CITY OF CHICAGO

defeating west nile

An overview of what we're working towards.

Introduction

01 Mosquito borne zoonotic disease

02 First identified in 1999 in NY, US

Current figures

US TOTAL CASES

51,801

TOTAL US DEATHS 1999 - 2019

2,390

OUR MAIN MISSION.

To predict when and where mosquitoes will test positive for West Nile Virus

WHY?

To effectively allocate resources towards preventing the transmission of west nile virus

Data

01 Main Dataset

02 Spray

03 Weather

data cleaning

01 WNV only detected in 2 species

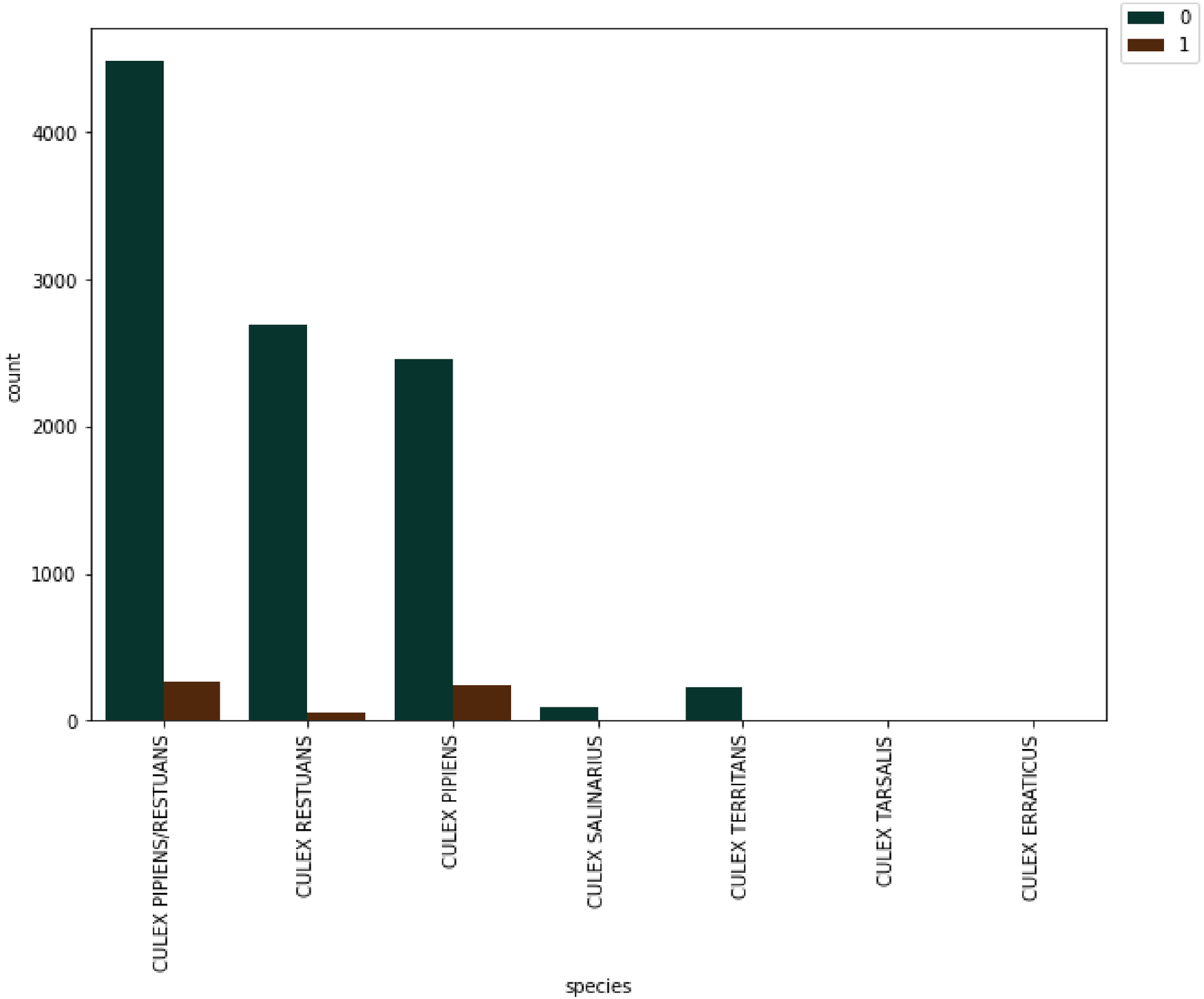
02 Remaining species classified under *Culex sp*

