THE EFFECTS OF US ON THEM:
A study on the impact of human presence on plants in urban parks.

CUNY MACAULAY HONORS COLLEGE AT CUNY

Sara Louie, Lisa Maldonado, Samantha Ong
City College of New York

Humans have the capability to create natural environments, bring in invasive species and creatures, and shape the movement and spread of natural materials through design. Central Park and the Nybg are two examples of parks artificially created in urban areas.

THE PARKS

THE NEW YORK BOTANICAL GARDENS
·USE: To salvage a plot of natural forest and to cultivate diverse bio-life.
·MAINTENANCE: Specialists who document the plant life and have a botany background
·Has an entrance fee

CENTRAL PARK
·USE: To provide a natural refuge contrasting the urban environment
·MAINTENANCE: Mainly through volunteers
·Has a significant amount of unguarded entrances
·No entrance fee

Comparison of New York Botanical Garden's and Central Park's Purpose and Design

THE HUMANS

WE'RE LOOKING AT:
· Air Pollution (CO2, O3, NO2, SO2)
· Water Pollution
· Human maintenance (introduction of species, removal of species, usage of pesticides, watering)

We examined the relationship between plant diversity (native vs. non-native) and their abundances with human pollution and maintenance. The two urban parks, Central Park and the New York Botanical Gardens both contrast in their design and purpose, allowing us to closely look at human factors that may not be apparent by just looking at an individual park. By looking at both the collected data and case studies, we were better able to carefully pick apart the role of human interaction in these urban areas. Through looking at the intention and design of each park, its maintenance, and other factors that affect plant diversity, we hope to discover the effect that human presence has on the plants of two major New York City parks.

