

Overview of Urban Heat Islands (UHI), UHI Mitigation Strategies, and Potential Inclusion in State Implementation Plans (SIPs)



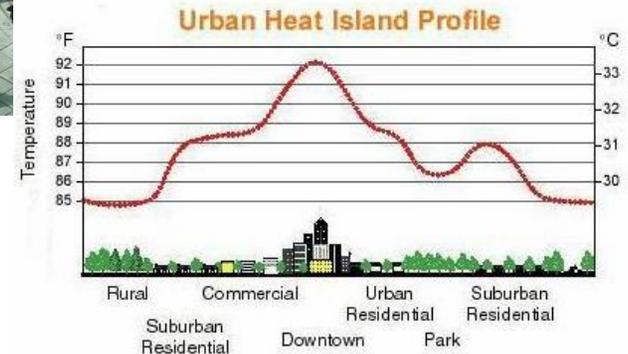
HEAT ISLAND REDUCTION
I N I T I A T I V E



Eva Wong
MWAQC Technical Advisory Committee
July 8, 2005

Presentation Outline

- Metro Washington UHI and Links to Ozone (Dr. Ivan Cheung – 7 min.)
- UHI Mitigation Strategies and Screening Tool (Eva Wong – 7 min.)
- Houston's AQ Modeling Work (David Hitchcock – 7 min)
- Q&A (5-10 minutes)



