



# SPEAK FOR THE TREES, Boston

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## Urban Heat Island Effect

**Grades:** 7th - 12th

**Standards:** 7.LS.2.4 / 8.ESS.3.5 / HS.ESS.2.6

**Setting:** Indoor

**Purpose of Lesson:** Students will explore the importance of reducing the Urban Heat Island Effect and understand its connection to climate change.

### Essential Questions:

- What is Urban Forestry and Tree Equity?
- What is the Urban Heat Island Effect?
- How does the Urban Heat Island Effect affect climate change?
- How can we reduce the Urban Heat Island Effect?

### Materials:

- Google slides
- Temperature gun
- Air quality monitor

### Program Session Schedule [~ 65 - 80 minutes]:

Self Introduction & Group Check-ins: 5 mins

Discussion of lesson topic: 20 mins

Activity: 30 - 45 mins

Review & Wrap-Up: 10 mins

## Lesson Implementation

**Self Introduction & Group Check-ins (5 mins):** Take this time to introduce ourselves and our organization, who we are, what we do, and our goal for today's lesson.

### Guided Discussion (20 mins):

- What is urban forestry?
  - "What does an urban forest look like?"
    - Allow students to think about this term and try defining it before providing this definition:
      - A forest or collection of trees that grow in a city and are being taken care of.
- Why is climate change important? What are the trends we have discovered about climate change so far?
  - Climate change frequently leads to more severe and longer heat waves during the summer months.
  - These longer heat waves increase illnesses, death, poverty, deforestation, and energy and electricity usage.



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\*Definition of the *Urban Heat Island Effect* = Heat islands are urbanized areas that experience higher temperatures than outlying areas.

- Fun fact:
  - Daytime temperatures in urban areas are about 1-7 degrees Fahrenheit higher than temperatures in outlying areas, and nighttime temperatures are about 2-5 degrees Fahrenheit higher.
  - Co2 levels in urban areas are 300 to 500 ppm more than their outlying counterparts
- How do these infrastructures impact our environment and ecosystems?
- What are some examples of Boston infrastructures?
  - Pavement/Cement, buildings, bridges, trains, airports, tunnels, subway systems, and railroads.

Infrastructure:	Impact on the environment:
Dark Pavement	<ul style="list-style-type: none"> <li>- Dark pavement is a darker tone of cement that is also known as asphalt</li> <li>- <u>Temperature</u>: Dark pavement tends to absorb more sunlight and heat up faster than light-colored pavement. This phenomenon is known as the "urban heat island effect."</li> <li>- <u>Energy Consumption</u>: Dark pavement absorbs heat, causing buildings and cars in cities to increase their ACs, which costs more energy and money.</li> </ul>
Subway System	<ul style="list-style-type: none"> <li>- Subway riders and transit workers in major cities are being exposed to levels of air pollution that could increase the risk of heart and lung problems.</li> <li>- The continuous subway construction causes a significant demand for construction materials and increased greenhouse gas emissions.</li> </ul>
Buildings	<ul style="list-style-type: none"> <li>- Poorly designed and constructed buildings use more energy, increasing the demand for energy production and contributing to global warming.</li> <li>- Land, air, waste, noise pollution, and soil erosion are harmful outcomes for the environment when buildings are constructed.</li> </ul>

5. How could we reduce the urban heat island effect?

Strategies:	Outcomes:
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Trees and Vegetation	<ul style="list-style-type: none"> <li>- Increasing tree and vegetation cover lowers surface and air temperatures by providing shade and cooling through evapotranspiration. The trees and vegetation can also reduce stormwater runoff and protect against erosion.</li> </ul>
Green Roofs	<ul style="list-style-type: none"> <li>- Growing a vegetative layer (plants, shrubs, grasses, and/or trees) on a rooftop reduces roof surface temperatures and the surrounding air and improves stormwater management.</li> <li>- Also known as “rooftop gardens” or “eco-roofs,” green roofs achieve these benefits by providing shade and removing heat from the air through evapotranspiration.</li> </ul>
Cool Pavements	<ul style="list-style-type: none"> <li>- Cooling pavement is a lighter tone of cement that is also known as concrete</li> <li>- Using cooling sidewalks, parking lots, and streets reflects more solar energy and enhances water evaporation.</li> <li>- They can also reduce stormwater runoff and improve nighttime visibility.</li> </ul>

## Indoor Activity Alternative/Lab (30 - 45 mins):

- Do we see the urban heat island effect in our communities?
- Where do you think are some “hot spots” and cooler areas in our city or our current environment?
- Students will participate in a lab comparing different temperatures and CO2 levels in different locations.
  - One will be with a high canopy coverage and the other with a low canopy.
- They will use [Tree Equity Score](#) maps to find the temperature and other demographics and [Air Quality Index Map](#) for CO2 emissions.
- After finding results and comparing them, have a discussion as to why they think these specific neighborhoods lack tree coverage and others have equitable tree coverage.
- “What is Tree Equity?”
  - Tree Equity ensures fair access to the benefits of trees, especially in low-income and minority communities. It addresses disparities in tree distribution within communities.
    - Tree equity: the importance of trees in all neighborhoods

**Review & Wrap-Up (10 mins):** Bring students back together to share their recordings about their group findings and the trends from the activity. Questions to ask:

- What trends have you found?
- How do you think this impacts your community?
- What was a challenge when conducting this lab?
- How can you help others in improving your communities' green spaces?



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## Demographics

### AVERAGE SURFACE TEMPERATURE / TREE CANOPY PERCENTAGE

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### LANGUAGE ISOLATION

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### SOCIO-ECONOMIC STATUS

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### HEALTH RISK

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### MINORITY POPULATION

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## RESULTS

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## ANALYSIS

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## LINGERING QUESTIONS

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