

Wildfire Climatology and Composites for Pattern Identification across New York State

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Abstract

Although New York State is not typically thought of as an area prone to wildfires, statistics show that the state averages 182 Forest Ranger reported fires per year. Thus, there is a need for meteorological composite patterns to identify and recognize the conditions affecting wildfire potential. Wildfire data from 2000-2017 acquired from the New York Department of Environmental Conservation Forest Rangers was examined and spatially plotted using GIS software to create a New York wildfire climatology. While 32% of these wildfires were less than one acre, and nearly 89% were less than 10 acres, this study raises awareness of wildfires throughout every region across the Empire State. Graphs of annual and monthly occurrence, total acres burned, and wildfire cause (both frequency and location) are included in this examination.

The top five most active New York wildfire days and top five days with the most acres burned during the 2000-2017 study period were used to build weather composites using the North American Regional Reanalysis (NARR). Forecasters can use these composites of 500 hPa heights, mean sea level pressure, and 850 hPa vector wind to develop meteorological pattern recognition for potential wildfire activity in New York State. This, combined with knowledge of the seasonal state of fuels together with historical wildfire sources and activity, may help to increase forecaster awareness to both potential Red Flag days and active wildfire days.

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1. Introduction

The high frequency of wildfire activity in the Western U.S. is well known among the general population. Large wildfires in this part of the country frequently make national news headlines each year with huge impacts. These wildfires are measured in millions of acres burned each year, sometimes taking large numbers of homes within communities and even the lives of those who did not evacuate in time. While New York State wildfires do not often make national headlines, the frequency of fire activity is significant and warrants closer attention, especially by meteorologists forecasting weather conditions where fires may rapidly spread, thereby endangering life and destroying property.

The low acreage burned, low frequency of fires, and minimal newsworthy events creates a perception that New York State does not have wildfires. There is data that supports this generalization. A list of historically significant wildland fires published by the National Interagency Fire Center (NIFC 2017a,b)

https://www.nifc.gov/fireInfo/fireInfo_stats_histSigFires.html tallies 78 significant fires ranging from those reported by Lewis and Clark as early as 1804 to the Rim Fire in 2013. This tally included only one significant wildfire for New York State, namely, the April 1903 Adirondack Fire, while California made the list 17 times. Additionally, National Weather Service (NWS) Storm Prediction Center (SPC) statistics show that the probability of a wildfire greater than or equal to 100 acres centered on seven-day windows across the Continental United States, http://www.spc.noaa.gov/new/FWclimo/cli_mo.php?parm=100ac only shows a 2 to 5% chance of occurrence in New York in a small

area between western Long Island and the southern Catskill Mountains between 3 April and 9 May.

Locally, even the frequency of Red Flag Warning issuances by NWS Buffalo for expected critically dangerous weather conditions, which may result in dangerous fire behavior, is low when compared to a sample of other warning products. This data was acquired using the “WFO VTEC Event Counts for a Given Period” Data Plotter by Iowa State University accessible at <http://mesonet2.agron.iastate.edu/plotting/au-to/?q=109>. **Table 1** shows only six Red Flag Warnings issued between October 2005 and October 2017, where significantly more Tornado, Severe Thunderstorm and Winter Storm/Lake Effect Snow warnings were issued.

It was hard to find much of any previously published, peer-reviewed wildfire research specific to New York State. Only one paper, (Pollina et al, 2013) detailed a wildfire climatology for the Northeast United States along with a meteorological evolution of major (greater than 100 acres burned) wildfire events. The New York State Department of Environmental Conservation (NYSDEC) has some excellent wildfire information posted on their wildfires webpage,

<http://www.dec.ny.gov/lands/4975.html> including wildfire history and various charts and maps. However, the author was interested in a detailed visual of wildfire activity across New York. Research below adds meteorological data through NARR composites to assist forecasters and fire partners with identifying basic weather patterns associated with significant New York wildfire activity and Red Flag Days¹.

¹ Red Flag Warning threshold for NWS Buffalo is defined <http://www.weather.gov/buf/FireWeather>

2 Data and Methodology

2.1 New York State Wildfire Database (2000-2017)

The New York State wildfire data was acquired from the NYSDEC Forest Rangers through the Fire and Aviation Management Web (FAMWEB) Applications of The National Wildfire Coordinating Group (NWCG). The databases used (NYSDEC 2016 and FAMWEB 2018) contained wildfire data from 2000-2017, and included date, address, county, acres burned, cause, and geographic latitude and longitude coordinates for each wildfire. A total of 3278 wildfires were recorded by NYSDEC Forest Rangers during the 18 year period. **Figure 1** shows each fire plotted on a map of New York State with the size of the point dependent on the total acreage burned using ArcMap GIS software. The average number of fires per year during this time period was 182 (**Figure 2a**). A total of 32,037 acres were reported burned across New York State during the 18 year study period. The average number of wildfire acres burned per year was 1780 (**Figure 2b**). Almost 89% of the fires in the dataset were less than 10 acres (**Figure 3**).

2.2 New York State Wildfire Graphs and Map Plots

The database was sorted spatially and temporally to produce multiple graphs and map plots for the wildfire climatology. Wildfires and acres burned were sorted by county and graphed in **Figures 4a-b**. For reference, **Figures 5a-c** show New York counties, population, and Fire Danger Rating Area (FRDA) regions. Color-filled maps using ArcMap GIS software of total fires per county and acres burned per county were created along with maps showing the county ranking (1 being the most) for total wildfires and acres burned in each of the 62 counties during the study period (**Figures 6-9**).

Figures 10a-b show the total number of wildfires and acres burned per month on bar graphs to highlight the peak months with wildfire activity. **Figure 11** shows map plots of wildfire locations per month across New York State. **Figure 12** shows total wildfires sorted by cause with **Figure 13** showing stacked bar graphs of these causes per county. **Figure 14** shows line graphs of each wildfire cause by month of the year. **Figure 15** shows the most common non-Miscellaneous reported wildfire cause for each county. **Figure 16** shows map plots of the locations of each of the sorted wildfire causes, as identified in Chapter 6 of the Guide to Wildland Fire Origin and Cause Determination ([PMS 412](#)) published by the National Wildfire Coordinating Group (2016). Fire cause is determined by the Fire Chief in charge of the scene.

2.3 Top Five New York Wildfire Days, Top Five New York Days with Wildfire Acres Burned, and Six New York Red Flag Warning Days with NARR Composites

The New York dataset acquired from NYSDEC Forest Rangers was used to determine rankings of daily wildfire activity and total number of wildfire acres burned per day during the study period. The top five most active wildfire days 2000-2017 are listed in **Table 2**. The top five days with most wildfire acres burned are listed in **Table 3**. Each table shows the dates, total number of wildfires and acres burned on the respective dates. These top five most active wildfire days and days with wildfire acres burned were used to build composite charts for weather pattern recognition of conditions favorable for high wildfire activity. The NWS forecasts weather conditions favorable for rapid fire spread. Red Flag Warnings are issued when a set of thresholds is forecast or expected to be met or exceeded. Each NWS office has their own criteria for Red Flag Warnings which are collaborated with the

local fire partners. Six Red Flag Warning days between 2005-2017 are listed in **Table 4** and show the total number of New York counties warned, wildfires reported, and wildfire acres burned for each respective date. These dates were used to build composite weather pattern charts of 500 hPa geopotential height, Mean Sea Level Pressure (MSLP), and 850 hPa wind speed (**Figures 18-20**), using the high resolution (32km/45 layer) NARR model provided by the National Oceanic and Atmospheric Administration (NOAA) Earth System Research Laboratory Physical Sciences Division in Boulder, Colorado (Mesinger et al. 2006).

3. Results

3.1 New York Total Wildfires, Acres Burned, and Ranks by County

Multiple graphs and map plots were created to build the 2000-2017 New York wildfire climatology. **Figure 1** shows all wildfires reported by NYSDEC Forest Rangers sorted in bins by acres burned using the 2000-2017 dataset. A total of 3278 wildfires were reported during this period. The distribution shows that most areas of the state have seen a least some level of wildfire activity with larger concentrations focused across the southern half of the Southern Tier and Leatherstocking FDRAs, the Hudson Valley, Catskills, and Long Island FDRAs per **Figure 5c**. **Figure 2a** shows a bar graph of wildfire activity sorted by year along with a line representing the 18-year average of 182 wildfires per year. There is not a discernable pattern showing up in this bar graph as there are nearly as many above average and below average years with wildfire activity. The year with the most wildfires was 2001. **Figure 2b** shows a bar graph of wildfire acres burned by year along with a line representing the 18-

year average of 1780 acres burned per year. Most years are well below the average acres burned while 7 years ran above normal. 2001 again was the most notable year. **Figure 3** shows a bar graph of total wildfires sorted by acres burned. A total of 88.59% (2904/3278) of wildfires in NY were less than 10 acres with only 31 wildfires being 100 acres or greater. The highest density of these largest wildfires occurs downstate within the Hudson Valley FDRA. **Figure 4a** shows a bar graph of 2000-2017 wildfires sorted by county with **Figure 6** showing the same data plotted on a county map. **Figure 7** shows a plot of the ranking of county wildfire activity from highest to lowest. Comparing **Figures 4a and 6** with **Figures 5a-b** shows that of the top 5 counties with the highest wildfire counts, only Suffolk County has a high population, while Essex, Warren, Hamilton, and Franklin counties are among the least populous. Outside of the 5 boroughs of New York City, much of western New York and the majority of the Lake Ontario Plains FDRA show the lowest wildfire activity during the study period. **Figure 4b** shows a bar graph of 2000-2017 wildfire acres burned sorted by county with **Figure 8** showing the same data plotted on a county map. **Figure 9** shows a plot of the ranking of county wildfire acres burned from highest to lowest. The highest density of wildfire acres burned occurred within Sullivan, Ulster and Orange counties near the Catskill FDRA and Suffolk county on Long Island. The lowest acreage totals occurred within 4 of the 5 densely populated boroughs of the New York City Metropolitan area and western portion of the Lake Ontario Plains FDRA.

3.2 New York Wildfires by Month

Wildfire data was sorted by month in order to show peak monthly wildfire occurrence. **Figure 10a** shows a bar graph of total wildfires sorted by month with one large peak

and two more subtle peaks in the data. While the first and third peaks, April and November, coincide with periods when fuels, such as combustible material, are driest, the second peak, August, is possibly the result of drying fuels from the lush summer rains in June and July. April's peak occurs just before most deciduous trees in New York begin to foliate. New York's most active month for wildfires is in April, during which nearly 38% of wildfires occurred during the study period. The third peak in November coincides with the curing of foliage before the winter snow pack sets in. **Figure 10b** shows a bar graph of total wildfire acres burned sorted by month. This graph reveals similar results as total wildfires per month, but better highlights the importance of watching for wildfire activity increasing just before the snow pack arrives. Monthly wildfire activity was plotted spatially using GIS software shown in the tiles of **Figure 11**. Besides the lower spatial coverage of wildfire activity during the winter months, another notable difference that pops out between these maps is the higher density of wildfire activity in the more rural counties of New York State including the Adirondack FDRA.

3.3 New York Wildfires by Cause

Wildfire data was also sorted by cause in order to learn about the frequency of the most common sources of wildfire activity in New York. **Figure 12** shows a bar graph with the various wildfire causes and number of wildfires with those causes. The most common cause without challenge was debris burning with just over 32% of the total count of wildfires. The second and third most common causes are campfire and arson. A stacked column chart of wildfire causes for each county is shown in **Figure 13**. The most common non-miscellaneous wildfire cause for each county is easier to see on the map in **Figure 15**. Debris burning is most common

from the New York Southern Tier bordering Pennsylvania and in the Catskills. Long Island and two of the five New York City boroughs experience the highest numbers of arson caused wildfires. It is not surprising to see campfire caused wildfires are most frequent in the wilderness of the Adirondack, Adirondack High Peaks and Upper Hudson Valley/Champlain FDRAs.