03 Dealing with missing data

04 Data Merging

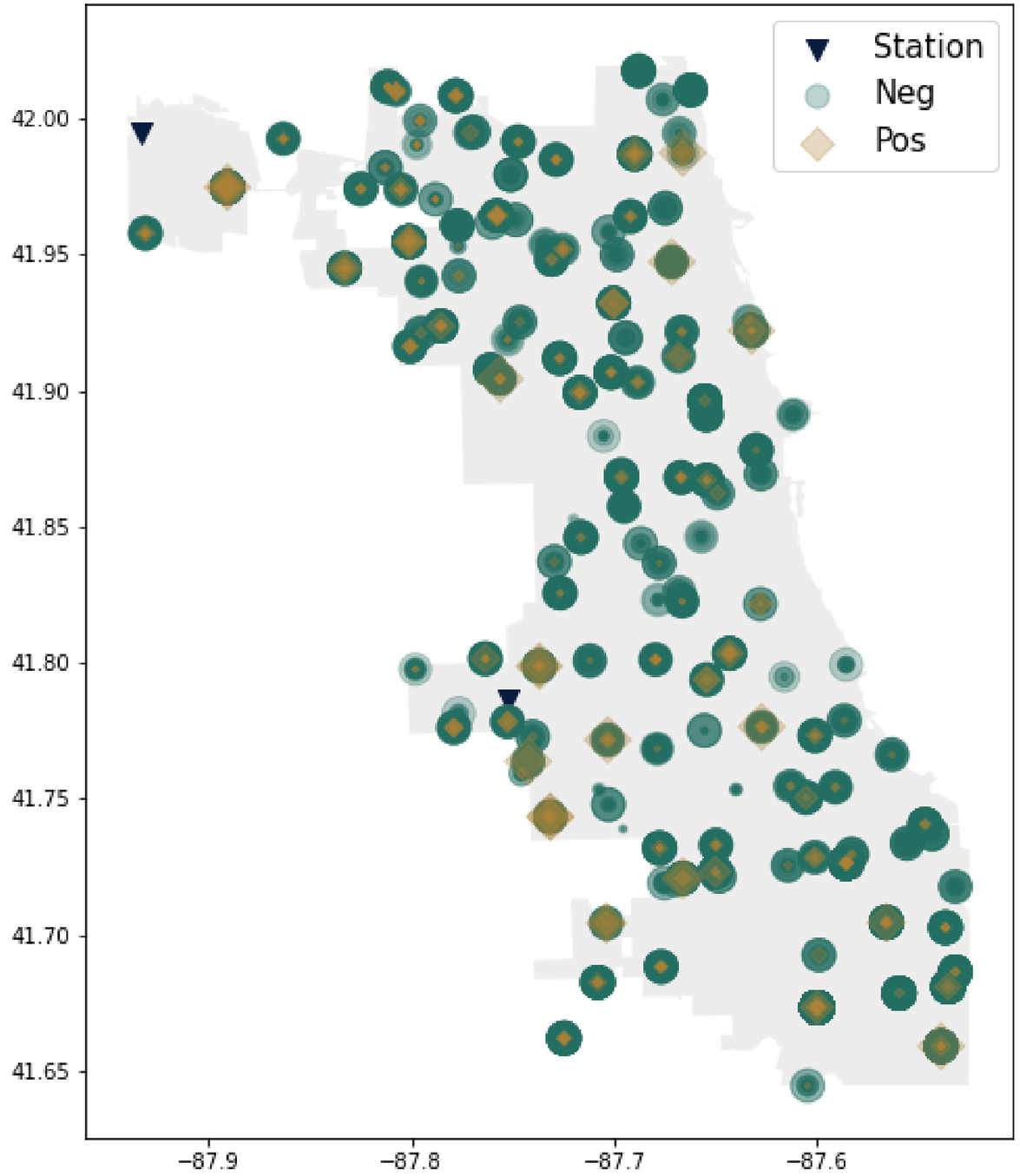
West nile virus vectors

0: Virus not present
1: Virus present

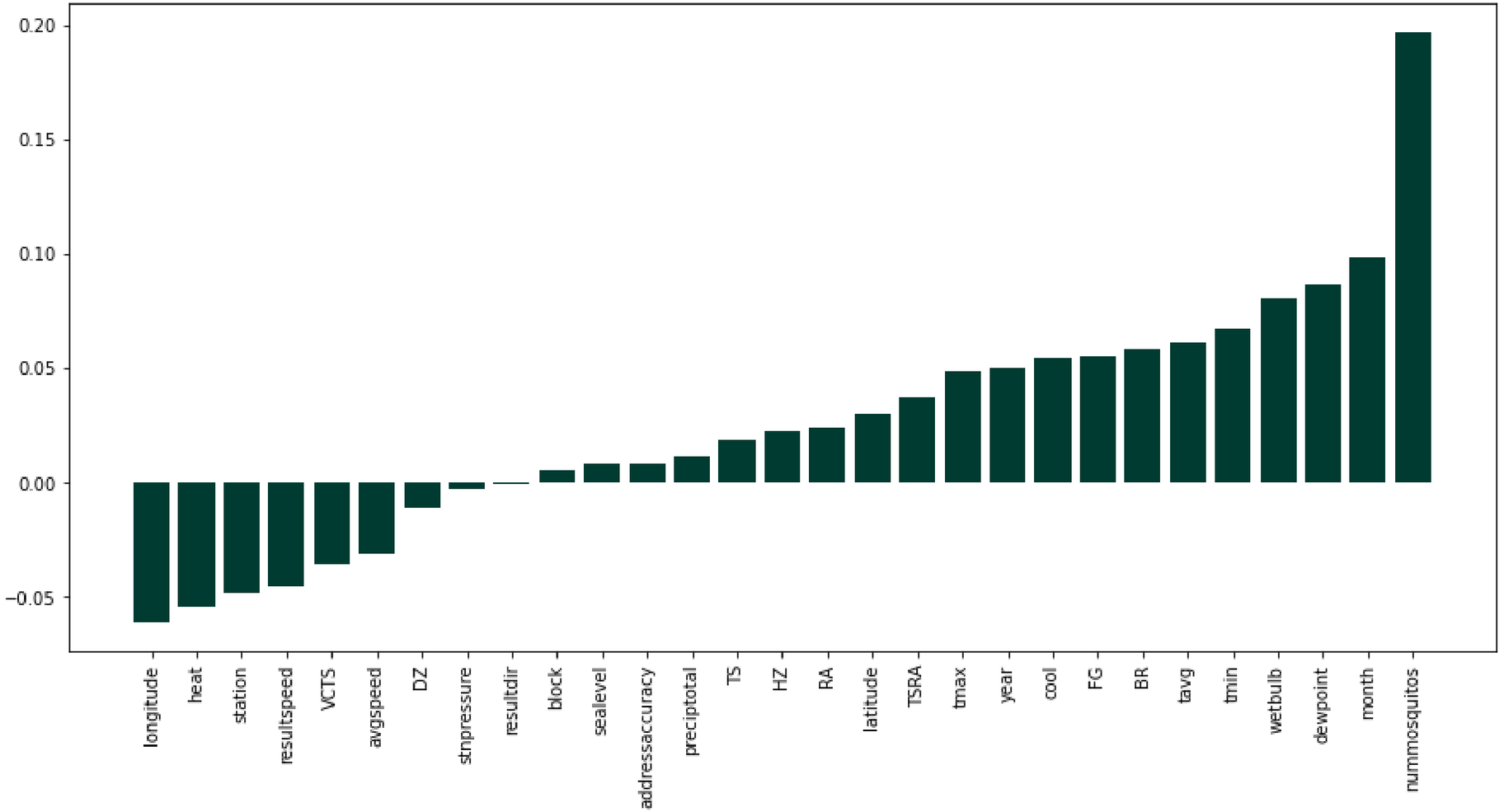


location of mosquitoes

