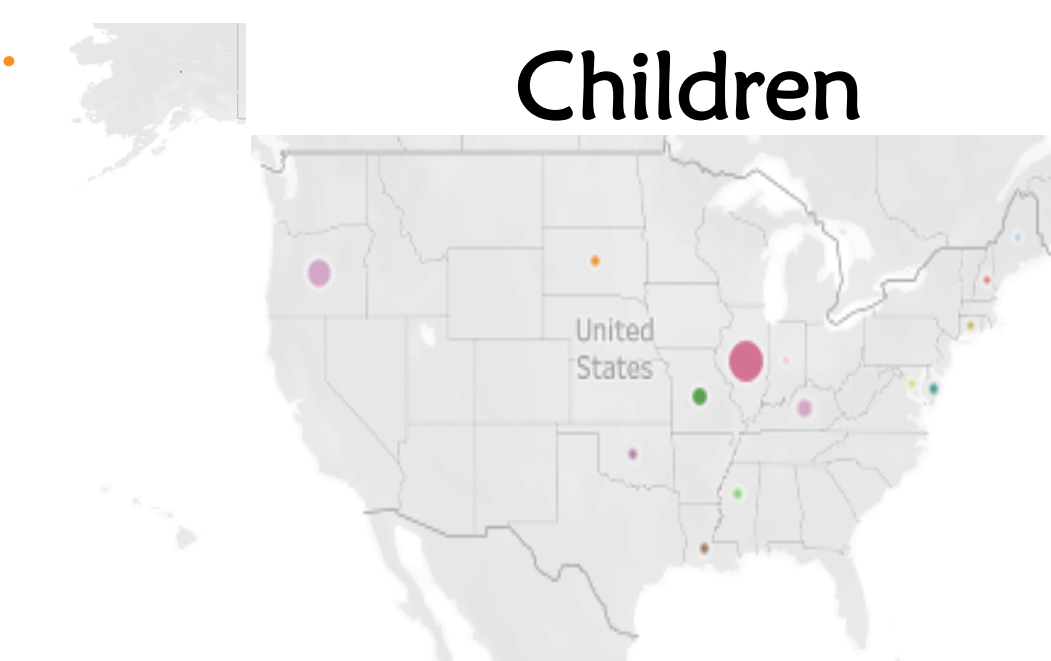
Different states, different tolerances.

What causes have led to wildfires across America?

