

Introduction

Every single year human lives, ecosystems and properties are at risk due to wildfires in the state of North-Carolina (NC). Wildfires harm both air and water quality while efforts to fight wildfires are expensive and put emergency personnel in harms way. A better understanding of the dynamics behind destructive wildfires can aid prevention efforts. This report analyses the causes, timings and sizes of wildfires across different counties in NC. The data is obtained from the United States Forest Service (USFS) and spans across 1992 to 2015.

The analyses in this report have been performed on a dataset containing the following categorical variables: the county the fire occurred in, its fips code, the year and month the fire was discovered in, the official cause with a matching cause code and the fire size binned into seven categories. The continuous variables studied are the discovery date of the fire, the fire size and the coordinates of the fire. The only missing values in the dataset are for the variables county and the fips code. The county variable also contained several erroneous entries, all of which were correctable. Below the first 5 rows of the dataset are depicted as an example.

| Obs | Year | Discovery date | Cause code | Cause | Fire size | Fire size class | Latitude | Longitude | State | County | Fips code | Month |
|-----|------|----------------|------------|---------------|-----------|-----------------|----------|-----------|-------|----------|-----------|-------|
| 1 | 2005 | 11MAR05 | 2 | Equipment Use | 0.6 | B | 35.23 | -82.88 | NC | Buncombe | 21 | Mar |
| 2 | 2005 | 27JAN05 | 7 | Arson | 50.3 | C | 35.00 | -83.35 | NC | Macon | 113 | Jan |
| 3 | 2005 | 06FEB05 | 7 | Arson | 0.1 | A | 35.93 | -81.72 | NC | Caldwell | 27 | Feb |
| 4 | 2005 | 12FEB05 | 5 | Debris Burnin | 125 | D | 36.00 | -81.59 | NC | Caldwell | 27 | Feb |
| 5 | 2005 | 16APR05 | 5 | Debris Burnin | 25 | C | 35.99 | -81.85 | NC | Avery | 11 | Apr |

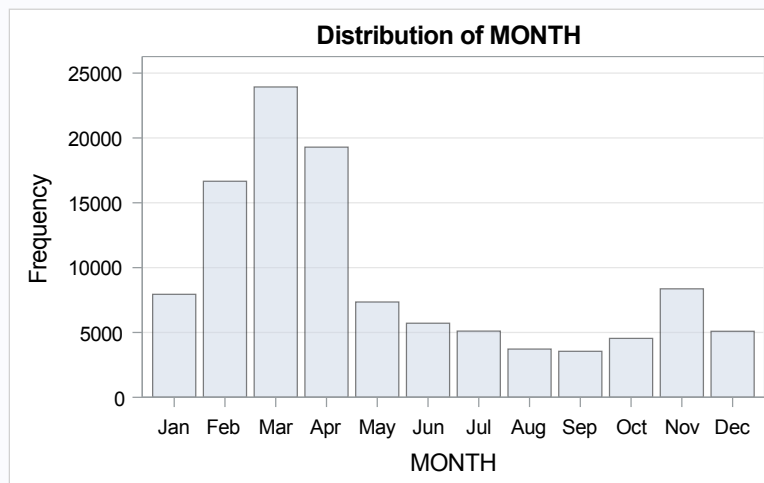
The FREQ Procedure

| Number of Variable Levels | | | | |
|---------------------------|--|--------|----------------|-------------------|
| Variable | Label | Levels | Missing Levels | Nonmissing Levels |
| STATE | Two-letter alphabetic code for the state in which the fire burned (or originated), based on the nominal designation in the fire report. | 1 | 0 | 1 |
| COUNTY | County, or equivalent, in which the fire burned (or originated), based on nominal designation in the fire report. | 101 | 1 | 100 |
| FIPS_CODE | Three-digit code from the Federal Information Process Standards (FIPS) publication 6-4 for representation of counties and equivalent entities. | 101 | 1 | 100 |
| FIRE_YEAR | Calendar year in which the fire was discovered or confirmed to exist. | 24 | 0 | 24 |
| STAT_CAUSE_CODE | Code for the (statistical) cause of the fire. | 13 | 0 | 13 |
| STAT_CAUSE_DESCR | Cause of the fire. | 13 | 0 | 13 |

