# SPRAYING RECOMMENDATIONS TO PREVENT WEST NILE VIRUS

TEAM MATH | A Data Science Team

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# Background, Methods, Objectives

## BACKGROUND

- There is an epidemic of West Nile Virus in the city of Chicago
- The Department of Public Health has set up a surveillance and control system to monitor mosquito activity in the city

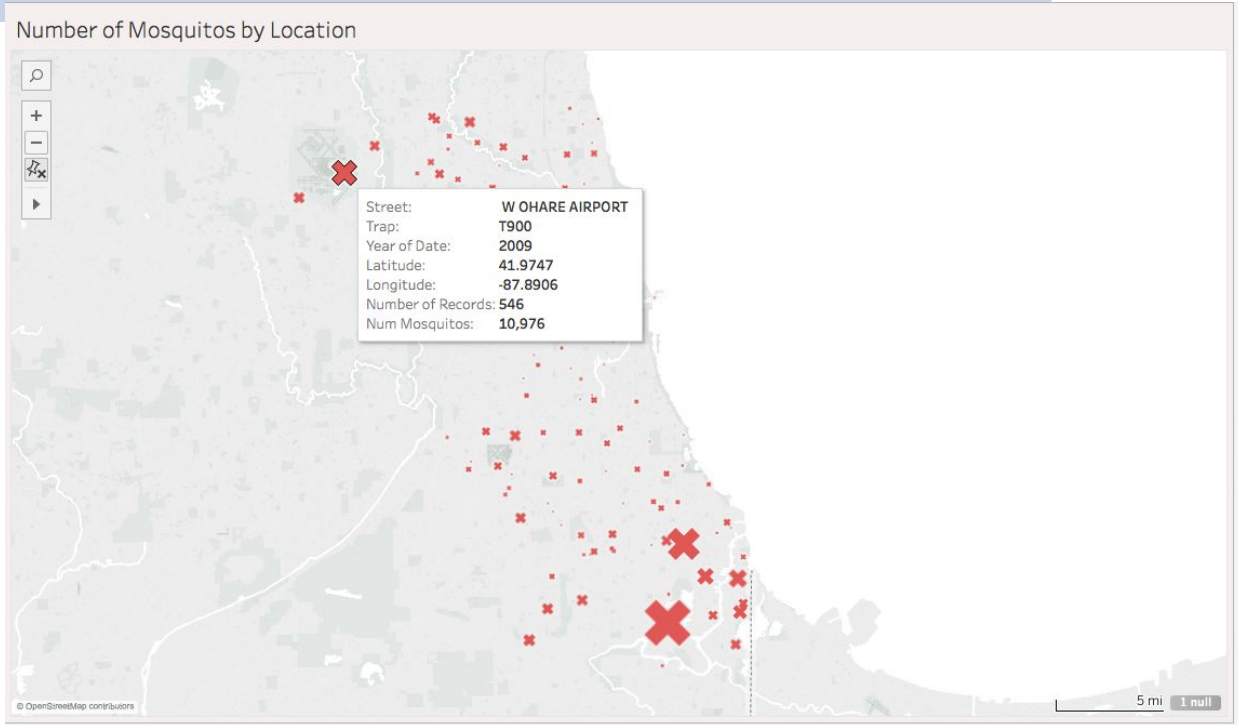
## METHODS

- Utilizing data spanning from 2007 to 2015 on mosquito activity, pesticide spray data, and Chicago weather data a model was built to predict where and when would be most optimal to spray
  - Note: Chicago began spraying for mosquito control in 2011

## OBJECTIVES

- Derive an effective plan to deploy pesticides throughout the city to prevent the spread of West Nile Virus
- Construct a cost-benefit analysis to map out the most cost-effective methods

# NUMBER OF MOSQUITOS BY LOCATION




Summary

| | |
|---|---|
| Count: | 343 |
| AVG(Latitude) | |
| Sum: | 14,353.... |
| Average: | 41.8465 |
| Minimum: | 41.6446 |
| Maximum: | 42.0174 |
| Median: | 41.8527 |
| AVG(Longitude) | |
| Sum: | -30,078... |
| Average: | -87.6914 |
| Minimum: | -87.9310 |
| Maximum: | -87.5316 |
| Median: | -87.6918 |
| SUM(Num Mosquitos) | |
| Sum: | 270.078 |
| Average: | 787.40 |
| Minimum: | 2 |
| Maximum: | 38,268 |
| Median: | 320.00 |
| SUM(Number of Recor... | |
| Sum: | 38,600 |
| Average: | 112.21 |
| Minimum: | 2 |
| Maximum: | 17,588 |
| Median: | 54.00 |