Mosquitos found throughout Chicago, data from 2007 - 2013



West Nile Virus – Predictors

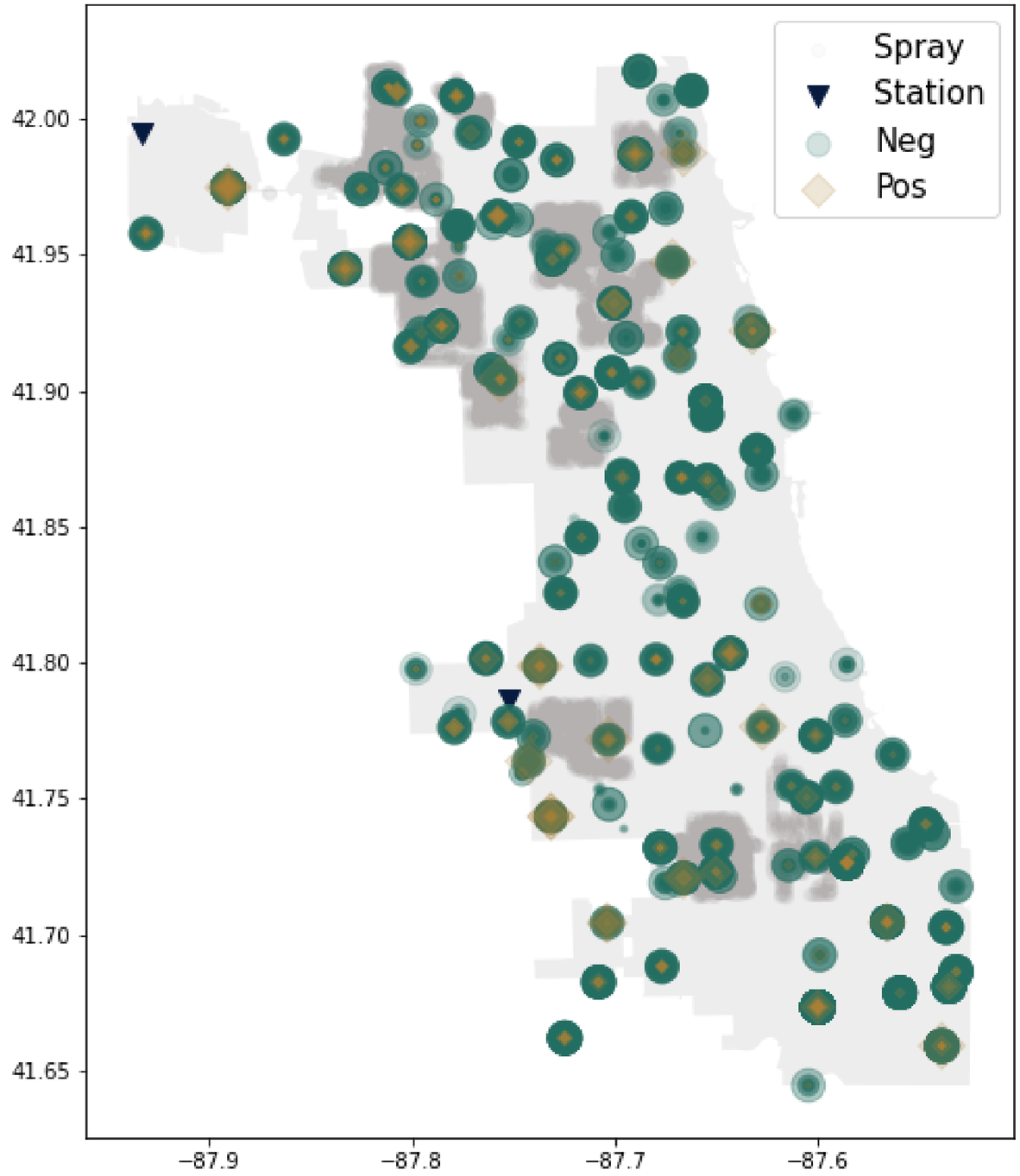


To reduce mosquitos:

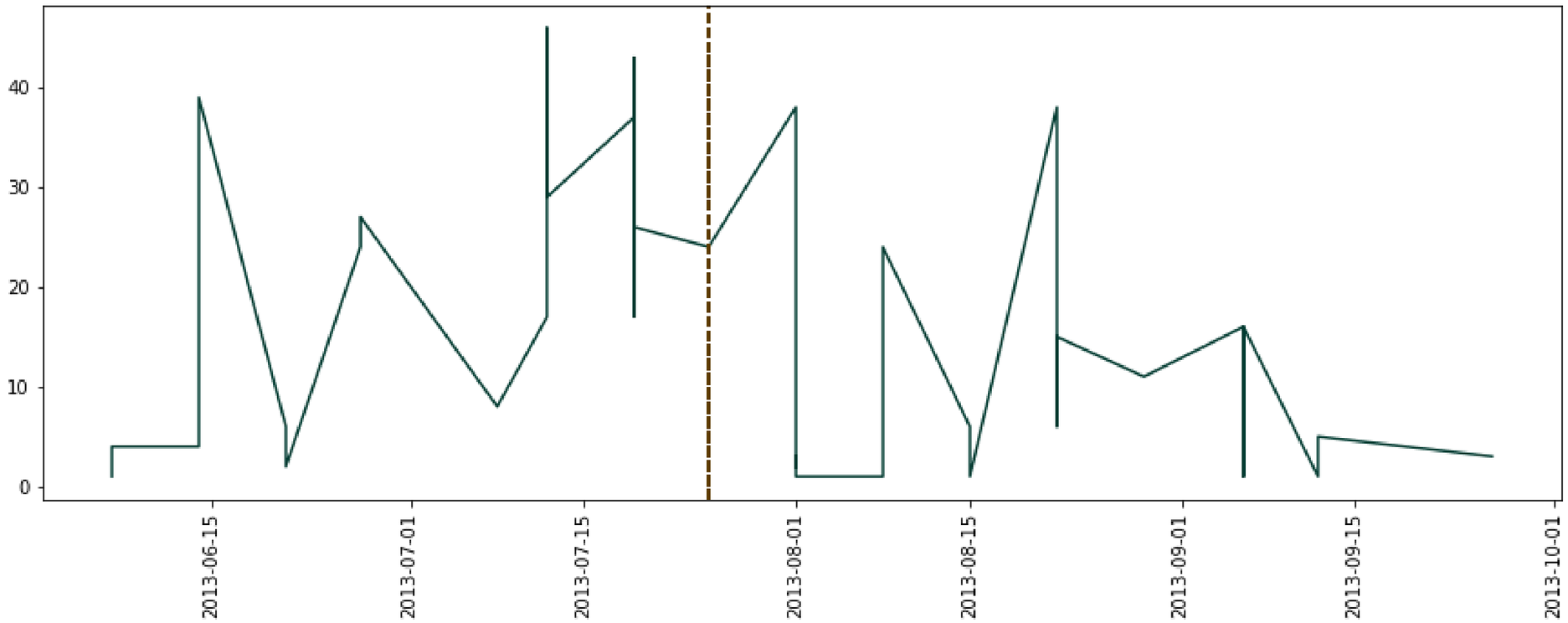
Does the spray help?