A comparison was made between wildfire cause and month of occurrence to determine seasonality for fire cause plotted on a line graph in **Figure 14**. This plot followed a similar trend as **Figures 10a-b**, with the highest peak of fire cause occurring in April, followed by a sharp drop-off with foliating trees and rapid growth of low vegetation and ground cover from May through June. Map plots of wildfire cause are displayed in the tiles of **Figure 16**. Most of these maps show a fairly uniform spread across New York State, but there are three that stand out. The plot of debris burning caused wildfires, shows these are confined to more rural parts of New York. The plot of lightning caused wildfires, and, the plot of campfire caused wildfires, both show a higher density of occurrence in the Adirondack, Adirondack High Peaks and Upper Hudson Valley/Champlain FDRAs.

3.4 New York Top Five Wildfire Days, Top Five Days with Wildfire Acres Burned, and Western New York Red Flag Warning Days with NARR Composites

The top five wildfire days in New York during the 2000-2017 study period are listed in **Table 2** while the top five days with New York wildfire acres burned are listed in **Table 3**. The top 5 days were chosen to capture the synoptic pattern surrounding the most active days with the highest number of wildfires and acres burned out of 1284 unique fire days during the study. Using the top 5 dates can

be insightful when compared to composites which often dampen the amplitude of meteorological signals. Four of the five dates of the top five wildfire days occurred in the month of April, while the fifth date occurred on May 1. This aligns well with the monthly frequency of wildfire activity shown in **Figure 10a**.

Three of the five top days with New York wildfire acres burned occurred in April, with one date in early May and one date surprisingly in November. Most of these dates made the top five list due to one or two large fires which occurred on the respective days. The April and May dates also aligned with the monthly frequency of wildfire acres burned from **Figure 10b**. The November date should raise awareness that wildfire activity still needs to be watched closely through the fall months when fuels are drying in advance of winter.

The six Red Flag Warning days were selected because they all included at least a few counties within the NWS Buffalo County Warning Area (CWA) during the 2000-2017 study period. These are listed in **Table 4** along with the number of New York counties warned, total number of wildfires reported and acres burned on those days. A comparison of **Tables 2 and 4** only shows one date, 17 April 2009, made its way onto both tables. Since four of the five top wildfire days in New York did not occur when Red Flag Warnings were issued, there is not a clear correlation between wildfire frequency and NWS Red Flag Warnings. That is, Red Flag Warnings do not quantitatively indicate a risk of high wildfire activity. Instead, they are meant to inform fire partners when weather could create an environment in which any fires that do develop may quickly get out of control and be difficult to contain. Red Flag Warnings are based on low relative humidity, a lack of rainfall, wind speed, and

fuels susceptible to burning. Wind speed may play a role in the discrepancy between warning days and number of wildfires.

A comparison of **Tables 2 and 3** shows only one of the dates in the top five New York Wildfire Acres Burned days matched a New York Red Flag Warning Day. This was 09 April 2012 where 1503 wildfire acres burned from 8 wildfires while 41 New York counties were under a Red Flag Warning. Again, one of the criteria for a Red Flag Warning is gusty surface winds which can lead to rapid fire spread. **Figure 17** shows the locations of the wildfires of 09 April 2012 along with color-filled counties which were under a Red Flag Warning. Only one of the wildfires, which burned 1.5 acres in Saratoga County, occurred without a Red Flag Warning.

3.5 500 hPa Height NARR Composites for Top Five New York Wildfire Days, Top Five Days with Wildfire Acres Burned and Six Red Flag Warning Days

NARR composites centered on 18z for the top five New York wildfire days, top five days with New York acres burned, and the six Red Flag Warning Days were created to identify a common 500 hPa height pattern for significant New York wildfire and New York Red Flag conditions. **Figure 18** shows that across the Eastern U.S., including New York, a ridge in the 500 hPa heights is favored for all three data sets. In comparison, the ridge is strongest with the 5700 meter contour north of New York for the top five New York wildfire days, while the ridge is about 60 to 120 meters weaker during the top five days with New York acres burned and the six Red Flag Days.

3.6 MSLP NARR Composites for Top Five New York Wildfire Days, Top Five Days with Wildfire Acres Burned, and Six Red Flag Warning Days

NARR composites centered on 18z were also created to identify a common MSLP pattern for each data set. **Figure 19** shows a pattern with strong high pressure centered over or just east of the Southeast U.S. is favored for all three data sets. The center of the high to the south or southwest of New York places a pressure gradient across the state which suggests gusty surface winds with clockwise flow around the center of the high. This pattern also would favor a flow of Gulf moisture northward across the Mississippi and Ohio River Valleys, but it is thought that the higher dew point air does not precede or coincide with high fire activity and especially Red Flag conditions.

As mentioned earlier, Pollina et al, 2013 detailed a wildfire climatology for the Northeast United States along with a meteorological evolution of major wildfire events. In that study, they also created composites of MSLP for each of their region 1 (which includes western NY) and region 2 (I-95 corridor) study areas. The patterns showing up in **Figure 19** are similar to their MSLP composite for Region 2 day of the event with high pressure centered over the Carolinas. The high displaced to the south was also highlighted in Schroeder et al (1964) as contributing to periods of fire danger due to the increase pressure gradient across the Northeast region. One notable difference to highlight between the three composites in **Figure 19** are that the surface high ridges well into the Northeast states for the top five New York fire days while the composite surface high is a bit stronger and more compact in the six New York red flag days composite which allows a tighter gradient and thus stronger winds to lie across New York State.

Additionally, the MSLP pattern for top five days with wildfire acres burned reflects a gusty northwest flow across western New

York where high pressure is building in behind the departing low to the northeast. The pressure gradient across New York is strongest on these days along with drier air moving down from Canada. If a fire started in this pattern, it could easily get out of control given the stronger winds. An Eastern Region Technical Attachment from Evenson et al (2003), found this pattern to be common in the Spring, which fits 4 of the 5 dates in **Table 3**, and the one most worrisome to forestry personnel in Vermont.

3.7 850 hPa Wind Speed NARR Composites for Top Five New York Wildfire Days, Top Five Days with Wildfire Acres Burned, and Six Red Flag Warning Days

Finally, **Figure 20** shows NARR composites created to identify a favorable supporting low level jet pattern for high fire activity and New York Red Flag Warning Days. In all three composites a strong low level jet, highlighted by the yellow/light green to blue-green color fills (8-13 m/s), roughly extends from the Southern Plains states northeast into the Great Lakes. This group of composites helps point out some differences between the setup for days with a higher number of wildfires (lighter winds over New York) and a set up for Red Flag days (strong low level jet extending over New York) and acreage burned. It is worth noting that the 850 hPa flow is northwesterly in the acres burned pattern when compared to the southwesterly flow for both the top wildfire and Red Flag days. As eluded to in the MSLP composites section above, the northwesterly direction could potentially add to stronger winds mixing down with steeper low level lapse rates due to the drier upstream Canadian sourced air, as opposed to a moist southwesterly flow with air sourced from the Gulf.

4. Conclusion

This study created a New York wildfire climatology, as well as composites for pattern identification of favorable weather conditions for a potential increase in wildfire activity and fire spread. The wildfire climatology can be used as a point of reference to better understand the level of wildfire activity across New York State. While over 89% of wildfires in New York during the study period were less than 10 acres, the yearly average of 182 wildfires and 1780 acres burned indicates they do occur quite frequently with the highest activity occurring in April. The small size of wildfires in New York is due in large part to the quick response to fire starts by New York's local firefighters and Forest Rangers.

The NARR composites have been shared with forecasters at NWS Buffalo to raise awareness in synoptic patterns which, given fuel conditions favorable for burning, would potentially increase fire activity in New York State. This pattern generally favors a 500 hPa ridge over the Eastern U.S., surface high pressure centered over the Southeast U.S. and strong low level jet extending from the Southern Plains into the Great Lakes. Information from this climatology and composites should expand to other NWS offices which cover New York State. Fire partners and others with interests in preventing and controlling the spread of wildfires would also benefit from this study.

5. Acknowledgements

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and Emergency Management, NYSDEC Division of Forest Protection, for access to and explanation of the wildfires dataset. April Marinov, GIS Specialist Trainee, NYSDEC Division of Forest Protection, for help with GIS questions associated with the wildfire dataset and how wildfire acreage was calculated. Nancy Van Voorhees, Fire Protection Specialist, NYS Division of Homeland Security and Emergency Services, OSPC, Inspections and Investigations Branch for assistance with understanding fire cause and where to find associated resources. Jefferson Wood, Former Lead Forecaster NWS Buffalo for assistance with ArcGIS. NOAA/OAR/ESRL PSD, Boulder, Colorado for providing NARR model composite web interface.

6. References

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Table 1. A table of total number of weather warnings issued by NWS Buffalo from 2005 through 2017. Count is number of VTEC (Valid Time Event Code) issuances for a particular warning. This data was acquired using the WFO VTEC Event Counts for a Given Period Data Plotter by Iowa State University.

Number	Warning Type
6	Red Flag Warning (RFW)
58	Tornado Warning (TOR)
219	Winter Storm Warnings and Lake Effect Snow Warnings (WSW)
1310	Severe Thunderstorm Warning (SVR)

Table 2. Top five New York Wildfire Days centered on 18z from 2000-2017.

Top 5 Wildfire Days in New York 2000-2017	Total number of Wildfires reported	Total number of Wildfire Acres Burned reported
1 May 2001	24	85
17 April 2005	24	81
17 April 2009	22	130
16 April 2005	22	74
14 April 2001	21	67

Table 3. Top five days centered on 18z with New York Wildfire Acres Burned from 2000-2017.

Top 5 Days of Wildfire Acres Burned New York 2000-2017	Total number of Wildfire Acres Burned reported	Total number of Wildfires reported
17 April 2008	2944	17
03 May 2015	2781	12
23 April 2016	2057	2
09 April 2012	1503	8
13 November 2016	1195	5

Table 4. Six New York Red Flag Days centered on 18z from 2009-2017.

