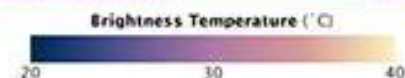
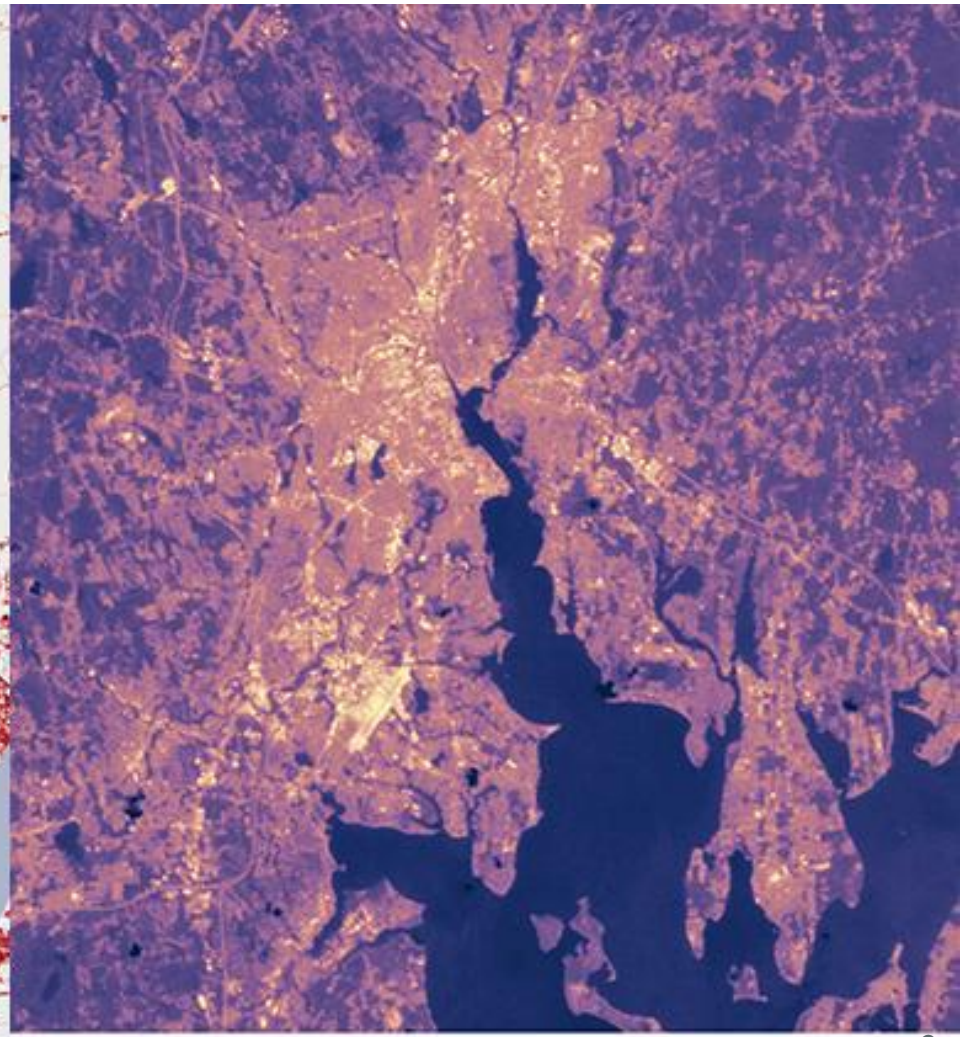


Providence, Rhode Island “City Heat Islands”

*How the ALBEDO causes
temperature changes*

Warm Up

List the patterns you observe from the two maps that show amount of developed land and amount of heat radiating off the Earth's surface (brightness temperature).



Hypothesis

Make a hypothesis to explain the patterns you observed.