METHOD:
For a 24-hour period, approximately 500 students led by field guides observed and recorded plant life in Central Park (Sep 2013) and the New York Botanical Garden (Sep 2014). Using the data collected, we compared it to the available data on demographics and pollution from government agencies and organizations.
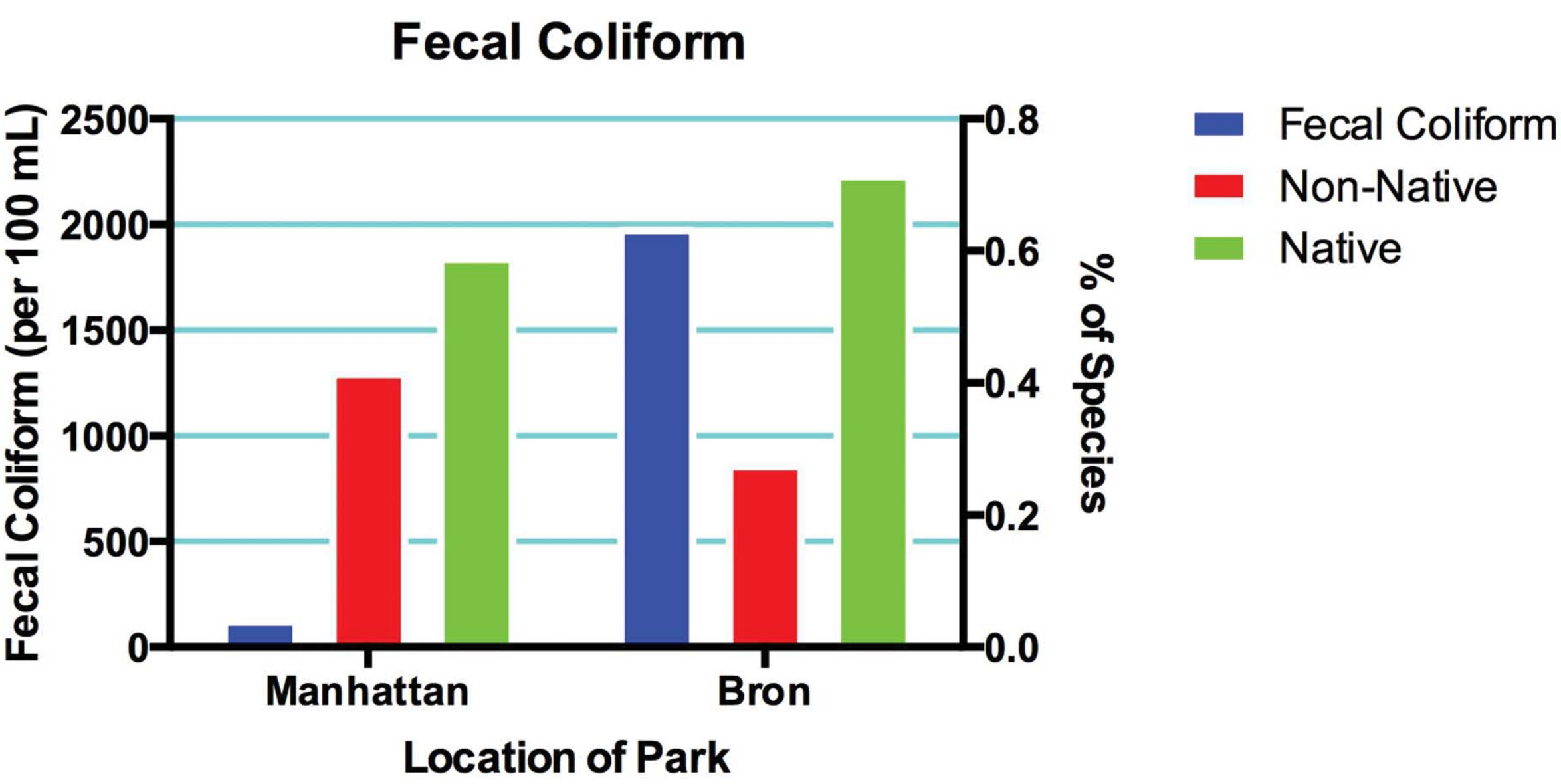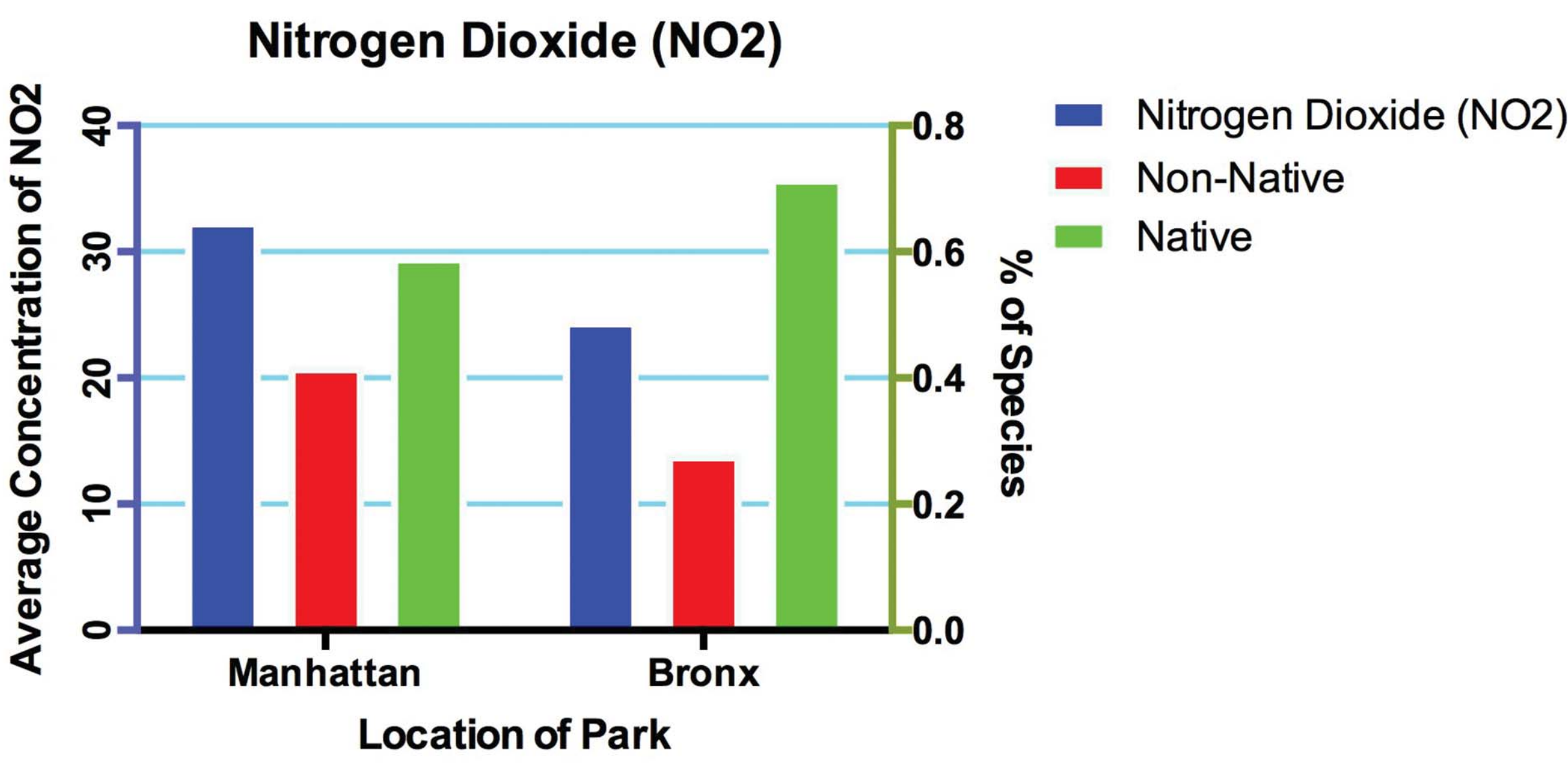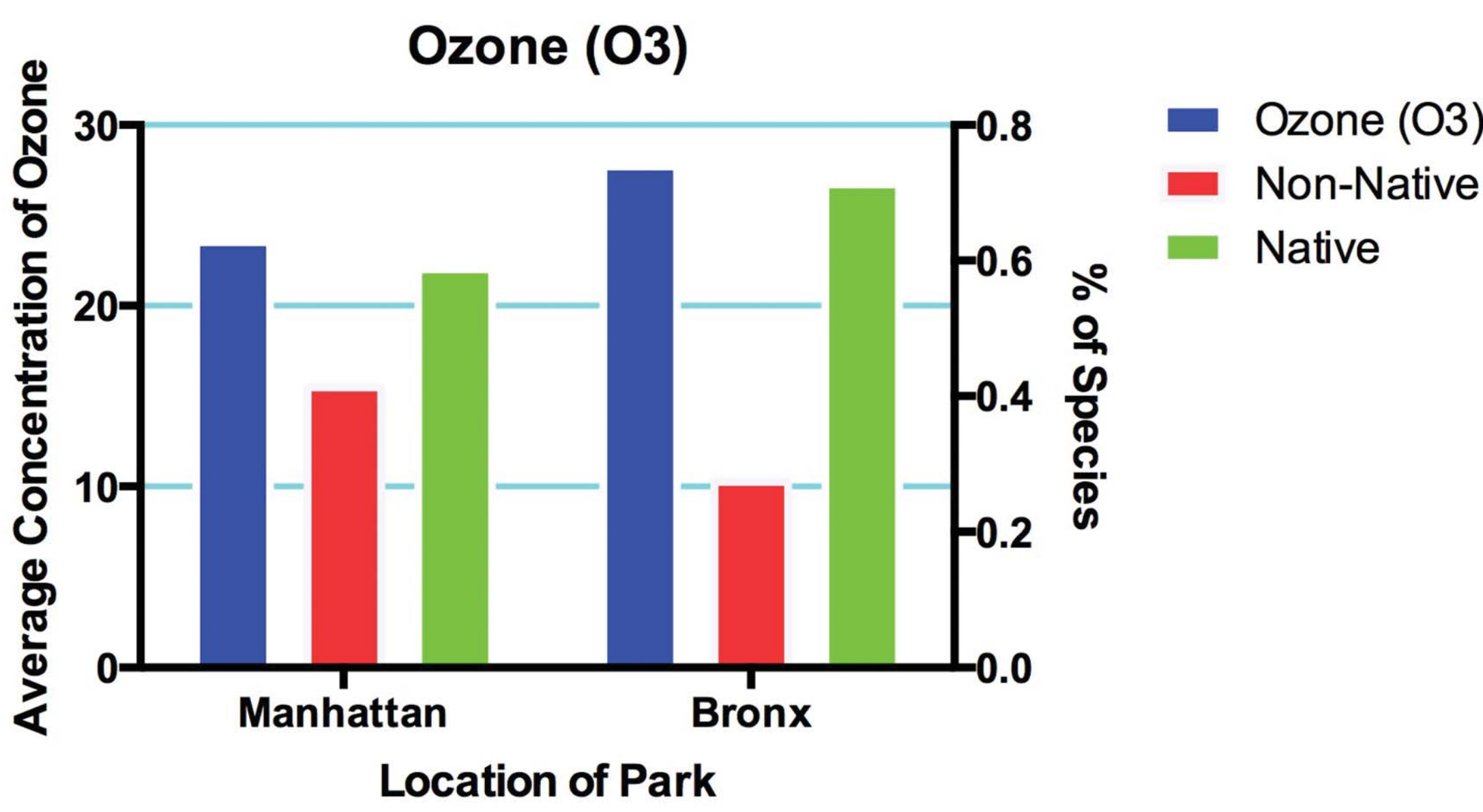