Six New York Red Flag Warning Days 2009-2017	Total number of New York counties Warned	Total number of Wildfires reported	Total Wildfire Acres Burned
25 March 2009	7	10	98
17 April 2009	35	22	130
18 April 2009	5	9	396
03 April 2010	7	8	32
09 April 2012	41	8	1503
04 May 2015	61	7	44

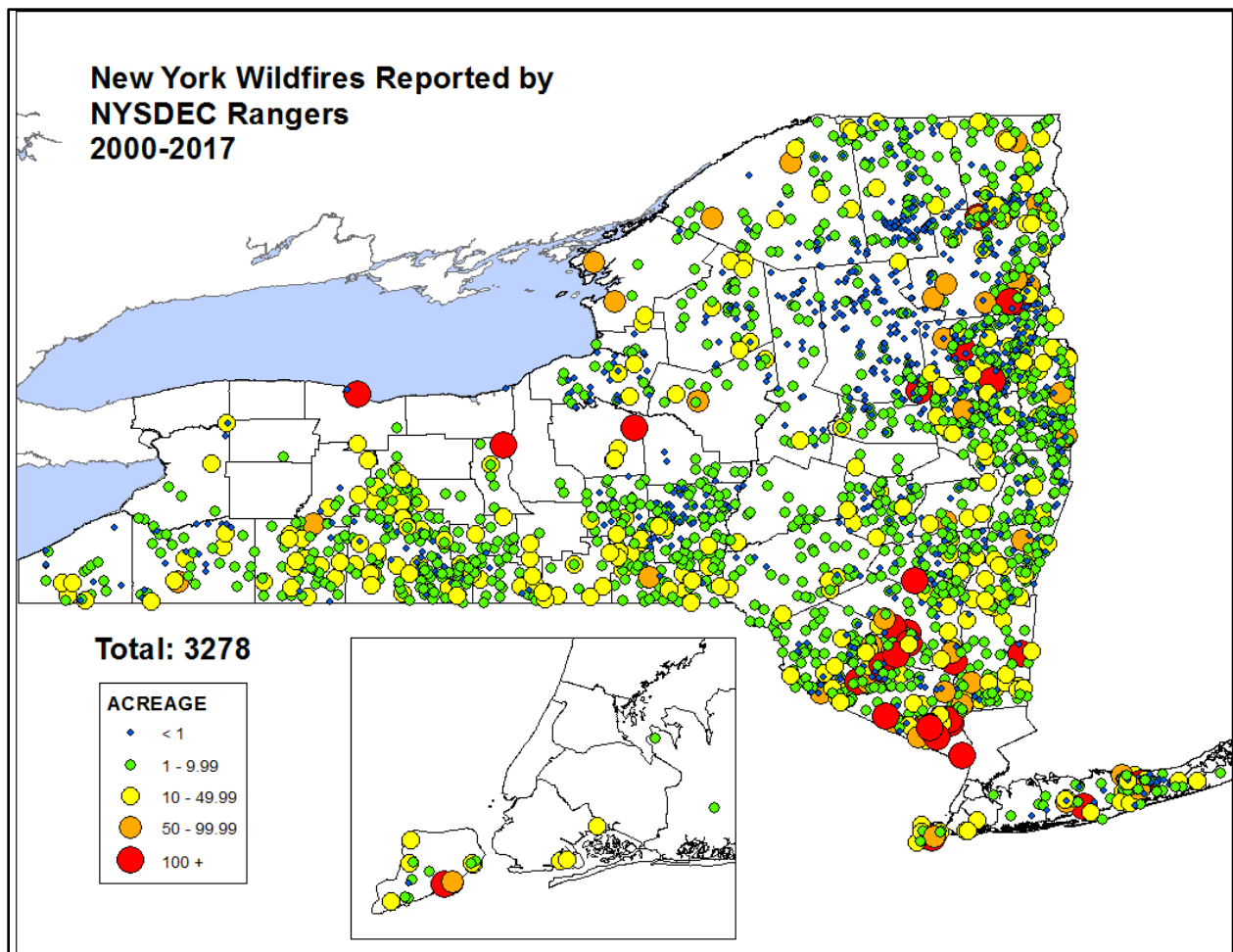


Figure 1. A map showing total wildfires and acreage as reported by New York State Department of Conservation Forest Rangers from 2000-2017.

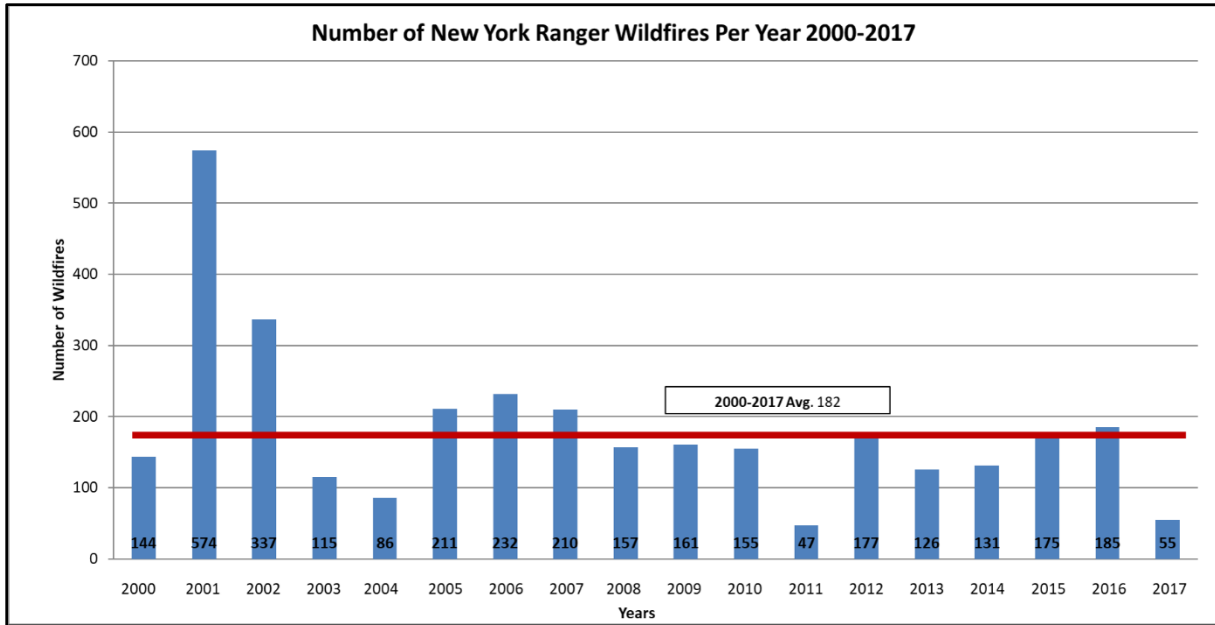


Figure 2a. A chart showing the number of wildfires across New York State from 2000-2017 sorted by year with 18 year average of 182 fires/year.

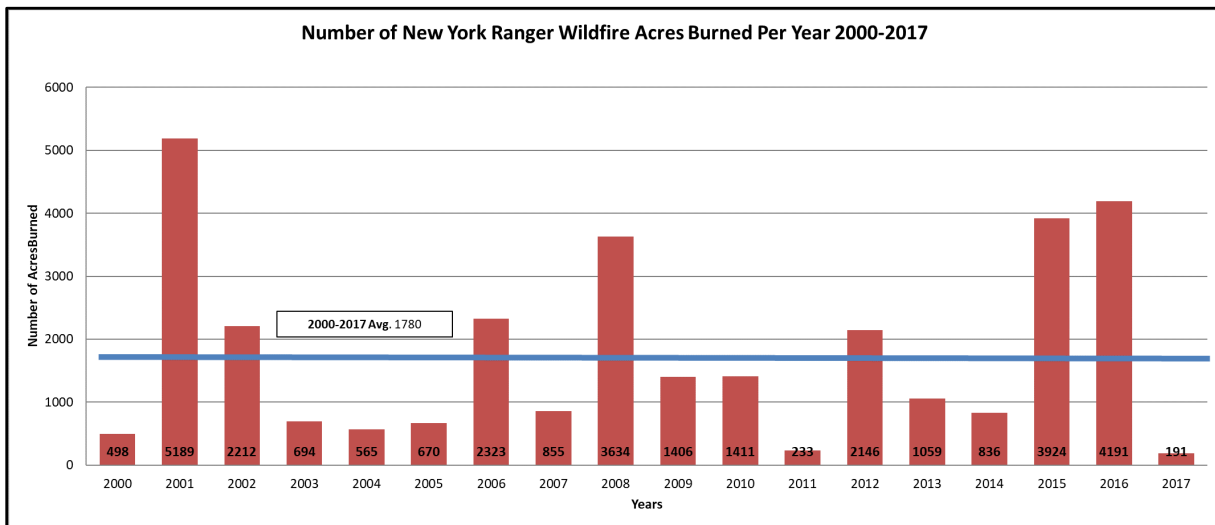
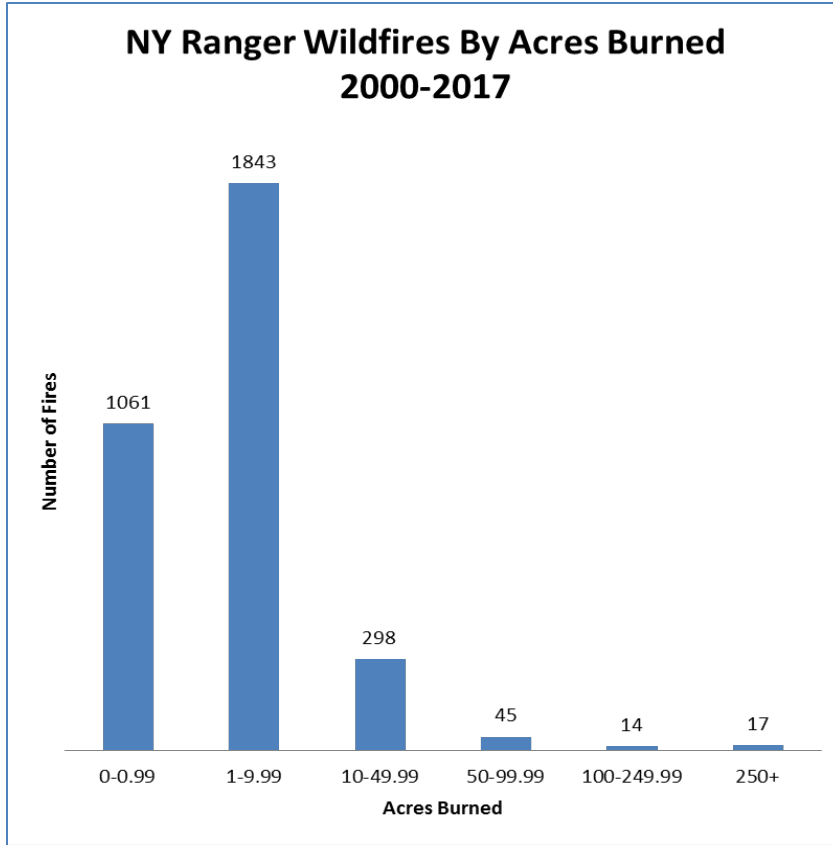


Figure 2b. A chart showing the number of wildfire acres burned across New York State from 2000-2017 sorted by year with 18 year average of 1780 acres/year.



32.37%	56.22%	9.09%	1.37%	0.43%	0.52%
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Figure 3. A bar graph showing total New York wildfires sorted in categories by acres burned from 2000-2017. Total acres burned was approximately 32037 acres. Note that 88.59% of wildfires were less than 10 acres.

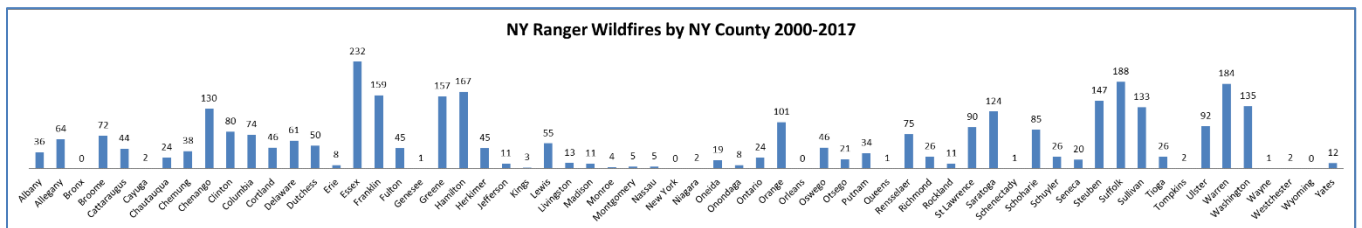


Figure 4a. A chart showing total wildfires sorted by 62 New York counties from 2000-2017.

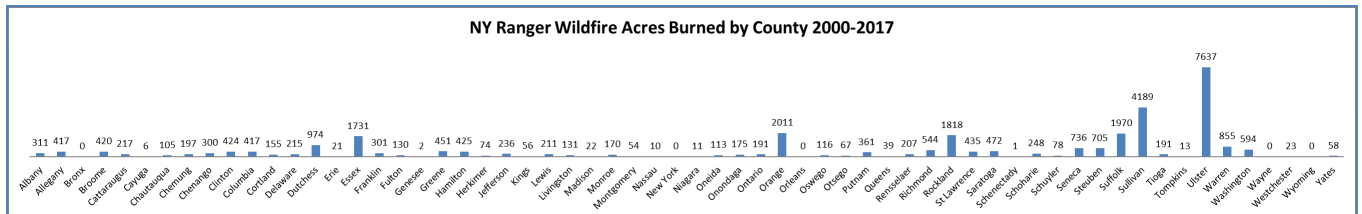


Figure 4b. A chart showing total wildfire acres burned sorted by 62 New York counties from 2000-2017.

