



# Tracking Shifts in Disturbance

Regimes

December 16, 2021

FEMC Annual Conference





# Defining Disturbance

**Disturbance** events that cause changes to or disrupt the function and services of forest ecosystems

**Disturbance regimes** the patterns of a given disturbance event(s) and its impacts.

# Guiding Project Questions

- What are the **key drivers and responses** to disturbance?
- What are the historical and anticipated shifts in trends in **extent, severity, frequency**
- What **sources** are available for baseline and monitoring information?



# Selected Drivers

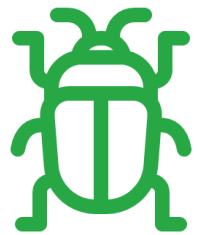


## Extreme Weather

- Flooding
- High Winds

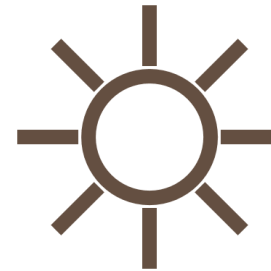


## Fire



## Pests

- Advancing Invasives
- Established Invasives
- Native Pests



## Drought



# Outputs

## Resource Finder

To identify where monitoring of forest disturbance is occurring and quickly find data



## Trend Analysis

To provide an overview of patterns in each disturbance and analysis of change over time





# Technical report with detailed analysis and methodology



## MONITORING AND COMMUNICATING CHANGES IN DISTURBANCE REGIMES

October 2021

Website to explore analyses and find additional monitoring resources

**Analysis**

Frequency Extent Severity Location

STATE:  CT  MA  ME  NH  NY  RI  VT

Show Trends  
 Standard Error  
 Average  
 Total

Wind Frequency is represented by two metrics, 1) the average number of high wind events and 2) the total number of high wind events

**Disturbance Trend Summary**

Long-term trends across the region indicate that the **average number** of high wind events at any given station is stable.

However, the **total number** of high wind events reported across the region, as well as the number of stations reporting **at least one** high wind event is increasing. This indicates that high wind events are increasing in some, but not all, locations.

Interestingly, the **both the average maximum wind speed and the number of extreme high wind events (>95 percentile)** has decreased significantly, indicating that while high wind events are becoming more widespread and frequent, extreme wind events are not.

**Highlights**

- 2005 recorded the highest number of extreme high wind events, likely due to Hurricane Katrina. This serves as a reminder, that even in inland parts of the region, hurricanes can be a widespread driver of disturbance. Note that Hurricane Sandy (2012) and Tropical Storm Irene (2011) did not contribute high wind events like Hurricane Katrina, as they were primarily rain events (see Flood).
- 2013 had several storms that brought damaging wind to the region including, winter storm Nemo, Tropical Storm Andreas and an early season blizzard. Similarly, Nor'easters in 2010 brought high winds and heavy rain across the region. This highlights that hurricanes are not the only driver of high wind events, with more localized, lower level storms also impacting northeastern forests.
- Temporal patterns in frequency and extent indicate that high wind events are becoming more widespread across the region. However, a decrease in average wind speed indicates that smaller, localized events are driving this pattern.

**Monitoring & Additional Resources**

Use this map to browse programs and data products that are related to disturbance regimes and their impact on forest ecosystems. You can see where monitoring of forest disturbance has occurred and where there are gaps for further exploration. All programs and data products have descriptions and links to additional resources as available.

Map Table View

Filters: Disturbance Type State Year to Filter Search

Filters specified: No filter applied.

[www.uvm.edu/femc/disturbance](http://www.uvm.edu/femc/disturbance)



