



Location: Detroit, Michigan
Image Types: (Top) Classified image of thermal infrared band
(Bottom) False-color composite made using thermal infrared and near infrared bands
Acquisition Date: May 16, 1992
Acquired by: Landsat 5 Thematic Mapper (TM) sensor
Cover Images
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Cover Images
Formatted by: Nathan Handley, VA Imagery

Explanation

Most urban areas are significantly warmer than their surrounding rural landscapes, resulting in a heat island condition. Urban land surfaces are the main cause for the development of urban heat islands, with energy loss from air-conditioning and heating systems a secondary contributor. As population centers grow cool rural areas become covered by nonevaporative and nonporous buildings and roads resulting in a decrease in cooling from the evaporation of moisture from plants and an increase in urban temperatures.

The cover page provides two different views of the urban heat island for the Detroit metropolitan area. These images were produced using Landsat 5 Thematic Mapper (TM) data collected on May 16, 1992. The TM scanner records information in seven portions (bands) of the electromagnetic spectrum. Six of these bands deal with reflective energy and gather data at a ground resolution of 30m x 30m across the image. The seventh band (Band 6) acquires emitted energy in the thermal infrared area of the spectrum. However, this band has a lower spatial resolution with a ground coverage of 120m x 120m. The bottom image of the Detroit heat island is a false color composite based on an enhanced Band 6 being assigned the color red and Band 4, the near infrared band, the colors of green and blue. Because of its ground resolution Band 4 provides the spatial detail; whereas, Band 6 shows the amount of heat being emitted. The top image uses only Band 6 and was created using a mathematical procedure developed by NASA (National Aeronautics and Space Administration) to convert Band 6 numeral readings into actual temperature values. These values were grouped into temperature classes to form the image. This image lacks the spatial resolution of the bottom image but provides Fahrenheit readings.

Detroit (A) is surrounded by many smaller cities that collectively make up the metropolitan region, and together with Detroit form the urban heat island landscape. One of these smaller cities is Dearborn (B), home of the Ford Motor Company and its Ford River Rouge Complex (C). Both images identify the complex as a large hot spot with temperatures between 90°F and 95°F, which are very high temperatures for 9:30AM when the satellite crossed over. The complex possesses steel producing facilities, requiring hot furnaces. The bottom image also shows River Rouge, which is used to transport materials to and from the complex. Nearby, River Rouge Park (D) is one of the coolest land surfaces on the images with temperatures between 65°F and 70°F. Dark green in the top image, the park has large forested areas. The coolest areas on the images correspond to Lake St Clair (E) and the Detroit River (F). In general, the images show major roads with adjacent buildings as being hot areas and the city of Detroit as being warmer than the surrounding smaller cities, most likely due to the variances in tree coverage and the levels of building and road densities.

Reflection Questions:

- 1) Have students to discuss what could be done in their community to reduce heat conditions produced by human activities.
- 2) Have students to record temperature readings at different locations around their school and place these readings on a map. Make sure that the readings are taken at the same time and are on different surface conditions. Discuss the differences in the temperature readings.
- 3) Have students to research the light blue-grey areas on the bottom image and determine the type of land surface.

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