Highlight Street

Highlight Street

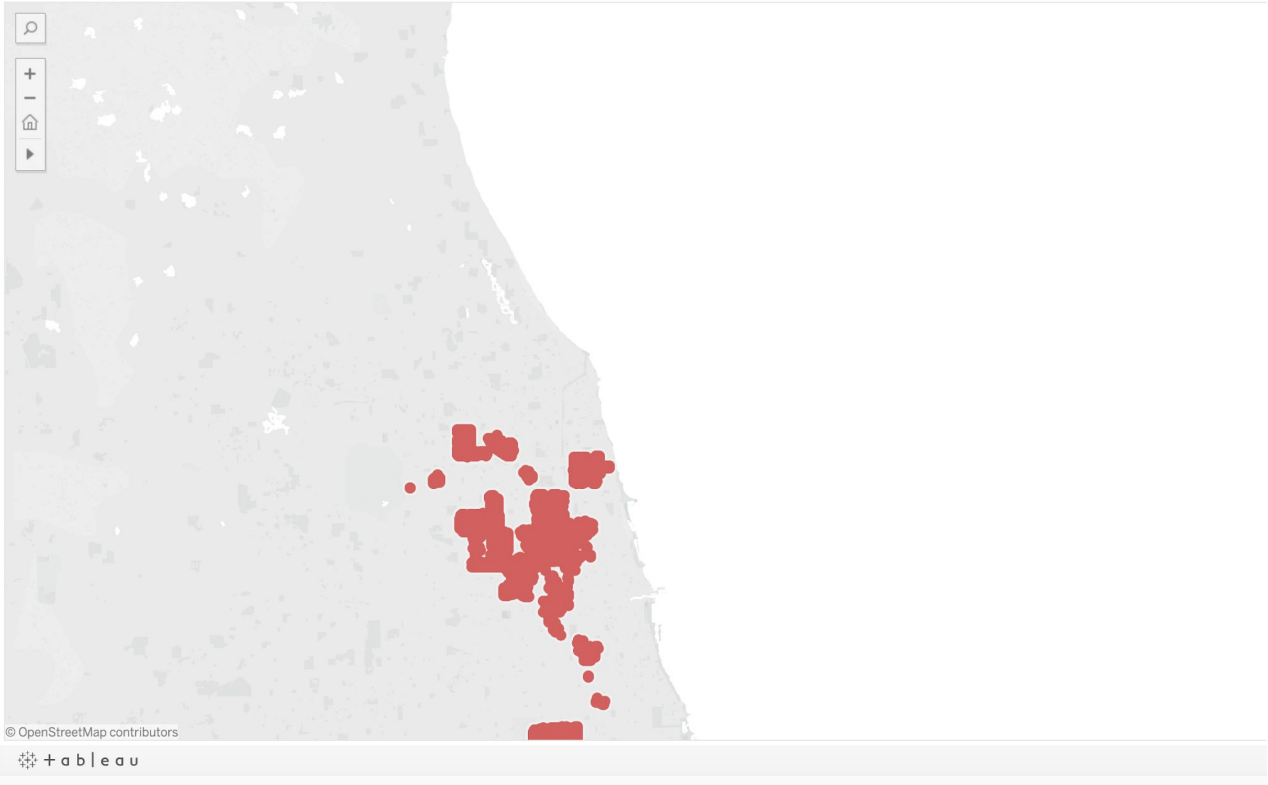
SUM(Num Mosquitos)

2
10,000
20,000
30,000
38,268

Caption

Map based on average of Longitude and average of Latitude. Size shows sum of Num Mosquitos. The marks are labeled by Street, Trap and Date Year.