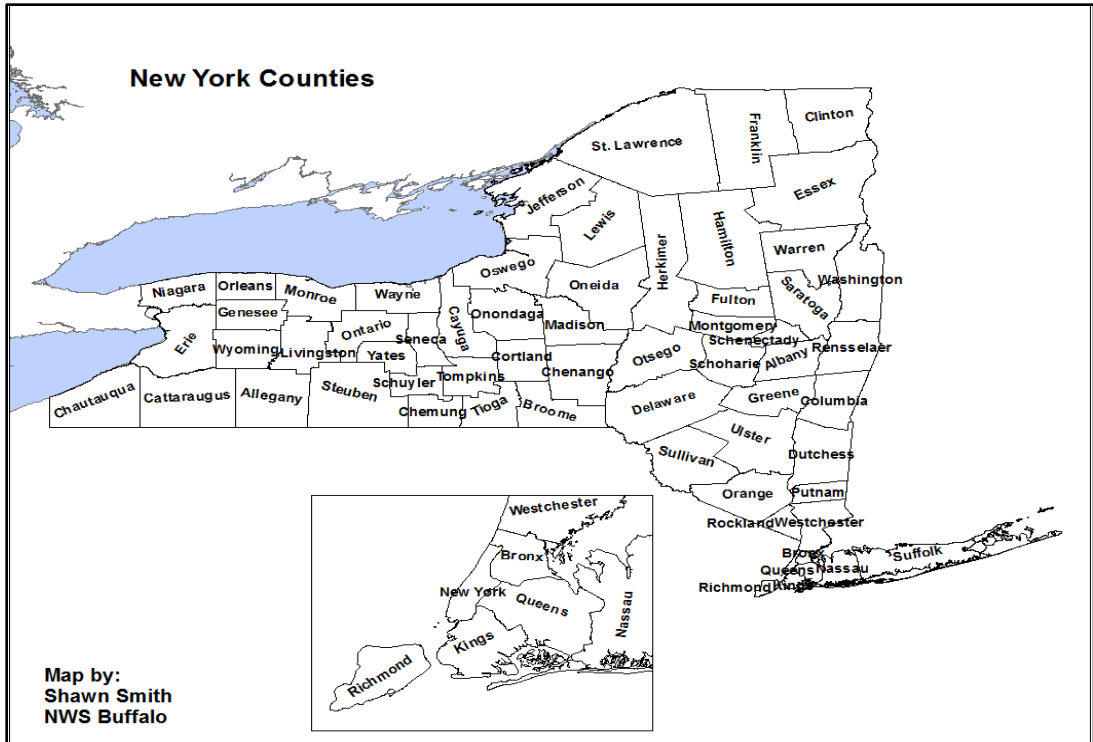


Figure 5a. A county map of New York State for reference created with ArcMap software.

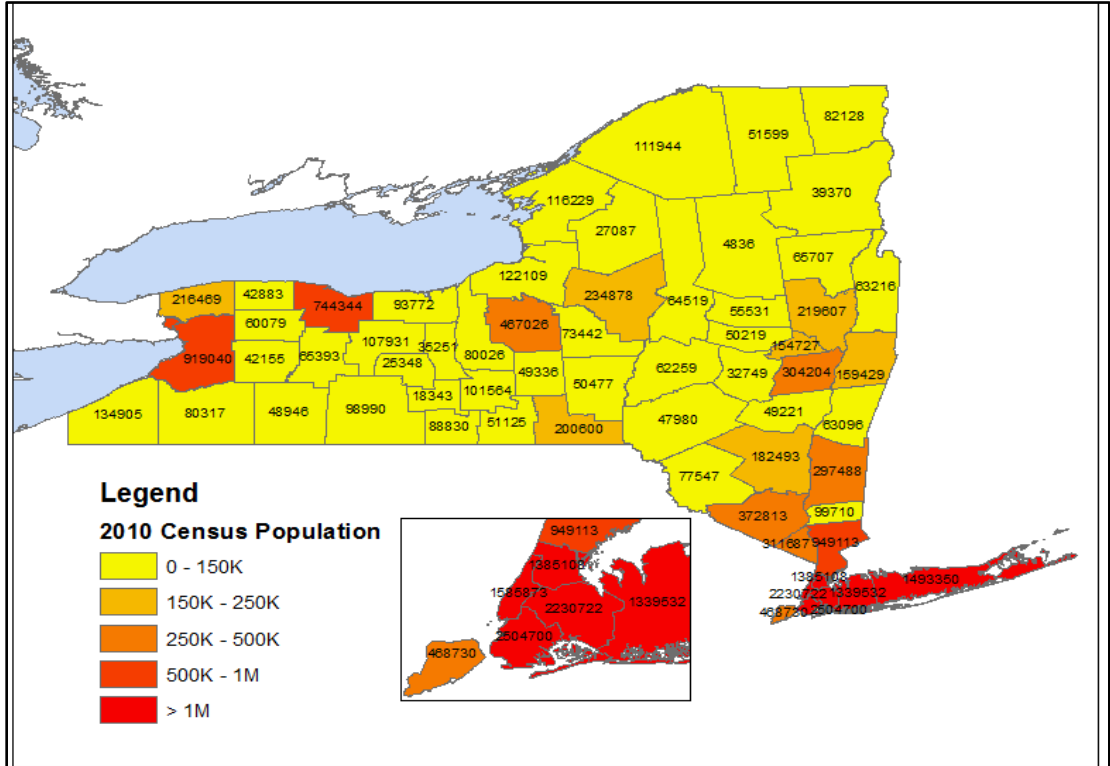


Figure 5b. A population map of New York State using 2010 US Census data obtained via https://www.health.ny.gov/statistics/vital_statistics/2010/table02.htm (New York State Department of Health 2017)

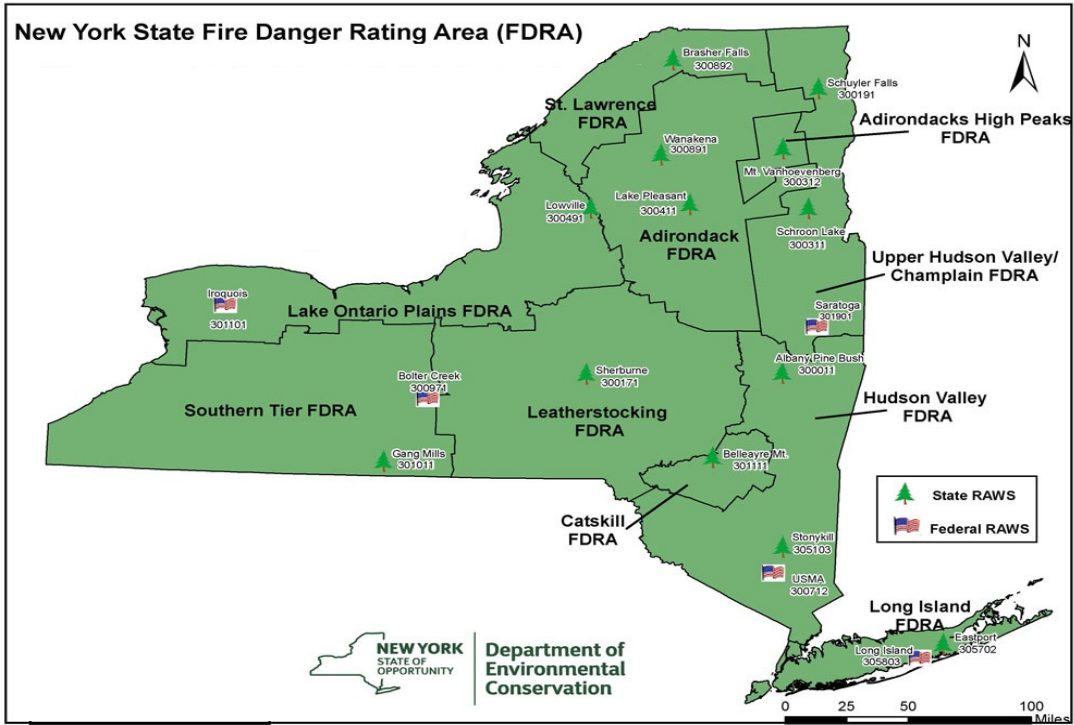


Figure 5c. A map of New York State Fire Danger Rating Areas for reference. Map produced by NYSDEC.

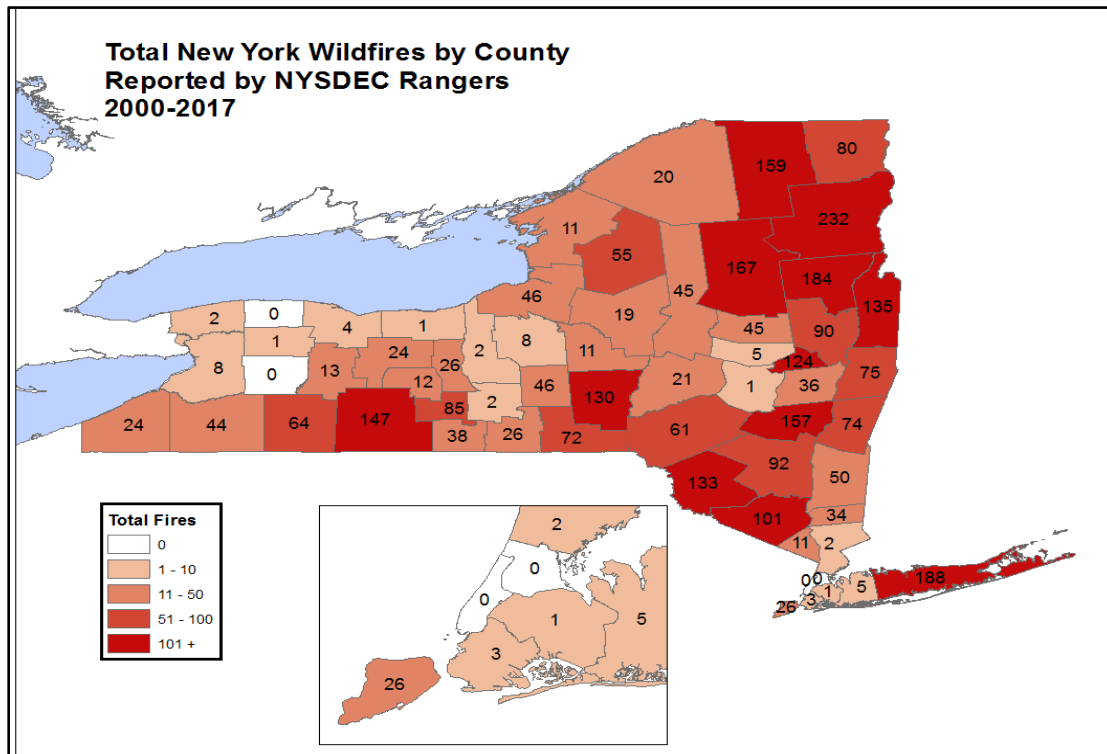


Figure 6. Total wildfires sorted and color-filled by New York county from 2000-2017. Total wildfires were 3278.

