Trees, Traffic, and Health: An Analysis of Aerial Particulate Matter on Four Streets in Washington DC

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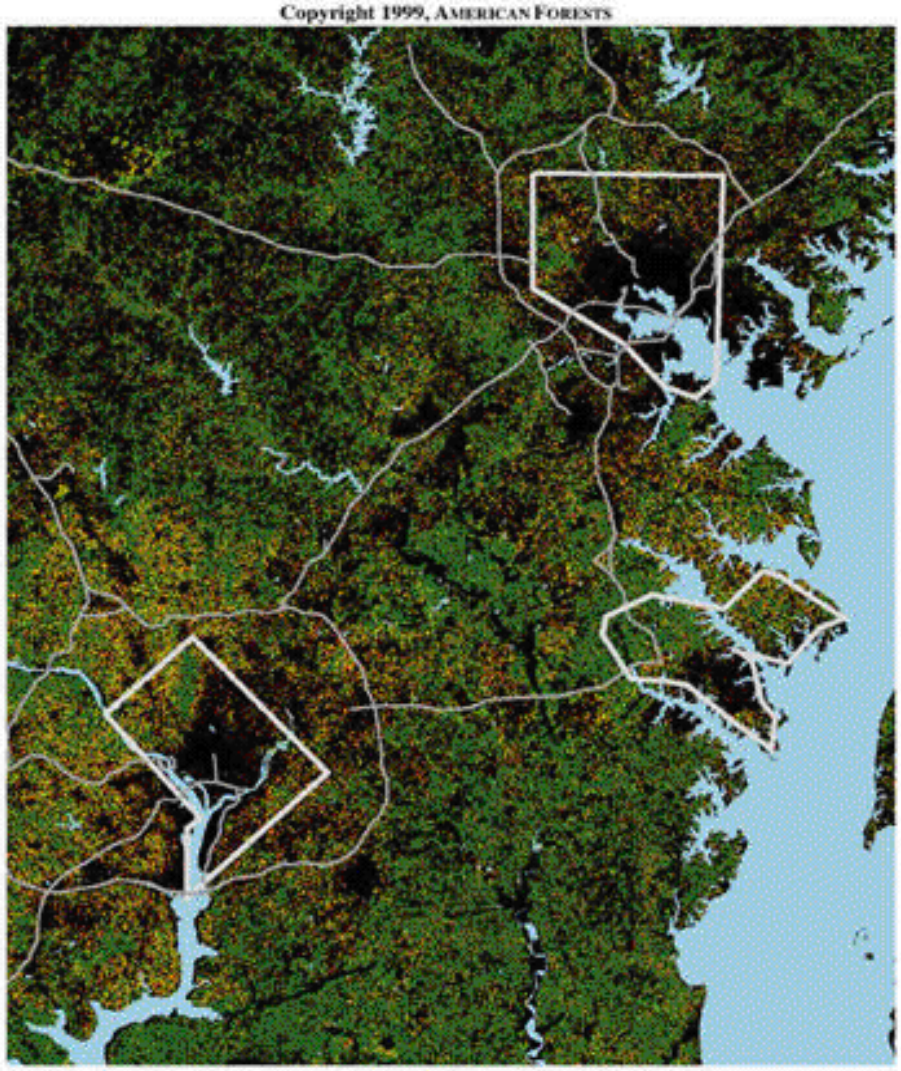
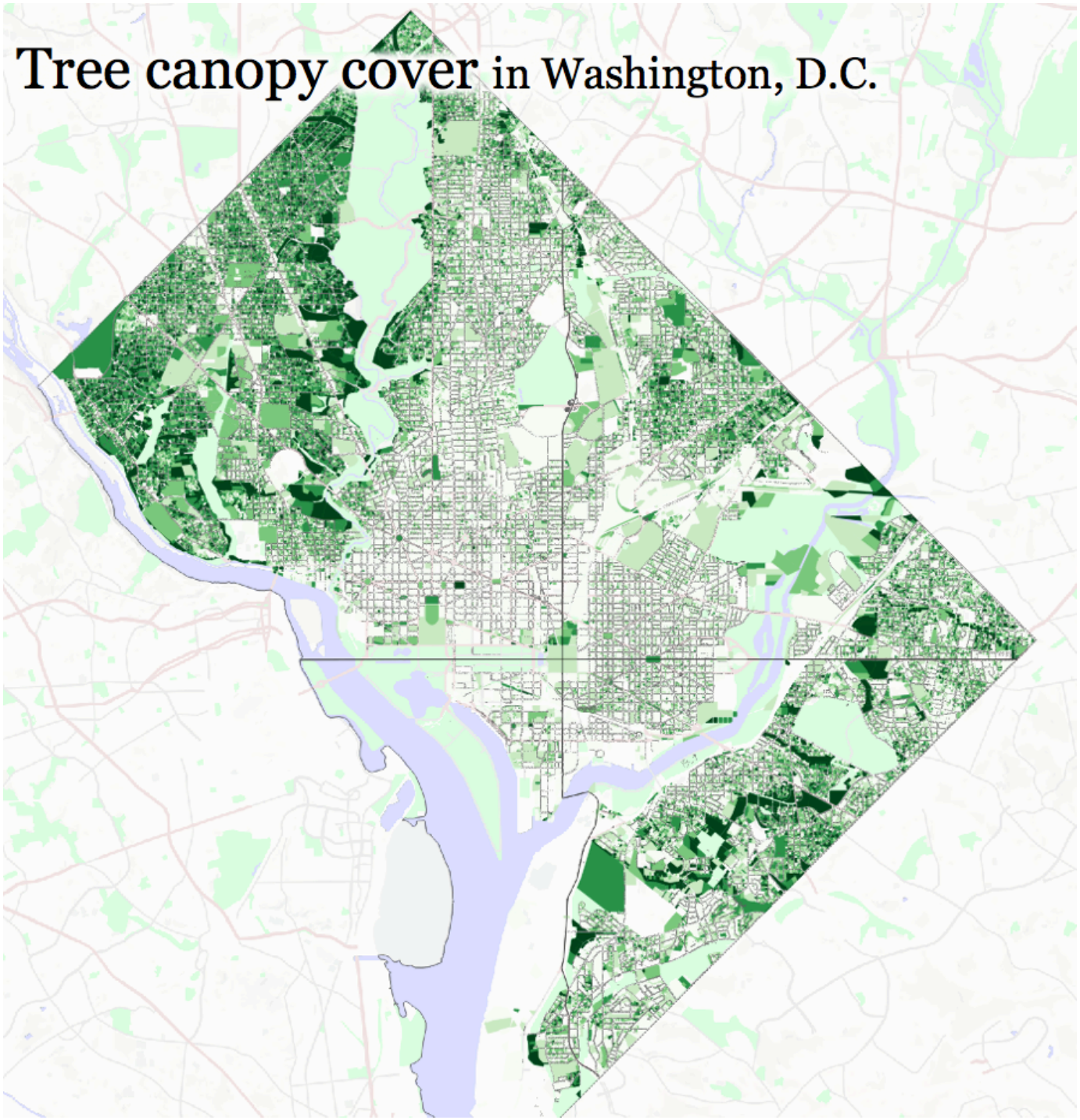
Tree coverage change in the Baltimore-Washington region