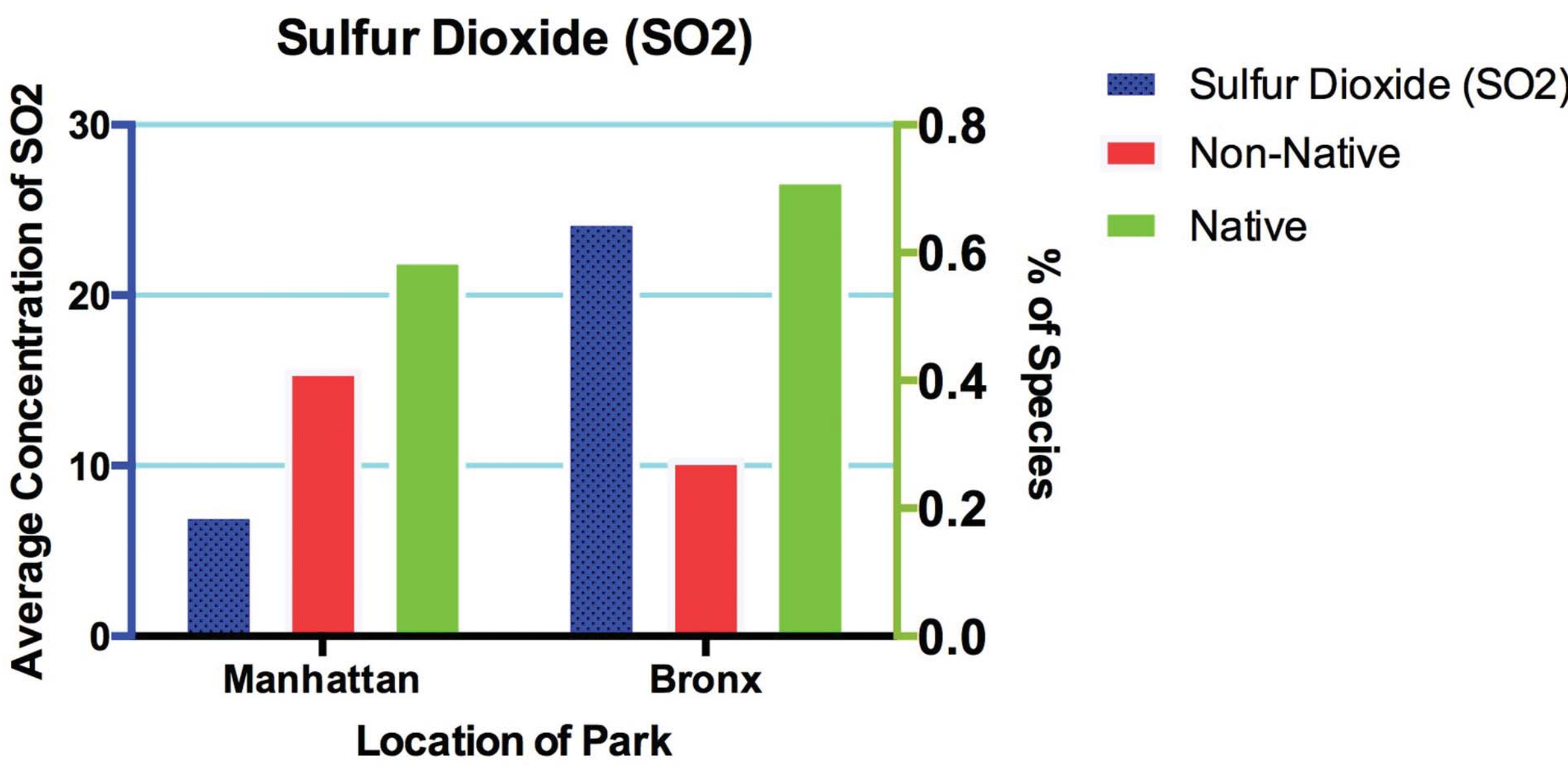
From this collected data, we researched the nativity of each species and the background design of sections of central park to understand human maintenance.

