URBAN HEAT ISLAND EFFECT

IPRO 328 – URBAN HEAT ISLAND

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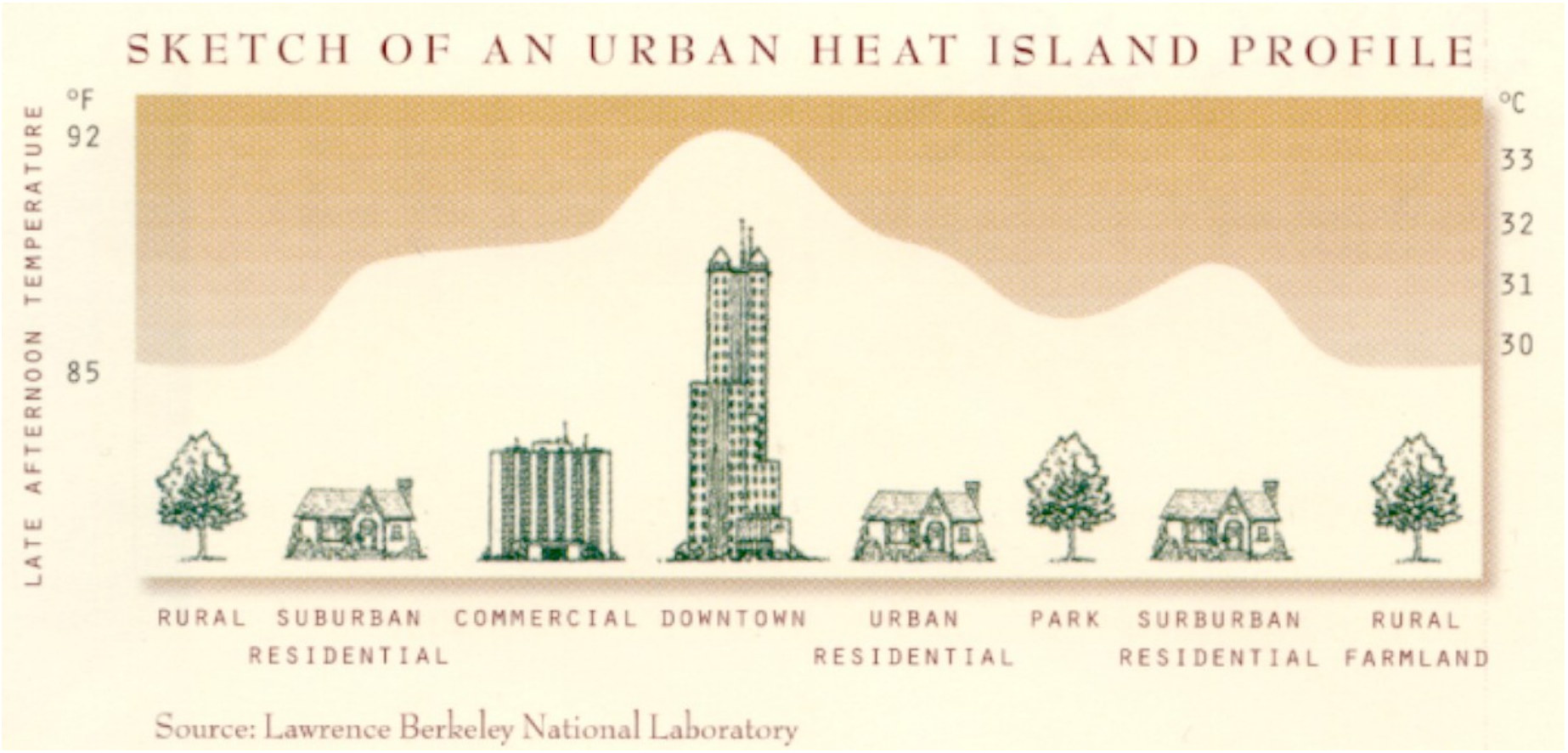
GOAL

- **TO BETTER UNDERSTAND URBAN HEAT ISLAND EFFECT AND POSSIBLY FIND AN EFFICIENT WAYS TO BATTLE IT.**

URBAN HEAT ISLAND

- **A BUILT ENVIRONMENT WHEREIN THE LARGE PROPORTION OF DARK ABSORBING SURFACES TRAP SUNSHINE AND RADIATE IT BACK INTO THE ATMOSPHERE, CAUSING HIGHER AMBIENT TEMPERATURES AND HIGHER POLUTION LEVEL.**