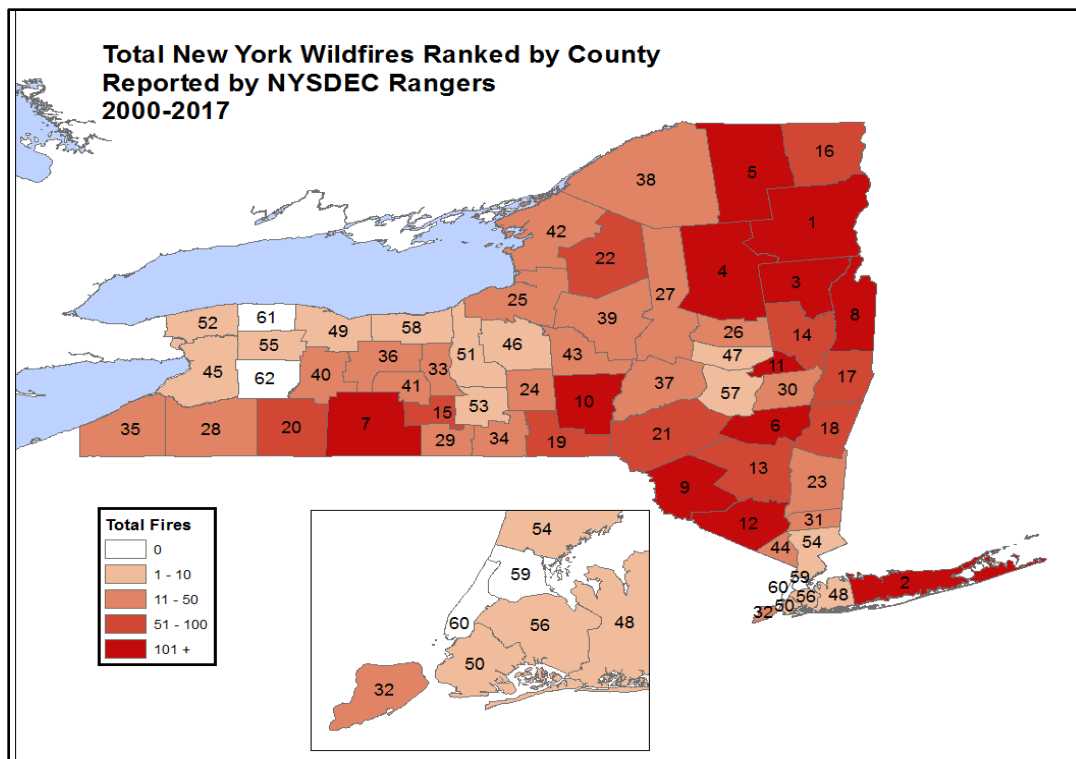


Figure 7. New York Counties ranked and color filled by total wildfire activity from 2000-2017.

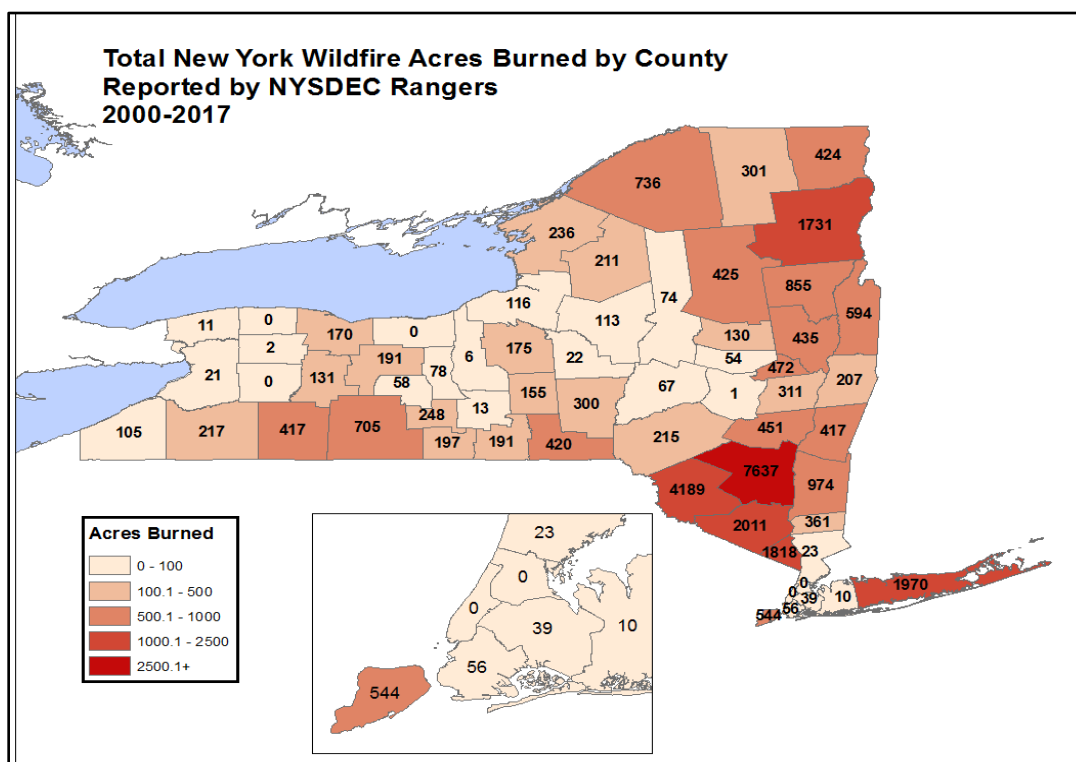


Figure 8. Total wildfire acres burned sorted and color-filled by county from 2000-2017. Total acreage burned was 32,037 acres.

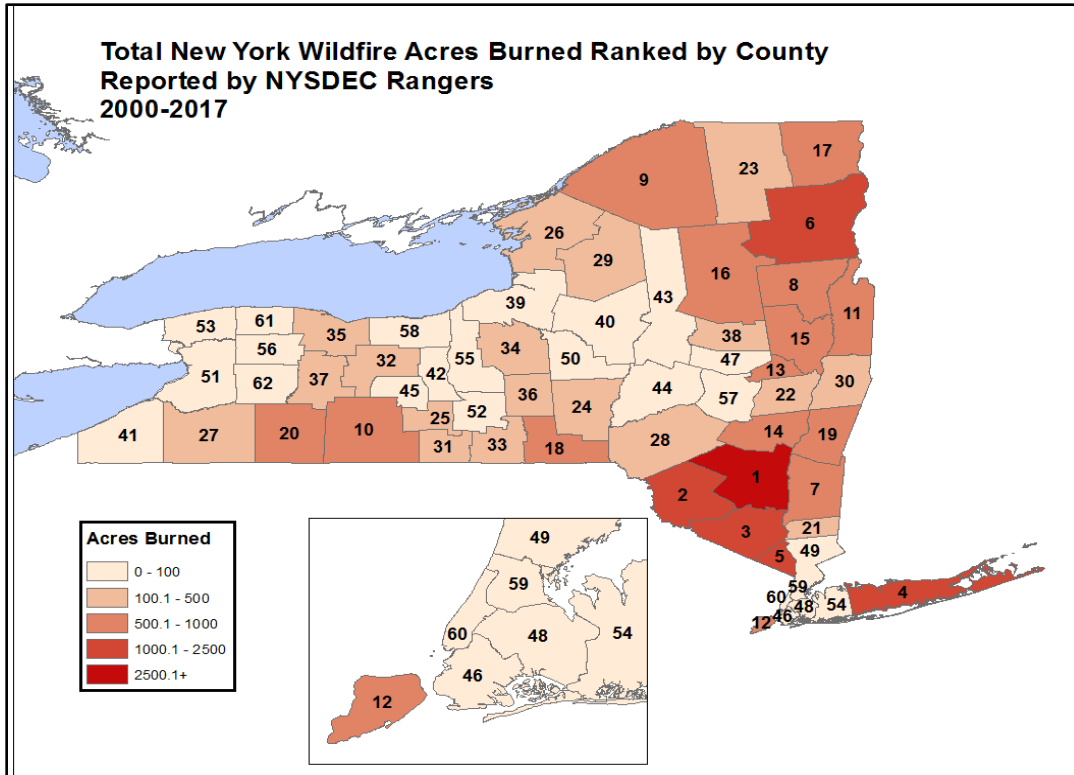


Figure 9. Total wildfire-acres burned ranked by county and color-filled from 2000-2017.

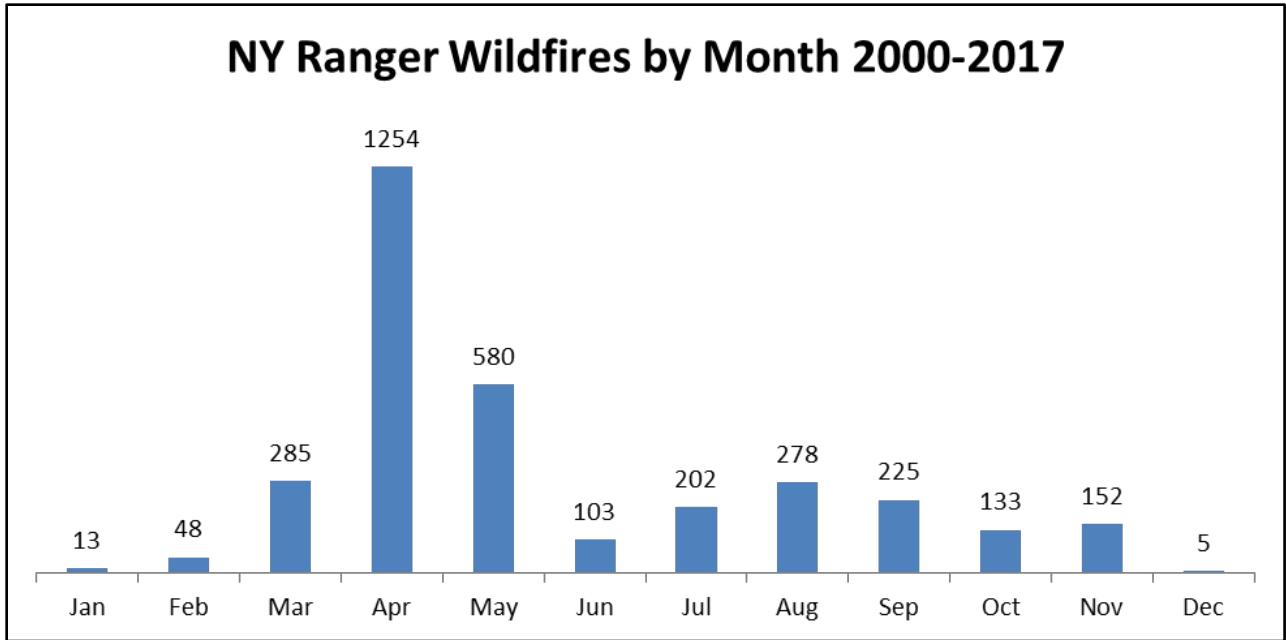


Figure 10a. Total New York wildfires sorted by month from 2000-2017.

