J4.4 NEW YORK STATE FIRE CLIMATOLOGY

Joseph Kennedy*[1], Beth L. Hall[2], and Timothy J. Brown[2]

[1]New York State Forest Rangers, Albany, New York
[2]Desert Research Institute, Reno, Nevada

1. INTRODUCTION

Historical fire and weather information has many uses for fire management, such as the assessment of fire danger, fire severity, and prescribed burn planning. An historic fire-weather and wildland fire occurrence database to support the New York State Department of Environmental Conservation Wildland Fire Management Programs is being developed to meet these uses and to gain a better understanding of both the weather and fire climatology in this region. Deployment of Remote Automated Weather Station (RAWS) in New York State began in 1998 and has continued to date with 16 stations now fully operational. However, to fully assess fire activity and a statewide fire weather/danger climatology, a longer period of record is desired. To create a 25-year climatology (1980-2004), the North American Regional Reanalysis (NARR; http://wwwt.emc.ncep.noaa.gov/mmb/rreanl) dataset was explored as a potential weather data source. Multiple linear regression equations were developed that use data from NARR to estimate weather data for missing and questionable observations, and to complete a 25-year record. The final dataset will be in Weather Information Management System format compatible with decision-support tools such as FireFamily+.

To fully assess fire activity across the state in the context of fire danger, a historical fire occurrence database was built that converted hand written NYS Forest Ranger fire records to standard NIFMID format. For integrating the fire occurrence data into FireFamily+ software, an agency definition for New York State was created that used Administrative Region, County, and Town information for each fire record to categorize fire occurrence into associations for relating to local weather station data. This paper discusses the datasets and the management implications of a New York State fire climatology.

*Corresponding author address: Joseph Kennedy, New York State Department of Environmental Conservation, 625 Broadway, Albany, NY 12233; email: kennedy@northnet.org

2. DATA

Historical weather data from 16 weather stations in New York were acquired that included both hourly and once-daily observations (Figure 1). Though several of these stations have recently been integrated with the satellite communication feed of the RAWS network, automatic hourly observations are only available for less than five years. However, the state of New York has been managing these weather stations manually for several years beyond that.

Once-daily data includes the 1300 LT observation of temperature, relative humidity, wind speed, and wind direction. They also include the 24-hour maximum and minimum temperature and relative humidity values along with the number of hours of precipitation and precipitation amount. Hourly data from RAWS includes temperature, relative humidity, wind speed, wind direction, and cumulative precipitation amount.

The objective of creating 25 years of weather data for New York required the use of an additional data set that contained no missing data and could be integrated with original observations in order to create a dataset that is as close to the expected observations as possible. Data from the NARR project was acquired for this purpose. Multiple linear regression analysis was applied to the NARR and original observations. Output from this statistical analysis included regression equations of predictor variables from the NARR data set. Predictor variables from NARR included surface temperature, relative humidity, specific humidity, long- and short-wave radiation, vector components of low-level winds, and various parameters related to surface precipitation. Data from NARR is on a 32km grid at 3-hourly intervals from 1979 through 2004.

Historical fire occurrence data includes (in most cases), the date of discovery, fire name, region, county, town, cost, cause and acres

burned. Location information for each record does not contain specific latitude/longitude coordinate information; spatial analysis of historical fires is limited to polygonal analysis based upon the Administrative Region, County, and Town information.

3. FIRE ANALYSIS

To date, nearly 7000 fire records as reported by the New York State Forest Rangers have been included in the New York State fire database. There is an important caveat that needs to be noted prior to making conclusions about these data - there has been no official system and methodology for reporting fires by local fire departments of which represent nearly all of the initial attack responses to wildland fire, except in the backcountry of the Adirondack and Catskill forest preserve areas. Therefore, it is understood that a large number of fires are not included in the database, but the exact amount is uncertain. However, given the spatial and temporal distributions of fires that have been reported, it is likely that the certain percentages or patterns are generally valid (e.g., peak season, primary cause).

A preliminary analysis shows that for the state overall, the peak fire season is spring with April having the largest number of fires (Fig. 1). Figure 2 shows that debris burning is the leading cause of state fires while lightning is effectively the least likely cause of a fire. Figure 3 shows that most fires occur in the eastern half of the state.

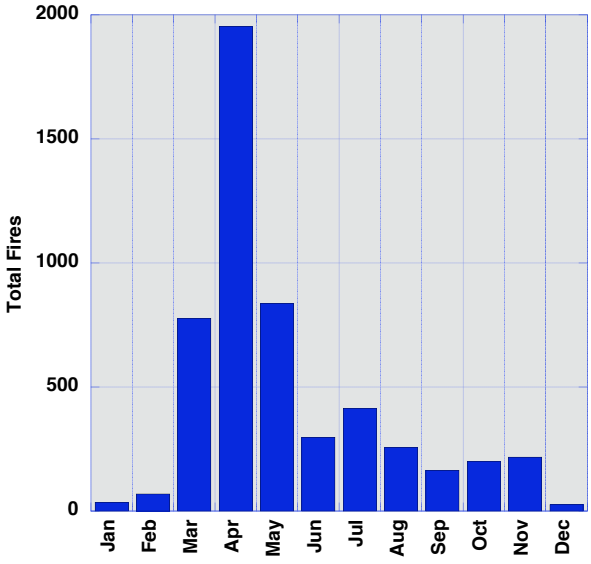

Figure 1. New York state historical fire occurrence by month.