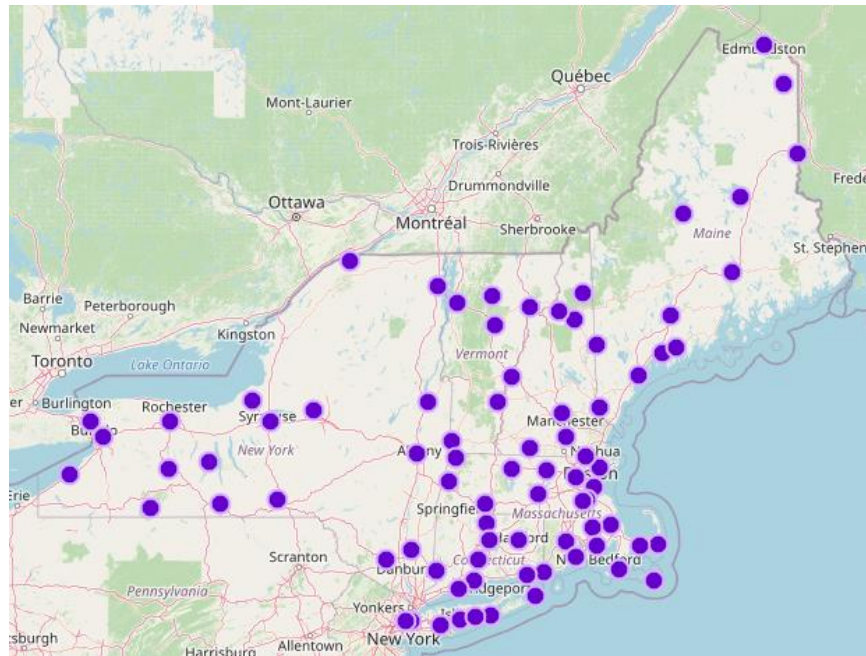
Drivers with significant trends over time



# Driver: High Winds

“High wind” → greater than 55 mph

2001 to 2020



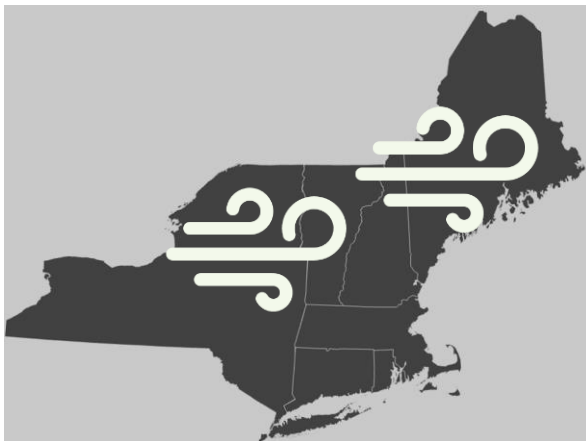
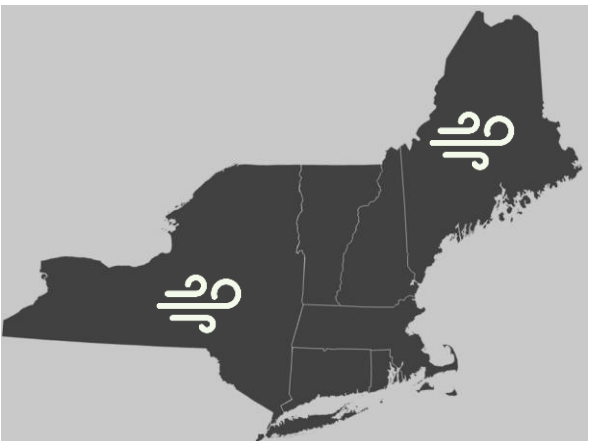
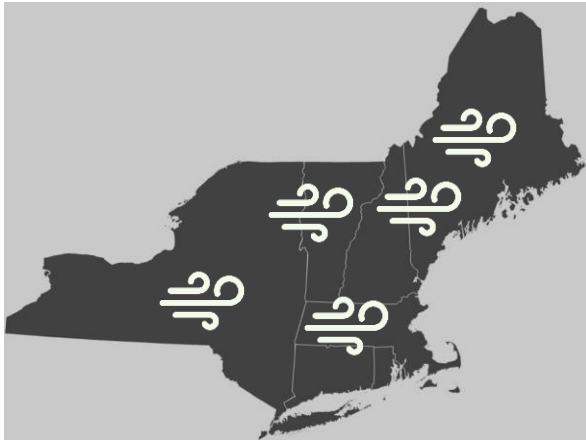
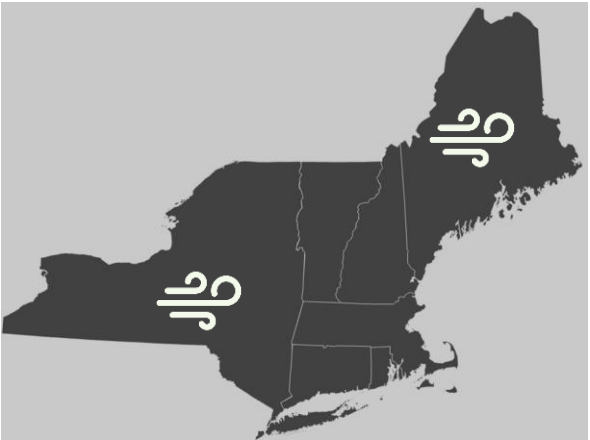
1,886 events across 73 stations