OBJECTIVE

What: Students will explain how albedo affects the climate (particularly temperature) of a region

How: investigate surface temperatures around the school yard

Why: to explain how albedo is related to the rate in which Greenland is melting

Surface Temperature Lab

Introduction: We will go outside and measure of the surface temperature of various surfaces (remember: changes in the surface temperature heat or cool the air above)

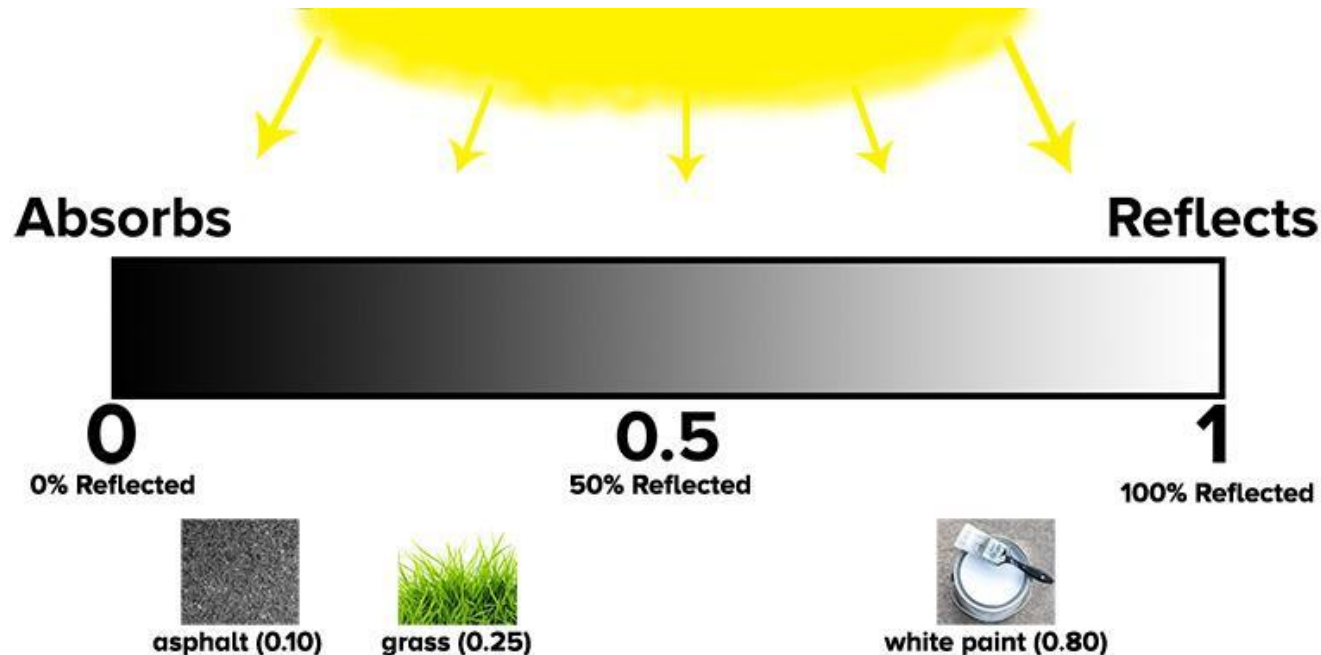
Hypothesis:

Predict what you expect to find when you go outside and measure the surface temperature of various surfaces. Explain your hypothesis.

Lab Analysis

- Describe the patterns you observed and explain why you think these patterns exist.

ALBEDO - The amount of light reflected by a surface.



Albedo

Albedo is measured on a scale of 0-1. A 0 means that the surface of a material absorbs all of the sunlight that hits it. A 1 means that a material reflects all of the light energy that hits it. In other words, a 1 on the albedo scale means 100 percent reflection. A 0 means no reflection.

ALBEDO and TEMPERATURE

Develop a
statement
comparing
albedo and
temperature

Albedo and Temperature

When a material absorbs solar radiation, some of that light energy is converted into heat energy, and the material warms up.

