BCSM: AP Environmental Science Mr. Callahan: Fall 2018

Student Name: Date:



***Hot in the Urban Hot Tub*: A Heat Island Investigation**

**Background:**

The term "[heat island](https://www.epa.gov/heat-islands/learn-about-heat-islands)" describes built up areas that are hotter than nearby rural areas. The annual mean air temperature of a city with 1 million people or more can be 1.8–5.4°F (1–3°C) warmer than its surroundings. In the evening, the difference can be as high as 22°F (12°C). Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality.

Urban "[heat islands](https://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.files/fileID/7553)" are created principally by man-made surfaces, including concrete, dark roofs, asphalt lots and roads,which absorb most of the sunlight falling on them and reradiate

that energy as heat. Many urban streets have fewer trees and other vegetation to shade buildings, block solar radiation and cool the air by evapotranspiration. Higher summertime temperatures can result in increased levels of air pollutants and increased heat stress and other public health consequences for

urban residents. However, there are still uncertainties involving the impacts of heat on vulnerable populations, the relationship of heat-related mortality to built environment and social risk

factors, the impacts of urban form on creating elevated temperatures, and the best approach for specific municipalities for dealing with these problems.

**Hypothesis:**

You form a hypothesis on whether or not heat islands exist in an area that you will decide upon as a group. You will collect data to prove or refute your hypothesis.

**Plan the Experiment:**

Use the Science Inquiry Lab Notebook template as a guide and follow the below steps:

1. After an initial research study, decide on a research question.
2. Develop a hypothesis based on your research question - use supporting evidence and your knowledge of scientific concepts to ensure you have a strong hypothesis.
3. List the materials you will need and then give them details of your procedure - \*note that every team will receive the same data gathering kit, but if there are additional materials you’ll need, develop a list.
4. Identify the conditions you will hold constant and name a single independent variable. Decide which dependent variable you will measure and how you will know if your data supports your hypothesis.
5. Devise your experimental procedures.

**Check the Plan:**

Review the “Scientific Method” to make sure you have included all the pertinent steps.

1. Does your plan test only one variable?
2. Have you determined the location of your experiment? Also, have you decided how often you will take measurements?
3. Did you make a data table that compares the observations you made on the control and experimental groups? Did you include a set-up for a graph of your data?

**Materials:**

|  |  |
| --- | --- |
| **Materials Required for This Lesson/Activity** | |
| **Quantity** | **Description** |
| 6 | Raspberry Pi computers |
| 6 | Gravity surface temperature sensor |
| 6 | Gravity air temperature sensor |
| 6 | Gravity air quality sensor for Arduino |
| 6 | Vernier Surface Temperature Sensor |
| 6 | Vernier Go Direct Temperature Probe |

**Carry Out the Experiment**

This is intended to be a long term study. We will examine seasonal variation. Therefore, it’s imperative that lab groups develop a data collection schedule. Each Friday we will collect data and check-in on experimental progress.

**Write a Formal Lab Report**

See page 6 of the Scientific Inquiry Notebook Template for the format of the lab report

**Extension**

If time allows in May, each team will be required to develop a heat island reduction/mitigation strategy. Your teams will also examine the environmental and public health impact of heat islands on New York City.

We will present your findings to the school’s PA as well as Community Board 3 to advocate for more park space as a means of reducing the heat island effect.