SKETCH OF AN URBAN HEAT ISLAND PROFILE



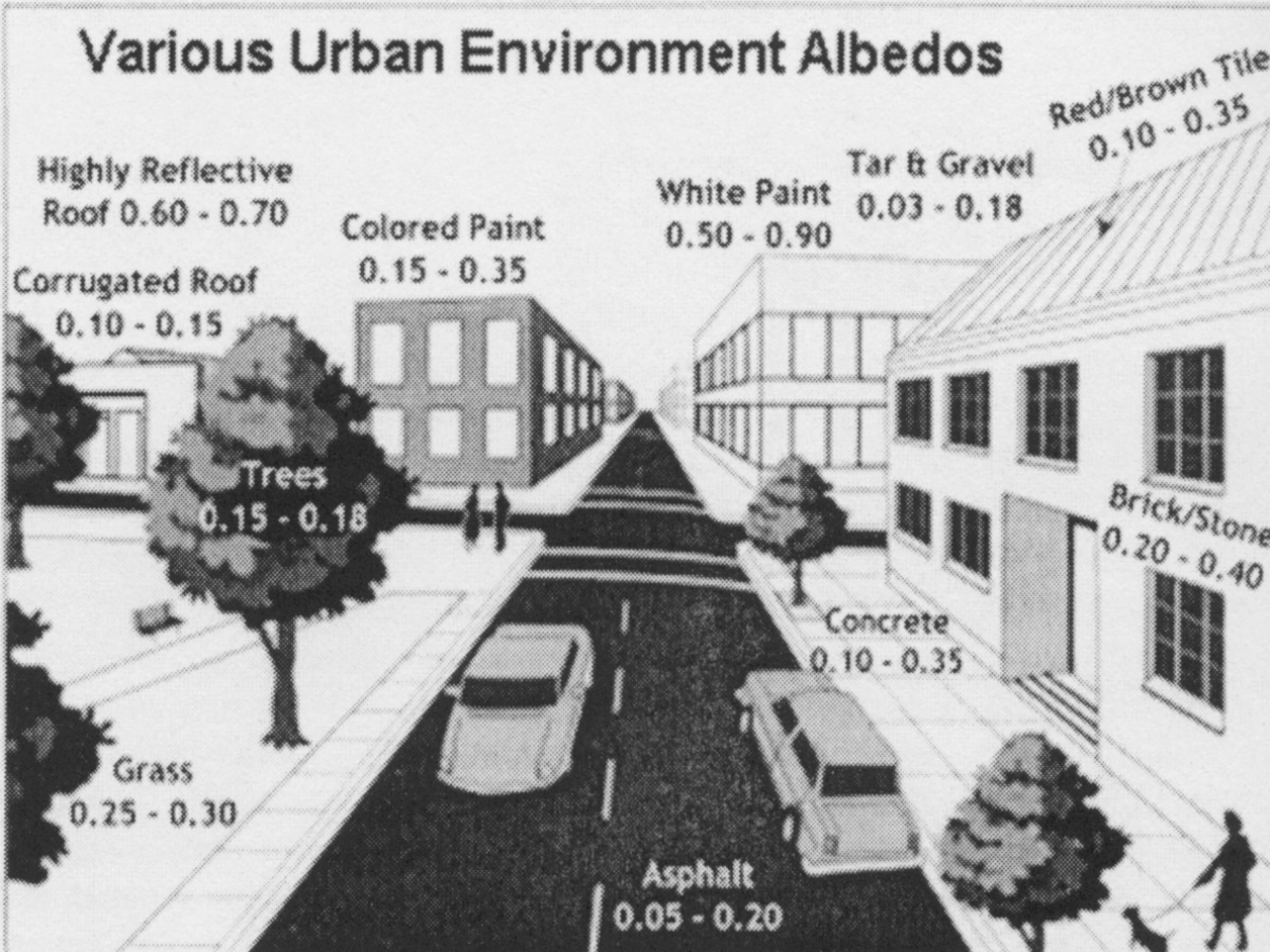
Source: Lawrence Berkeley National Laboratory

SOURCES OF URBAN HEAT ISLAND

- **THERE ARE FEWER TREES, AND OTHER NATURAL VEGETATION TO SHADE BUILDINGS, BLOCK SOLAR RADIATION AND COOL THE EVAPORATION OF WATER FROM THE SURFACE OF LEAVES AND THE SOIL.**