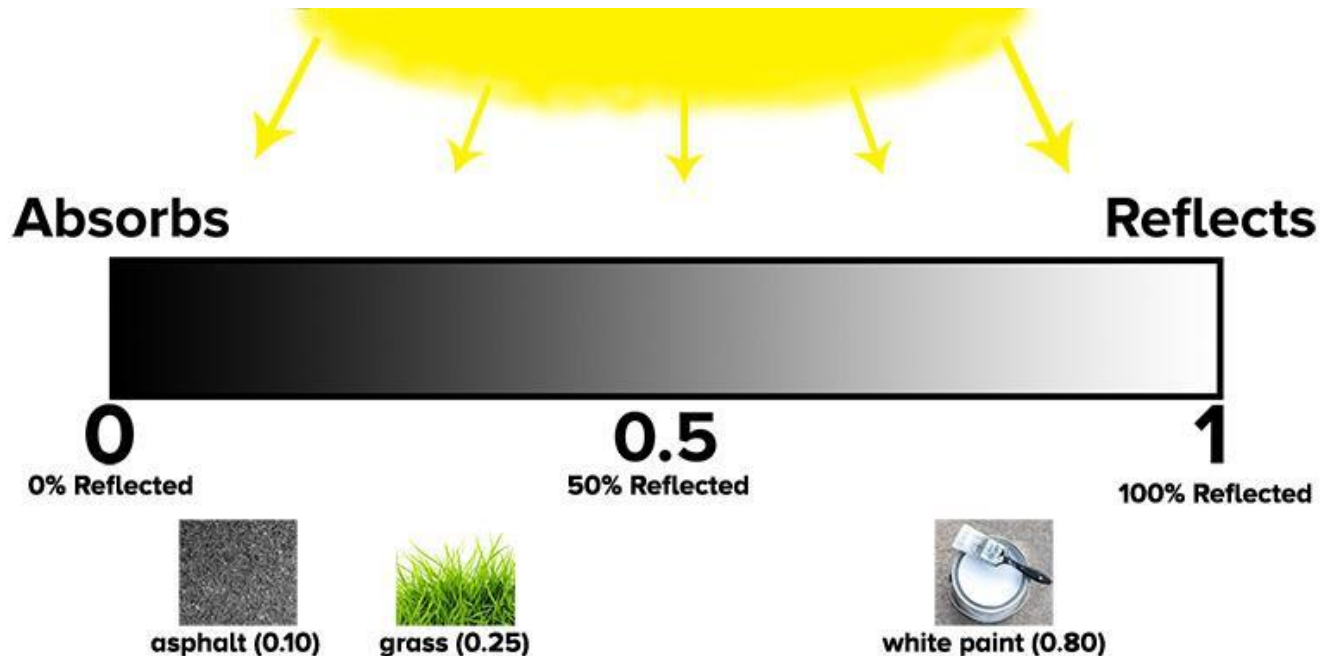
(In general, the lower the albedo, the darker the surface color, and the greater the temperature and vice versa).

That's why an asphalt parking lot will feel hot if you walk across it on a sunny day.