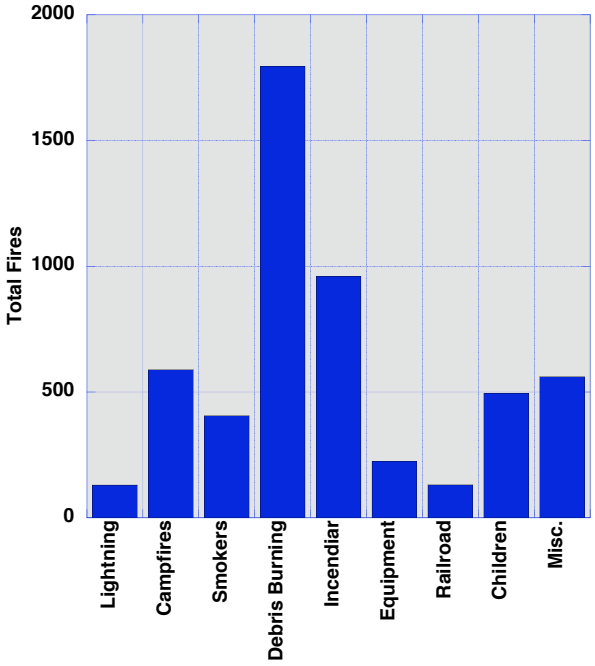

Figure 2. New York state historical fire occurrence by cause.

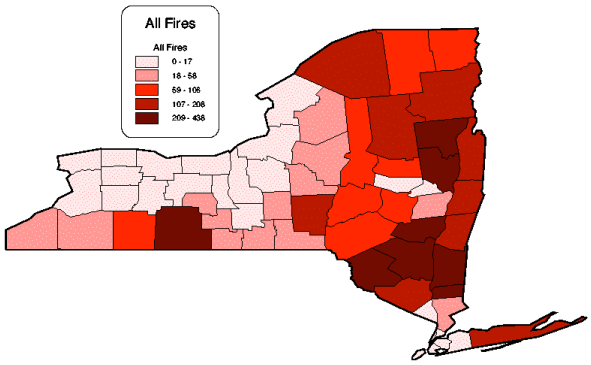

Figure 3. Number of fires by county.

4. WEATHER ANALYSIS

Developing the historical weather dataset for this project is work in progress. Once completed, the 25-year record will allow for analysis of indices from the National Fire Danger Rating System (NFDRS) that can be used to assess fire weather/fire danger patterns across the state, and ultimately be related to fire business (e.g., resource allocation demands). Figure 4 shows the locations of RAWS (red triangles) and current fire danger rating areas (areas of similar fuels, topography and climate) defined by the New State Department of Environmental Conservation.

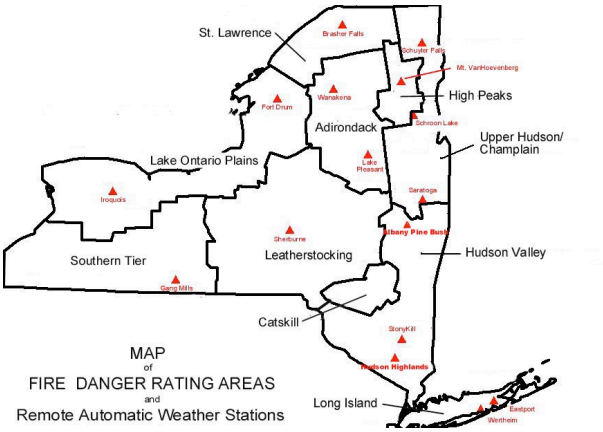

Figure 4. Current locations of operational RAWS (red triangles) and fire danger rating areas (black boundaries).

5. FUTURE WORK

Once the database building is completed, analyses will be undertaken to determine the relationships between fire occurrence and fire weather/fire danger. This will offer quantitative information in assessing fire business in New York State, such as determining resource allocation demands, initial attack responses, and preparedness levels.

ACKNOWLEDGEMENTS

The advice and consultation of Larry Bradshaw, Missoula Fire Sciences Laboratory, is greatly appreciated. We also thank Heather Kemp and Tesfamichael Ghidey, Desert Research Institute, for their contributions. This work is being done under a contract from the New York State Department of Environmental Conservation.