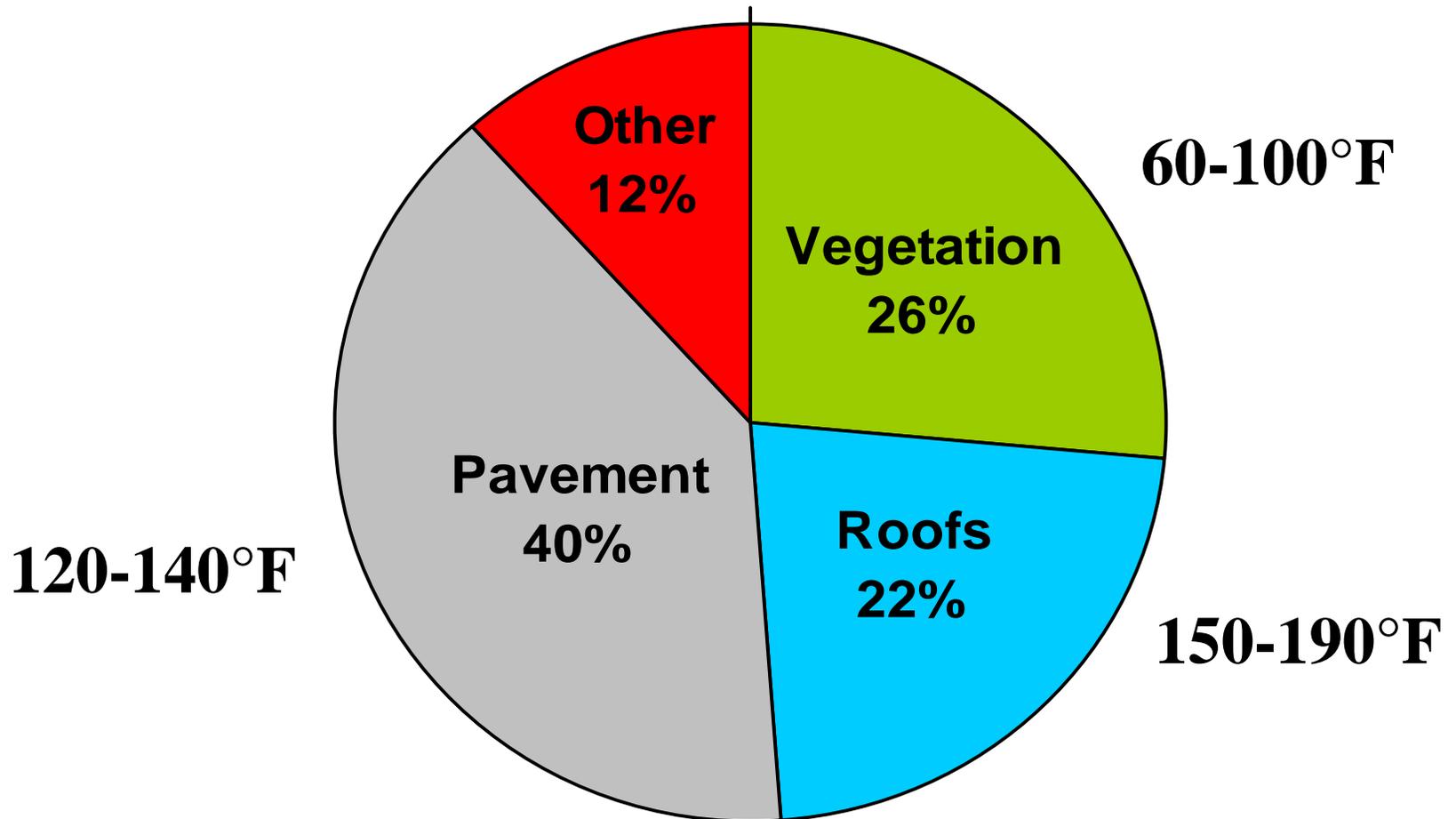
Strategies to Reduce Heat Islands

- **Urban Vegetation**
- **Cool Roofing**
- **Cool Pavements**



Strategies to Reduce Heat Islands

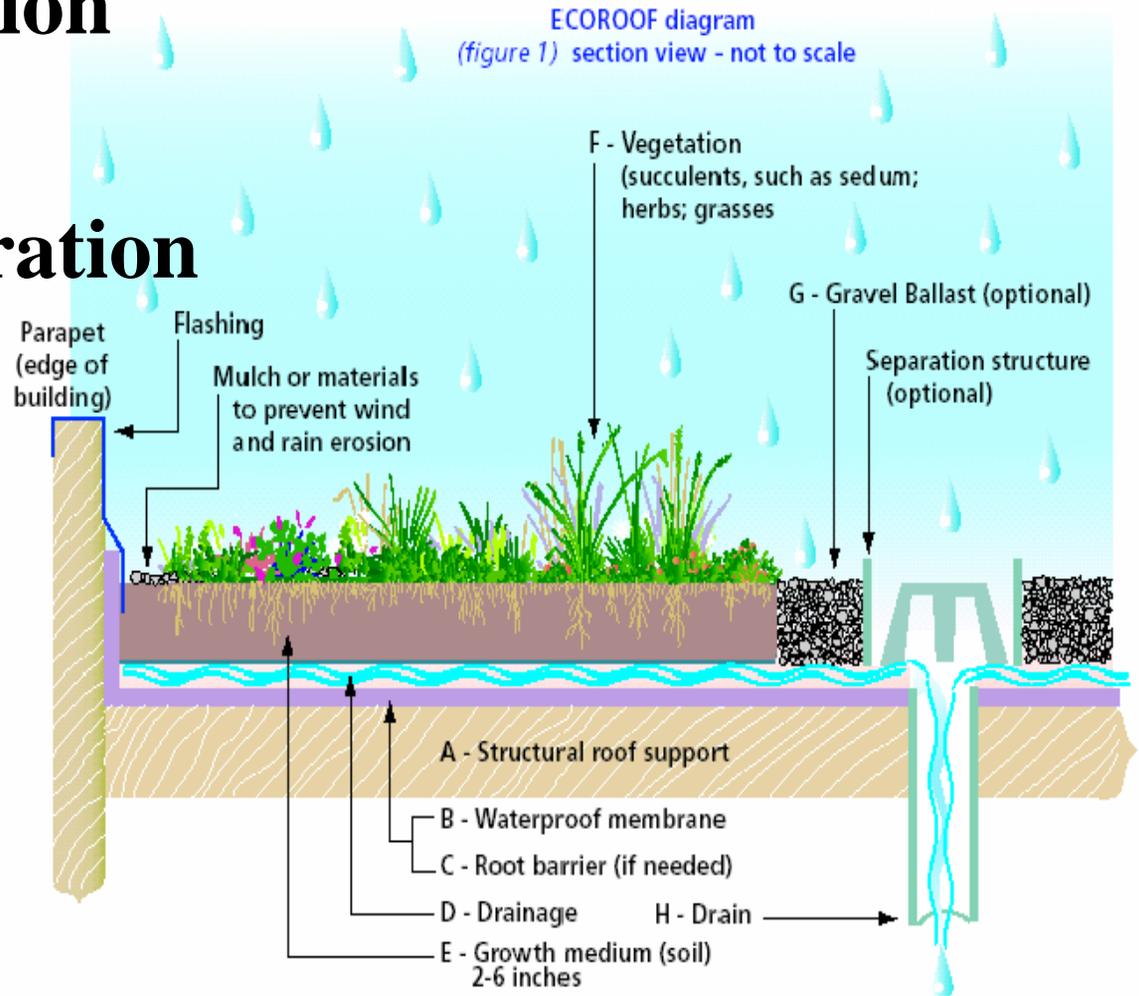
Average Urban Land Cover & Peak Temperatures Ranges



