The Urban Heat Island Effect in Providence

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Goals:

- UHIE calculations in Providence
- Recommendations to Providence
- Article with ecoRI to reach larger audience

Trees

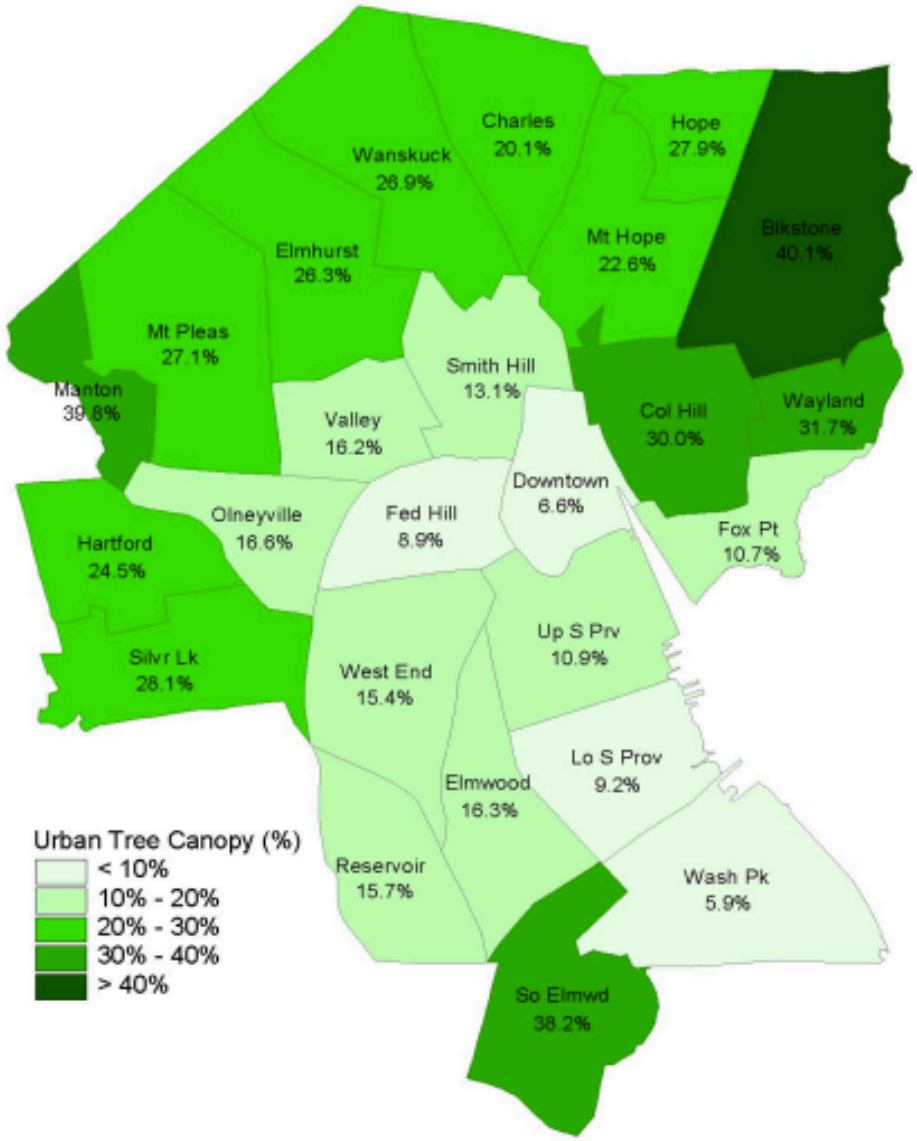


Figure 1: Urban tree cover in Providence, by neighborhood

- Summers in Providence 6-14°F warmer by 2100[1]
- Current: plant 13,200 trees by 2020 (1,100/year)[1]
- Trees 2020: plant 40,000 trees by 2020 (3,333/year)[2]

Summer air temperatures reduced 0.2°F for every 1% increase in canopy cover[3]

Current: summers in Providence 3.6 to 11.6°F warmer by 2100 (change of -2.4°F)

Trees 2020: summers in Providence -1.4 to 6.6°F warmer by 2100 (change of -7.4°F)