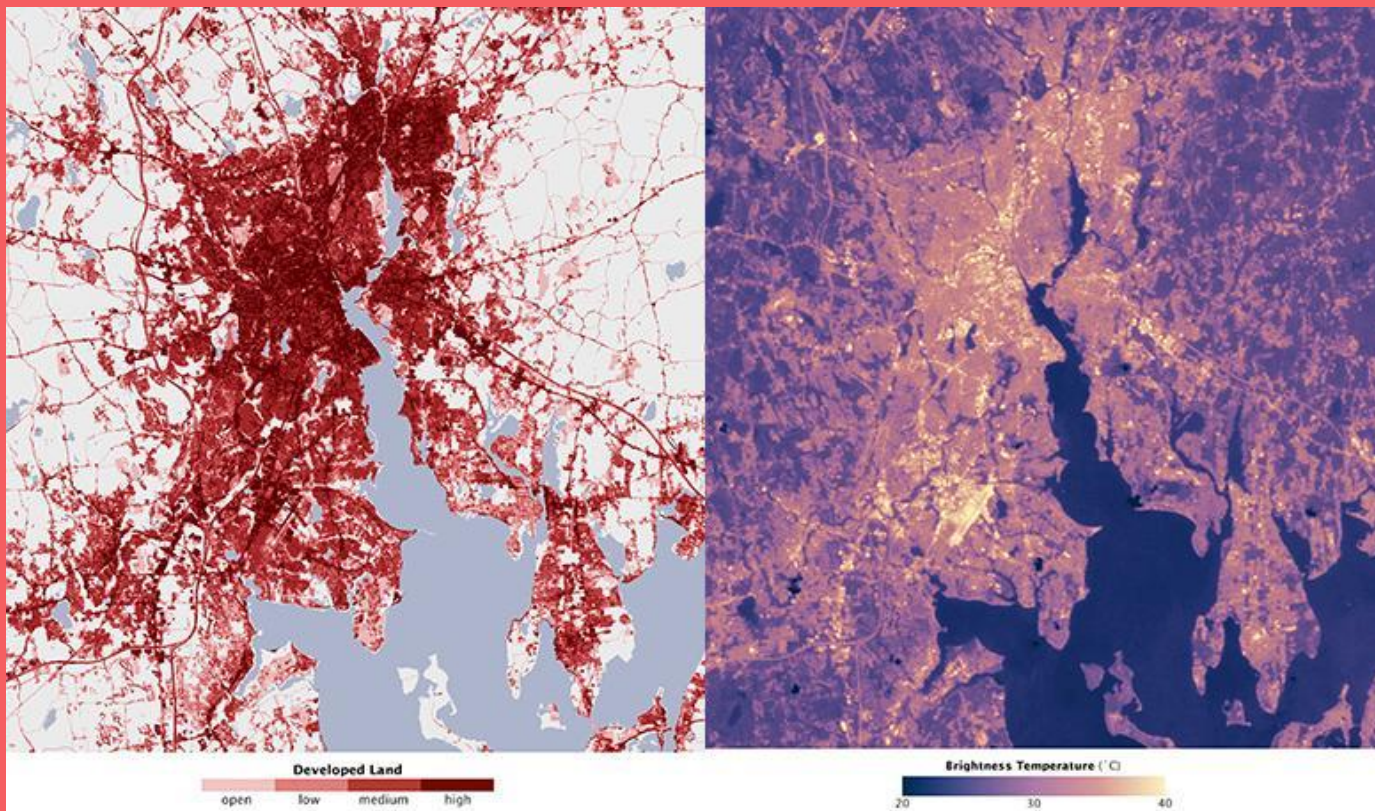


Data Table

- Return to your data table
- (*Leave Heading Blank*) now becomes Albedo Ranking
- **Task:** Try to rank each surface on a scale of 0 to 1 based on what you learned about temperature and albedo



