

Finding Lichens: Temperature & Population

Mariya Kooran, Fernando Velázquez, Donna Wattimena



The City College
of New York

MACAULAY
HONORS COLLEGE



Abstract

Our research examined whether there is any correlation between lichen population density in selected five major areas of nature in NYC and temperature. We collected population data from Prospect Park, Randall's Island, Greenwood Cemetery & the Gowanus Canal, Inwood Hill Park, and Alley Pond Park. After calculating population density, we created a scatterplot with the average temperature in New York City for the months leading up to when the lichen population data were gathered. The study reveals a strong, positive relationship between the lichen population density and the temperature for those five parks. However, our data collection method can be improved. Our sample size for the number of landmarks used is too low, so more sites should be included. Additionally, certain areas of each park could have been missed, and organisms could have been misidentified due to student efforts. We recommend future studies to implement these changes and collect data with a team of experts to ensure accurate results that can be generalized beyond the five landmarks we chose.



Background Information

Lichens are a composite organism composed of fungi and algae. These two share a symbiotic relationship in which the fungus receives nutrients from the algae, and the algae receives a form of shelter under the fungus. They are commonly mistaken for moss and fungi, but they are not the same. Given its unique nature, we wanted to do research on this creature and see if there is any trend with an increase in temperature.

Hypothesis

Given how higher temperatures generally negatively affect organisms, we hypothesize that an increase in temperature correlates to a decrease in the lichen population density in the five NYC areas: Prospect Park, Randall's Island, Greenwood Cemetery and the Gowanus Canal, Inwood Hill Park, and Alley Pond Park.

Methodology

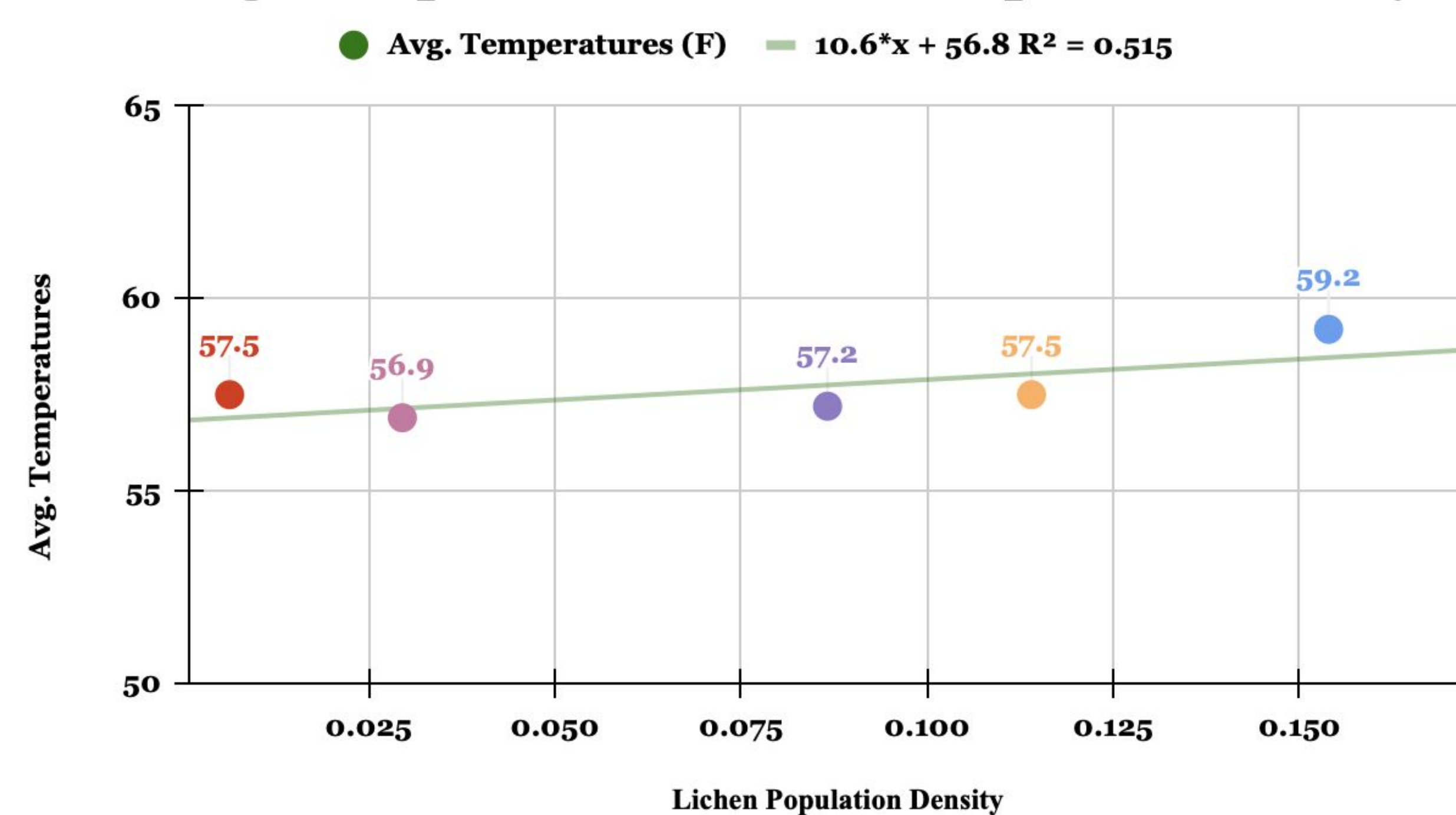
This research project uses a correlational research method to investigate the relationship between the Lichen population in NYC parks and the weather temperatures. We will:

1. Observe and analyze the BioBlitz data sets from the iNaturalist domain that show the lichen populations in NYC parks from 2017 to 2023, excluding 2020 and 2021. The NYC parks are Prospect Park, Randall's Island Park, Greenwood Cemetery, the Gowanus Canal, Inwood Park, and Alley Pond Park.
2. Found the acreage for each park from "database"
3. Calculated the lichen population density for each park by dividing the number of observances by park size.
4. Research and record the average temperatures in NYC leading up to lichen population recording from 2017-2023 (excluding 2020 and 2021 due to COVID-19) from the iNaturalist BioBlitz database.
5. Plot data points of lichen population density and average temperature on a scatter plot
6. Find the line of best fit and calculate correlation coefficient (r)

Results

NYC PARKS	Prospect Park 2023	Randall Island 2022	Green-wood Cemetery & the Gowanus Canal 2019	Inwood Park 2018	Alley Pond Park 2017
Total Lichen Pop.	81 Lichens	29 Lichens	14 Lichens	17 Lichens	4 Lichens
Total Acres	526.25 acres	254.30 acres	475 acres	196.4 acres	635 acres
Lichen per Acre	0.1539	0.114	0.0295	0.0866	0.0063

Average Temperatures vs. Lichen Population Density



R = 0.718

57.5 °F → 2017 (Alley Pond Park)
57.2 °F → 2018 (Inwood Park)
56.9 °F → 2019 (Greenwood Cemetery & the Gowanus Canal)
57.5 °F → 2022 (Randall's Island)
59.2 °F → 2023 (Prospect Park)

Conclusion

Our findings show that our hypothesis was incorrect. Our research found a relatively strong positive correlation between the lichen population density and the average temperatures, with an R-value of 0.718. The average temperatures from 2017 to 2023 have steadily increased alongside the Lichen population, which was unforeseen.

Limitations

A limitation of our research is that the databases used cannot accurately count the lichen population in the areas focused on, as the data collectors may have missed a lichen or misclassified a lichen as a fungus, as they are commonly mistaken for another. The data collectors are also Macaulay students and not experts in lichens.

Another limitation of our research is that we only used five years of data and observed only five park-like areas in NYC, which cannot demonstrate and verify a correlation between temperature changes and the lichen population growth.

Contributions of the Project/Future Research

While our research cannot be used to draw an accurate conclusion about the lichen population in NYC and temperature changes, it is a start in future discussions. Future researchers may use our project to investigate the correlation further through a deeper analysis of the lichen population density. Since the issue of climate change is multi-layered, other factors such as pm2.5 levels should be compared to Lichen populations.

References

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