- **ROOF AND PAVING MATERIALS HAVE LOW REFLECTIVITY AND ABSORB MORE OF SUN'S RAYS**

Various Urban Environment Albedos



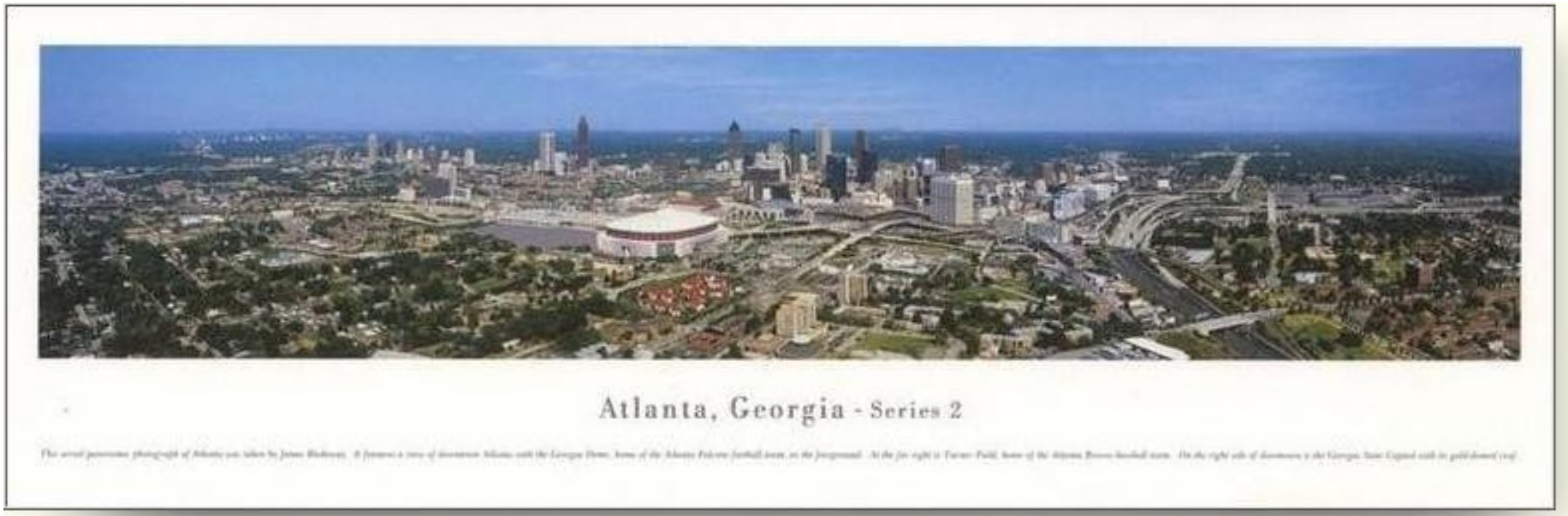
DOWNFALLS TO URBAN HEAT ISLAND EFFECT

- **DIRTY AIR QUALITY**
- **EFFECT PROLONGS AND INTENSIFIES HEAT WAVES IN THE CITIES**
- **PUTTING PEOPLE AT RISK FOR HEAT EXAUSTION AND HEAT STROKE**
- **CONCENTRATION OF GROUND LEVEL OZONE AGGRAVATE RESPIRATORY PROBLEMS SUCH AS ASTHMA**
- **INCREASE THE DEMAND FOR ENERGY**
- **IN LARGE SCALE GLOBAL WARMING**