From 1973-1997, average tree cover declined from 51% to 37%.





https://www.nationaljournal.com/md/654198/tree-canopy-cover-washington-d-c

700 T Street NW

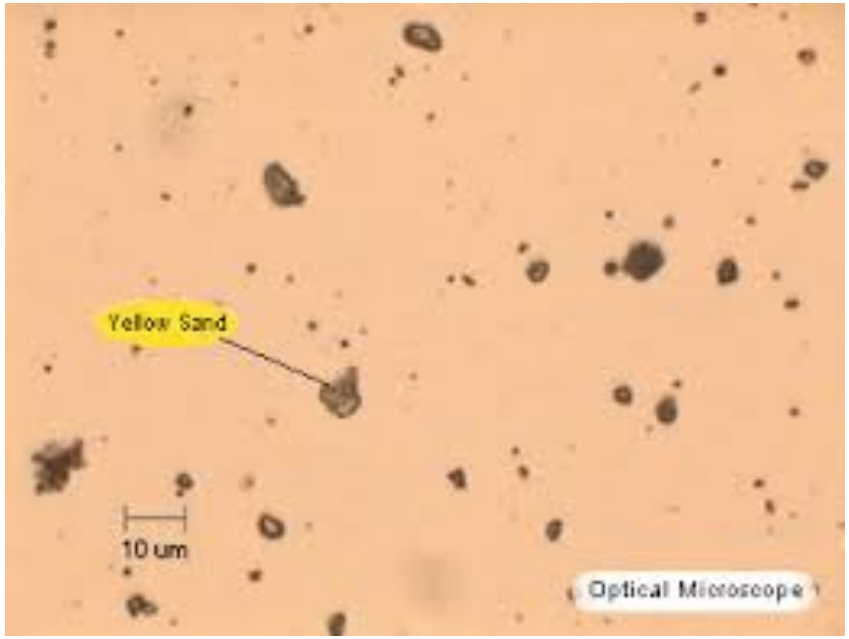
1500 T Street NW

Impacts of DC tree loss

- 19% increase in runoff
- 540 million cubic ft. water
- $1.08 billion in stormwater services ($2 per ft.)
- 34 million pounds pollutants
- **$88 million in air quality benefits**

Particulate Matter (PM)

Small particles suspended in air such as dust, pollen, soot, smoke, and liquid droplets.



