Information Technology for Government

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Many Computer Tools Available

- Electronic spreadsheets
- Database systems
- Remote sensing
- Geographic information sciences (GIS)
- Spatial analysis
- Network analysis
- Urban and regional models

GIS --The Organizing Framework

- GIS provides
  - organizes and displays information
  - permits spatial and network analysis
  - provides a way for us to share information
  - helps the development of models that predict future development and impacts

What We Cover

- Remote sensing
- GIS concepts and applications
- Urban models, briefly
- Planning support systems

Introduction to Remote Sensing

Remote Sensing Summary 1

- **Remote sensing : acquiring and analyzing data using distant devices recording electromagnetic energy**
  - **Digital scanning devices or analog photography**
  - **Airborne, terrestrial, Marine, or orbiting platforms**
- **Can be:**
  - **passive, sensing existing radiation**
  - **active, sensing radiation bounced off the surface, as with radar.**

Remote Sensing - Summary 2

- Remote sensing usually involves digital data, but also photography
- Usually means both the capture and computerized image analysis of data
- Features on the earth radiate energy at specific frequencies and intensities. Each kind of vegetation, for example, has its own "spectral signature" of infrared, visible, and ultraviolet frequencies.
- Accurate and quantitative, easily incorporated into GIS

Remote Sensing - Applications

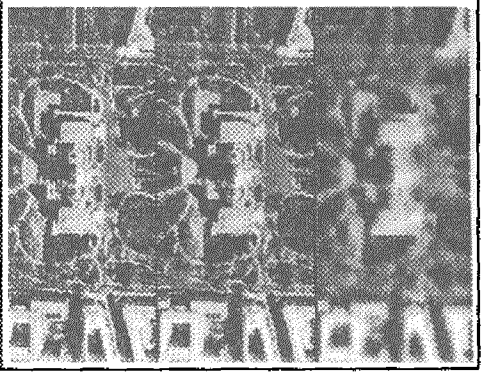
There are many ways remote sensing is used:

- Geostationary weather monitoring
- Cartography and mapping
- Natural resource management
- Disaster management-fire, earthquakes, etc.
- New hi-resolution systems as replacement for aerial photos
- Data for GIS

Resolution

- Four kinds of resolution define user needs:
- Spatial Resolution: How small an object do you need to see (pixel size) and how large an area do you need to cover (swath width)
- Spectral Resolution: What part of the spectrum do you want to measure
- Radiometric Resolution: How finely do you need to quantify the data (6 bit=0-63, 8 bit=0-255, 10 bit=0-1023)
- Temporal Resolution: How often do you need to look

1, 3, and 10 meters



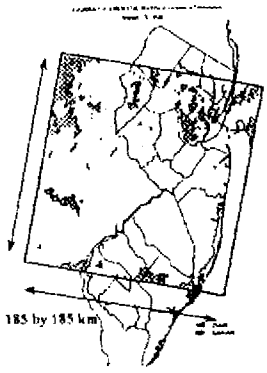
MSS color composite

- combining bands creates a false color composite
- red=vegetation
- light blue=urban
- black=water
- pink=agriculture

Swath width

- Landsat-185km (100 mi)
- 80 m = 40 Mb-4 bands (MSS)
- 30 m = 320 Mb-6 bands (TM)
- 10 m = 342.25 Mb-1band
- 5 m = 1.369 Gb -1 band
- 1 m = 34.225 Tb - 1 band

How small do we need?
How much data can we store and process?



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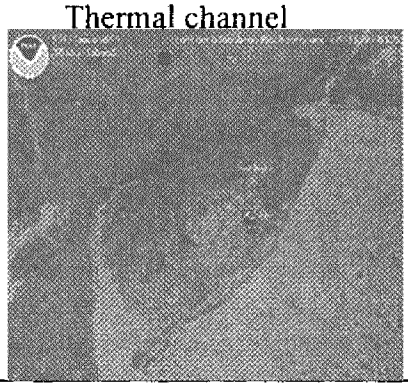
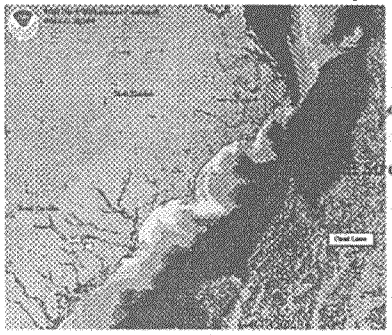
Remote Sensing is Useful for Government

- Assist in monitoring natural disasters
- Helpful in doing change detection over time
  - Land use
  - Environment
- Assist agriculture

Thermal channel



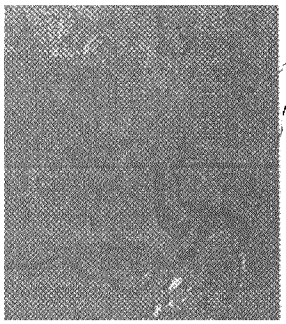
Thermal Sensing of Water Temperature



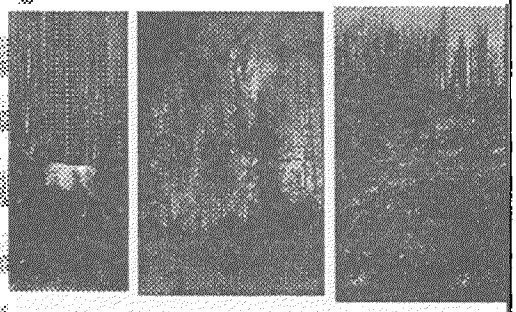
Meteorological satellites have saved countless lives

- Over 6,000 killed in Galveston, Texas hurricane in 1907
- Dr. Yash Pal, designer of a satellite information network to serve rural villages in India, noted that fatalities from nearly identical Bay of Bengal cyclones before and after the use of Geostationary weather satellites went from over 10,000 to only 25.

Change detection-Mississippi flood



1988 Yellowstone Fires



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