Data source: fastest 5-second wind speed dataset from the [NOAA Global Daily Summaries dataset](#)







# High Winds

*Becoming More Frequent?*

**No**

Small decrease in Vermont

*Happening in More Places?*

**Yes**

Regionally and in MA

*Getting More Severe?*

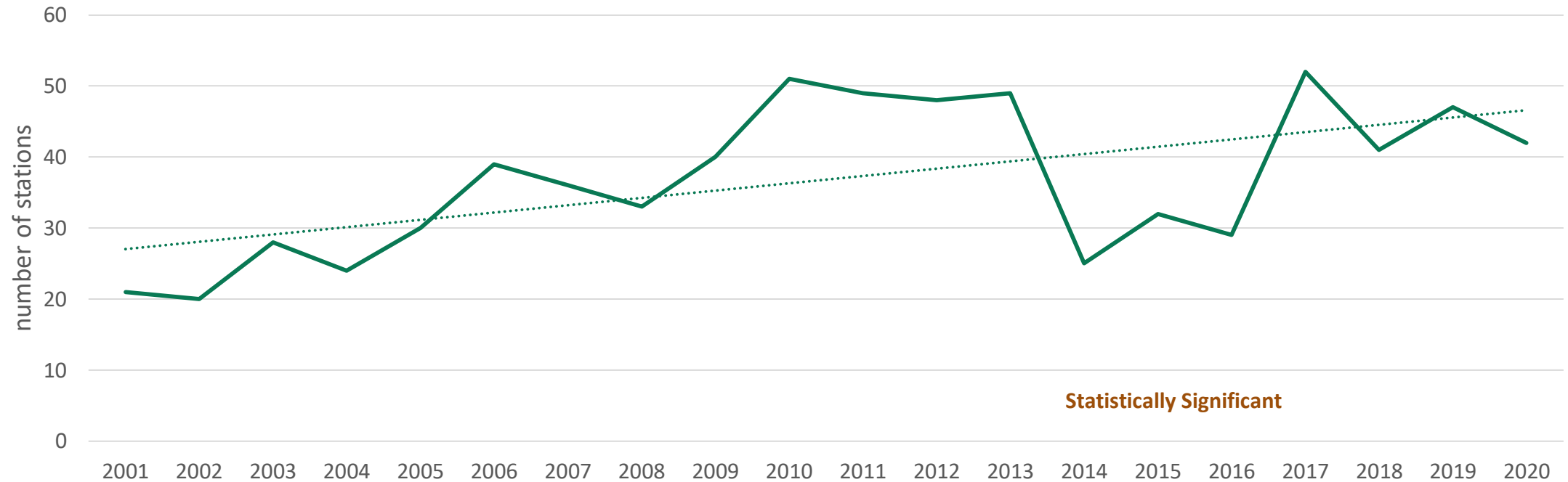