Particulate Matter: Origins and Concern

- Common among miners (black lung) and increasingly, urbanites

- Potential health risks include acute and chronic respiratory irritation and asthma

- High PM concentrations in cities are recognized as disproportionately impacting minority communities

Particulate Matter and Urban Environments

PM in cities is influenced by two key factors:

- Vehicular traffic – stirs up dust and produces PM through incomplete combustion

- Tree cover – thought to mitigate PM by physically knocking it out of the sky or by lowing velocity allowing it to settle

Our Study

- This is not the first study to measure particulate matter in cities. That work has been done and the results are reasonably conclusive as to its presence and risk.

- This study looked to investigate in a more detailed way the relationship of PM to its sources (vehicular traffic)

- The relationship to tree cover has not been well investigated

- We also wanted to see if tree cover was related to socioeconomic status

Hypotheses

1. Increased traffic would mean more PM – and that this would also manifest itself in the distance a given location was from a major thoroughfare

2. Areas with increased tree cover would have less PM

3. Socioeconomics could be related to PM and tree cover.

Methods

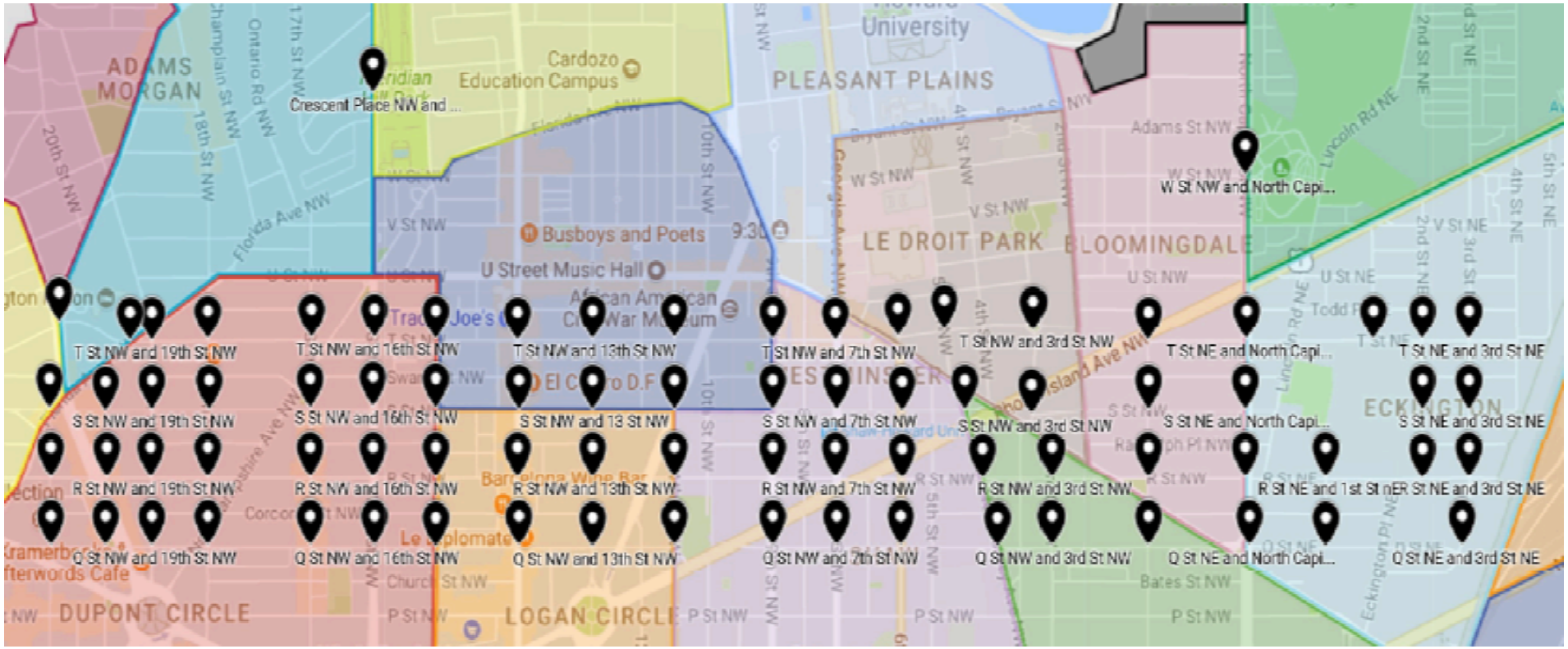
- Transects: Q, R, S, & T Streets
  - 300 NE to 2000 NW

- Data:
  - Particulate Matter
  - Tree Canopy Cover
  - Vehicular traffic
  - Demographics (Race / Housing value)