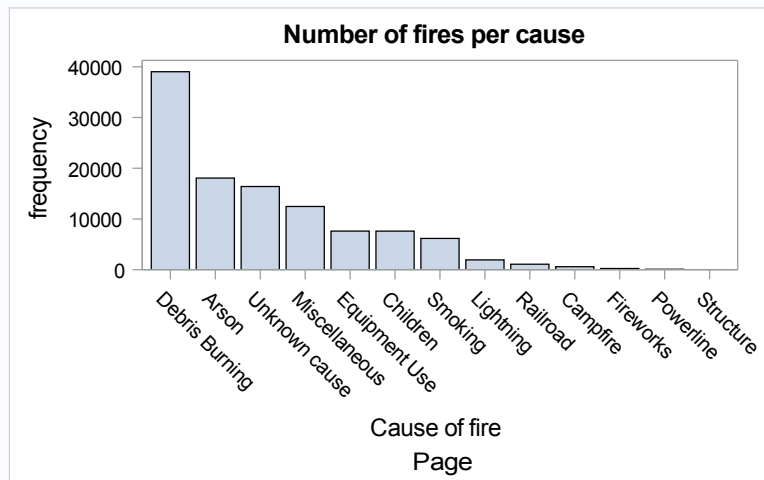
The table displays the number of levels for each categorical variable. The values for the state variable are all the same, namely 'NC' as a reference to the state of North-Carolina. Both the county and fips_code variables have 100 different levels and missing values. The data spans across 24 years and contains thirteen different categories for causes.

There do not appear to be any inconsistencies in any continuous variables. However, the size of the wildfires is skewed to the right, with a few unusually large wildfires. The most extreme observation being a wildfire which, according to the data, burned 45294 acres of land. There's no reason to assume these extreme values are errors as they appear to be realistic.

The FREQ Procedure



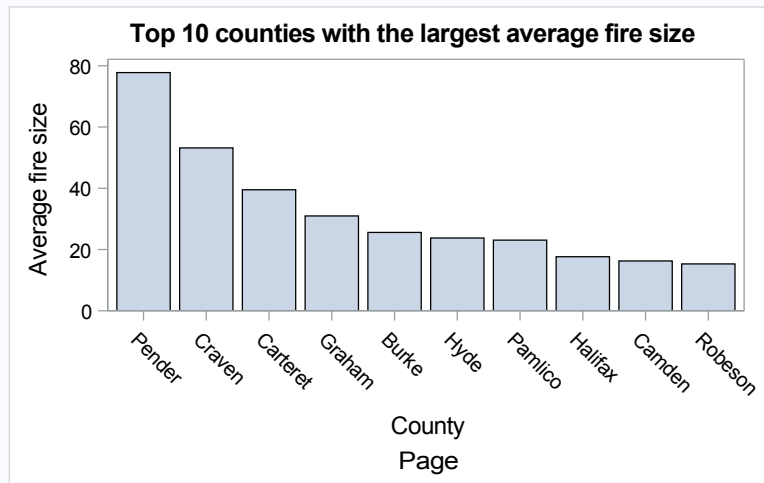
During late winter and early spring wildfires occur more often while summer is the calmest period.