**No, getting less**

Regionally, MA, NH, NY and VT

# Are high wind events happening in more places?



## Number of stations reporting **1** event



Yes

Regionally, as well as Massachusetts

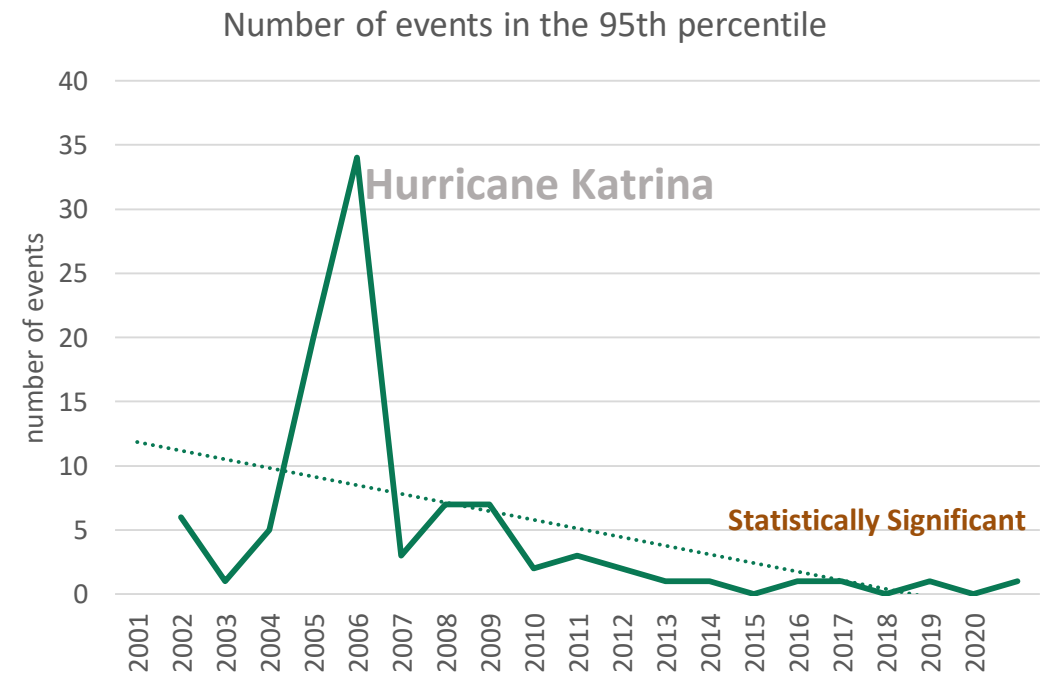
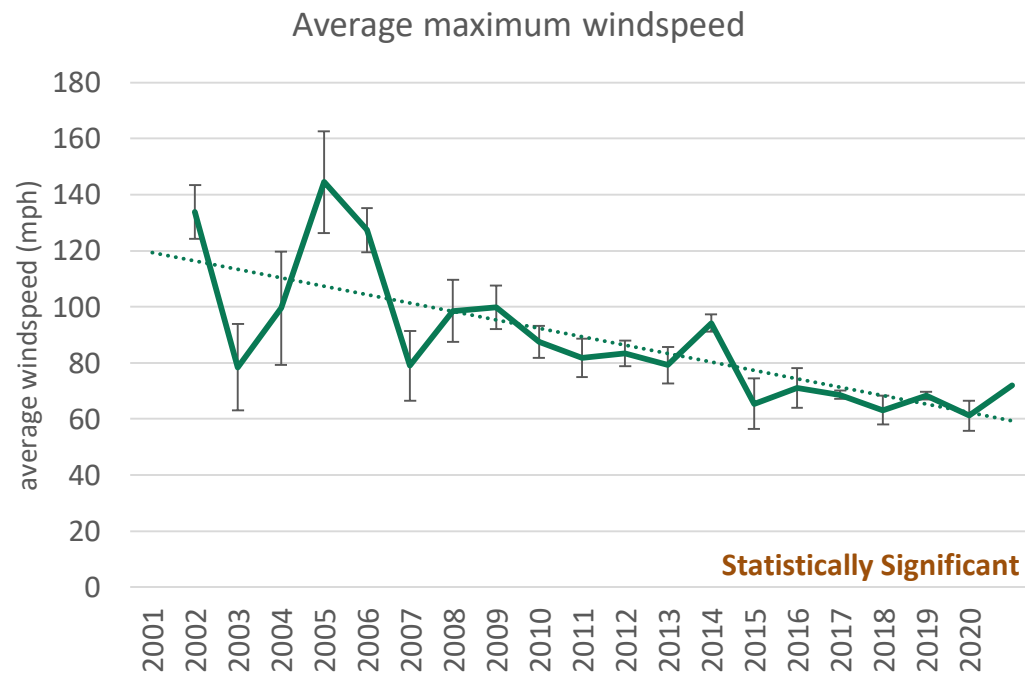