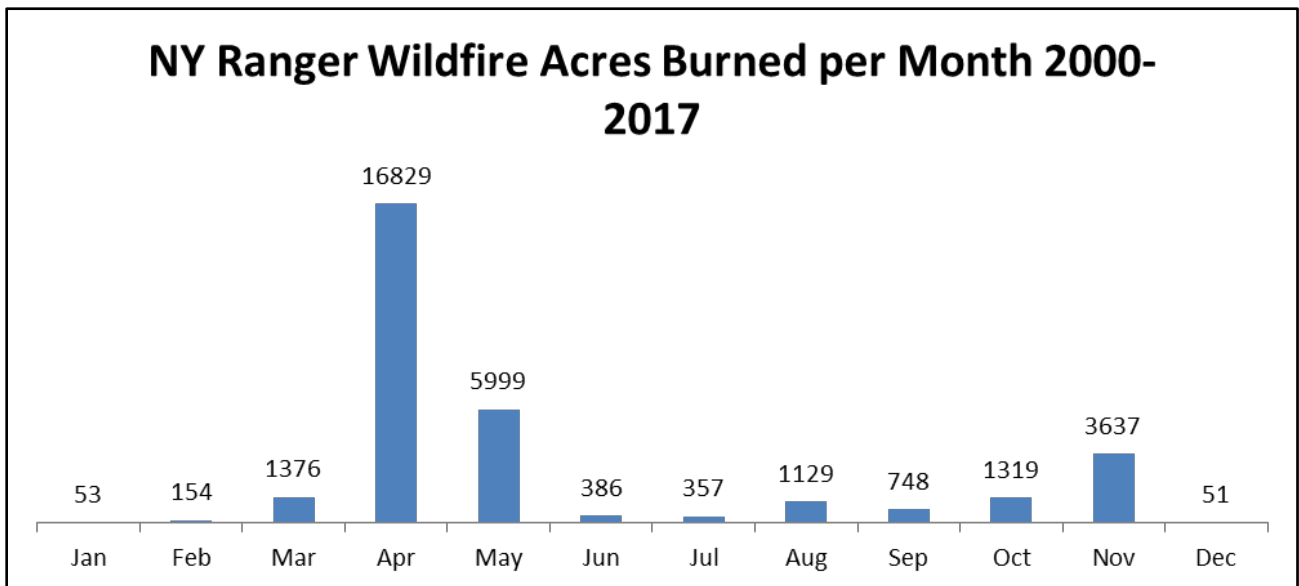


Figure 10b. Total New York wildfire acres burned sorted by month from 2000-2017.

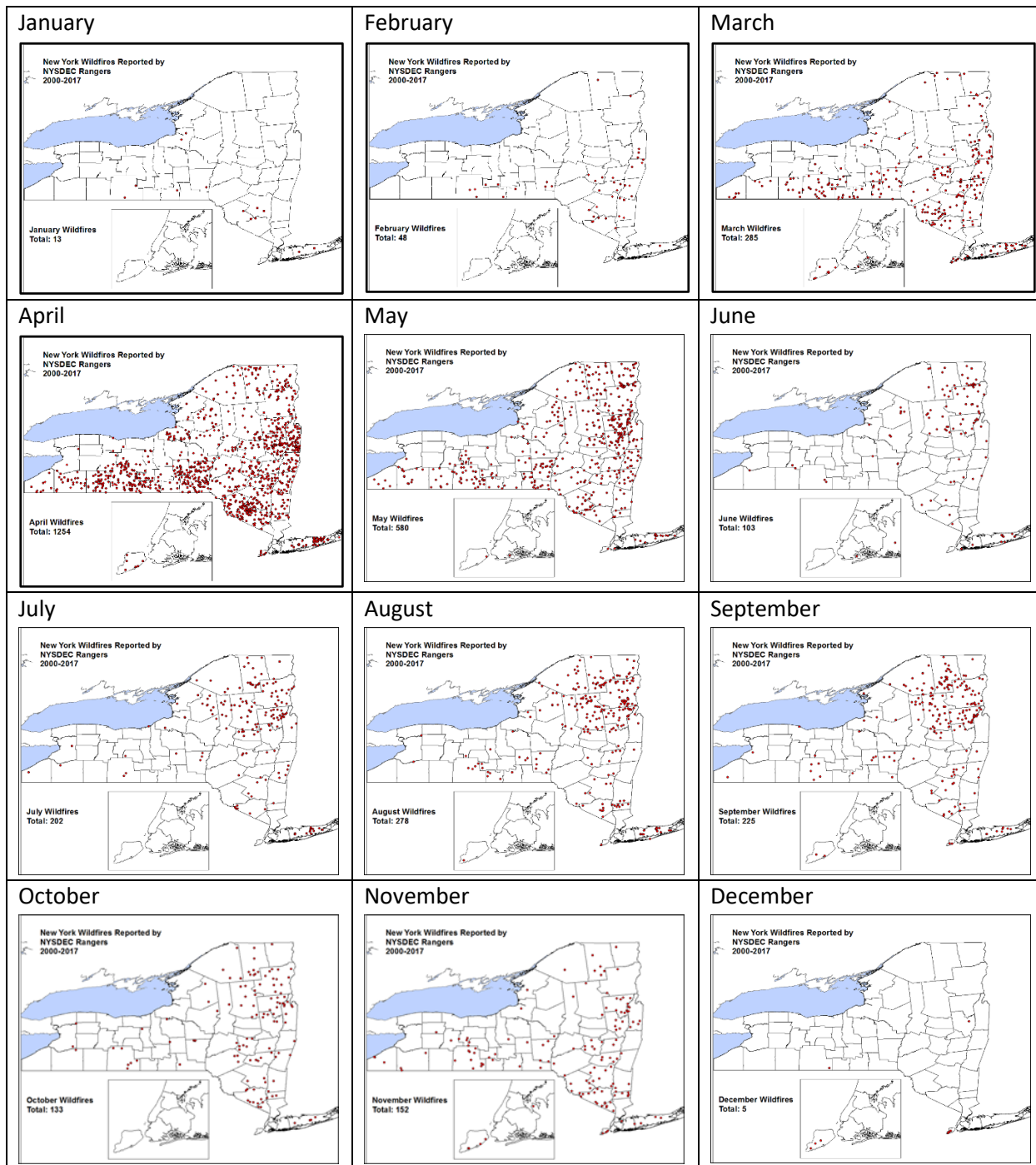


Figure 11. Maps of total New York wildfires reported from 2000-2017 sorted by month.

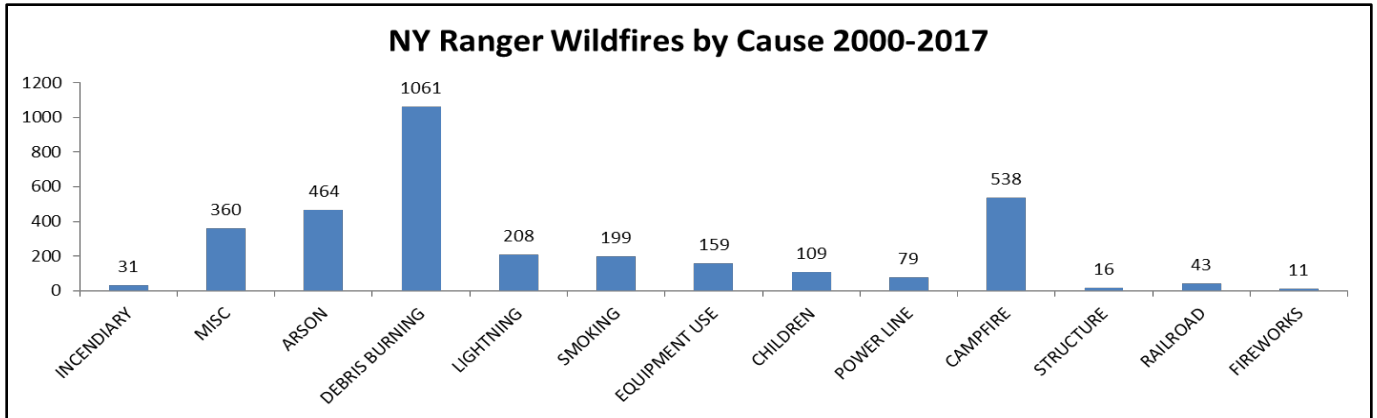


Figure 12. Total wildfires sorted by cause from 2000-2017.

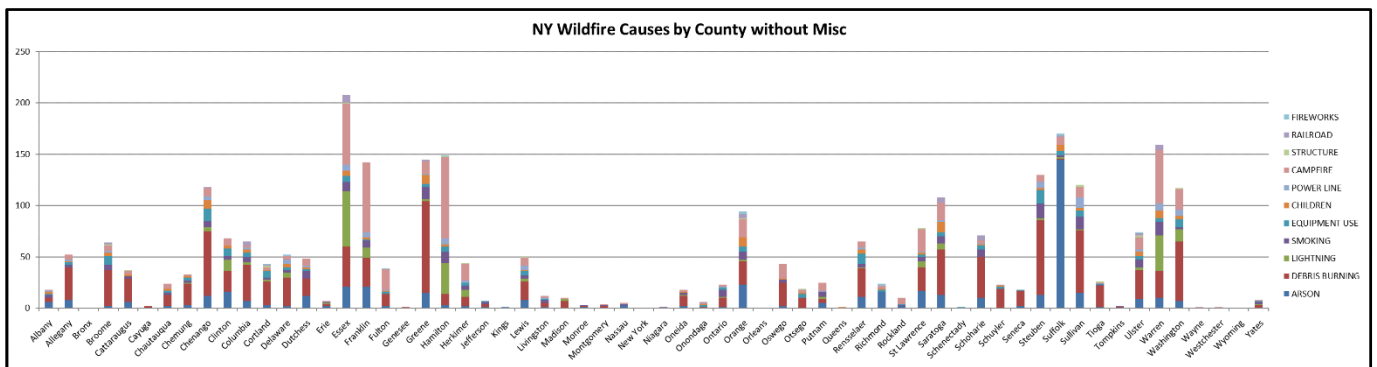


Figure 13. Wildfire causes in stacked columns sorted by county from 2000-2017.

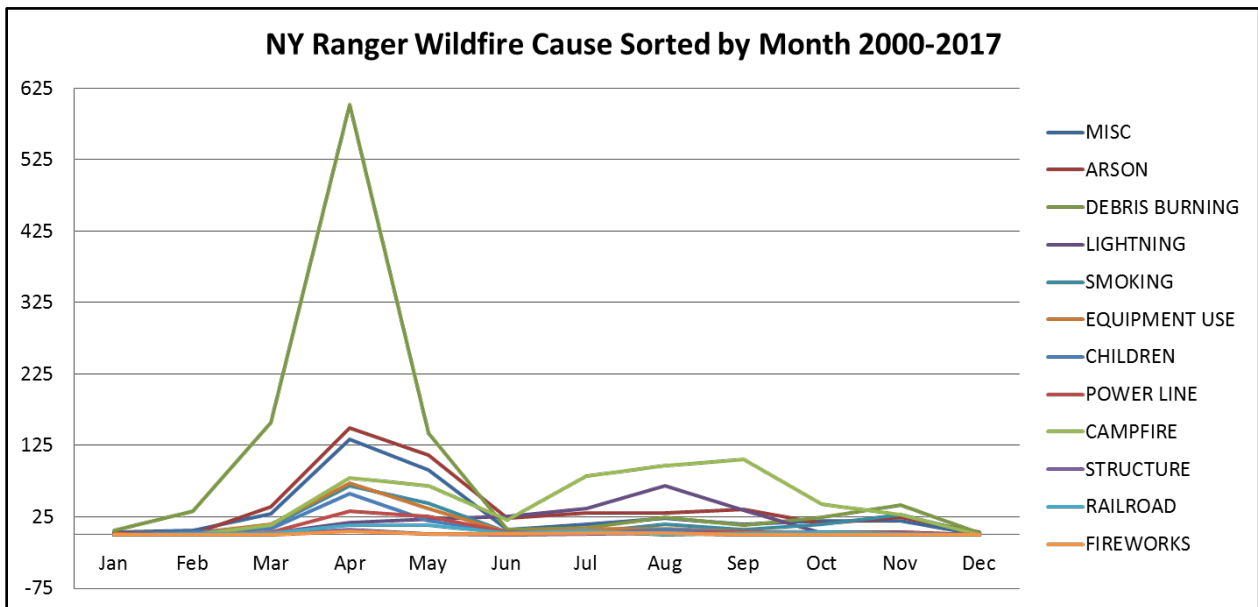


Figure 14. Chart showing all wildfire causes sorted by month from 2000-2017.

