Wildfire Climatology Trends Helping to Inform Fire Weather Forecasting

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Abstract

- Scientists at the Storm Prediction Center output fire weather forecasts to create warnings for those in high-risk areas using wildfire climatology data up to 2015.
- Expanding the tools available to the forecasters highlights the areas becoming more prone to severe wildfires, allowing time and resources to be allotted accordingly.
- Examining new data reveals an overall increase in mean fire size and number of fires greater than 5000 acres.

Objectives

- First, **updating** the existing daily climatology by using new data up to 2020
- Next, **creating new products** for:
  - Monthly, seasonal, and yearly probabilities of fire occurrence
  - Beyond the contiguous U.S. (Alaska, Hawaii), which lacked any wildfire climatology products from the SPC
- Finally, **examining trends** in wildfire size and number (total and regional) by completing a brief statistical analysis

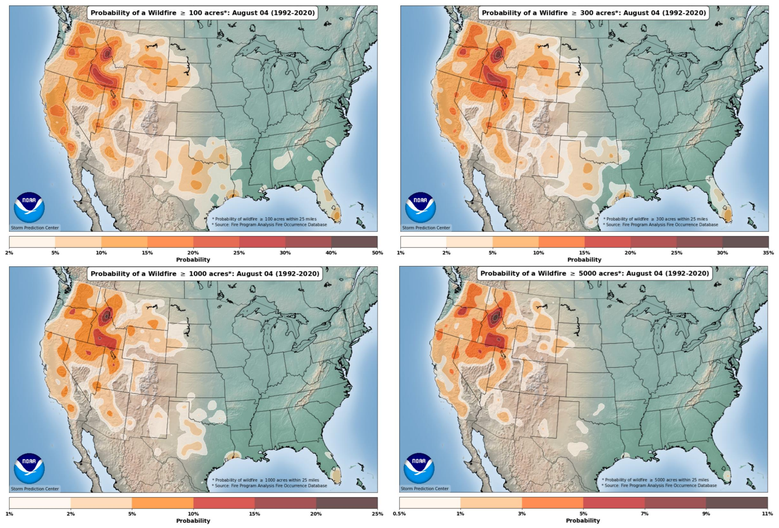


Figure 1: The updated daily climatology for each wildfire size (100, 300, 1000, 5000 acres). Note: the scale bars change for each fire size.

Methods

- The dataset used was from the Fire Program Analysis Fire Occurrence Database (FPAFOD) from Karen Short, which included 29 years of wildfires from 1992 to 2020.
- Updating the daily climatology was completed by modifying code from Nick Nauslar and plugging in latitude and longitude of each fire to a grid of 40 x 40 km.
- The probability was calculated by counting fires per grid box, maximum of 1 per year, then dividing by the total 29 years to create a probability of a wildfire in that location.
- Statistical analysis was completed by fitting a simple linear regression to a time series and examining the p-value showing significance.

Results

- Maximum probabilities exceed a 70% chance of a fire within 25 miles in a given year for areas in the northwest.
- Findings reveal that wildfire probability peaks in the western states of CONUS during meteorological summer, shifting northward from June to August which corresponds to the beginning of the monsoon season.
- Spring fires are highlighted with the monthly climatology, showing an increase in fire probability in Oklahoma during March.

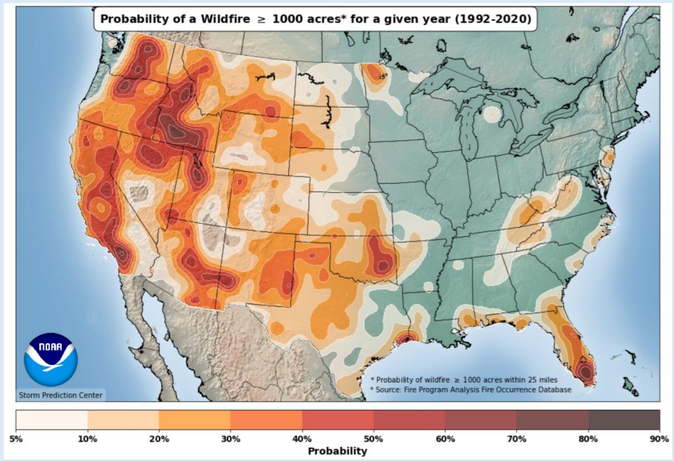


Figure 2: Yearly climatology for wildfire greater than or equal to 1000 acres.