Methods

- Counted PM particles on sticky tape on stop signs
  - # per mm^2/wk of exposure
- Two months (mid-Sept – mid-Nov) along Q, R, S, & T St in 3^{rd} St NE – 20^{th} St NW Washington DC
- Estimated % tree canopy coverage using satellite images from Google Maps
- Traffic volumes were obtained from the DC Department of Transportation

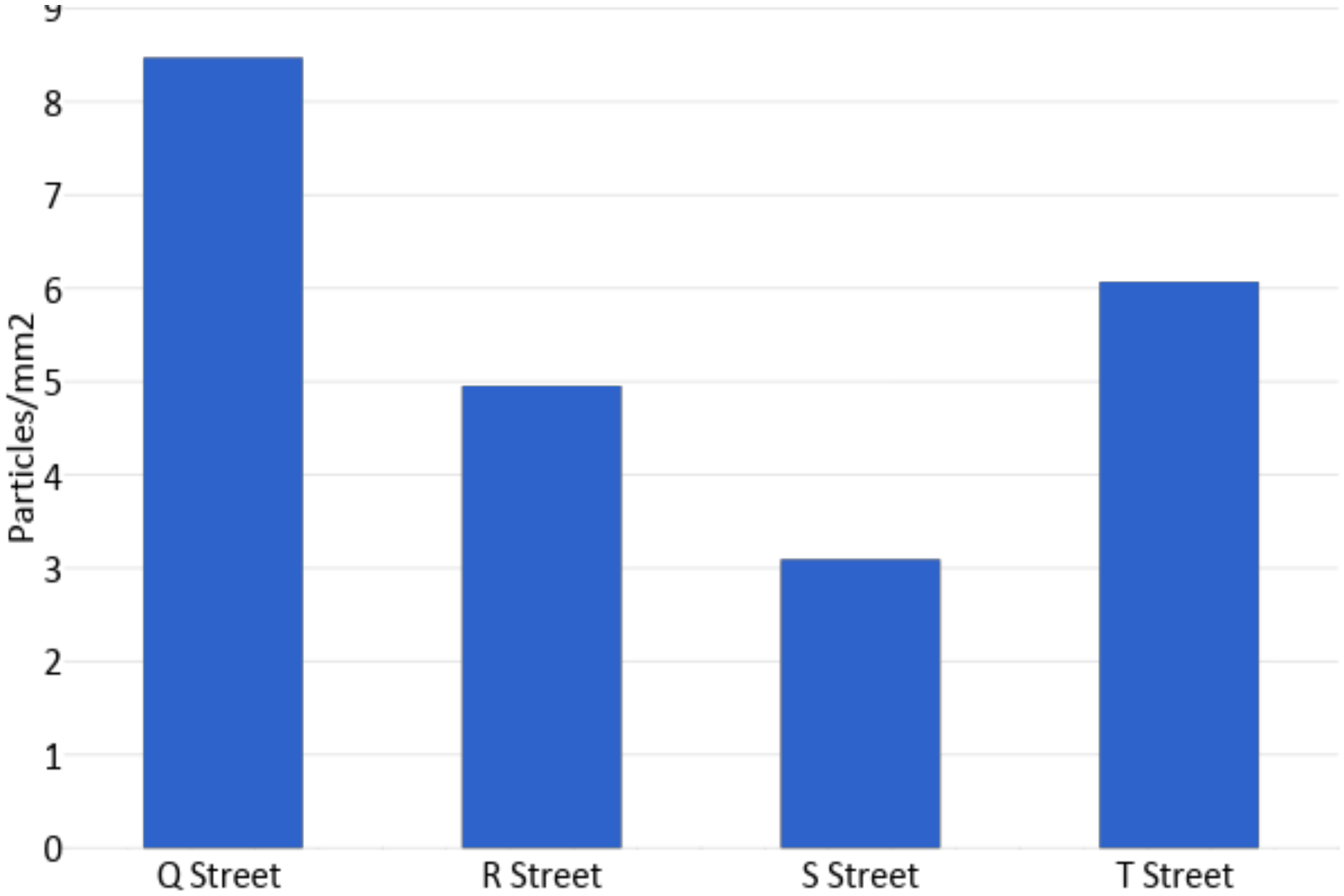
Particulate Matter Collection Sites



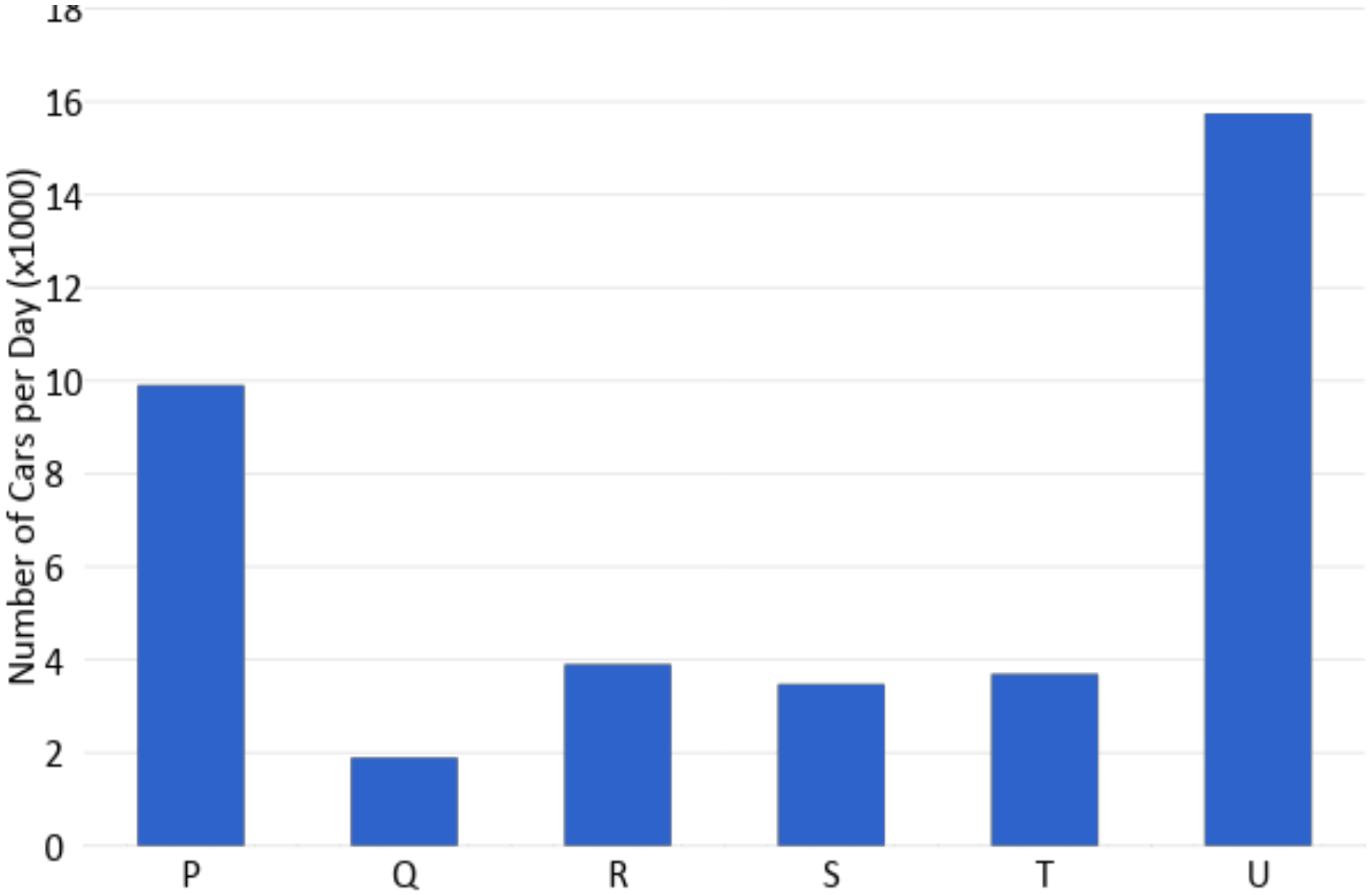