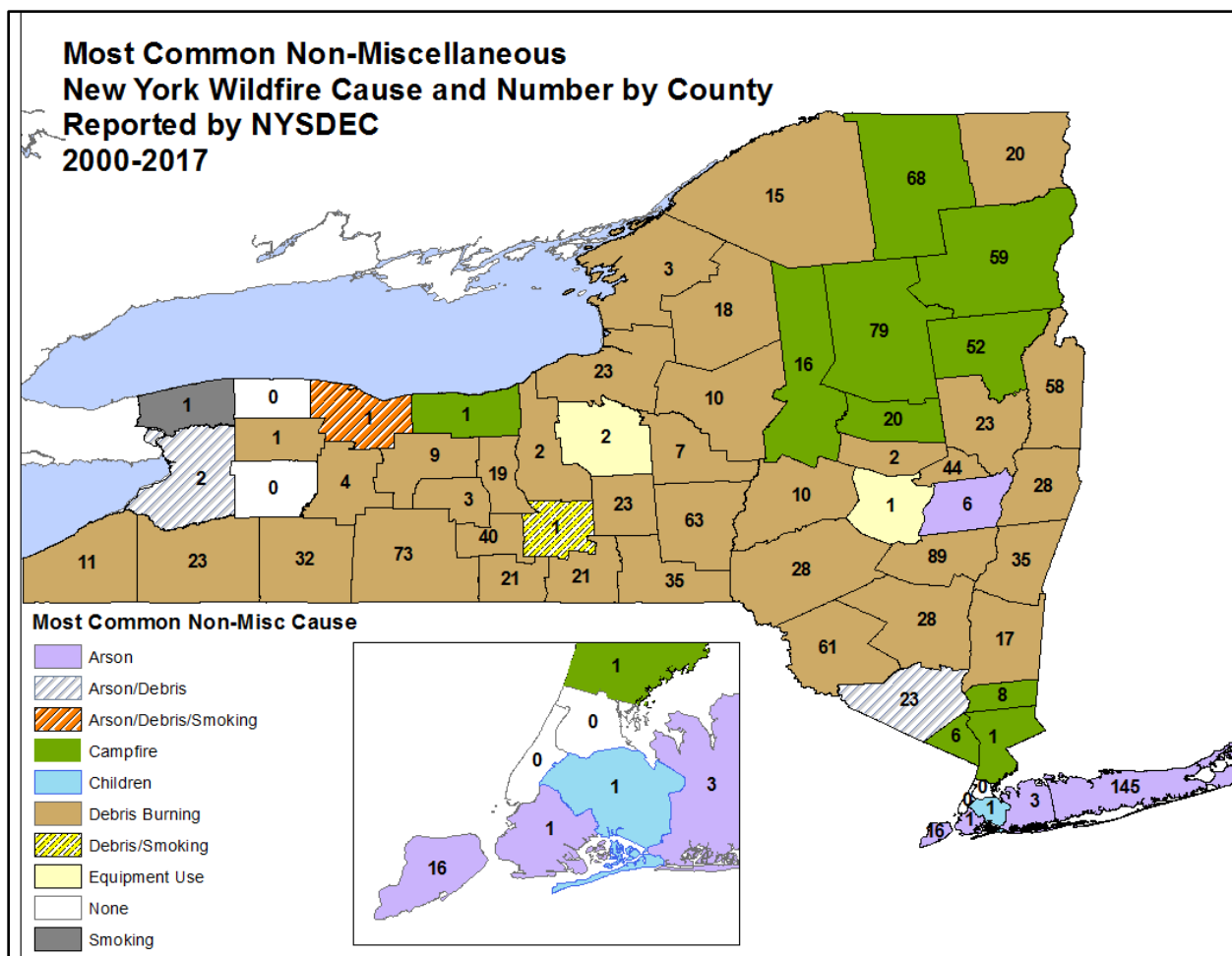


Figure 15. Map showing the most common non-miscellaneous wildfire cause for each county from 2000-2017.

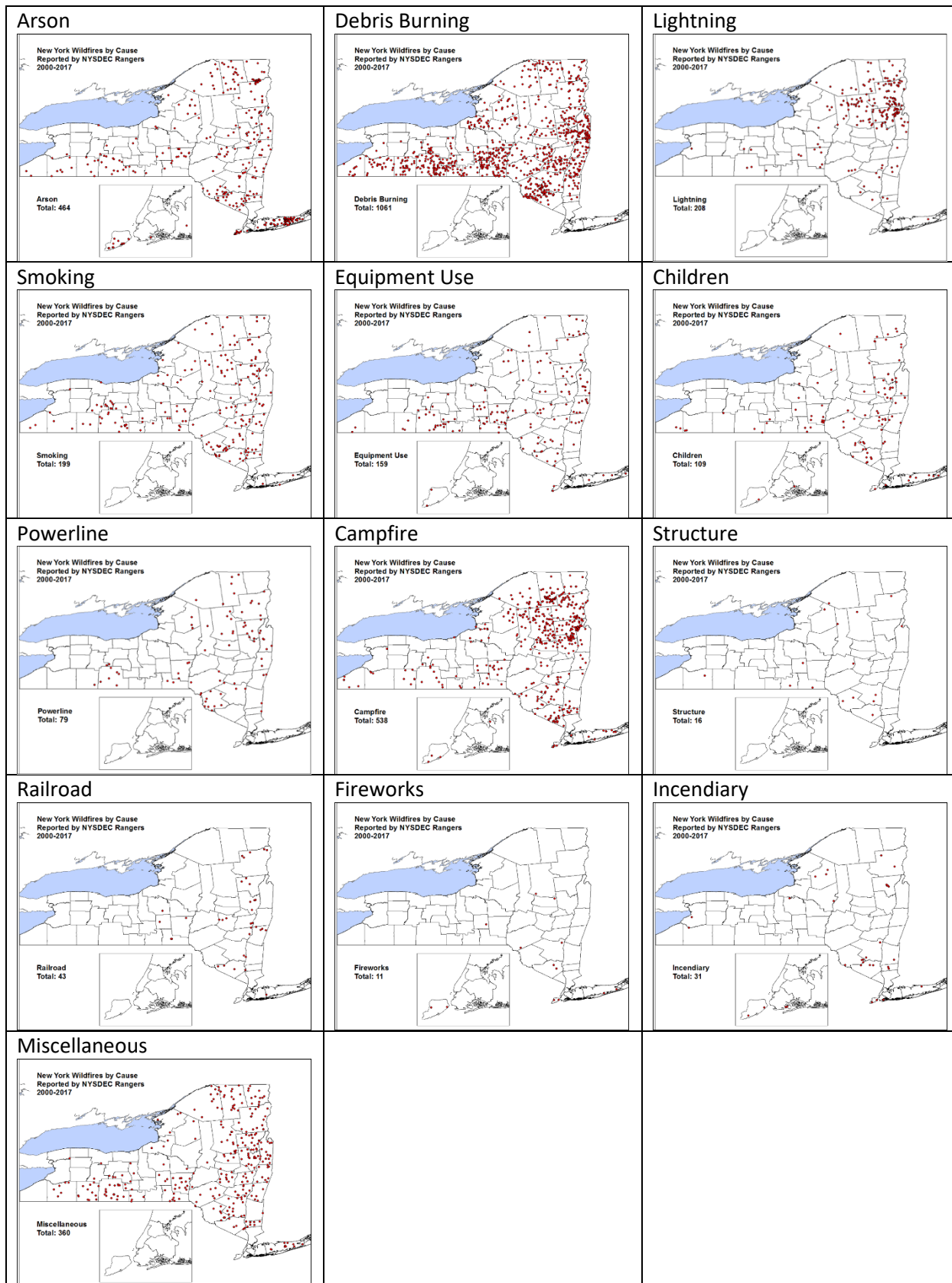


Figure 16. Maps of total New York wildfires reported 2000-2017 sorted by cause.

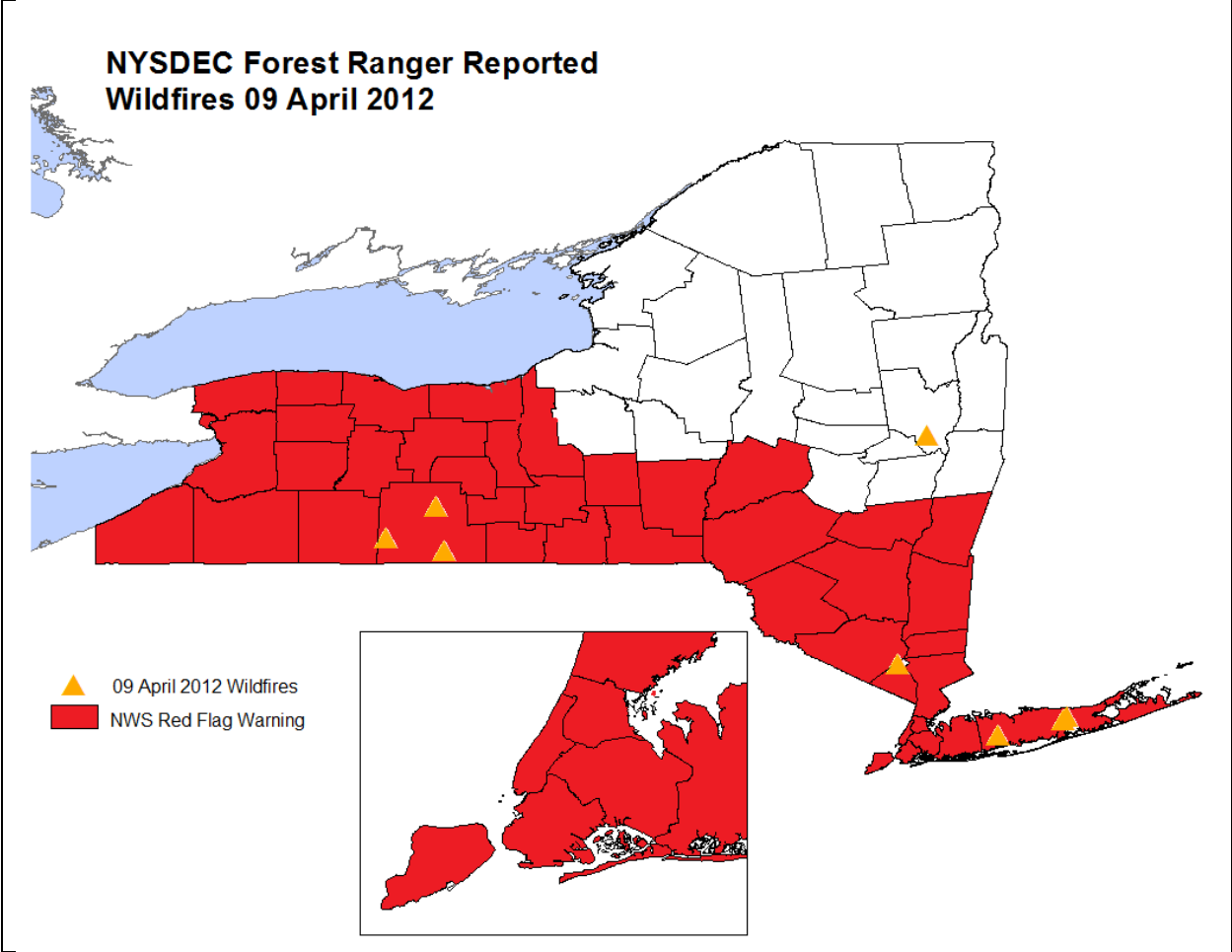


Figure 17. Plot of NYSDEC Forest Ranger Reported Wildfires from 09 April 2012 (One of the top New York Wildfire Acres Burned Days - 1503 Acres Burned). Red filled counties were under a Red Flag Warning.