location of spray

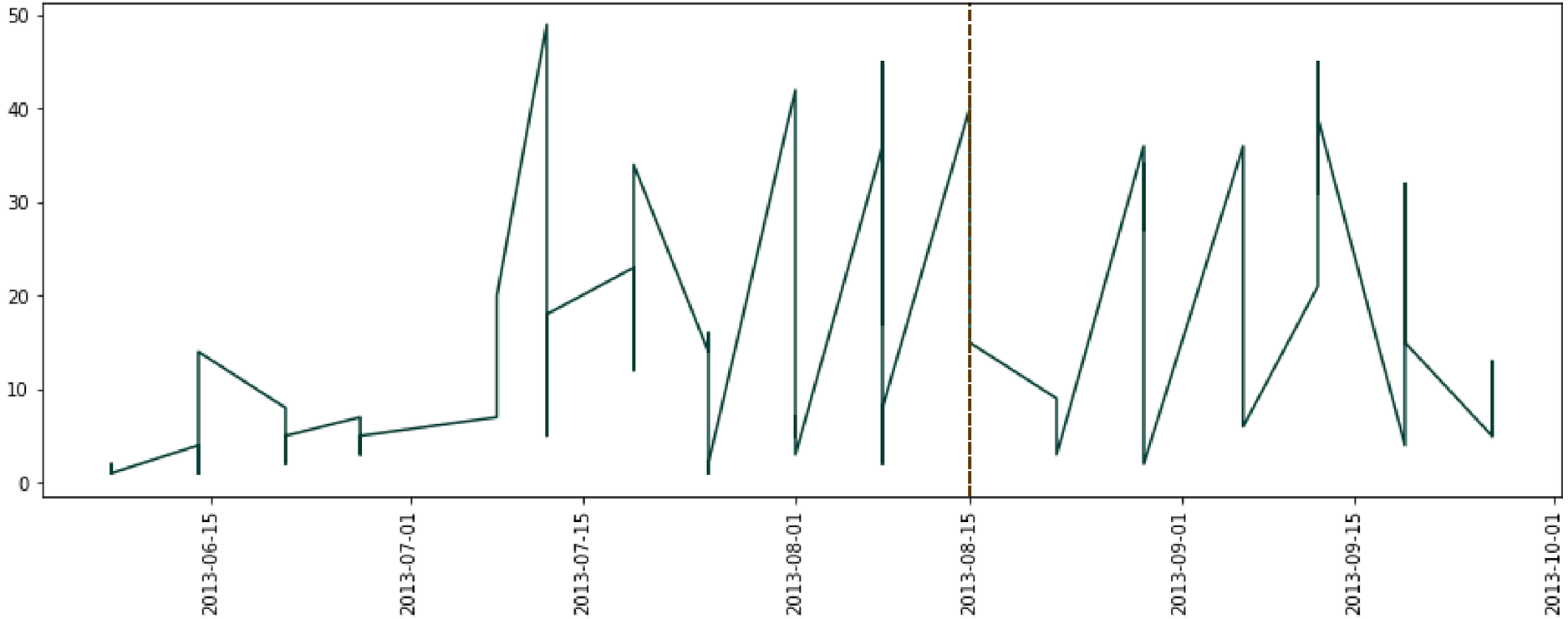
Spray data in Chicago, from 2011 - 2013



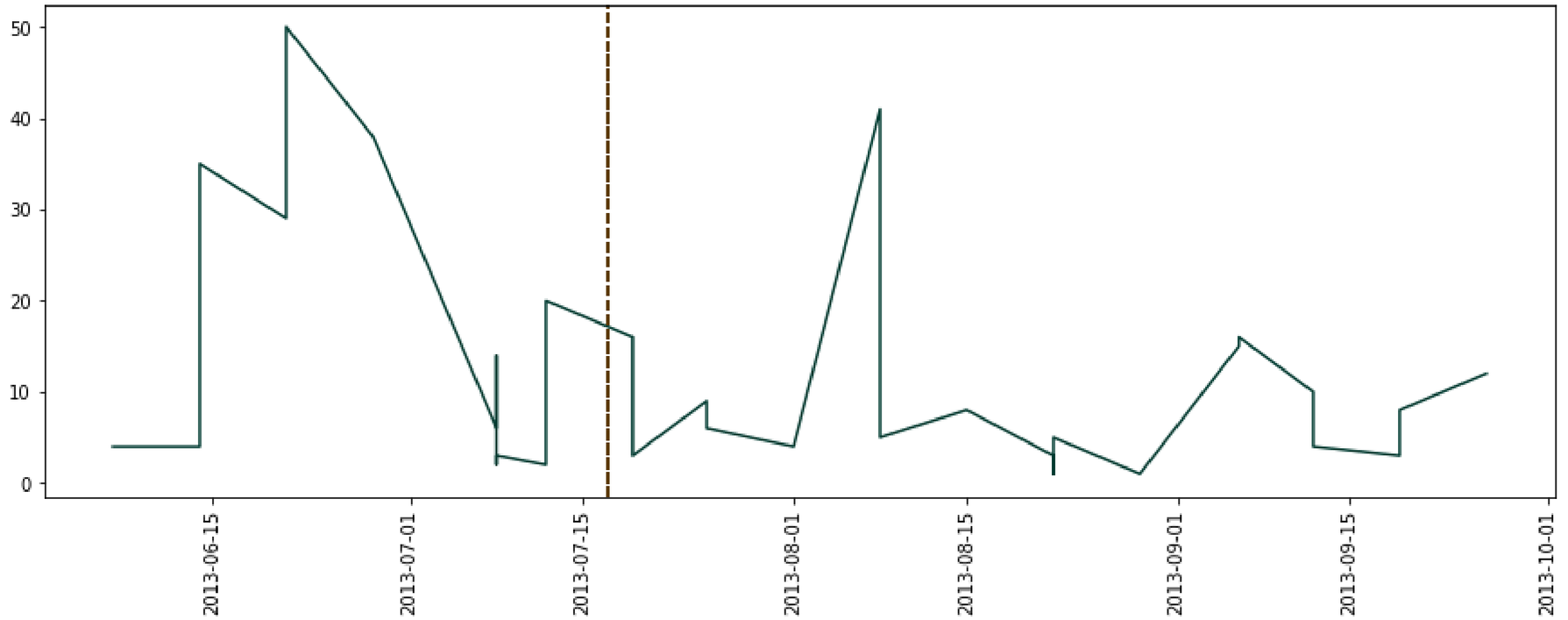
3900 North Springfield Avenue, Chicago



6100 West Fullerton Avenue, Chicago & 1300 North Laramie Avenue, Chicago



1700 West 95th Street, Chicago &
9600 South Longwood Drive, Chicago



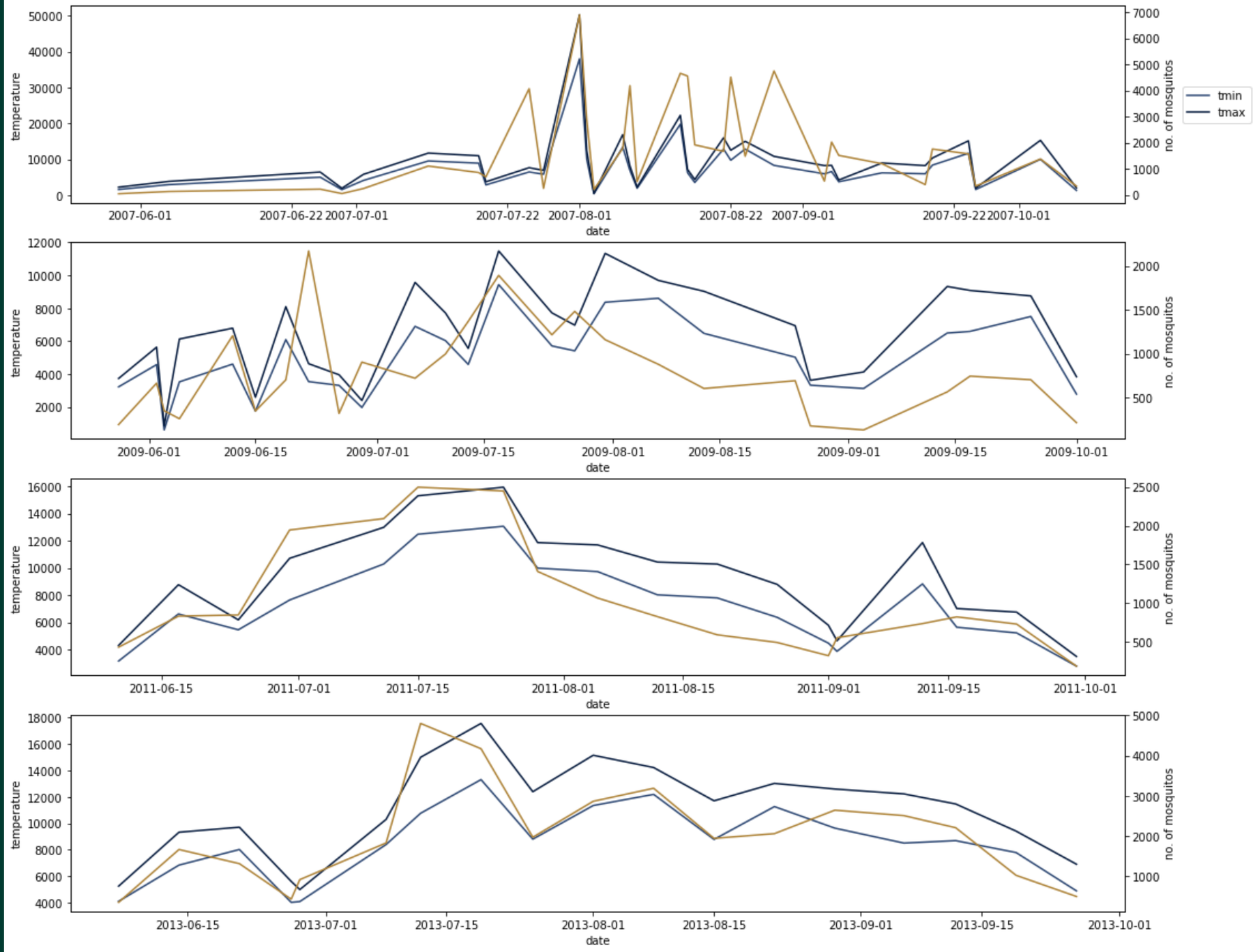
Spraying helps.

