Wildfires:

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Wildfires in the United States

Every year since 2000, an average of 71,300 wildfires burned an average of 6.9 million acres. This figure is more than double the average annual acreage burned in the 1990s (3.3 million acres).

Of the 1.4 million wildfires that have occurred since 2000, 197 exceeded 100,000 acres, and 13 exceeded 500,000 acres.

Congress considers the total federal cost of wildfire management, including the cost of suppression operations, costs that vary annually and are difficult to predict.

Overview

Overview

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Problem Statement

Congress is in charge of allocating funds to deal with wildfires in the United States. The allocation of these funds is made difficulty to due the unpredictable varying nature of wildfires. To try to contend with this reality Congress has asked our team to predict if wildfires are increasing both in terms of frequency and size. To this end our team used several time series models scored on RMSE to see if there was in fact an increase. In addition to this Congress wants us to see if the dbnr is a good index to use to predict wildfires.

Workflow

Exploratory Data Analysis

Making several maps displaying wildfires by type and size and making an interactive visual to display all fires in the United States in a timelapse.

Gathering & Cleaning the data

Formatting the data so it would be usable.

Getting more data to determine temperature

Modeling

We made several models to forecast the trends in wildfires

Challenges we faced.

1. The scale of our data
2. The lack of useful features
3. The lack of a meaningful index for the weather data
4. The homegeny of our data.

Our Data's Implications:
It lacks overall explanatory power with the features provided.


Understanding
Our Data

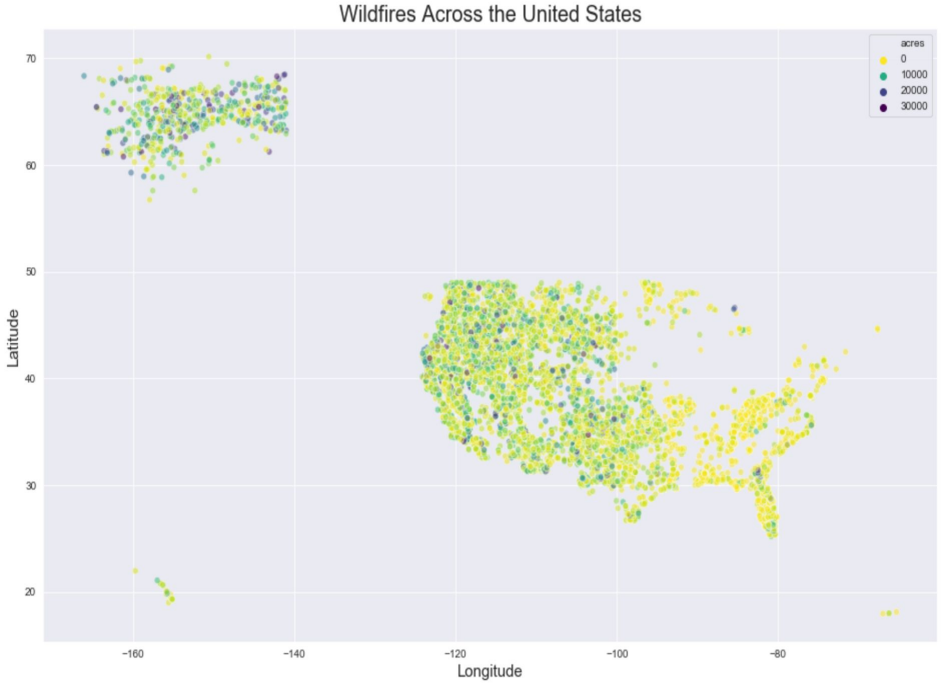
Our data had about 17,000 rows:

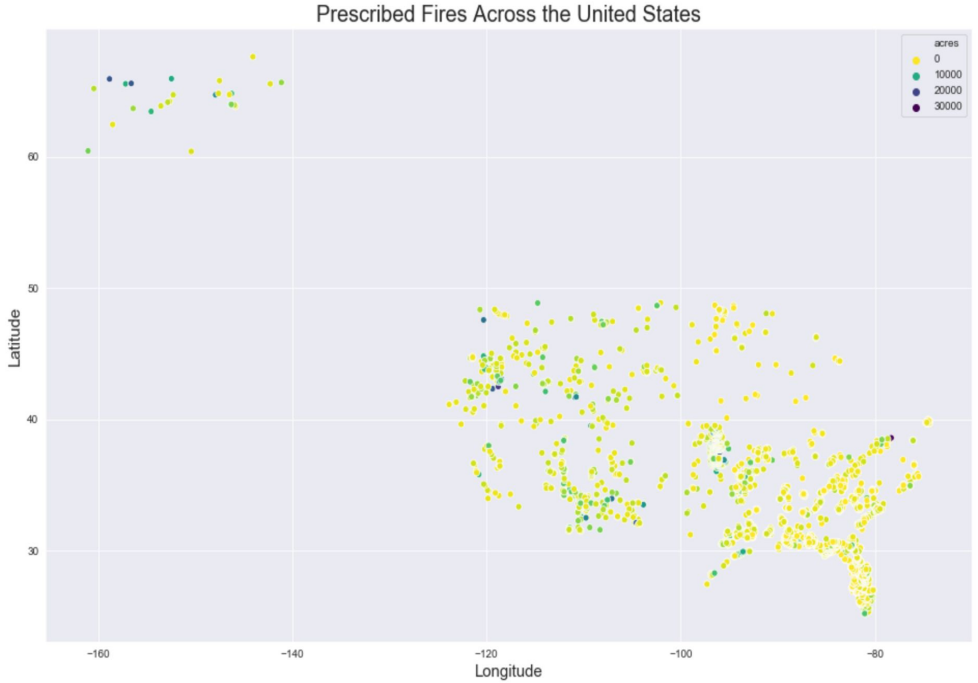
This broke down into location data

Type and size of fire

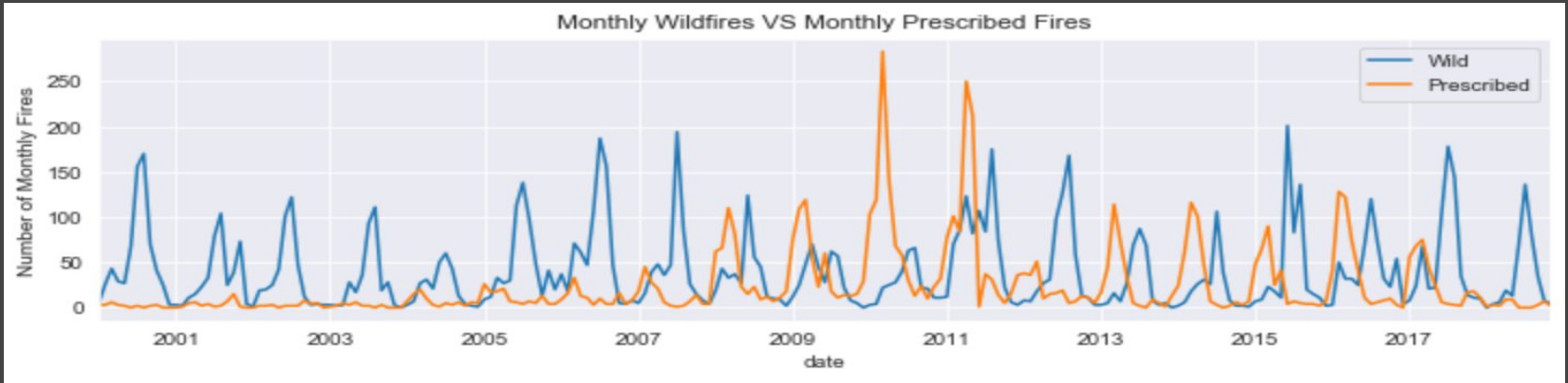
Nbr index values

Wildfires Vs. Prescribed Fires' Map

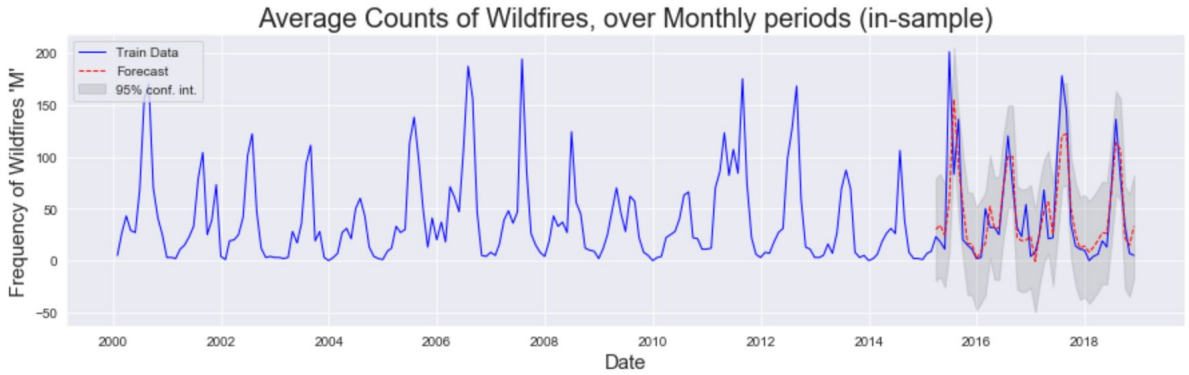




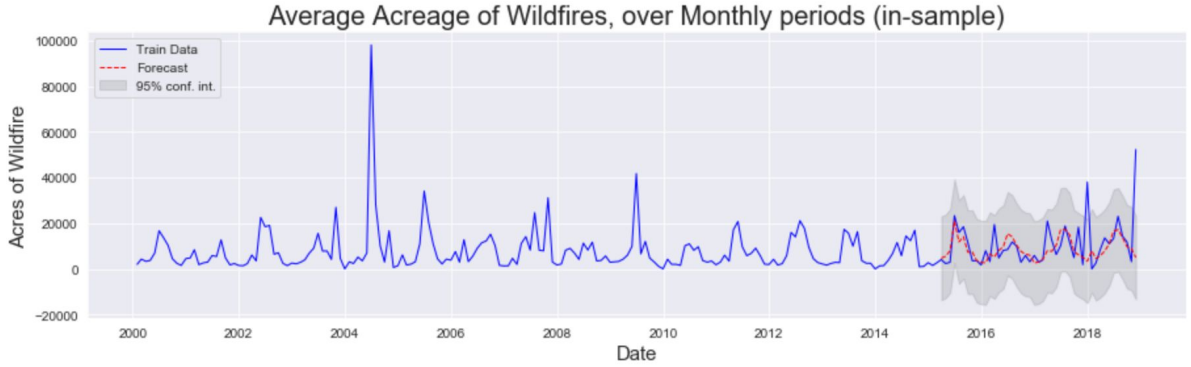
Prescribed Fires Vs. Wildfires



We used a separate SARIMAX model to look at the time series of number of wildfires across the US and the average acreage burn of those fires.



SARIMAX



SARIMAX

Model Scoring

When forecasting counts of wildfires, our model is off by +- 31 wildfires per month.

When forecasting average acreage of wildfires, our model is off by +- 10030 acres burned per month.

SARIMAX | Monthly Count of Wildfires

R2 | 60

RMSE | 31

SARIMAX | Monthly Average Acres of Wildfires

R2 | -0.04

RMSE | 10030

Conclusions

Overall the data does not contain explanatory power or features to tackle the problem statement.

Recommendations

In order for more definitive recommendations to be drawn, Have indexes that are able to more accurately describe and codify fires. Data needs to be collected that captures a longer period of time. Improve objectivity of NBR .

References:

- Sayad, Y.O.; Mousannif, H.; Al Moatassime, H. Predictive modeling of wildfires: A new dataset and machine learning approach. Fire Saf. J. 2019, 104, 130–146.
- https://www.mtbs.gov/
- https://www.noaa.gov/
- Mermoz, M.; Kitzberger, T.; Veblen, T.T. Landscape influences on occurrence and spread of wildfires in Patagonian forests and shrublands. Ecology 2005, 86, 2705–2715. [
- San-Miguel-Ayanz, J.; Schulte, E.; Schmuck, G.; Camia, A.; Strobl, P.; Liberta, G.; Giovando, C.; Boca, R.; Sedano, F.; Kempeneers, P.; et al. Comprehensive monitoring of wildfires in Europe: The European Forest Fire Information System (EFFIS). In Approaches to Managing Disaster—Assessing Hazards, Emergencies and Disaster Impacts; Tiefenbacher, J., Ed.; InTech: London, UK, 2012; ISBN 978-953-51-0294-6.
- https://www.kaggle.com/nagarajbhat/australian-bushfire-map-analysis