REFERENCES:
·Botanical Garden Air Pollution http://www.dec.ny.gov/airmon/stationStatus.php?stationNo=5
·CCNY http://www.dec.ny.gov/airmon/stationStatus.php?stationNo=73
·NY Health and Hygene: http://a816-dohbesp.nyc.gov/IndicatorPublic/PublicTracking.aspx
·New York City Department of Environmental Protection. Harbor Survey 2014. Collected Sampling Data, New York City: New York City Department of Environmental Protection, 2014.
·New York City Department of Health and Mental Hygiene. The New York City Community Air Survey. Assessment and Analysis, New York City: New York City Department of Health and Mental Hygiene, 2012.
Maher, Brendan A. "The future of biodiversity: old and new converge at the New York Botanical Garden. (News)." The Scientist 27 May 2002: 28. Academic OneFile. Web. 21 Oct. 2014.

HUMAN POLLUTION VS. NATIVITY BY PARK BOROUGH

Sulfur Dioxide (SO2) — Average Concentration of SO2 / % of Species — Location of Park: Manhattan, Bronx — Legend: Sulfur Dioxide (SO2), Non-Native, Native

Ozone (O3) — Average Concentration of Ozone / % of Species — Location of Park: Manhattan, Bronx — Legend: Ozone (O3), Non-Native, Native

Nitrogen Dioxide (NO2) — Average Concentration of NO2 / % of Species — Location of Park: Manhattan, Bronx — Legend: Nitrogen Dioxide (NO2), Non-Native, Native

Fecal Coliform — Fecal Coliform (per 100 mL) / % of Species — Location of Park: Manhattan, Bron — Legend: Fecal Coliform, Non-Native, Native

*Nativity data for New York Botanical Gardens from Macaulay Bioblitz 2014
*Nativity data for Central Park from Macaulay Bioblitz 2013