01 Reduce number of mosquitoes

02 For about 10-15 days

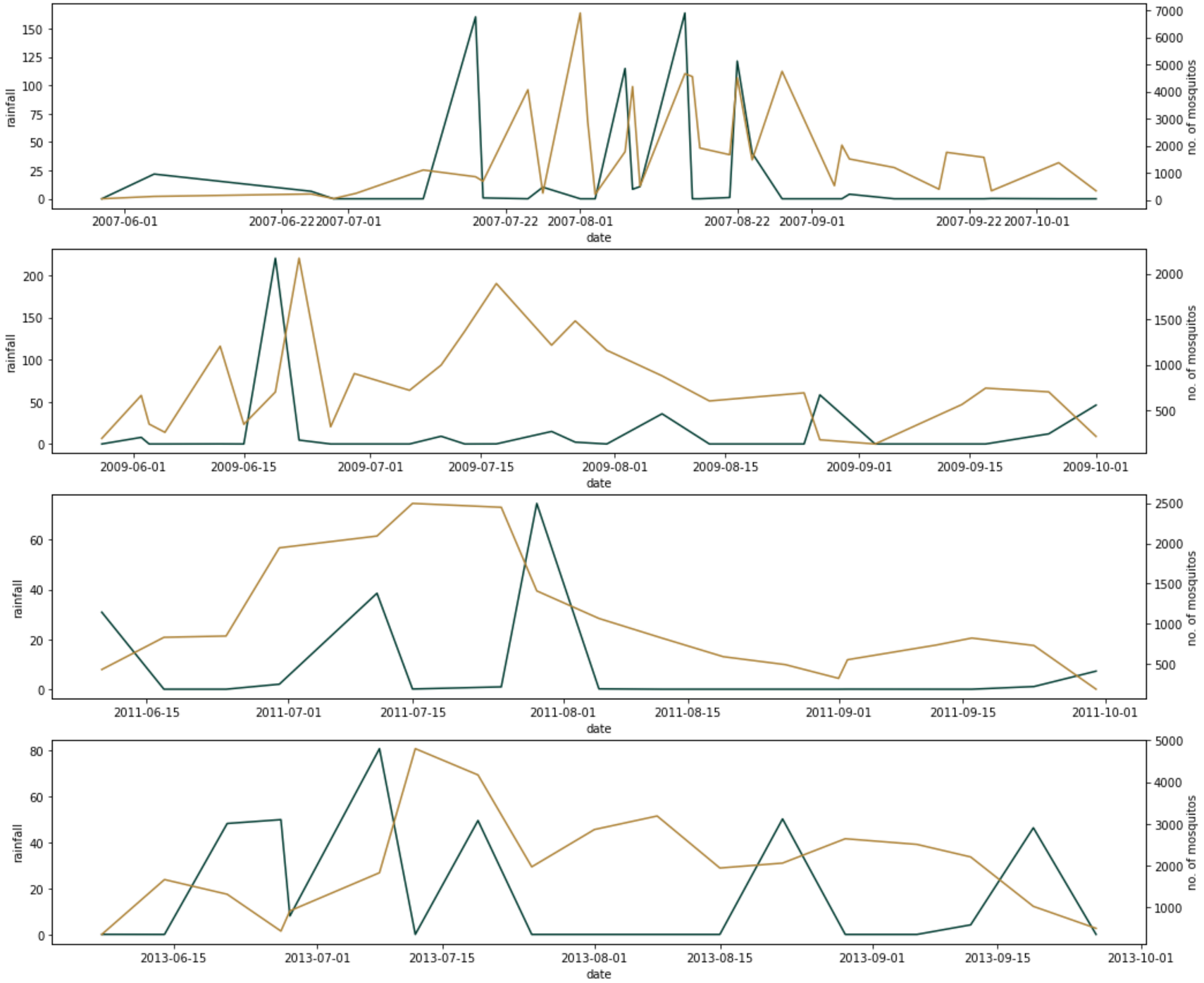
hot weather = more mosquitos

Temperature vs number of mosquitos



rainfall & number of mosquitos

hot and wet weather results in more mosquitos



Modelling

Tested various models

01 Logistic Regression

02 Gradient Boost

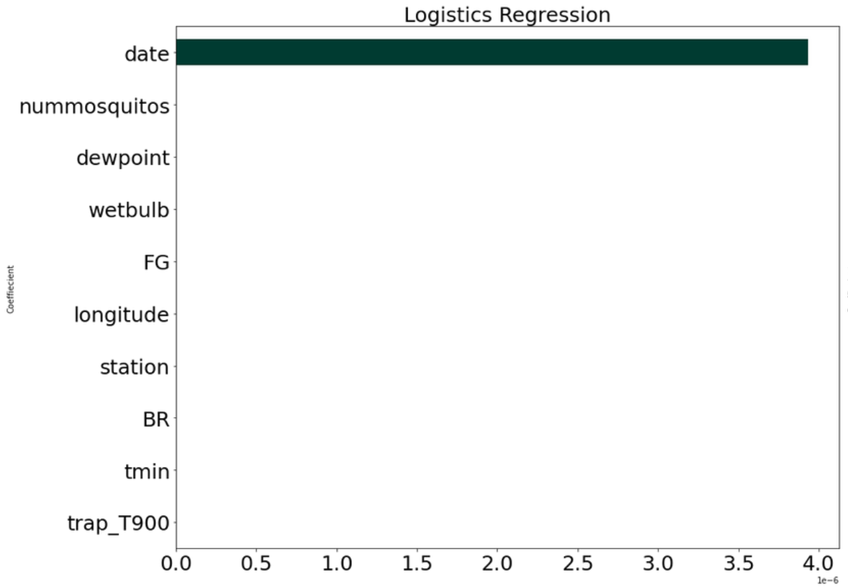
03 Ada Boost

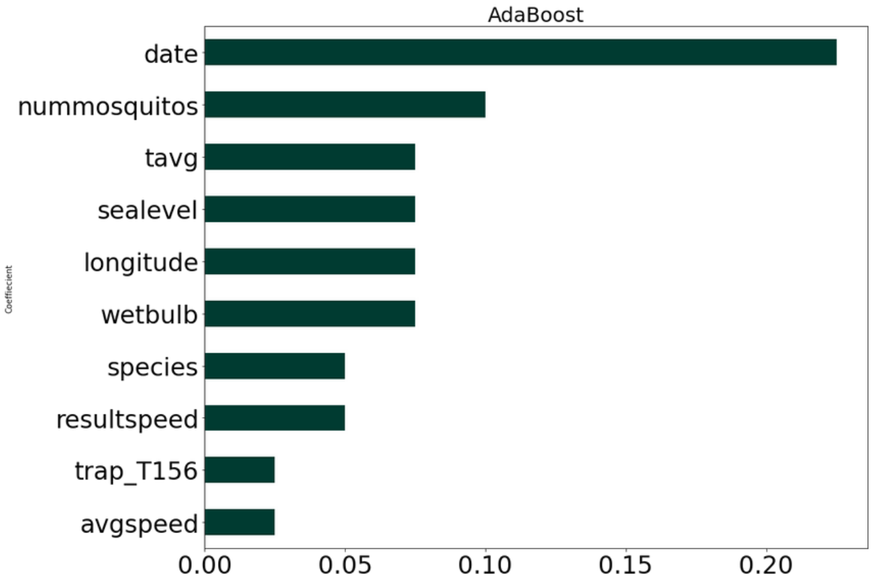
04 Random Forest

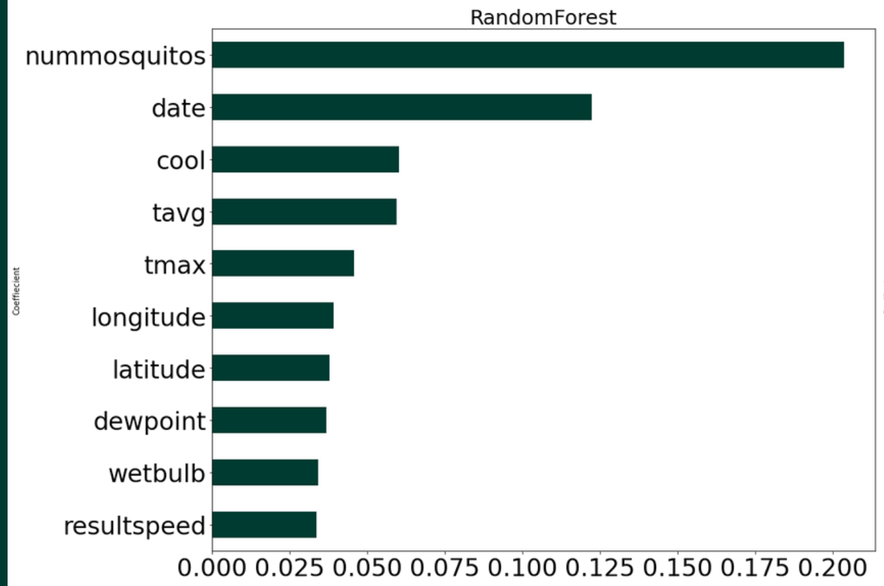
Sensitivity and F1 scores similar for all models