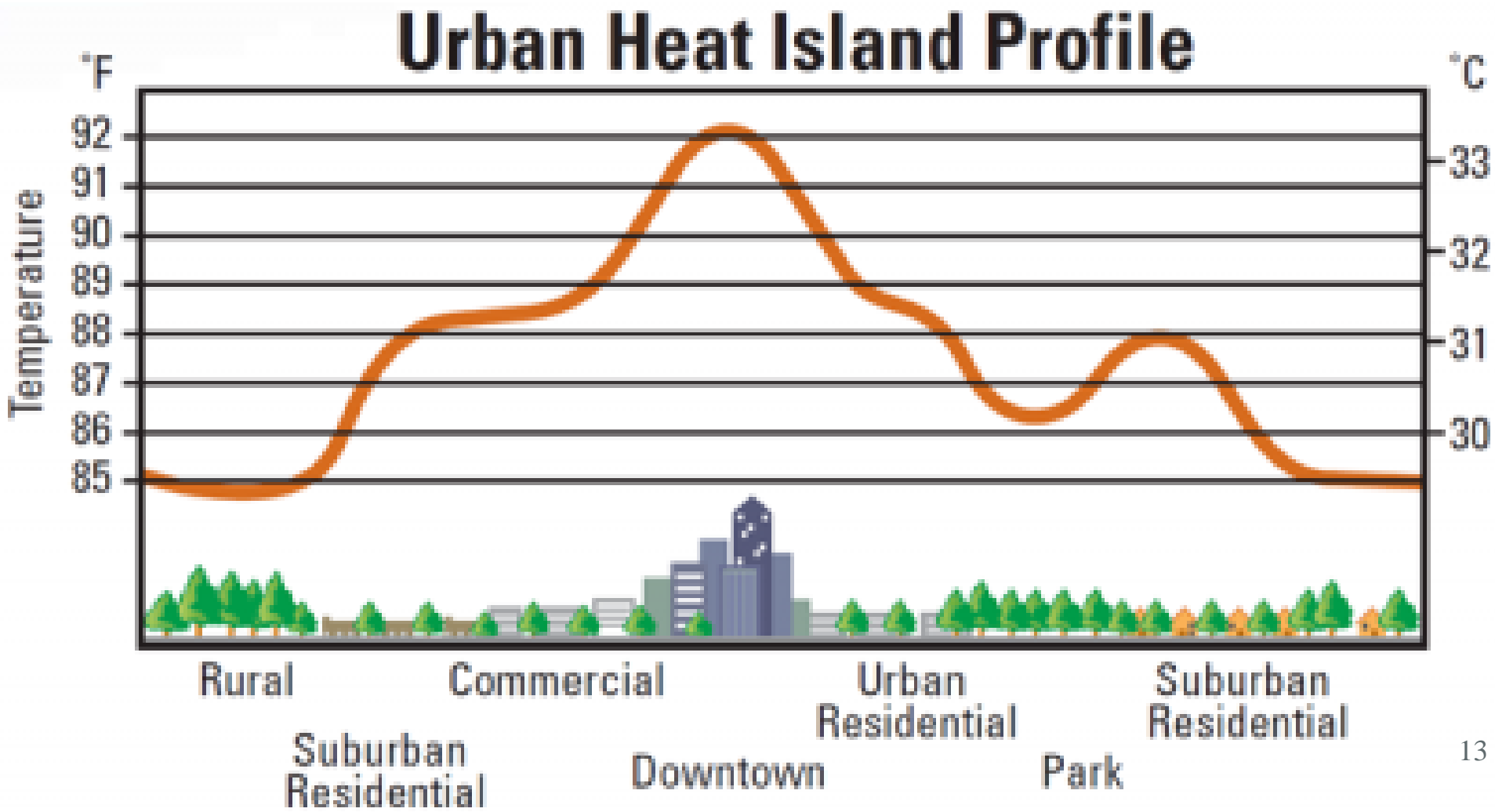
Albedo



Explaining the Rhode Island Phenomenon

Explain the patterns you observed in your warm-up

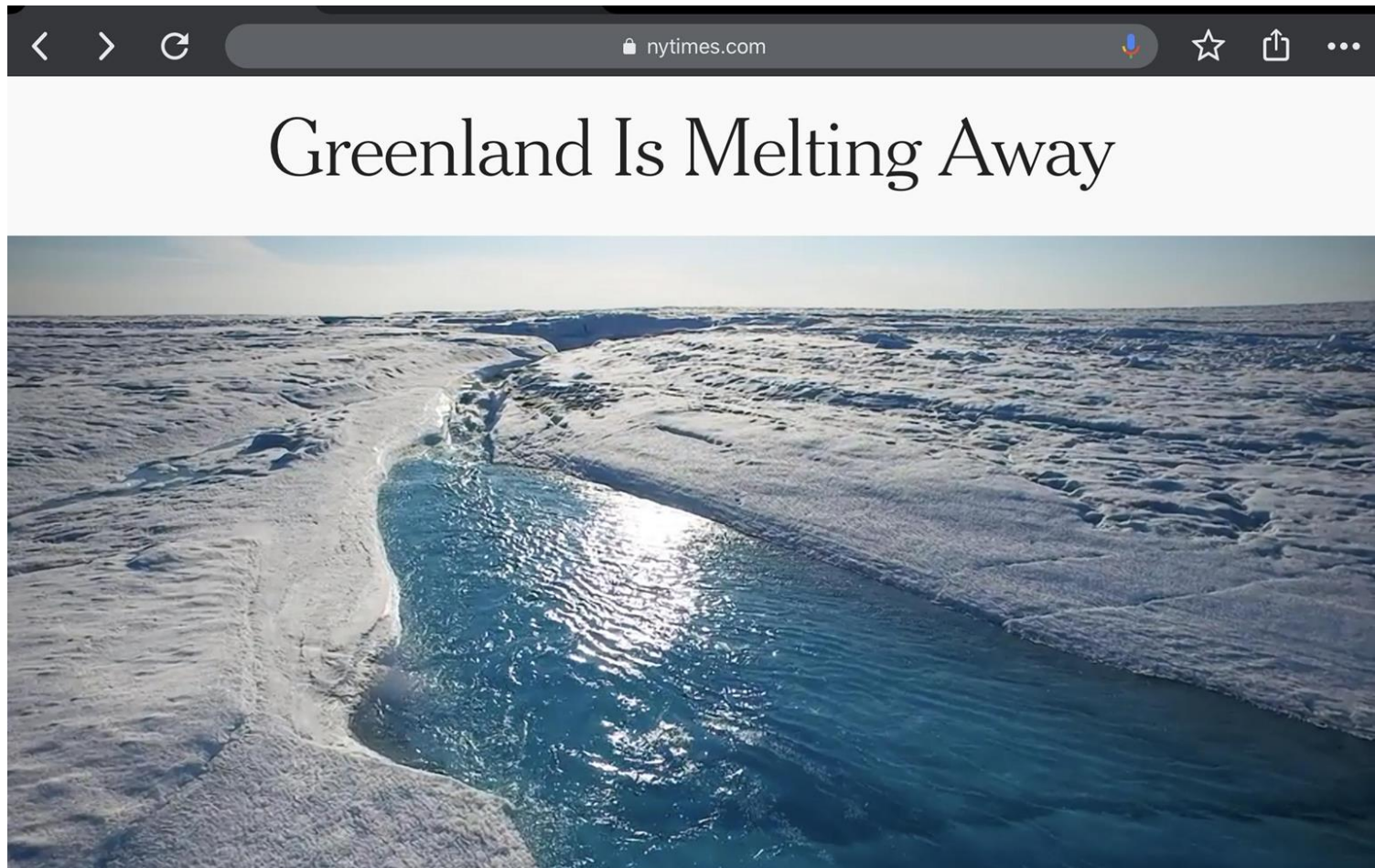
Places like Rhode Island have more pavement than rural regions, so they become an “urban heat island” in which their average temperatures are greater than the surround areas.



NASA discusses “Heat Island”