Key Strategies - Urban Vegetation/Green Roofs

- **Trees & Vegetation**
 - **Shading**
 - **Evapotranspiration**
- **Green Roofs**
 - **Extensive**
 - **Intensive**

ECOROOOF diagram
(figure 1) section view - not to scale



Key Strategies - Cool Roofing

- **Reflective Roofing**
- **Flat or Low-Sloped Roofs (Commercial)**
 - **Coatings**
 - **Single-Ply**
- **Sloped Roofs (Residential)**
 - **Tiles**
 - **Metal Roofs**
 - *Asphalt Shingles?*



Heat Island Mitigation – Estimated Benefits

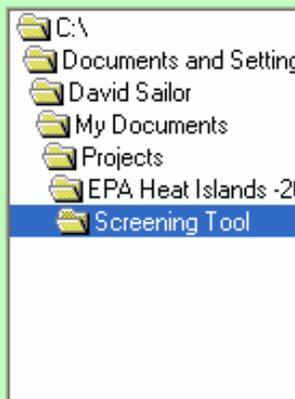
- Energy Demand
 - 10-25% annual energy savings w/all three strategies
 - Cool roofs and vegetation as EE strategy in SIP
- Air Pollution
 - Benefits from reduced energy demand – EE strategy
 - USFS approach – net removal of pollutants from vegetation
 - Reduce temperatures → Reduce ozone → Translate into equivalent emission reductions
- GHG Emissions
- Water Quality
 - Reduced thermal shock
- Health
 - With all strategies, 0-25% ↓ in heat-related deaths (8 cities)
 - Baltimore very modest results, high albedo most effective

Mitigation Impact Screening Tool (MIST)

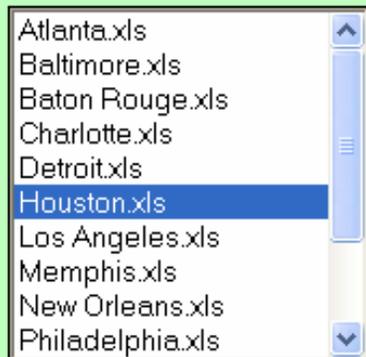
- Intended to provide **back of the envelope**/qualitative indication of likely impacts of UHI mitigation strategies **averaged at the city-scale**.
- Steps: (1) Select city. (2) Define albedo or veg increase. (3) Estimate impacts on meteorology, AQ, and energy.
- Met modeling conducted for 19 cities, including Baltimore and Washington available.
- Data from 19 cities extrapolated to other, 200+, **U.S.** cities.