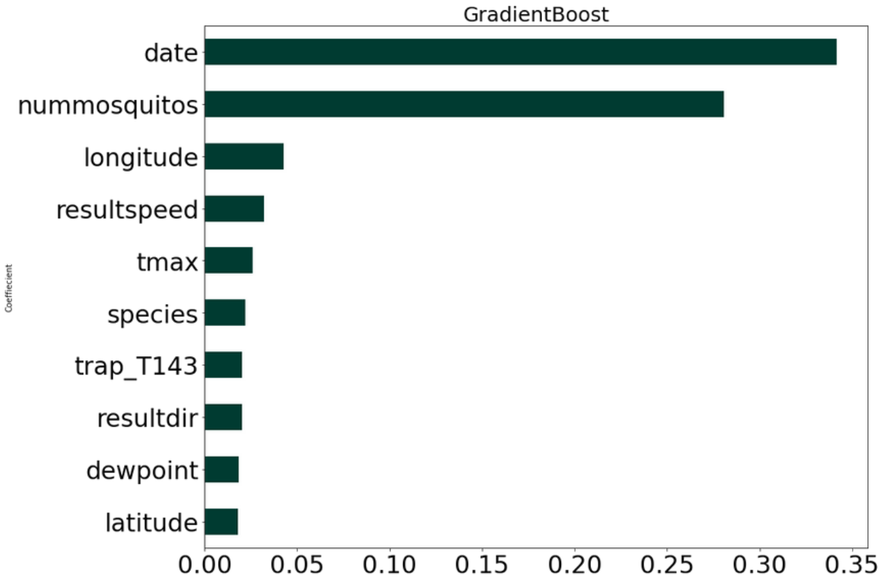
	Logistics	GradientBoost	AdaBoost	RandomForest
AUC Train	0.83	0.92	0.89	0.86
AUC Test	0.76	0.84	0.83	0.82
Sensitivity	1.00	0.99	0.99	1.00
F1 Score	0.97	0.97	0.97	0.97