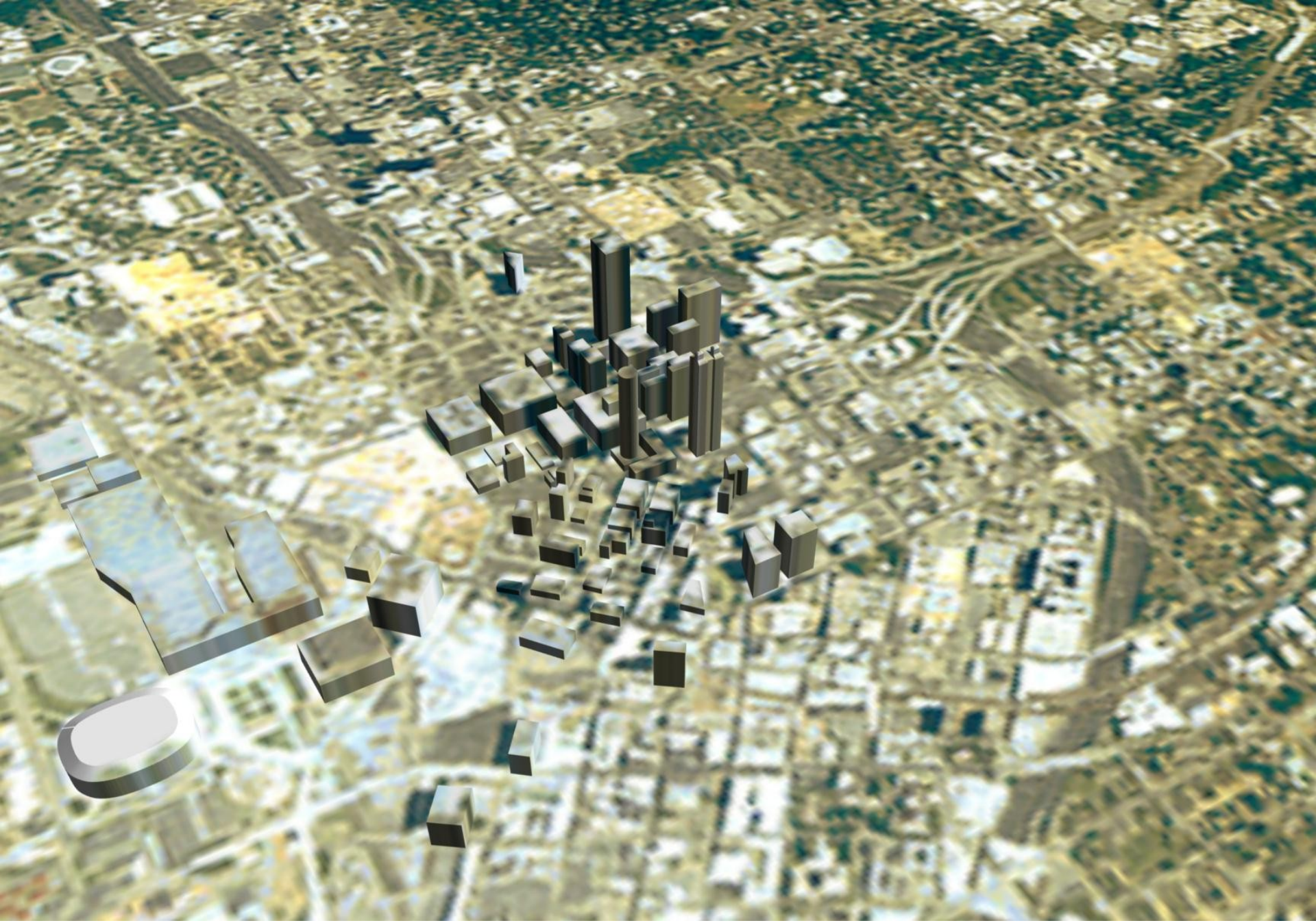
CITY OF CHICAGO

- The lake front makes Urban Heat Island effect almost non existent
- The cool winds setup air currents within downtown that remove heat concentration

ATLANTA CITY



- A landlocked place
- Hardly like Chicago, no place for the heat to go
- Heat kept within the city



