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

- 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)

Figure 1: Urban tree cover in Providence, by neighborhood
Green Spaces

- 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

Figure 2: Providence summer daytime surface temperature
High-Albedo Roofing

• Light roofs = 40% less electricity for cooling\textsuperscript{6}
• AC in circle of office buildings: max 1.3°F temp increase\textsuperscript{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
- Black asphalt = albedo 0.1
- Portland cement concrete = albedo 0.35

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

Figures