Mitigating New York City's Heat Island with Urban Forestry, Living Roofs, and Light Surfaces
New York City Regional Heat Island Initiative

Principal Investigators:

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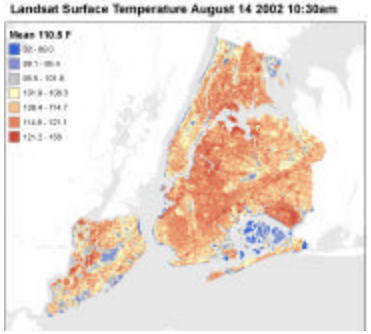
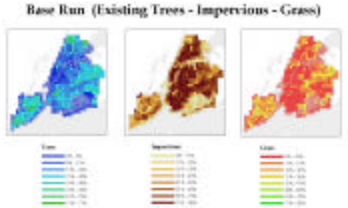
Heat island mitigation strategies, such as urban forestry, living/green roofs, and light surfaces, could be implemented at the community level within New York City, but their effects need to be tested with comparable methodologies. This study uses a mesoscale climate model (MM5) in combination with observed meteorological, satellite, and GIS data, to determine the impact of each of the mitigation strategies on surface and near-surface air temperature in the New York Metropolitan Region over space and time. The effects of localized changes in land surface cover in six case study areas are evaluated in the context of regional atmospheric mixing.

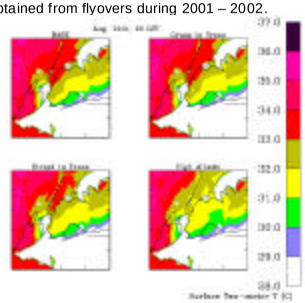
City-Wide Analysis



Remotely sensed thermal satellite data. Landsat ETM, August 14, 2002 at 10:30 AM, Band 6, resolution is 60 meters



Base percentages of trees, impervious surfaces, and grass within each 1.3 km MM5 grid box. Percentages were derived from a land cover classification performed by Myeong et al. (2003) on EMERGE aerial photography obtained from flyovers during 2001 – 2002.



MM5 base run and 100% open space planting (grass to trees), 100% curbside planting (street to trees), and 100% light surfaces (high albedo)

Key Findings

- Vegetation cools surfaces more effectively than increases in albedo (light-colored surfaces)
- Of the mitigation strategies tested, street trees have the largest cooling potential per unit area
- Planting street trees has greater cooling potential than open space planting
- Light surfaces (roofs + streets + sidewalks) offer the greatest potential city-wide air temperature cooling – 1.3°F (0.7°C) on average – because there is more available area in which to implement this strategy
- Living roofs have greater cooling potential than light roofs

Case Study Results

- Heat island mitigation potential is higher in Mid-Manhattan West and Lower Manhattan East.
- Heat island mitigation potential is moderate in Fordham and Maspeth
- Planting street trees in all available area in Mid-Manhattan could reduce air temperatures in this case study area by 1.1°F (0.6°C), averaged over all times.

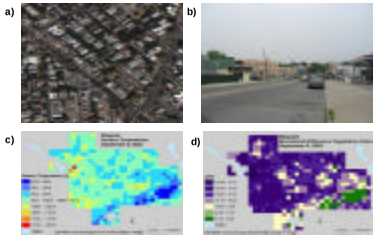
Base percentages for each land surface type and potential for mitigation

Case Study Area	Grass (%)	Trees (%)	Impervious (%)	Street Level Impervious (%)	Impervious Roofs (%)	Est. Avail. for Street Trees (%)
New York City	14.1	21.9	64.1	45.9	18.1	17.0
Mid-Manhattan West	2.6	3.1	94.3	49.3	45.0	26.1
Lower Manhattan East	8.3	8.1	83.6	48.2	35.4	29.4
Fordham Bronx	9.2	22.1	68.7	47.1	21.5	21.1
Maspeth Queens	17.5	22.3	60.2	38.2	22.0	17.9
Crown Heights	8.1	17.2	74.7	45.6	29.1	24.9

Case Study Analysis

Selection Criteria: [1] location within a load pocket, as defined by Con Edison, [2] hot spot, [3] available area for testing a range of heat island mitigation strategies

Case study areas and weather stations. Grid boxes correspond to the MM5 model 1.3 km grid.



Maspeth Queens case study area. a) aerial view, b) street view, c) gridded surface temperature on September 8, 2002 with resolution of 250 meters, d) gridded NDVI with resolution of 250 meters.

Street tree inventory from New York City Department of Parks in Maspeth Queens case study area.