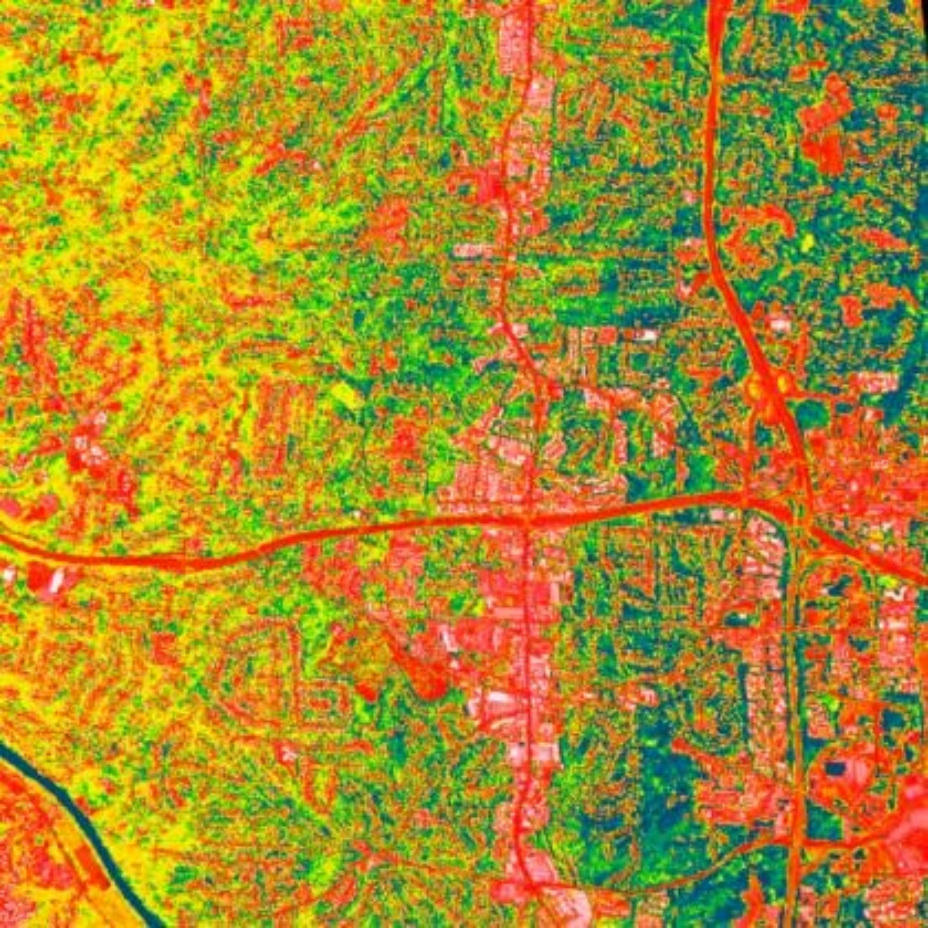
ATLANTA – DAY TRUE COLOR

ATLANTA – DAY THERMAL RESOLUTION

ATLANTA – NIGHT THERMAL RESOLUTION

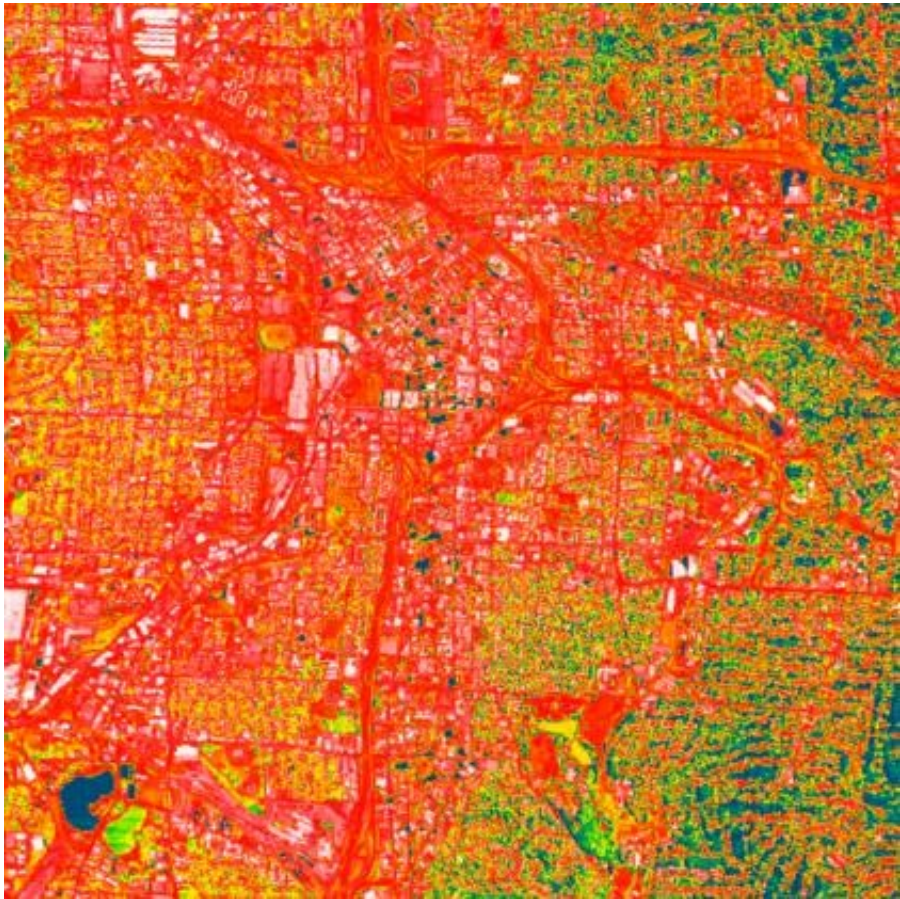
SUBURBAN – DAY – TRUE COLOR

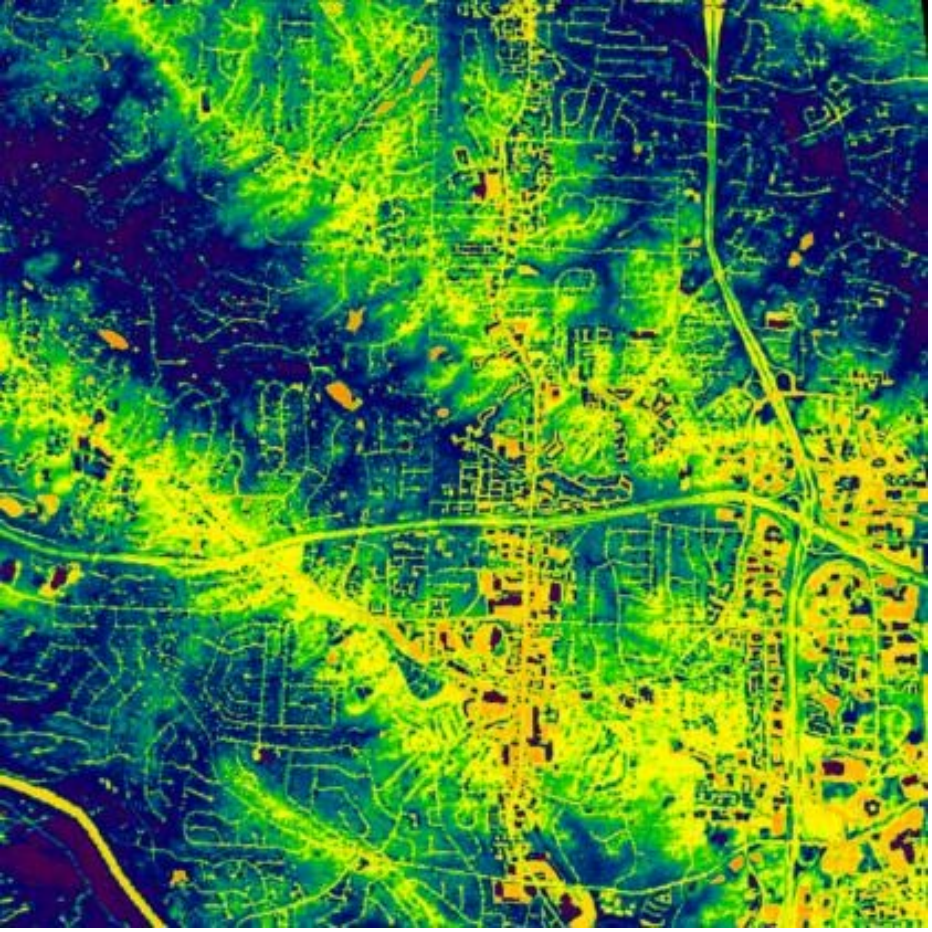