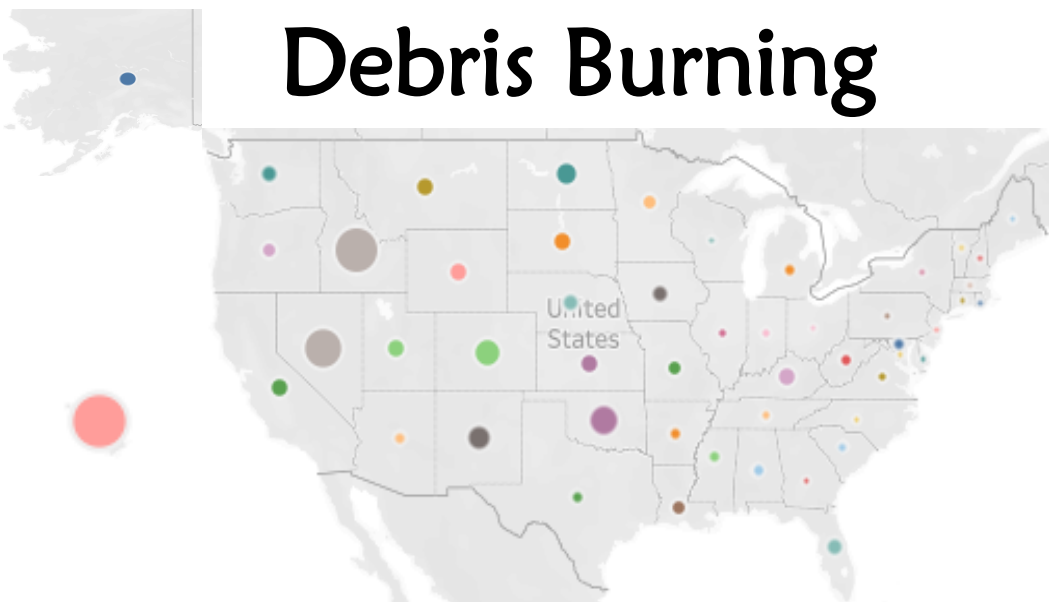
## Campfire



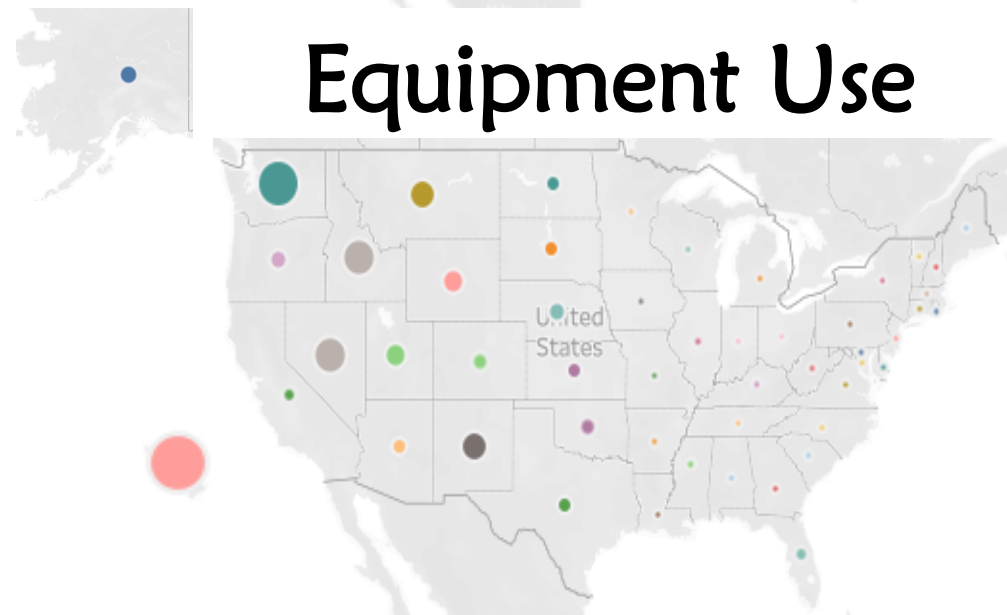
## Children



## Debris Burning



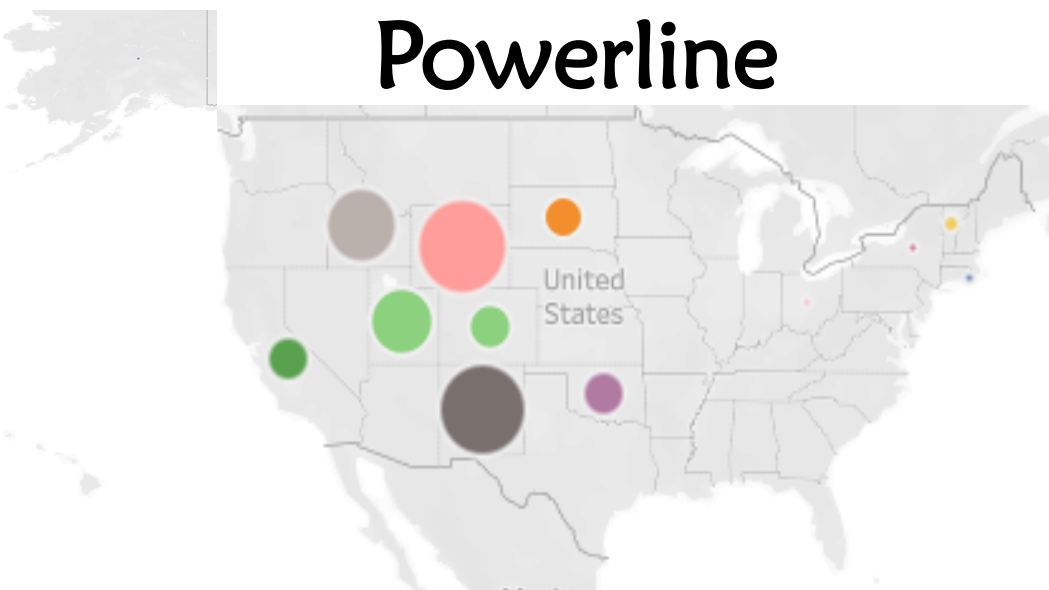
## Equipment Use



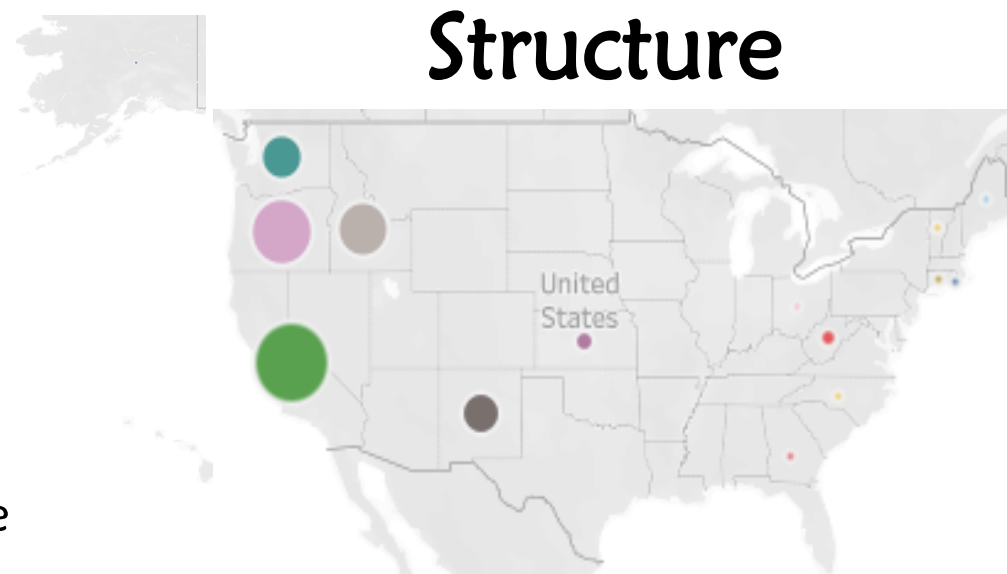