# Mosquito Historical Spray Locations



1

# OUR MODEL

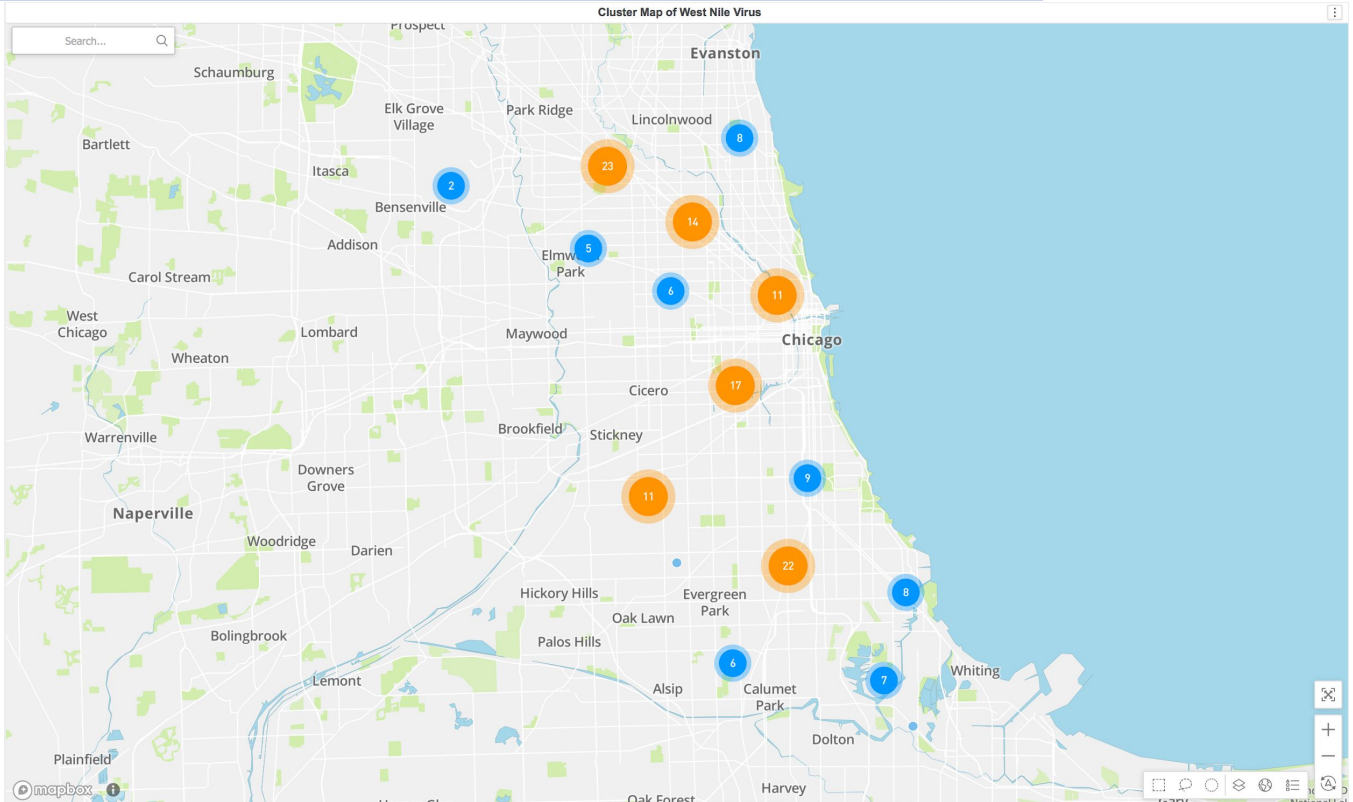
Where and when to spray

# OUR MODEL

- Objective: predict presence of West Nile Virus
- Random Forest
  - selected due to its management of unbalanced classes
- 71% accurate

We can accurately predict the presence of West Nile Virus 71% of the time

# WEST NILE VIRUS CLUSTERS



# 2

# COSTS AND BENEFITS

How to get the most bang for your buck

# COSTS

- The costs are not just financial
  - Pesticides in large quantities are harmful to health
  - Additionally, pesticides can be damaging to an ecosystem
- The financial costs range from $300 per square mile to $19,000 per square mile

Such a wide range is not conducive to planning a budget.

# BENEFITS

- The benefits are largely focused on health
  - West Nile Virus can result in severe disease, disturbed brain function, and death
- Since 1999, hospitalizations because of the virus have cost almost $800 million in the U.S.
  - The annual burden comes to $56 million
- There is no human vaccine

Prevention is the only option.