URBAN – DAY – TRUE COLOR



SUBURBAN – DAY – THERMAL RESOLUTION

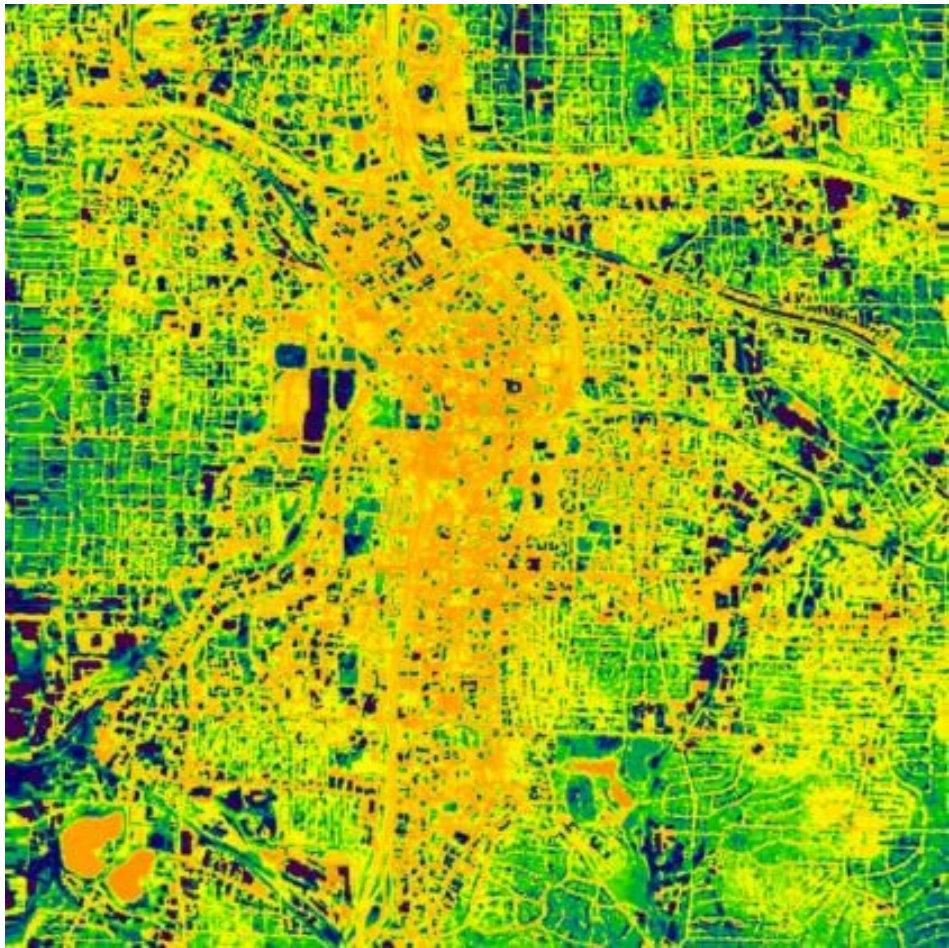
URBAN – DAY – THERMAL RESOLUTION



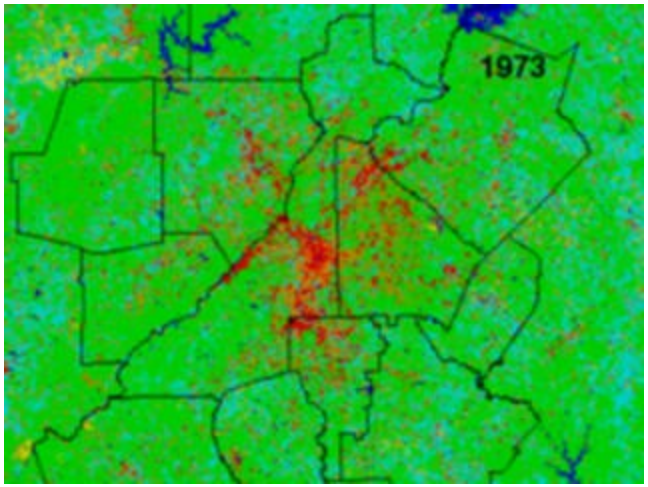


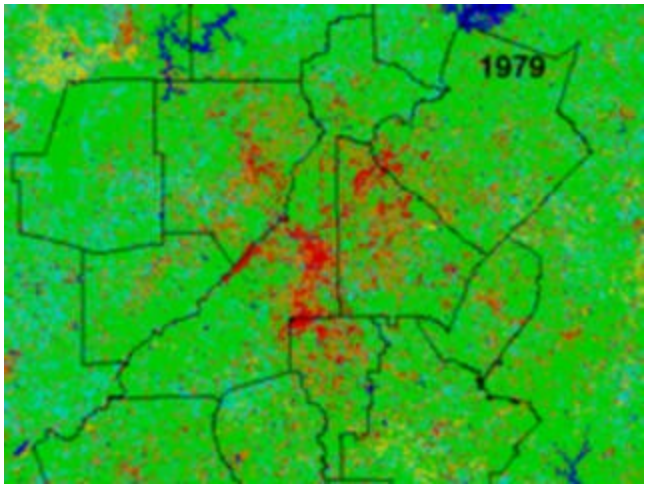
SUBURBAN – NIGHT – THERMAL RESOLUTION