Green Spaces

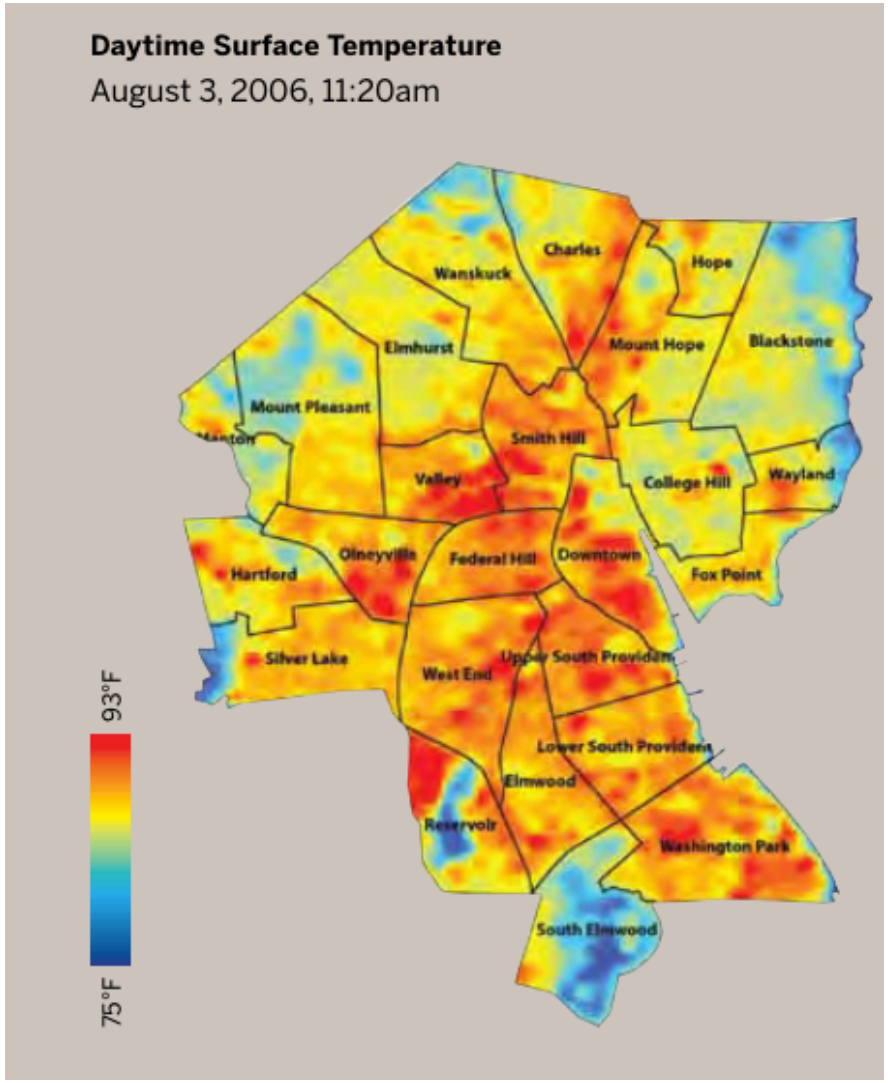


Figure 2: Providence summer daytime surface temperature

- Providence ground cover: 59% impermeable, 37% green space[4]
- Impermeable breakdown: 21% buildings, 30% asphalt, 8% cement[4]
- Guess: 4% of Providence is asphalt derived from parking ban
- Rip up this asphalt → 11% increase in green space

Increasing green space by 10% leads to cooling of 4.5°F in areas with little green cover[5]

Summers in Providence 1 to 9°F warmer by 2100 (change of -5°F) in areas that previously had little green cover

High-Albedo Roofing

- Light roofs = 40% less electricity for cooling[6]
- AC in circle of office buildings: max 1.3°F temp increase[7]

Max temp decrease from light roofing = -0.52°F

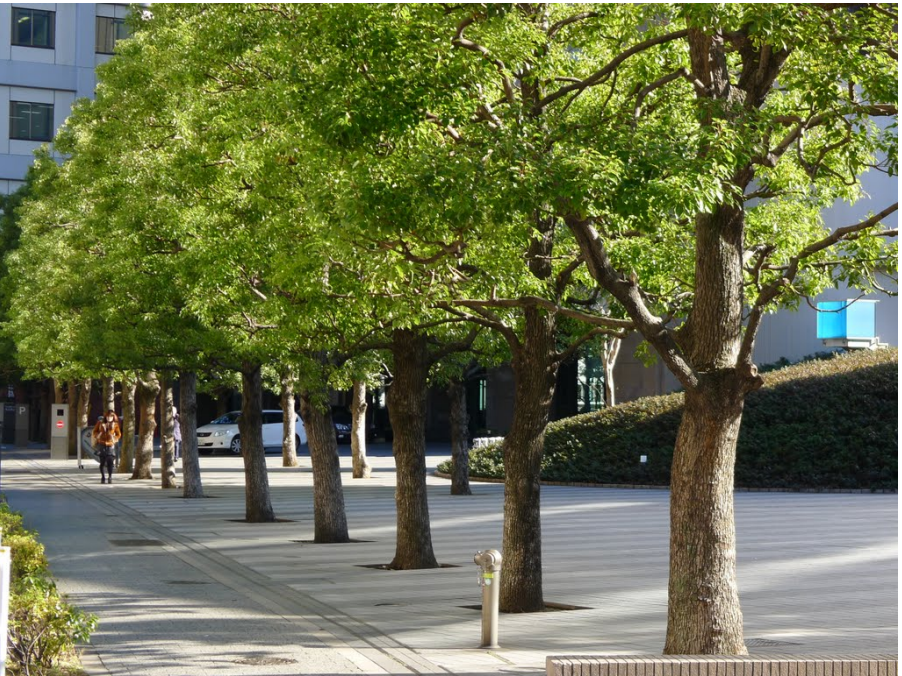
High-Albedo Roads

- Road reflectance increased from 10% to 35%, air temp reduced by 1°F[6]
- Black asphalt = albedo 0.1[8]
- Portland cement concrete = albedo 0.35[8]

Summers in Providence 5-13°F warmer by 2100 (change of -1°F)

Indirect Factors

- Providence trees remove 4,030 tons CO_2/year[4]
- Renewable energy reduces CO_2 emissions
- Distributed Generation Growth Bill: 200 MW of renewable energy projects to be built in RI from 2014-2019[2]



Recommendations to Providence

- Outside funding to meet Trees 2020 goal
- Get rid of parking ban → reduce asphalt cover
- Encourage high-albedo roofing

Works Cited

Data

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Figures

1. Cicilline, D., McMahon, R., & Still, D. "State of Providence's Urban Forest." City of Providence, Forestry Division. April 2008. https://www.providenceri.com/sites/default/files/file/Parks_and_Recreation/Providence_Urban_Forest_as_of_2008.pdf.
2. Roberts, T. et al. "Trees and the Urban Heat Island Effect: A Case Study for Providence, Rhode Island." Brown University Center for Environmental Studies. Spring 2010. http://cameronneat.com/Trees-and-the-Urban-Heat-Island-Effect.