Greenland is Melting Away

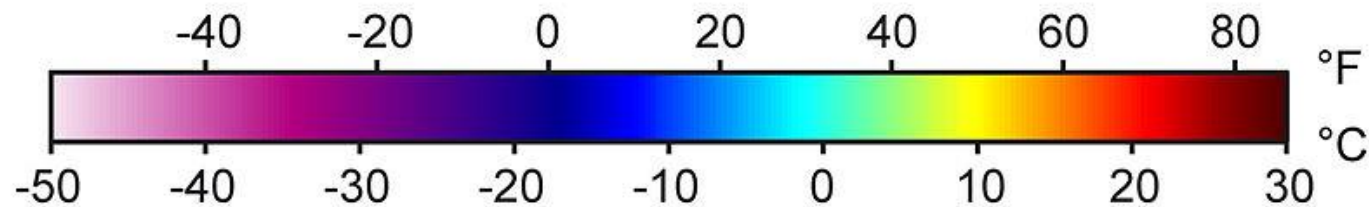
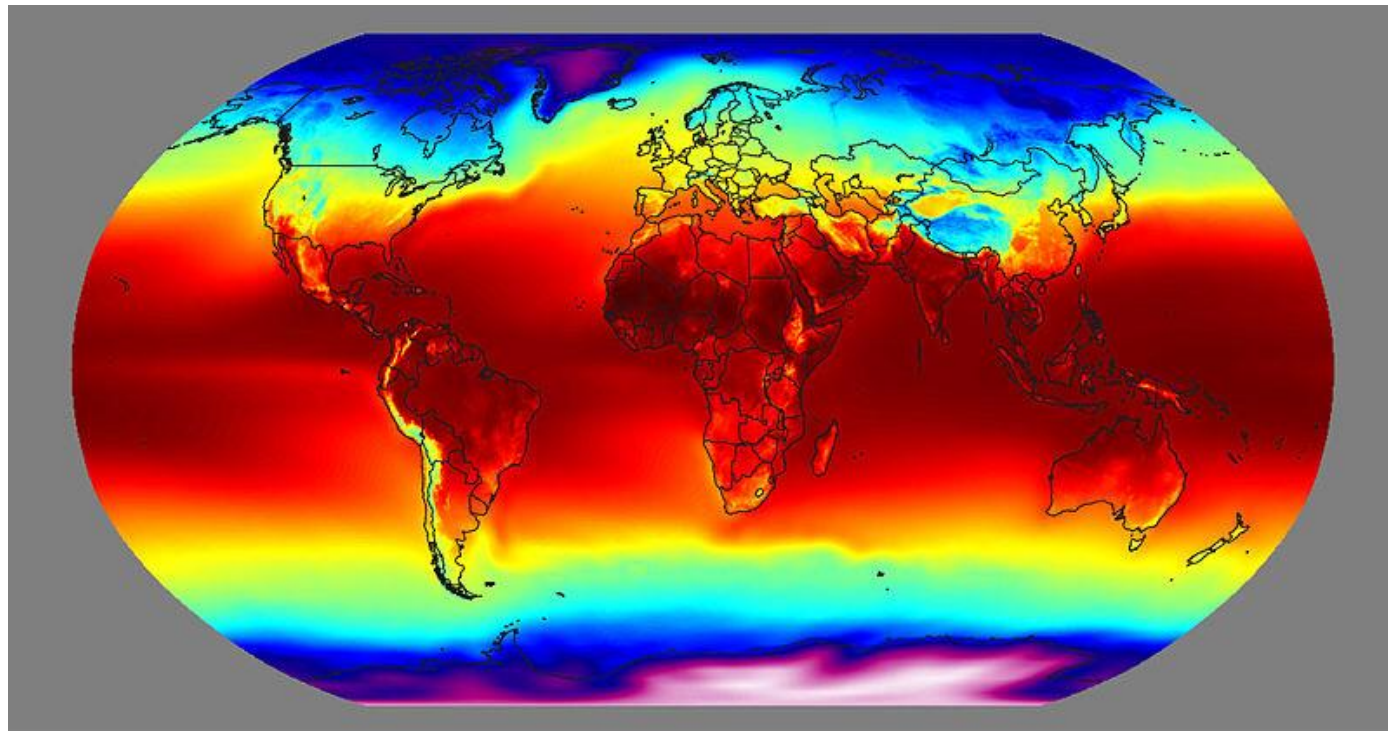
- A big body of water that lies on top of an ice sheet is called a supraglacial lake. To get a sense of the scale of such a lake, examine [this interactive](#).



Tasks to Complete and Explain Based on the Interactive:

- Describe what is running through Greenland.
- Describe the research related to the melting of Greenland and the impact on sea levels.
- Adjusting the size and scale: adjust the red square until each size roughly the size of a football field - 100 yards/300 feet. How much larger are the lakes than the length of a football field?
- What impact do supraglacial lakes have on the average albedo of the glacier?
- What is the average flow rate of melt water into the rivers?
- Why are scientists interested in calculating an accurate flow rate?

Why are Greenland's average temperatures warmer than Antarctica?



Annual Mean Temperature

Ice and Albedo

Other than rivers, what are some phenomenon that could reduce Greenland's Albedo?

How will the Australian wildfires affect Greenland?

- Based on your study of albedo, how do you think this soot could or will affect Greenland?
- How is the soot traveling to Greenland?