URBAN – NIGHT – THERMAL RESOLUTION

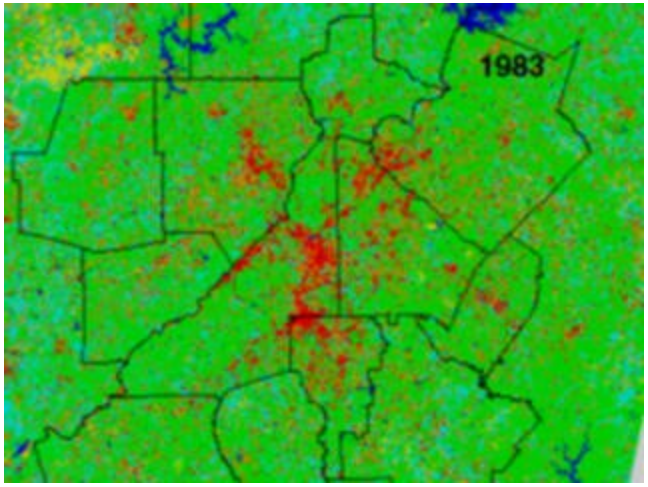


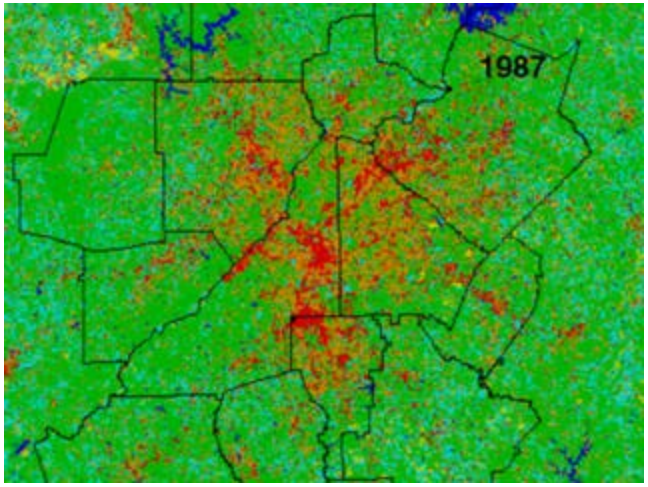
Urban Growth of Atlanta



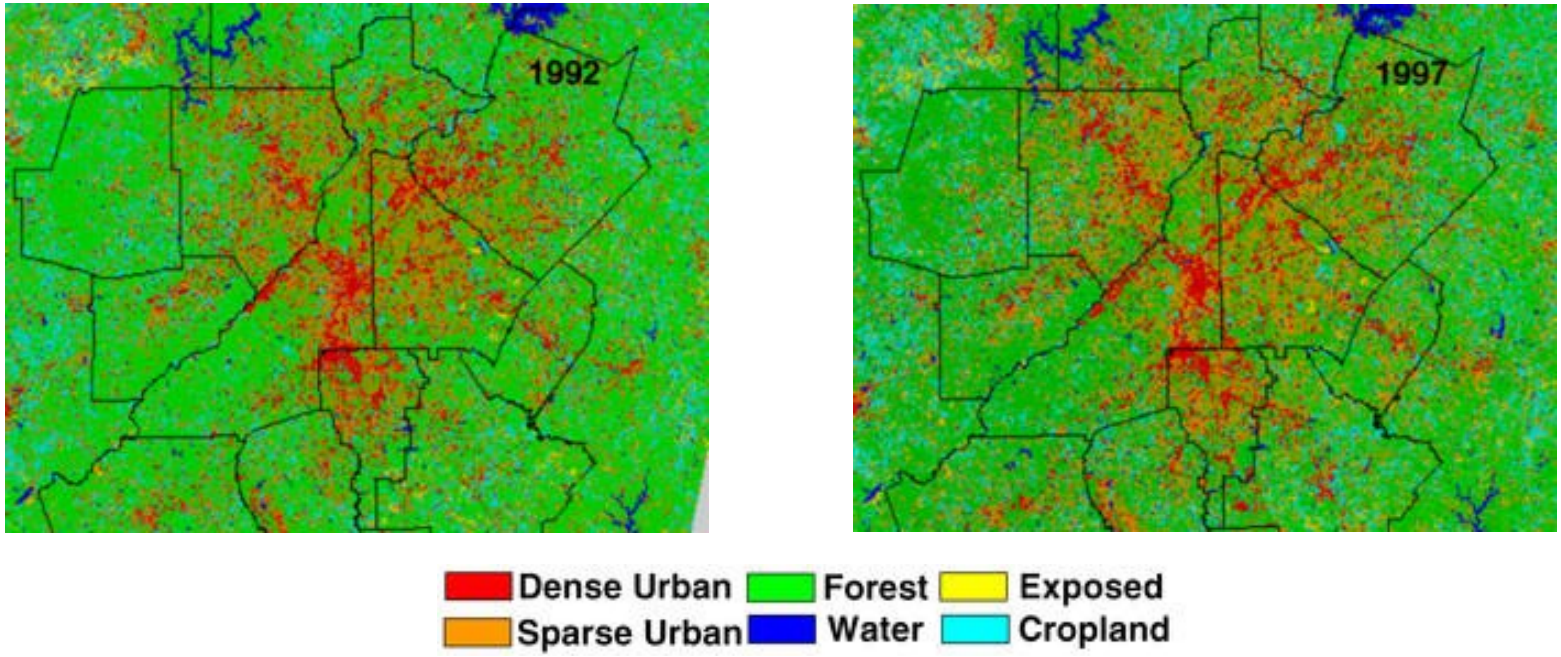


Dense Urban
Forest
Exposed
Sparse Urban
Water
Cropland





Urban Growth (contd)