Dupont Circle————Shaw/Howard University

21st NW————————————————————3rd NE

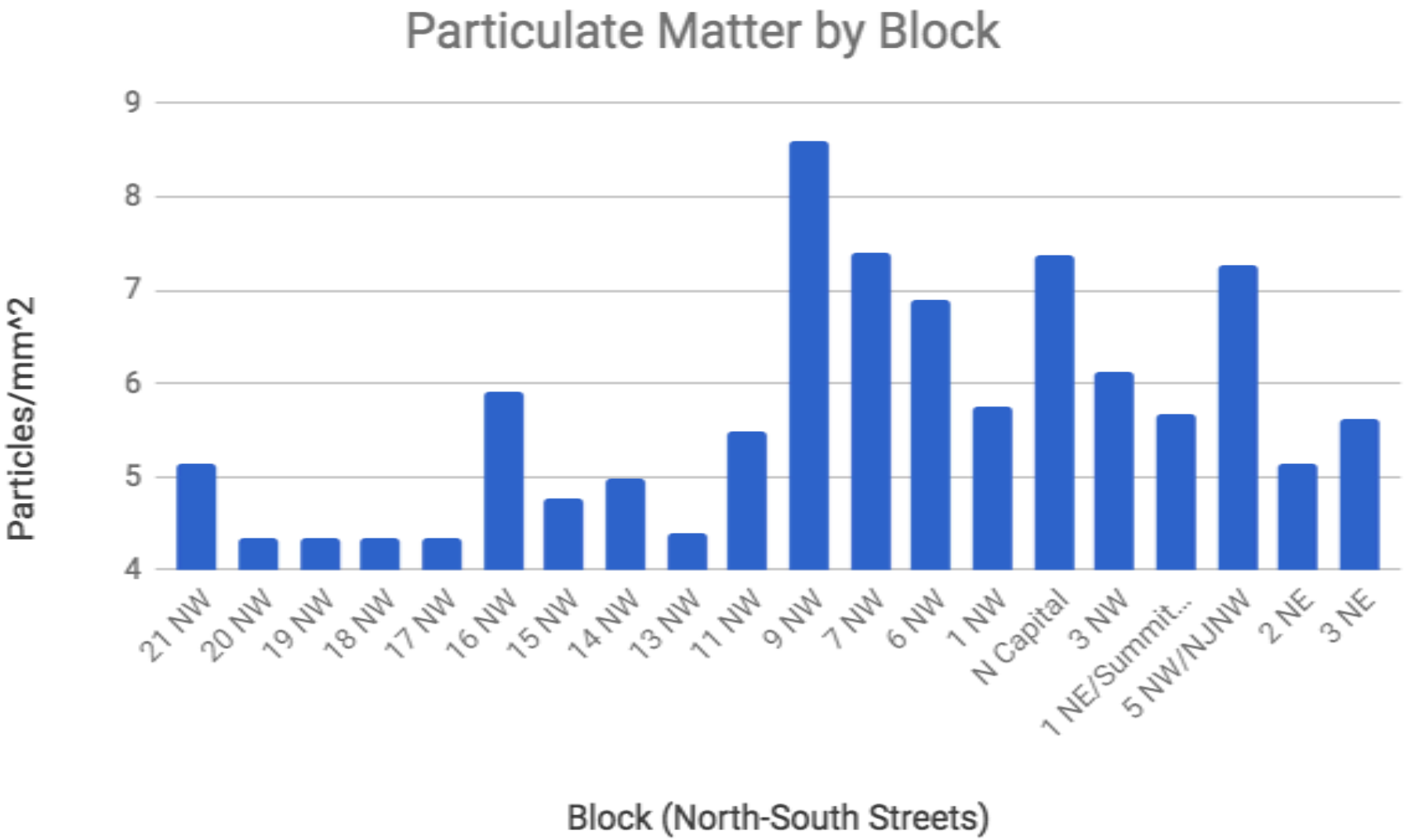
PM by Street (South-North)



Traffic by Street (South-North)



PM by Block (West-East)



