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i-Tree Academy, Spring 2021

Final Project Report

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Summary: For this project, I used i-Tree Canopy to determine land cover and related ecosystem service yield for the five boroughs that comprise New York City. This analysis was based on the collection of data from 250 points randomly selected by i-Tree Canopy. Data accuracy would likely be improved by the collection of land cover data from a greater number of points within the study area.

Results: Approximately 12% of NYC's land cover is classified as grass/herbaceous, 38% as impervious cover, 19% as canopy cover, and 37% as water. Canopy cover across the five boroughs removes approximately 2150 ± 283.29 tons of air pollution annually, which is valued at approximately $\$740,000 \pm 97,262$. Urban trees in the five boroughs contribute to approximately 30 ± 34 kgal on avoided runoff annually, which is valued at 260 USD. Figures and tables that outline the findings are included below.

Applicability: These findings indicate the ecological benefits that are provided by canopy cover across NYC. Of the benefits accounted, air pollution removal is the most economically substantial, with much of that attributed to the removal of $PM_{2.5}$, which is linked to respiratory illness. While the values of stormwater mitigation benefits are (unexpectedly) low, it is of value to note that trees do contribute to avoided runoff in myriad ways (e.g., interception, infiltration, evapotranspiration), and the service is collectively of value. These findings affirm that management and expansion of canopy cover across the five boroughs remains of high ecological and economic benefit to the city and its residents.

Figure 1. Study area

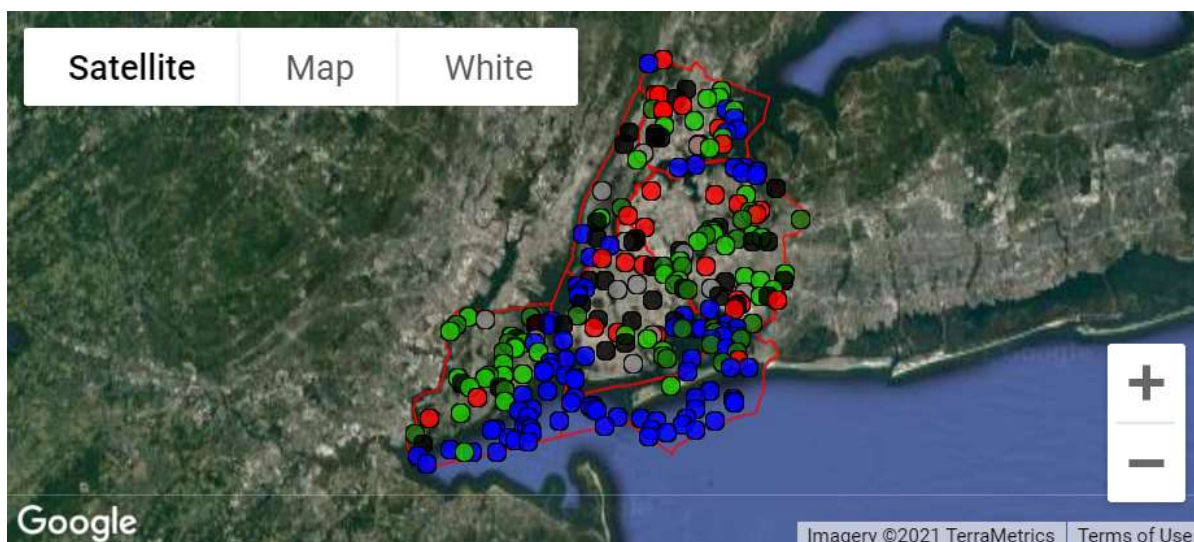


Figure 2.

Distribution of land cover across the 5 boroughs.

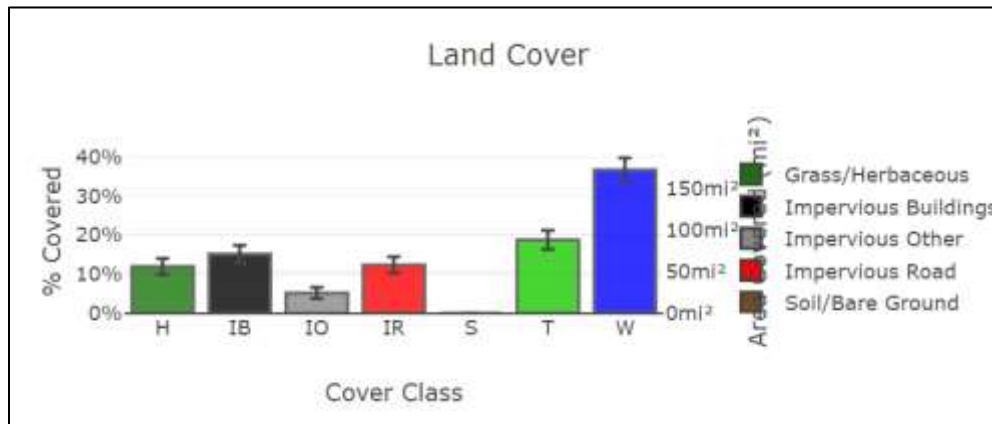


Table 1: Land cover across NYC's five boroughs.

Abbr.	Cover Class	Points	% Cover ± SE	Area (mi ²) ± SE
H	Grass/Herbaceous	30	11.95 ± 2.05	56.05 ± 9.60
IB	Impervious Buildings	38	15.14 ± 2.26	70.99 ± 10.61
IO	Impervious Other	13	5.18 ± 1.40	24.29 ± 6.56
IR	Impervious Road	31	12.35 ± 2.08	57.92 ± 9.74
S	Soil/Bare Ground	0	0.00 ± 0.00	0.00 ± 0.00
T	Tree/Shrub	47	18.73 ± 2.46	87.81 ± 11.55
W	Water	92	36.65 ± 3.04	171.88 ± 14.26

Table 2. Air pollution removal by trees in NYC’s five boroughs

Tree Benefit Estimates: Air Pollution (English units)					
Abbr.	Description	Amount (T)	±SE	Value (USD)	±SE
CO	Carbon Monoxide removed annually	25.34	±3.33	\$2,156	±283
NO2	Nitrogen Dioxide removed annually	138.15	±18.17	\$3,711	±488
O3	Ozone removed annually	1,375.95	±180.94	\$193,273	±25,416
SO2	Sulfur Dioxide removed annually	87.06	±11.45	\$649	±85
PM2.5	Particulate Matter less than 2.5 microns removed annually	66.86	±8.79	\$399,532	±52,539
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	460.89	±60.61	\$140,312	±18,451
Total		2,154.25	±283.29	\$739,632	±97,262

Table 3. Hydrologic impacts of urban tree cover across NYC’s five boroughs.

Tree Benefit Estimates: Hydrological (English units)					
Abbr.	Benefit	Amount (Kgal)	±SE	Value (USD)	±SE
AVRO	Avoided Runoff	29.06	±3.82	\$260	±34
E	Evaporation	2,399.28	±315.51	N/A	N/A
I	Interception	2,412.71	±317.27	N/A	N/A
T	Transpiration	3,246.60	±426.93	N/A	N/A
PE	Potential Evaporation	18,180.41	±2,390.74	N/A	N/A
PET	Potential Evapotranspiration	14,833.69	±1,950.65	N/A	N/A