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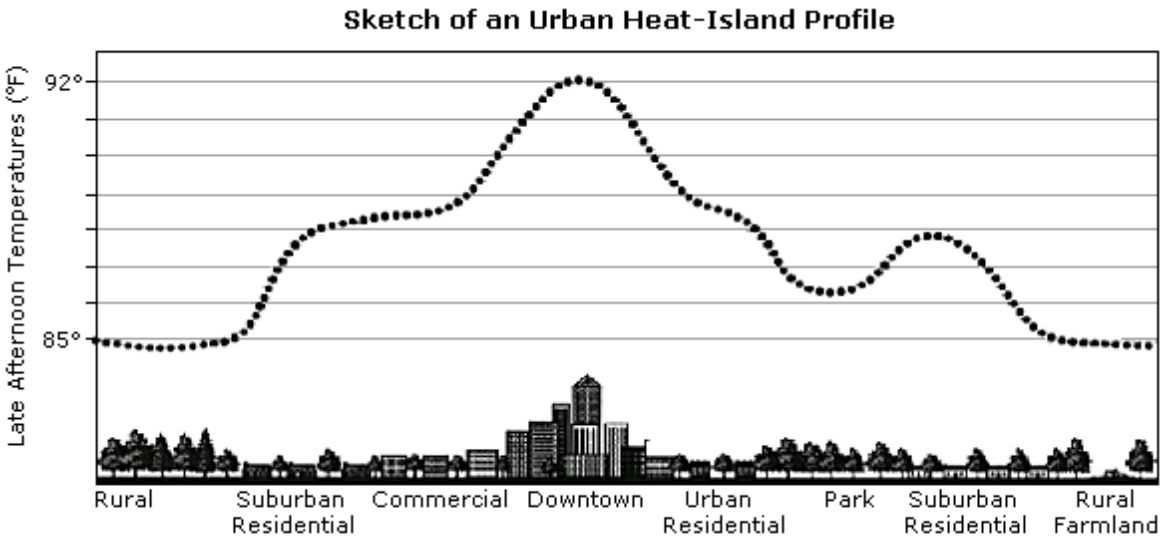
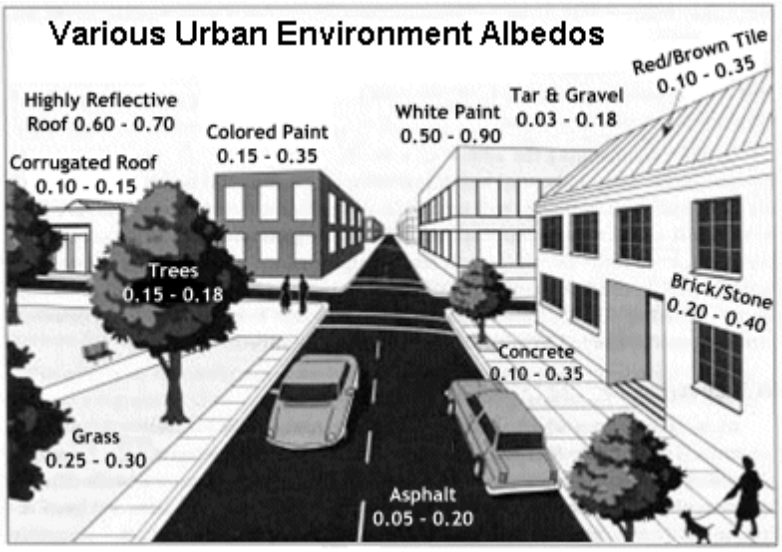
Heat Island



One of the fundamental components that sets a city apart from its rural surroundings is the climate that prevails over urban environments. In urban areas, buildings and paved surfaces have gradually replaced preexisting natural landscapes. As a result, solar energy is absorbed into roads and rooftops, causing the surface temperature of urban structures to become 50 - 70 °F higher than the ambient air temperatures. (Taha, Akbari & Sailor 1992). The image below shows albedo values for various urban surfaces, the albedo is a measure of the amount of solar energy reflected by the surface. As such, low albedo implies higher surface temperatures since the larger amounts of energy are absorbed. As surfaces throughout an entire community or city become hotter, overall ambient air temperature increases. This phenomenon, known as an "urban heat island," can raise air temperature in a city by 2 - 8 °F. (Oke 1987 and World Meteorological Organization 1984).



The resulting higher temperature caused by the urban heat island has the effect of increasing the demand for cooling energy in commercial and residential buildings. Increased demand for energy can cost consumers and municipalities thousands of additional dollars in air conditioning bills in order to maintain comfort levels. In addition, increased electricity generation by power plants leads to higher emissions of sulfur dioxide, carbon monoxide, nitrous oxides, and suspended particulates, as well as carbon dioxide, a greenhouse gas known to contribute to global warming and climate change. Finally, summer heat islands often accelerate the formation of harmful

smog, as ozone precursors such as nitrous oxides (NOx) and volatile organic compounds (VOCs) combine photochemically to produce ground level ozone. (SOS 1995).

On a larger scale, modification of the landscape through urbanization alters the natural channeling of energy through the atmospheric, land and water systems. Although large-scale atmospheric and climatic phenomena are global in scope, urban areas cannot be viewed in isolation because the local environment modifies the conditions in the thin air stratum above the ground, generally referred to as the atmospheric boundary layer. As humans alter the character of the natural landscape in the city-building process, the local energy exchanges that take place within the boundary layer are affected. Therefore, modification of the landscape influences the local (microscale), mesoscale, and even the macroscale climate.

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