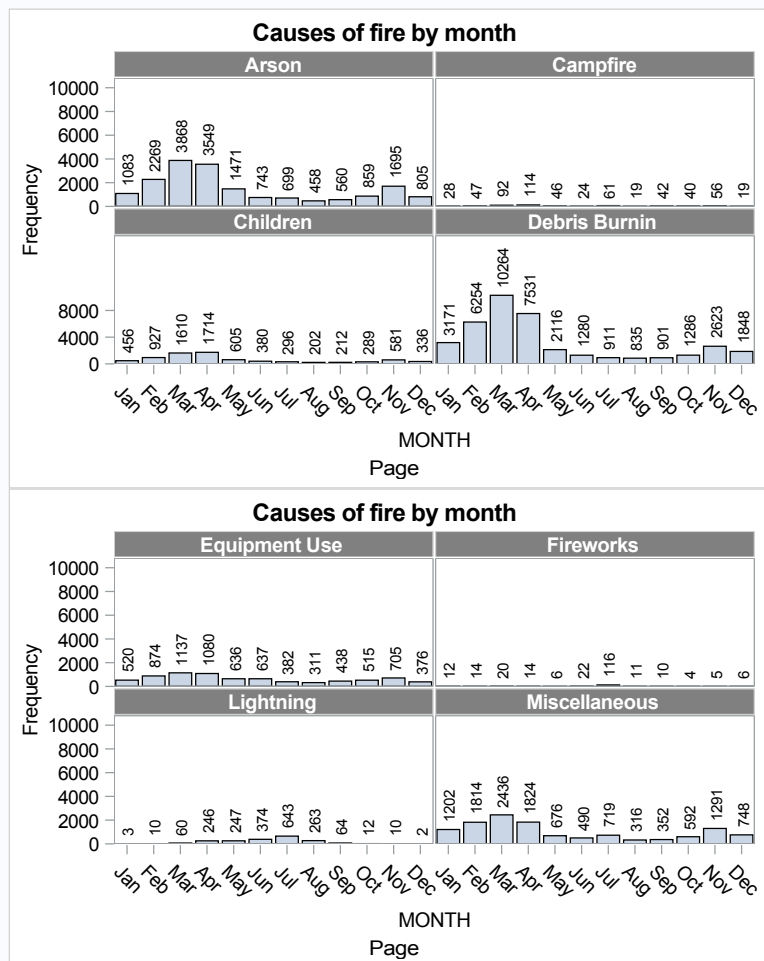
By far the main cause of forest fires is debris burning, which accounts for more than one third of all wildfires. A distant second is Arson. The third most common official cause is equipment use, which has barely been documented more often compared to wildfires caused by children. However, the large amount of unknown causes leaves some room for ambiguity.

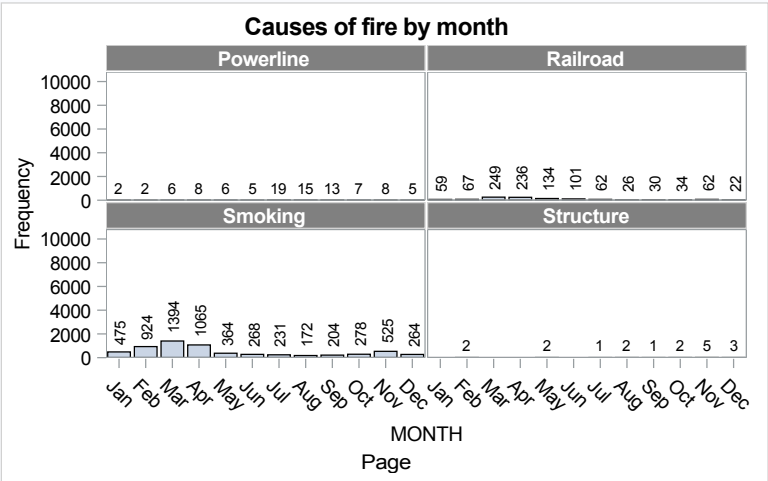
| Obs | COUNTY | _TYPE_ | _FREQ_ | n_obs | average | lower_CI | upper_CI |
|-----|--------|--------|--------|-------|--------------|--------------|--------------|
| 1 | Pender | 1 | 511 | 511 | 77.759041096 | -42.45166728 | 197.96974947 |

The county with historically the largest average fire size is Pender, where wildfires have on average burned 77.76 acres each.



The bar chart displays the 10 counties where historically the average fire size has been the largest. The county of Pender clearly towers above the others.





With the exception of lightning and fireworks, most causes follow the same trend. Namely a spike in late winter and early spring, while summer has the least occurrences of wildfires. Fireworks and lightning go against the trend as they more often cause wildfires during summer.

| | Fire Size: Estimate of acres within the final perimeter of the fire | | | |
|----------------------|--|------------|--------------|--------------|
| | Number of fires | Total size | Average size | Maximum size |
| Top 3 causes of fire | | | | |
| Debris Burnin | 39020 | 135370.5 | 3.469 | 2738.000 |
| Arson | 18059 | 175660.9 | 9.727 | 24600.00 |
| Equipment Use | 7611 | 39568.33 | 5.199 | 2300.000 |

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

FIRE_SIZE Comparisons for STAT_CAUSE_DESCR