## Fireworks



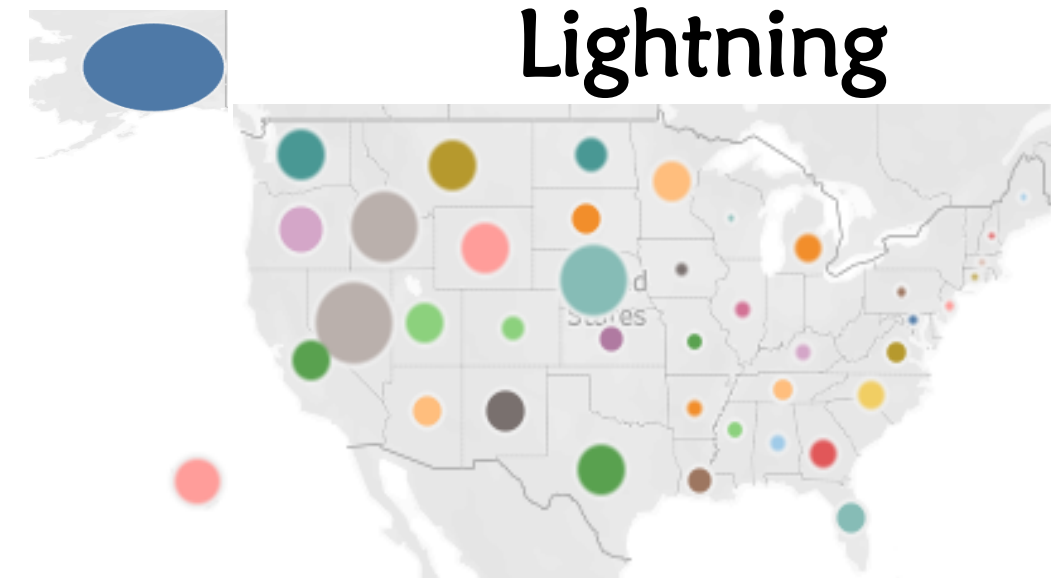
## Powerline



## Structure



## Lightning



\* Circles proportional to average size of fire in that state due to the given cause. All graphs use the same scale.

\* Data from 1992 to 2015  
Source: kaggle.com