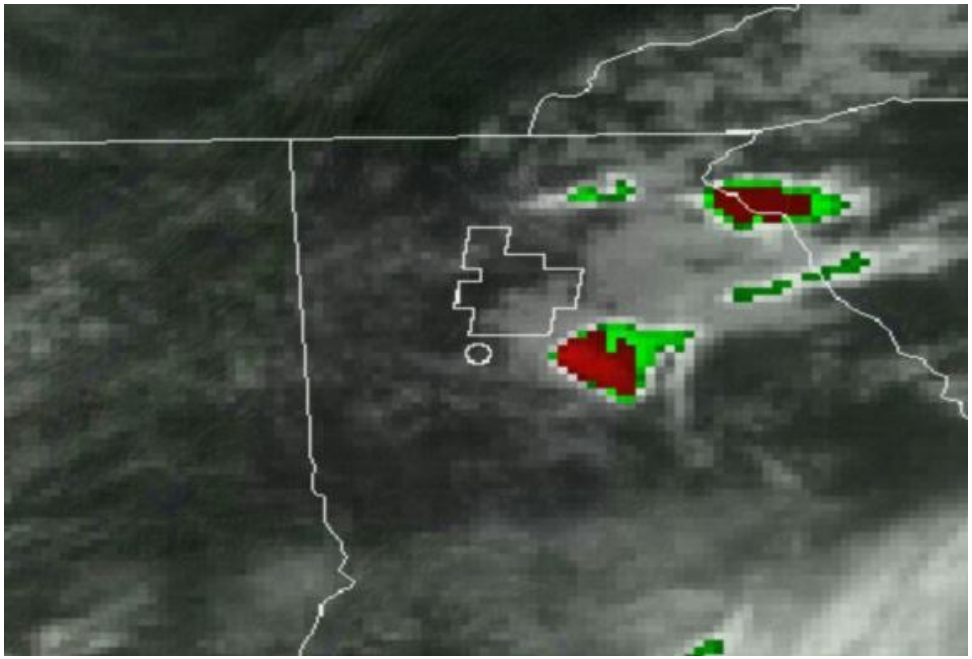


- Comparing Landsat images from the 70's to the 90's, we see that there has been a phenomenal growth

- Large patches of crop land have given way to commercial and residential developments, thereby increasing the Urban Heat Island Effect

Clouds formation

- Clouds begin forming over the city and pick up strength and size as they develop, moving east
- The city holds onto heat at night, it creates a low pressure system, with hot air rising and cooler surrounding air rushing in to replace it
- That cooler air condenses and forms thunderclouds



Movie – Integrating the data

MITIGATING URBAN HEAT ISLAND

- **WAY TO DECREASE THE RISK TO PUBLIC HEALTH DURING SUMMER HEAT WAVES**

- **REDUCING ENERGY USE AND EMISSIONS THAT CONTRIBUTE TO GLOBAL WARMING**

COOL ROOF STRATEGIES

- **USE REFLECTIVE ROOFING MATERIALS**
- **CREATE GREEN ROOF WITH VEGETATION OR ROOFTOP GARDENS**

GREEN COMMUNITY STRATEGIES

- **PLANT MORE TREES AND OTHER VEGETATION**

  - NEIGHBORHOODS WITH PLANTY OF MATURE TREES CAN BE UP TO 7 DEGREES COOLER THAN TREELESS AREAS NEARBY

  - THE INCREASE TREE COVER IN PARKING LOT REDUCES EVAPORATION OF HYDROCARBONS FROM CAR FUEL TANKS AND THE EMMISION OF NOX EMMISION FROM CAR STARTS-UPS

COOL PAVING STRATEGIES

- **INCREASING PAVEMENT REFLETIVITY CAN LOWER TEMPERATURE OF PAVEMENT AND ABBIENT AIR TEMPERATURES**

  - STREETS AND PARKING LOTS ACCOUNT FOR THE MAJORITY OF PAVED SURFACES IN URBAN AREAS.

  - DARK COLORED PAVEMENTS, SUCH AS BLACK ASPHALT, CAN GET TO 40 DEGREE HOTTER THAN THE SURROUNDING AIR

GREEN –GROWING CONCRETE

- **MAIN FUTERS OF GREE-GROWING CONCRETE**

  - STRENGTH & DURABILITY
  - ABILITY TO GROW PLANTS LIKE SOIL
  - IT CAN TAKE MEDIUM SIZED TREES
  - CANNOT BE EASILY ERODED BY RUNNING WATER
  - GREEN-GROWING CONCRETE CAN BE POURED ONSITE AND BE ALSO PRECAST

GREEN –GROWING CONCRETE