Encounters along T Street NW - 2006

	20-12	11-4 NE
Black	8	41
White	29	19

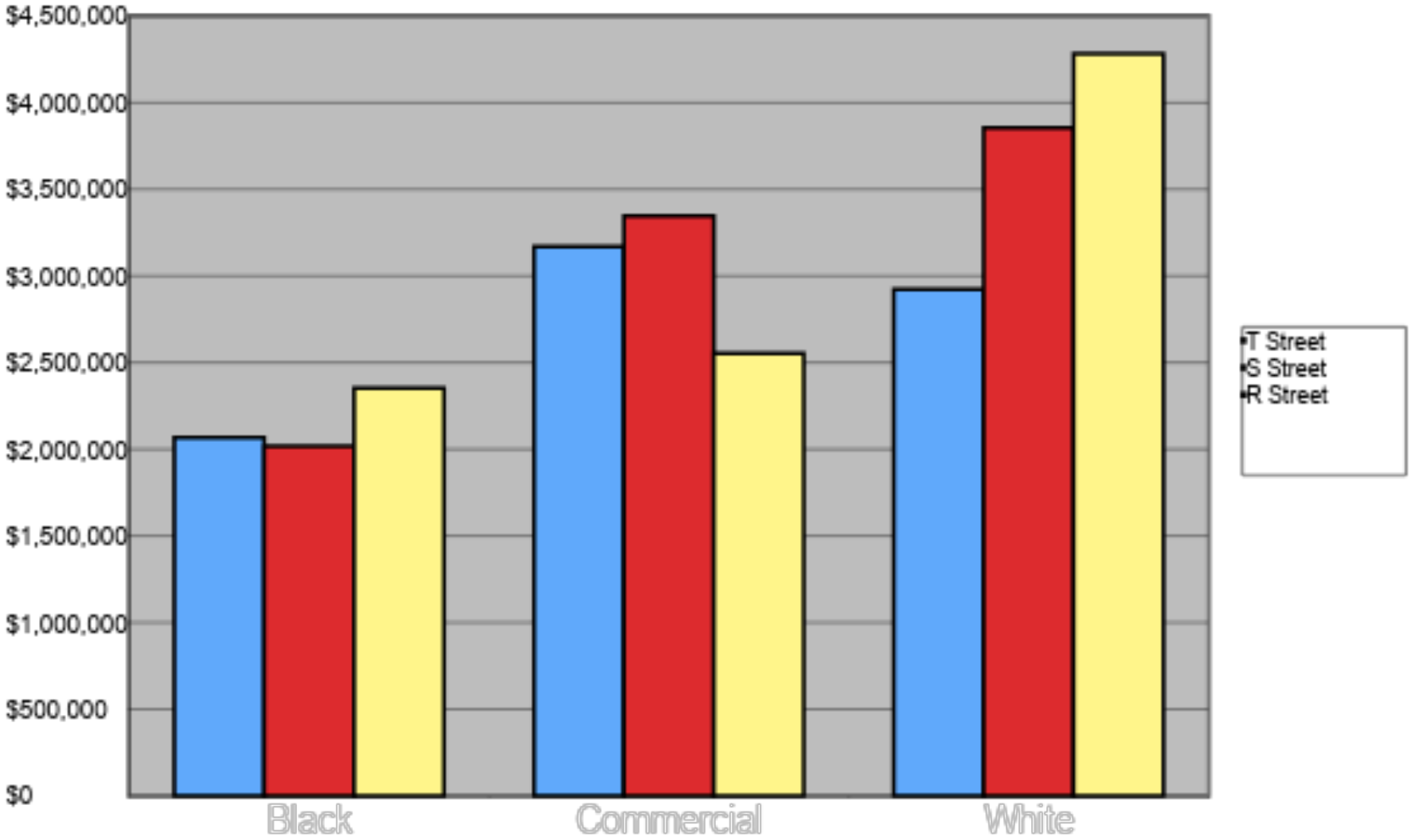
X^2: $p<0.0001$

19	30
18	30

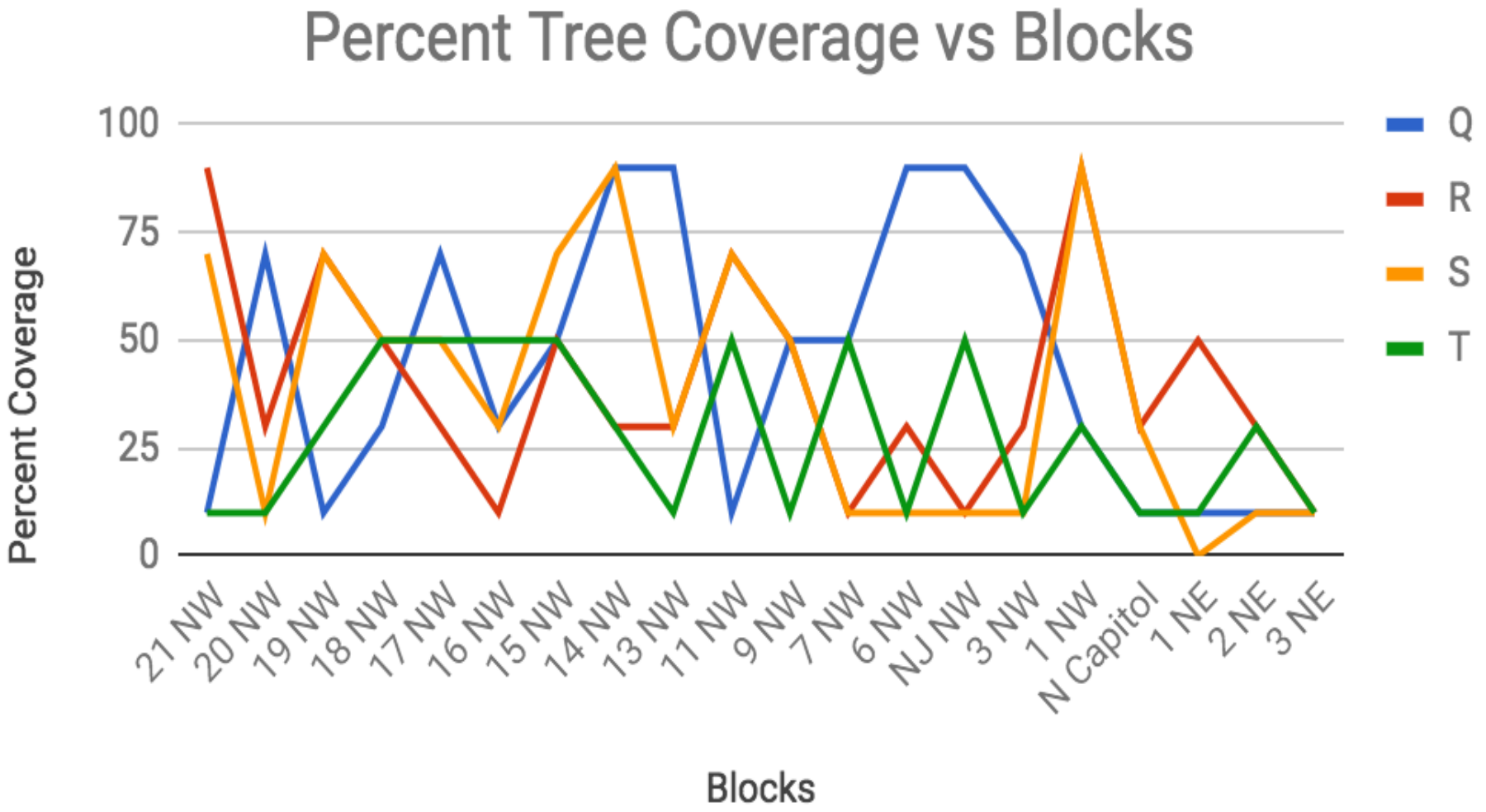
Residents

Random selection on T Street NW			
	Black	White	Other
Eastern third	36	11	5
Middle third	19	13	2
Western third	5	25	2

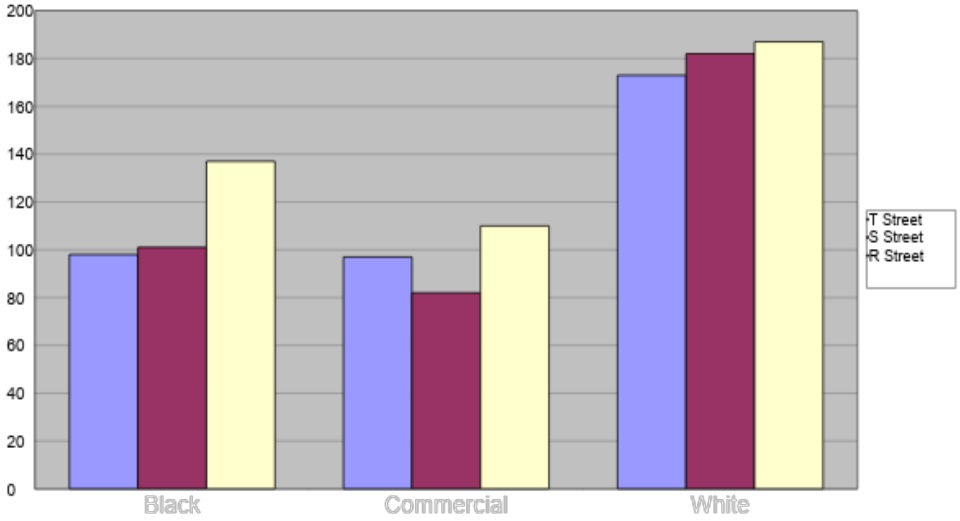
Mean Housing Value



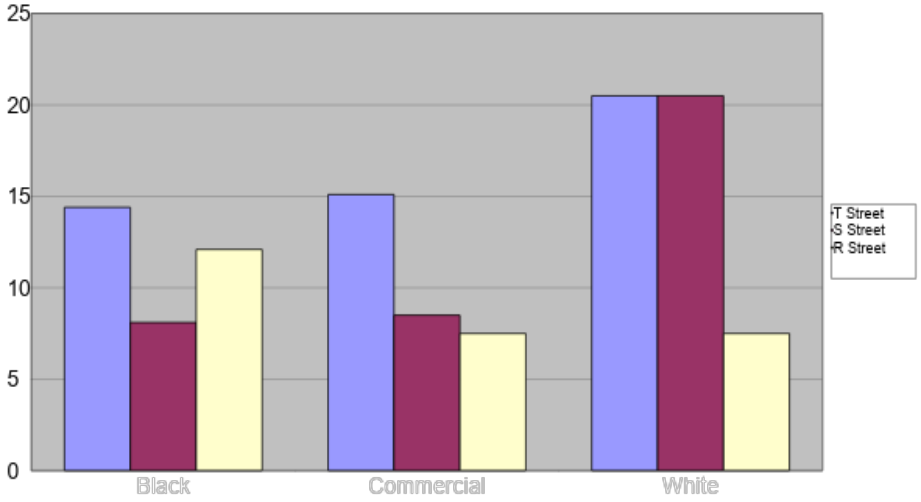
% Tree cover by Block



Number of Trees



Size of Trees



Results

- PM levels positively correlated with traffic flow on north-south streets.
  - Crosstown streets near major thoroughfares exhibited higher levels of particulate matter.
    - Q street contained highest levels of particulate matter coupled with the historically highest level of vehicular traffic.
- Tree numbers and coverage did not appear to be correlated to particulate matter levels. More investigation is needed.
- Updated data on demographics is also necessary

Discussion

- People in areas with more traffic and less trees are exposed to more dangerous levels of PM.
- Areas with higher PM on the east while the western areas of DC have more PM.
- Residents of these areas with more PM tend to be poorer minorities.

Acknowledgements

LSAMP Program

HBCU Climate Change Conference Organizers