# 3

# RECOMMENDATIONS

How to prevent West Nile Virus at the lowest possible cost

# RECOMMENDATIONS

## Identify more features that indicate the outbreak of a West Nile Virus epidemic

- As our model can draw on knowledge gained from more features, it can make more prescriptive recommendations on where and when to spray with higher accuracy
- Further research is required

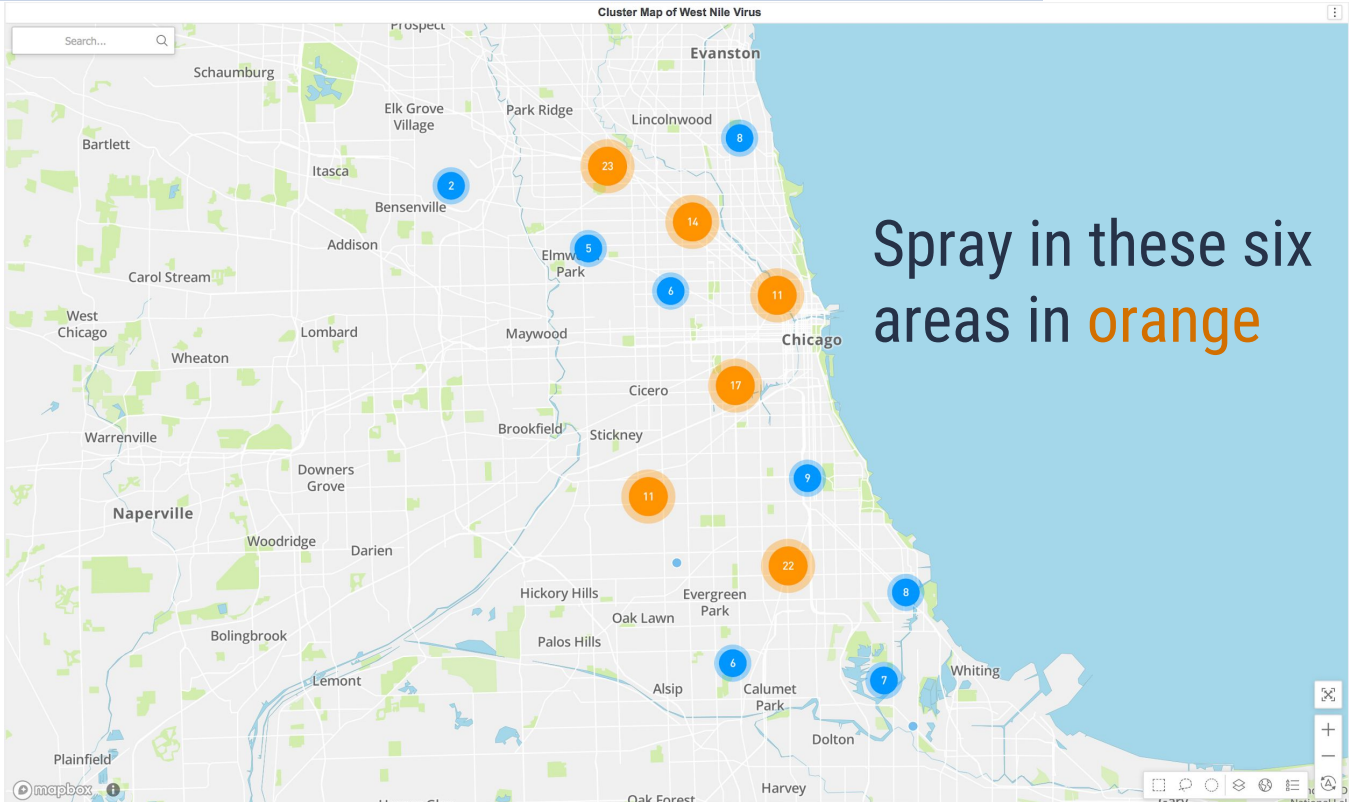
# RECOMMENDATIONS (cont.)

## Recommended Features

- % concentration of West Nile Virus*
- How often should an area be sprayed
- % concentration post-spray*

* relative to mosquito species

# RECOMMENDATIONS (cont.)



# THANKS!

Any questions?

# SOURCES

- Northwest Side Neighborhoods Targeted Again for West Nile Mosquito Spraying
- Study on West Nile Virus Hospitalization costs
- Estimated costs of spraying