CENTRAL PARK
·Overall, Central Park has a higher percentage of non-native species, that fluctuates between 35 and 75 percent according to the sampling collected at the 2013 Macaulay Bioblitz. This may be explained by the park's open entrances and artificial creation, meaning humans are the ones who chose what plants would be included and where.
·Central Park Conservancy overlooks the maintenance of the park. The park itself has three woodlands dedicated to keeping wildlife.
·Compared to the NYBG, Central Park was built for human enjoyment of recreational activities, and not solely on the preservation and care of natural spaces. For instance, there are baseball fields, meadows and a zoo that houses animals not native to the area.
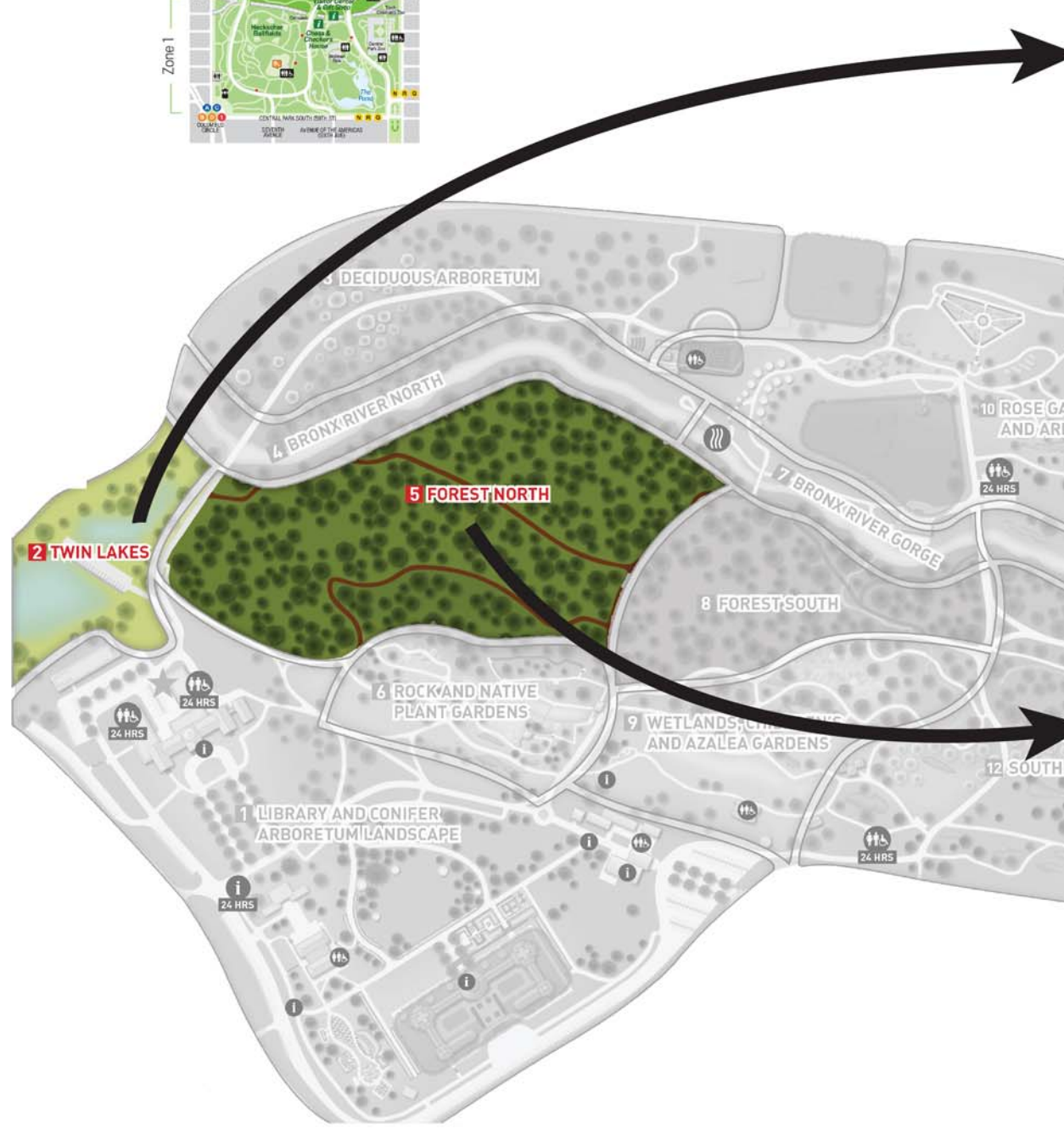
TWIN LAKES
·ABOUT: Two natural ponds located just off a paved road leading from educational buildings at the NYGB.
·FACTORS: Human presence (car pollution, building heat/exhaust, high congestion), Animal presence (birds, aquatic animals), human maintenance (minor)
·ANALYSIS: Comparatively, there is a larger percentage of non-native species (41.7%).
·25 Species, 10 Non-Native

FOREST NORTH
·ABOUT:Here, 50 acres of forest were able to grow without human interuption. The Thain Forest Center was established to help maintain the last native forest area in the North East region.
·FACTORS: Human maintenance (upkeep and protection), River on the North side, Human presence (paths and tours daily)
·ANALYSIS: Comparatively, this section has the lowest (20.0%) of non-native species.
·58 Species, 8 Non-Native

RESULTS:
• Based on the trends of the bar graphs there does not seem to be a connection between plant biodiversity and pollution data we used. The data on the bar graphs did not seem to have any effect on neither native or non-native plant biodiversity.

• Based on a Chi-Square 2x2 Contingency Test our null hypothesis (there was no relationship between these pollutants and plant biodiversity) was rejected for each pollutant and each nativity. The following is the list of p-values resulting from the Chi-Square Test: NO2 and Native, $p < .05$, NO2 and Non-Native, $p <.001$, SO2 and Native, $p < .001$, SO2 and Non-Native, $p < .001$, Ozone and Native, $p <.001$, Ozone and Non-Native, $p < .001$, Fecal Coliform and Native, $p < .001$, Fecal and Non-Native, $p < .001$. Thus, the null hypothesis was rejected in favor for the alternate hypothesis that there is a connection between these pollutants and plant biodiversity.

CONCLUSION:
• Our study is by no means a complete understanding of human effects on plant diversity, but it does point out several important factors. While the urban pollution data we acquired did not show significant correlation with plant diversity, human maintenance of the park has shown to be the key factor in the plant diversity and abundance in a given area.

• Further research is necessary in surveying all species in both parks, especially Central Park where the plant diversity is monitored and maintained less. Additionally, we did not touch much upon human activity drawing in other mammals and insects into the area that could further affect plant diversity in less maintained areas of the parks.