# Are high wind events getting more severe?



## Metrics: Average max windspeed and 95<sup>th</sup> percentile



No, they are getting less severe

Regionally, and in Maine, New Hampshire, New York, and Vermont

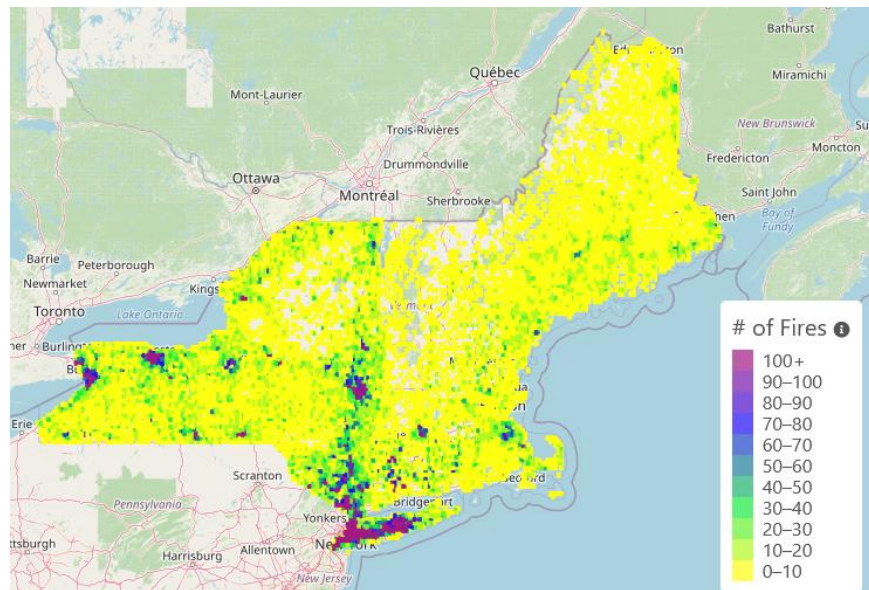


# Driver: Fire



“Fire” → Any fire with acreage reported

1992-2018



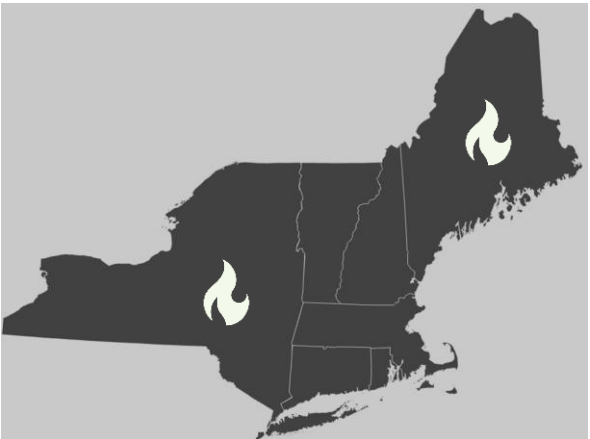
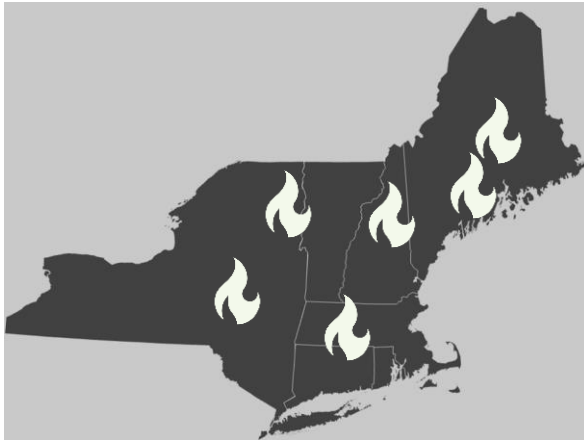
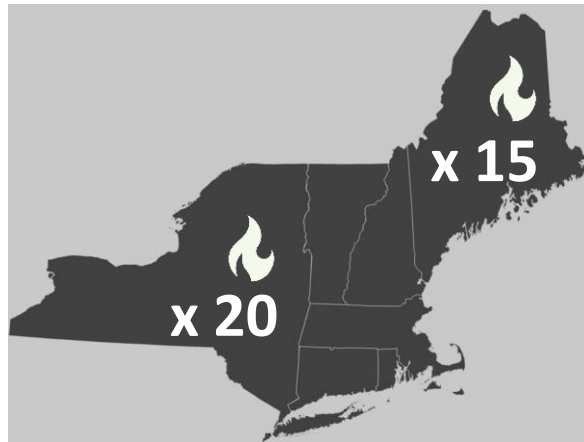
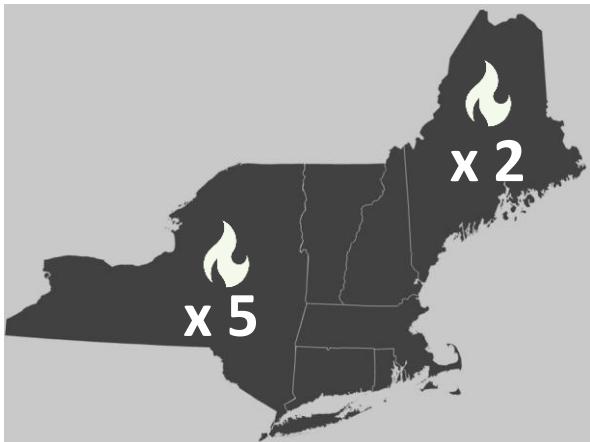
125,116 fires