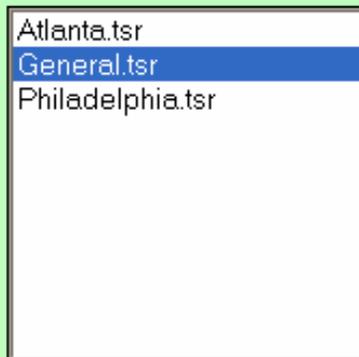
c: [v]



Select a City to Model:



Select from Available Ozone Models:



Mitigation Strategy:

- Albedo Perturbation
- Vegetation Fraction Perturbation
- Albedo and Vegetation Perturbations
- Apply constant Temp. Perturbation (C)

Albedo Perturbation: 0.00

Vegetation Perturbation: 0.00

Temperature Perturbation: 0.00



Debug Test Box

**DRAFT VERSION
for demonstration
purposes only**

Estimate Impacts

Help File

Version

EXIT

Output Options:

- 1-Hour Ozone (peak)
- 8-Hour Ozone (peak)
- Create Detailed Output File

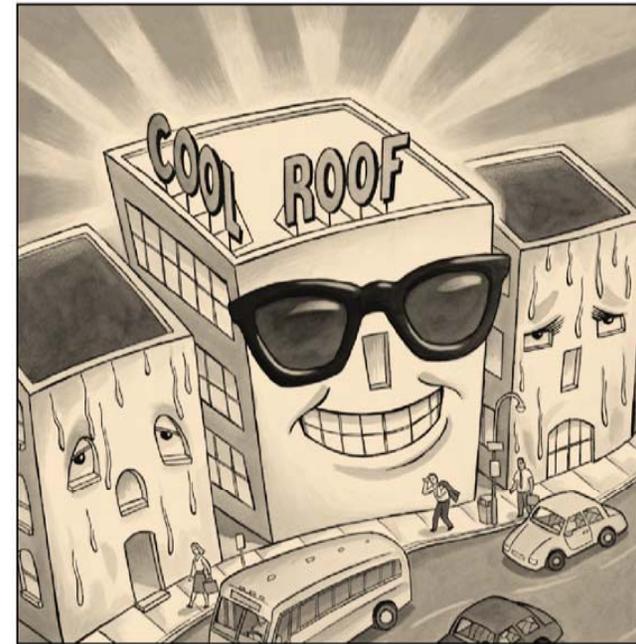
Detailed Output File Name: MitigationOutput.txt

SUMMARY RESULTS FOR OZONE

	1-hour	8-hour
Average impact over season (%):	<input type="text"/>	<input type="text"/>
Average impact on 5 worst days (%):	<input type="text"/>	<input type="text"/>

Programs and Policies to Support HI Reduction Strategies

- **Demonstration Projects: Chicago, Tucson**
- **Education: Utah Energy Office**
- **ENERGY STAR, Cool Roof Rating Council**
- **Weatherization – Philadelphia, Baltimore**
- **Green Building – USGBC LEED**
- **Incentives: Utilities, California, Florida**
- **Supplemental Environmental Projects – LA, DC, NJ**
- **SIP Policies**
- **Standards and Codes - Tucson, Chicago, CA- Title 24, Florida, Georgia**



If your business electricity costs are going through the roof, COOL IT!

The state of California has \$21,000,000 in cash incentives now available to California businesses that own or manage commercial buildings and replace their old roofs with new, white, energy-efficient roofs.



For details
SMUD Customers call 1-888-742-SMUD (7683)
or log onto www.smud.org/coolroof
Non SMUD Customers call 1-888-891-COOL (2665)
or log onto www.energy.ca.gov/coolroof



Brought to you by the California Energy Commission as another way to "Flex Your Power"

Resources

EPA's Heat Island Website www.epa.gov/heatisland

The Energy Star Website www.energystar.gov

Cool Roof Rating Council www.cooroofs.org

Supplemental Environmental Project Toolkit
http://www.epa.gov/cleanenergy/pdf/sep_toolkit.pdf

Edgar Mercado (SIPs) mercado.edgar@epa.gov

Art Diem (SIPs and SEPs) diem.art@epa.gov

Niko Dietsch (MIST) dietsch.nikolaas@epa.gov

Item 5 **Eva Wong (Heat Island Questions)** wong.eva@epa.gov