Model Coefficients

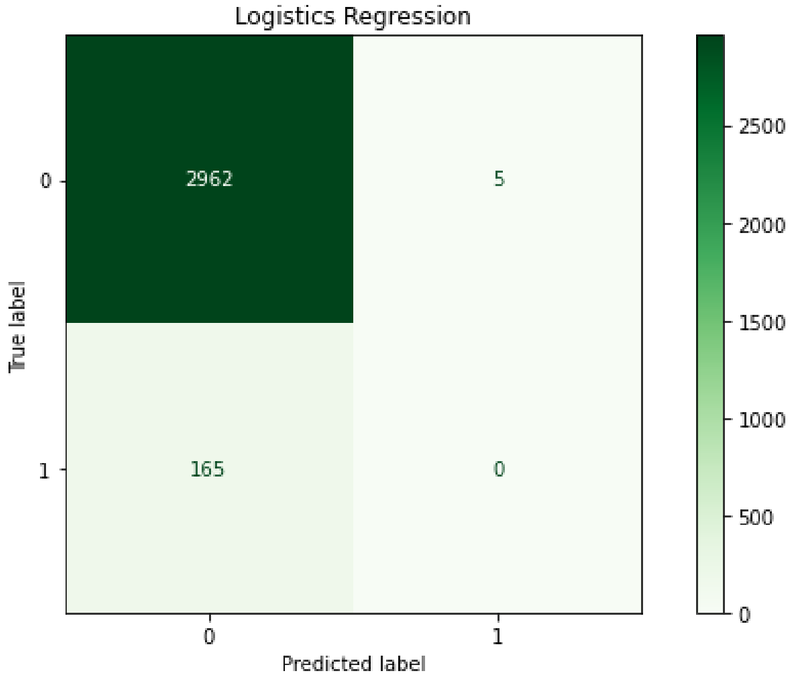


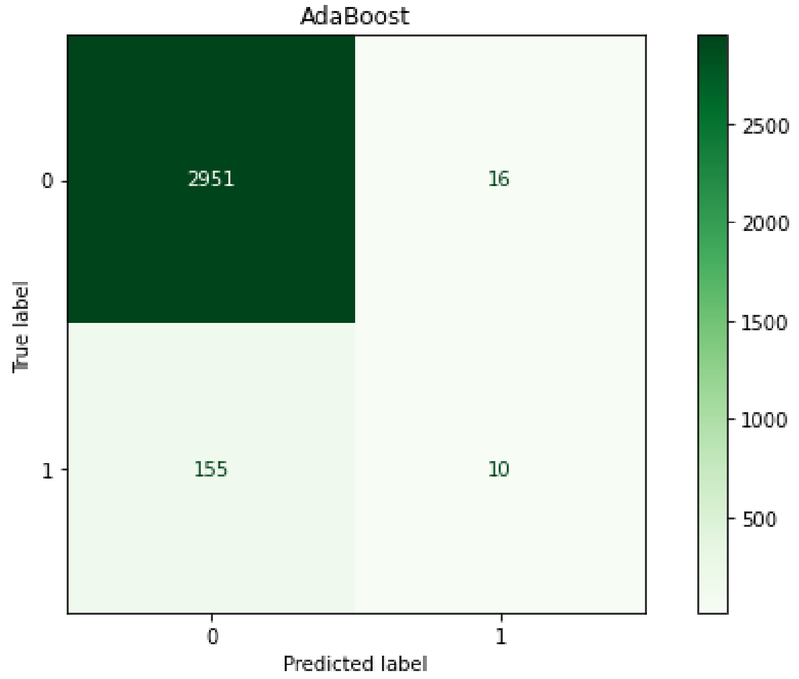


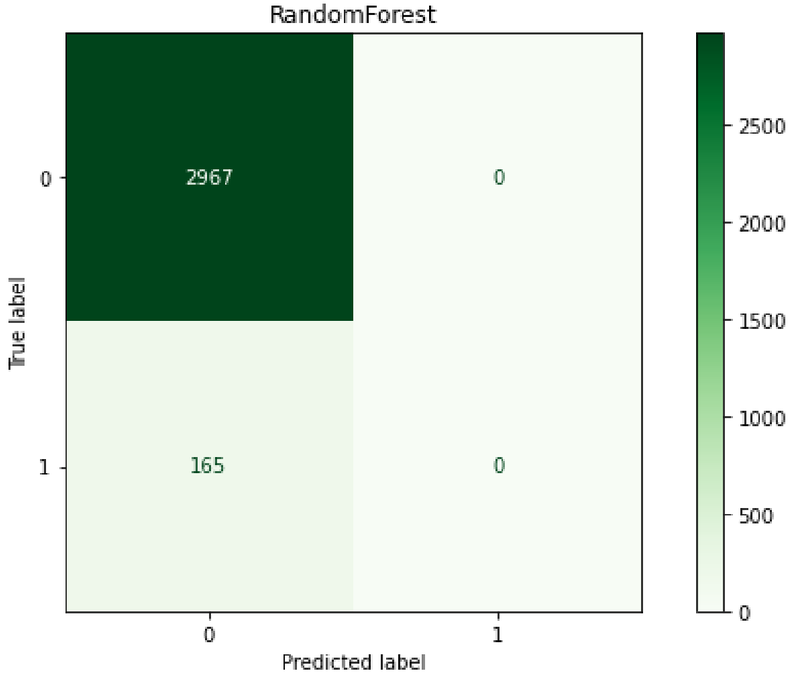


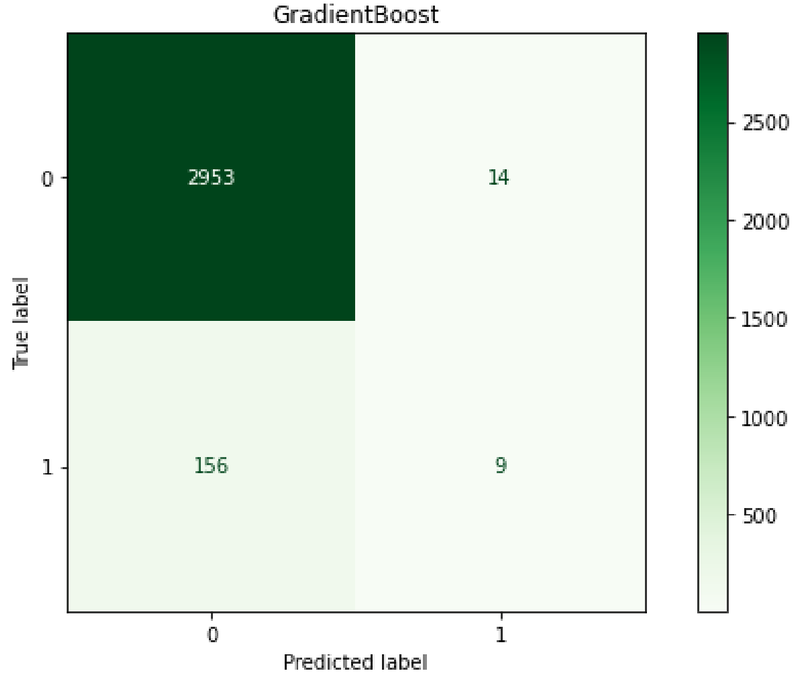


Confusion Matrix

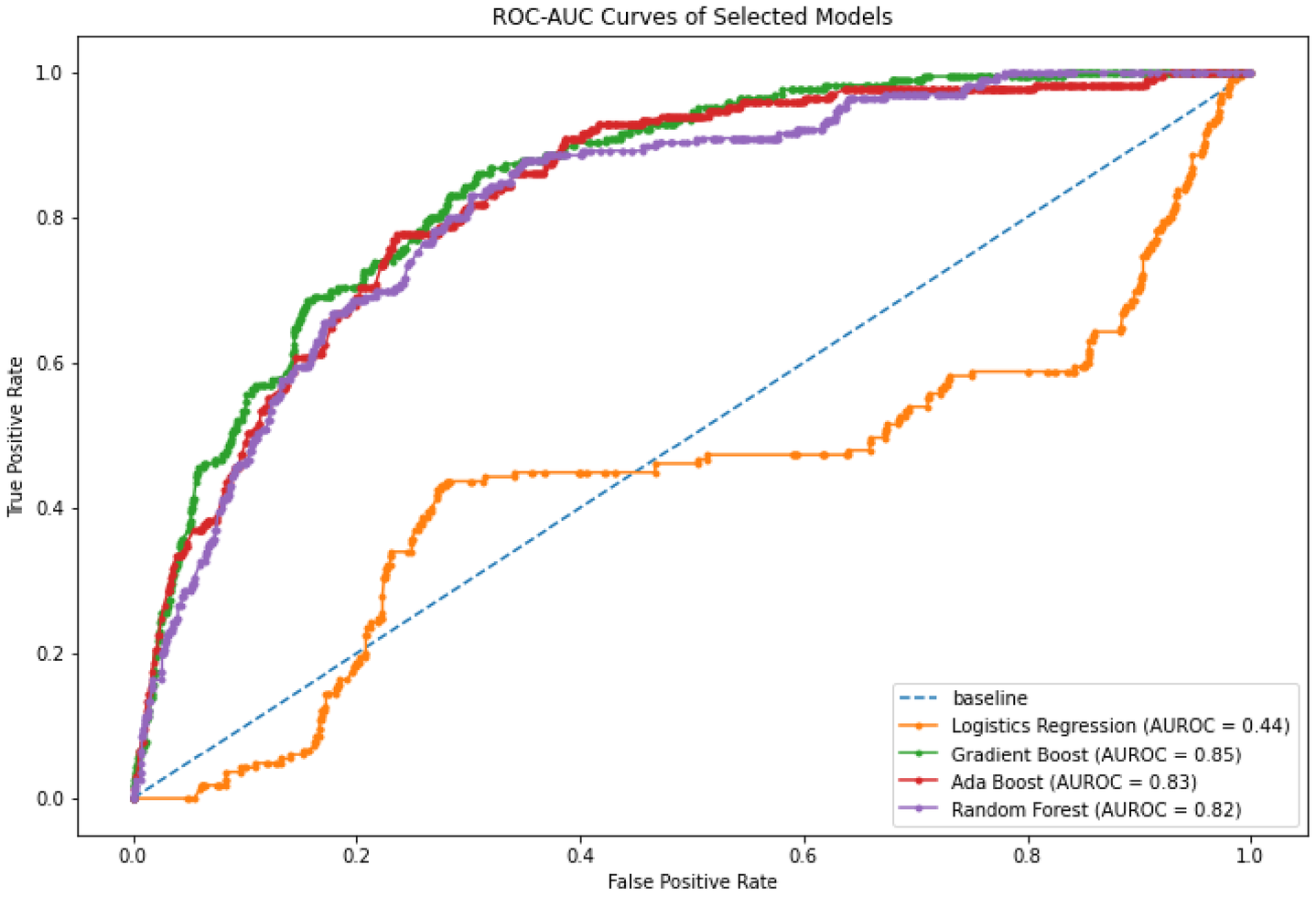








ROC–AUC Curve



RECOMMENDATIONS

Spray Locations

ORD Terminal 5, O'Hare International Airport
4100 North Oak Park Avenue,
1000 North Central Park Avenue
7000 North Moselle Avenue
3500 West 116th Street

Spray Frequency

We recommend spraying every 10-15 days in summer.

Cost Benefit Analysis

BENEFIT OF PREVENTING A CASE OF WEST NILE VIRUS IN HUMANS

$27,000 – $133,000

AVERAGE NUMBER OF CASES IN CHICAGO

100

LIMTATIONS

Bird Vectors

West Nile virus can spread through other vectors - this model does not take that into account.