Data source: [The Fire Program Analysis \(FPA\) fire-occurrence database](#)







# Fire

*Becoming More Frequent?*

**Yes**

Regionally, and in Connecticut, Massachusetts, New York and Vermont

*Burning More Overall Area?*

**No**

However, average area getting smaller regionally

*Burning More Area at Once?*

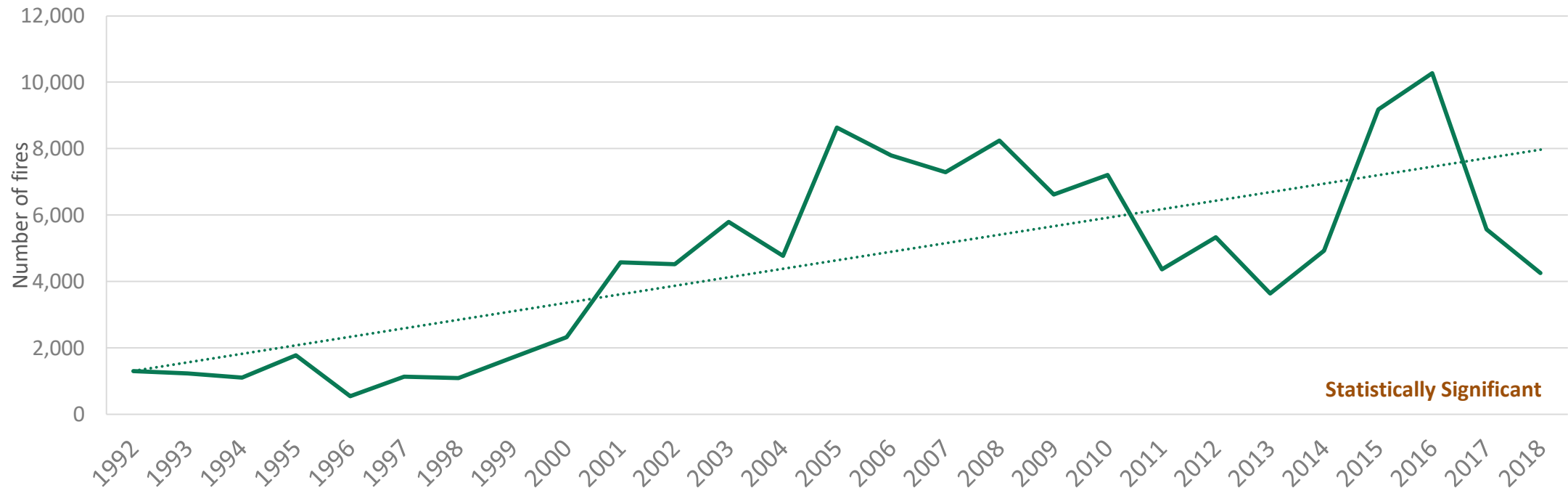
**No**

Maine and Rhode Island show decreases, while Massachusetts and Vermont show increases