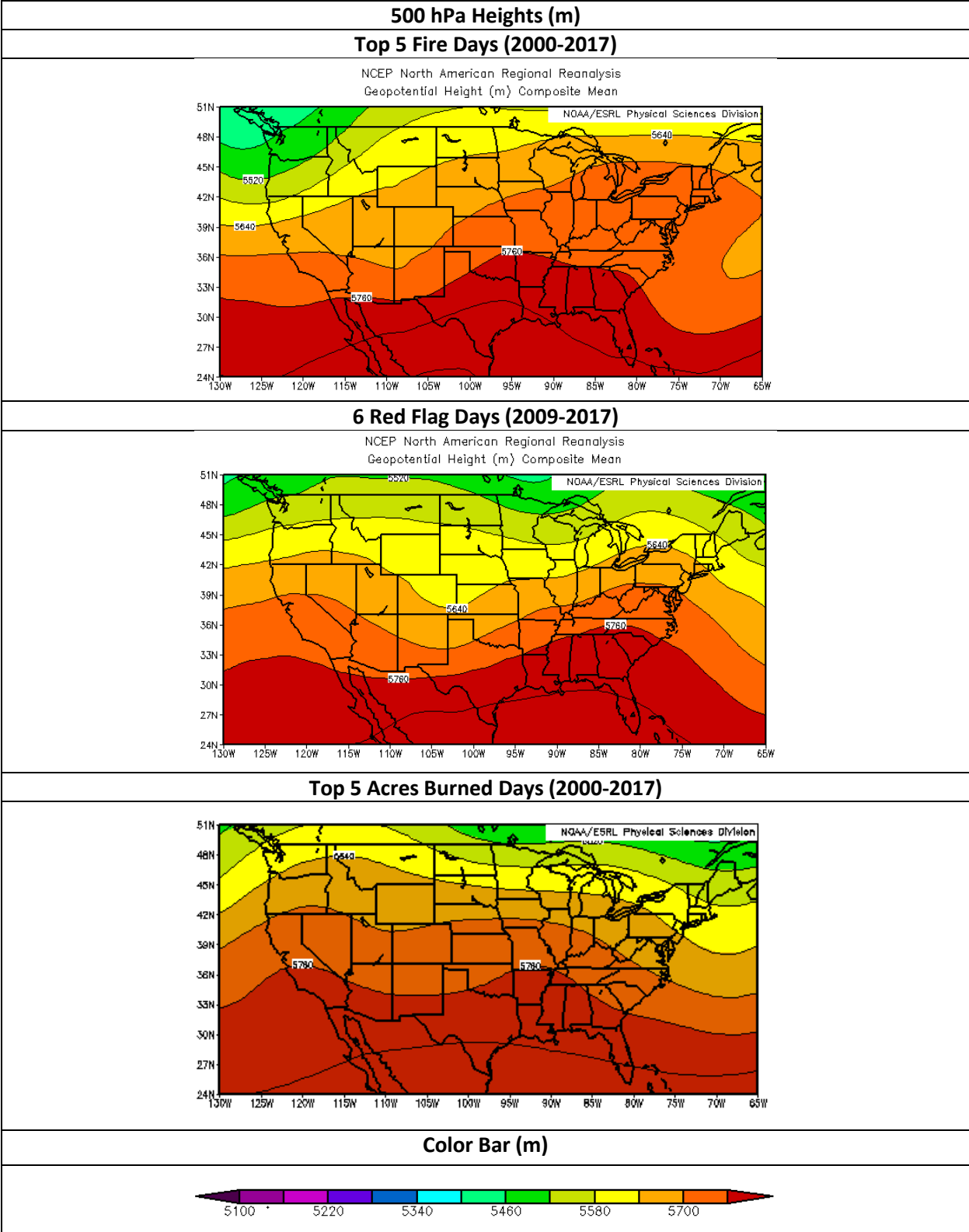


Figure 18. NARR composite maps for 500 hPa Geopotential Heights (m) for the top five New York Wildfire Days from 2000-2017 (Table 2), Six Red Flag Days from 2005-2017 (Table 4) and top five days with wildfire acres burned from 2000-2017 (Table 3).

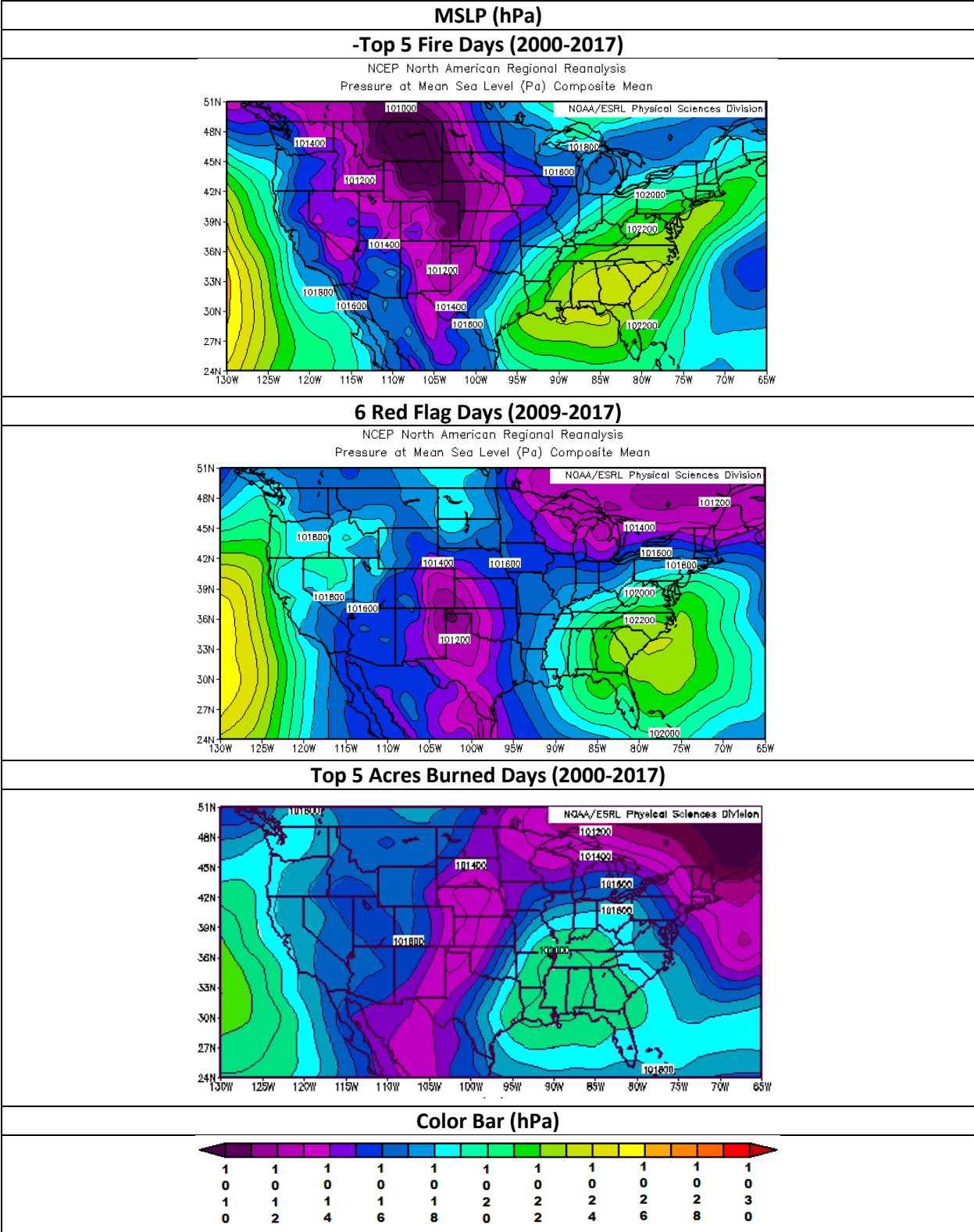


Figure 19. NARR composite maps for Mean Sea Level Pressure (hPa) for the top five New York Wildfire Days from 2000-2017 (Table 2), Six Red Flag Days from 2005-2017 (Table 4) and top five days with wildfire acres burned from 2000-2017 (Table 3).

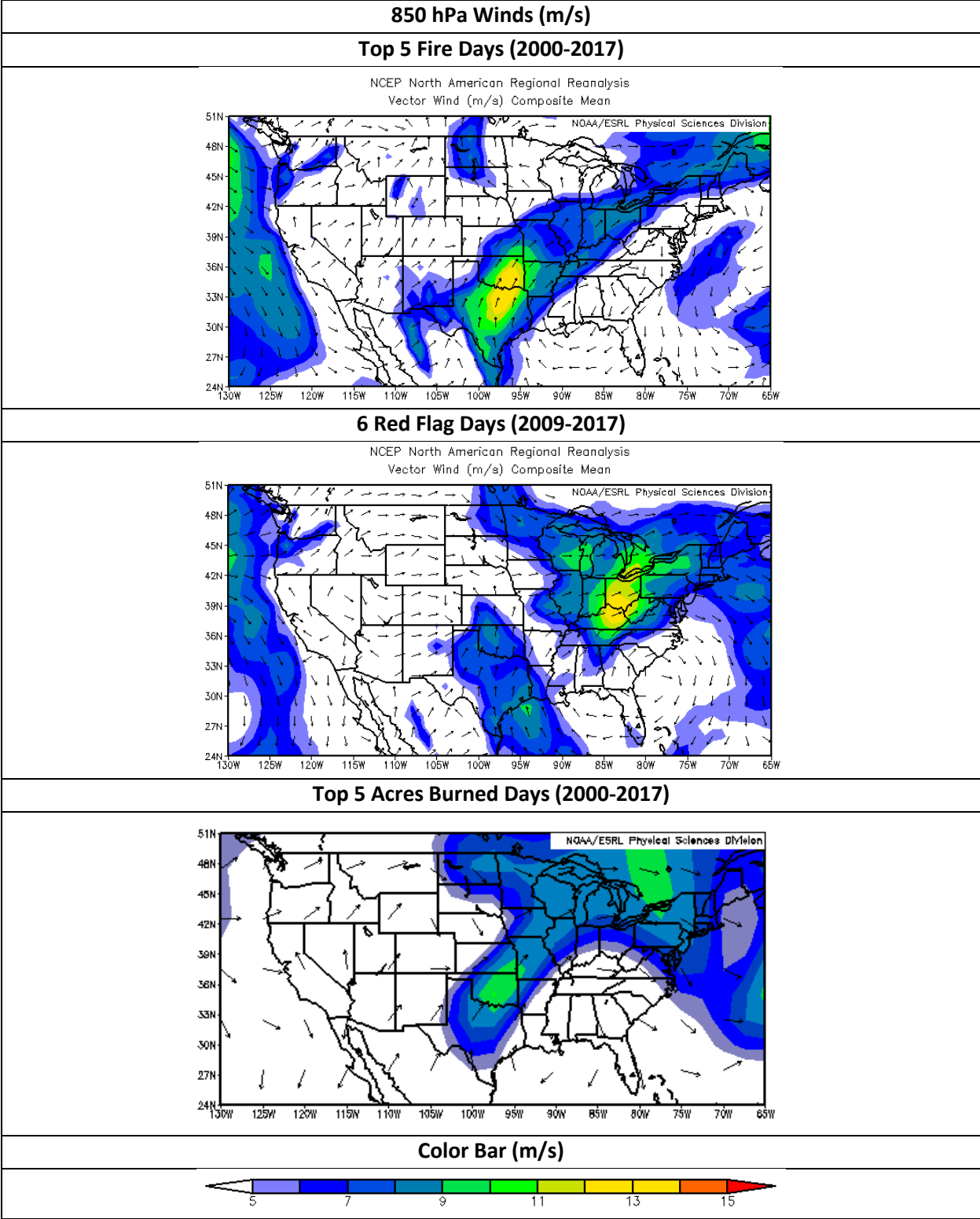


Figure 20. NARR composite maps for 850 hPa wind speed (m/s) for the top five New York Wildfire Days from 2000-2017 (Table 2), Six Red Flag Days from 2005-2017 (Table 4) and top five days with wildfire acres burned from 2000-2017 (Table 3)