- OCONUS climatology shows the short fire season in Alaska and a wildfire risk focused on Oahu for Hawaii.
- Trends show areas that are becoming more prone to large fires, such as the western, central, and southern regions outlined by the NWS.

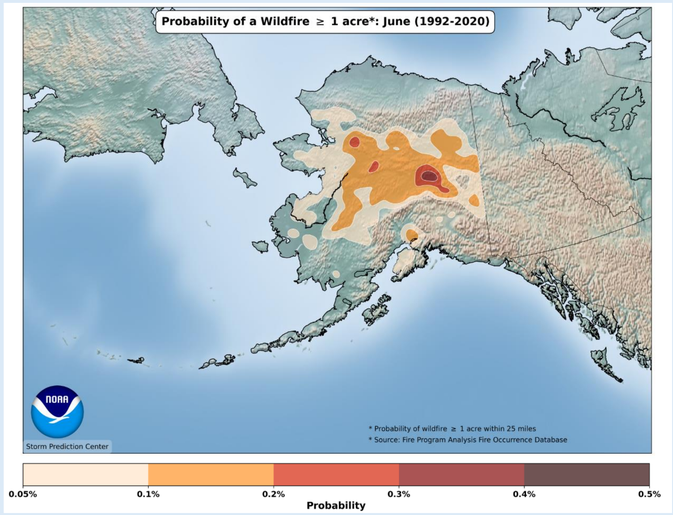


Figure 3: The Alaskan fire probabilities peak during June. Note the small fire size and percent probability.

Conclusions

- Wildfire occurrence is increasing for very large fires, and the mean size of fires is increasing overall, most significantly in the western region.
- The new wildfire climatology products will be uploaded to the Storm Prediction Center's website, hopefully becoming a helpful tool for the fire weather forecasters.

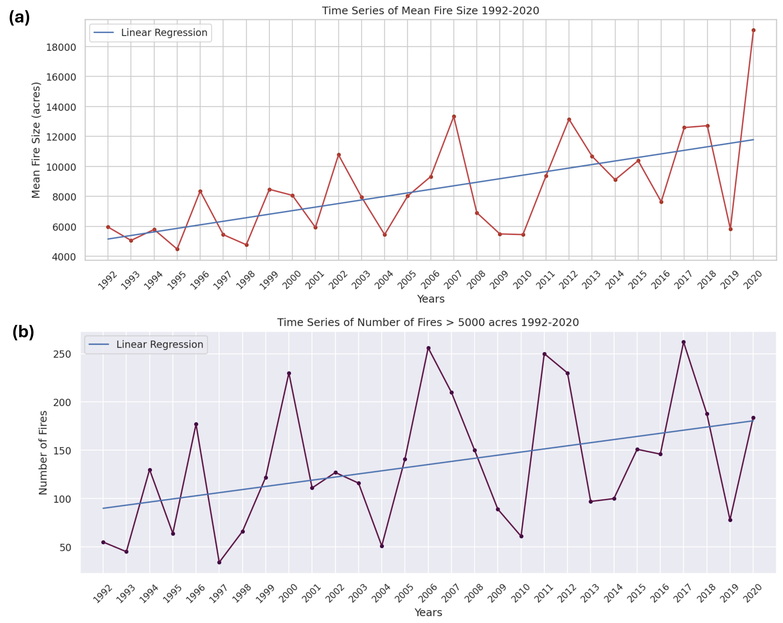


*Figure 4: Two time series showing the increase in **(a)** the mean fire size overall, and **(b)** the number of fires greater than 5000 acres*

- Only certain regions of the contiguous U.S. had significant increases in the mean fire size – the eastern region had a slight decrease in fire size.

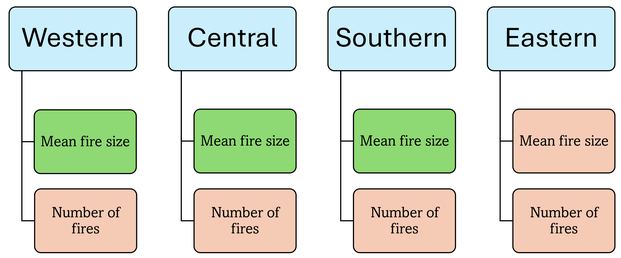


Figure 5: This graphic shows which regions have a statistically significant increase in either mean fire size or number of fires (green).

References and Acknowledgements

- Short, Karen C. Spatial wildfire occurrence data for the United States, 1992-2020 [FPA_FOD_20221014]. 6th Edition. (2022) Fort Collins, CO: Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2013-0009.6

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