# Are fires becoming more frequent?



Metric: **Number** of fires reported



Yes

Regionally, and in Connecticut, Massachusetts, New York and Vermont



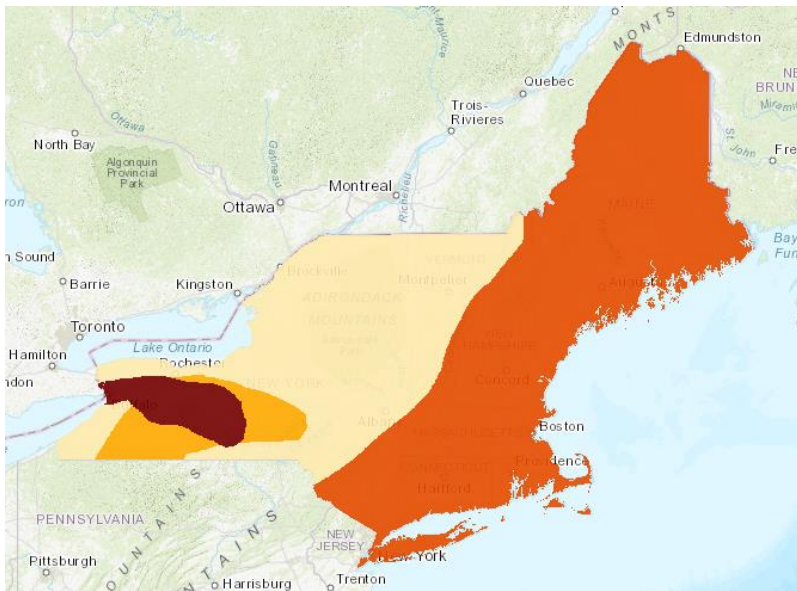


# Drivers without evidence of a trend over time



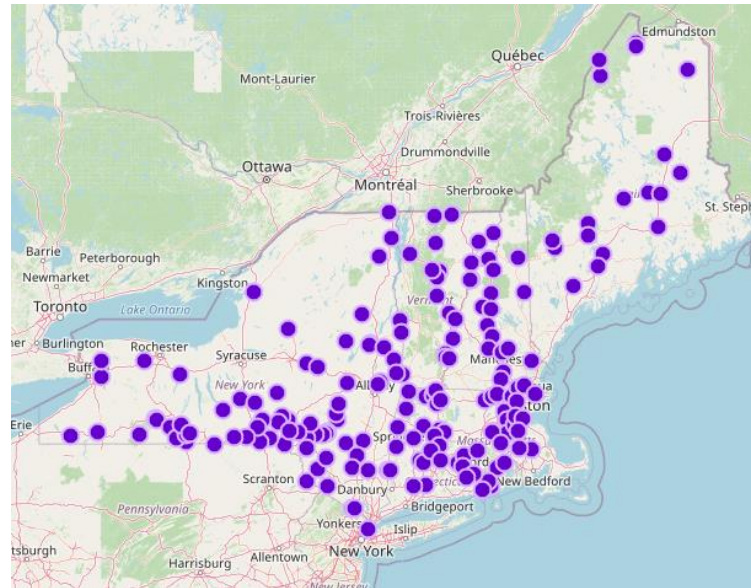
“Drought” → Any level of drought status

2000-2020



“Flooding” → Gauge levels above flood stage

2008 to 2020



179 stations

“Damage” → Area defoliated or killed

1918-2020



> 130,000 polygons



# Potential Next Steps

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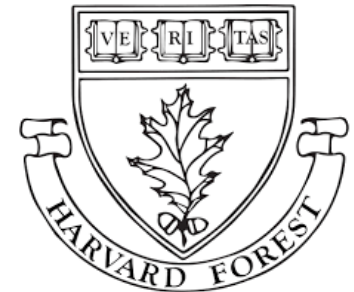


- Customizable charting to visualize data multiple drivers
- Inform future research to connect 'drivers' with 'responses'
- Continue to add resources to increase breadth

# Acknowledgments: Advisory Committee



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**VERMONT**  
AGENCY OF NATURAL RESOURCES



**DEM**  
RHODE ISLAND



**CAES**

The Connecticut Agricultural Experiment Station  
*Putting Science to Work for Society since 1875*





**Thank you!**  
**[www.uvm.edu/femc/disturbance](http://www.uvm.edu/femc/disturbance)**

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