

Landsat Thematic Mapper

Theme: a target with specific characteristics that can be measured from space

Mapper: Earth surface coverage is continuous

This presentation:

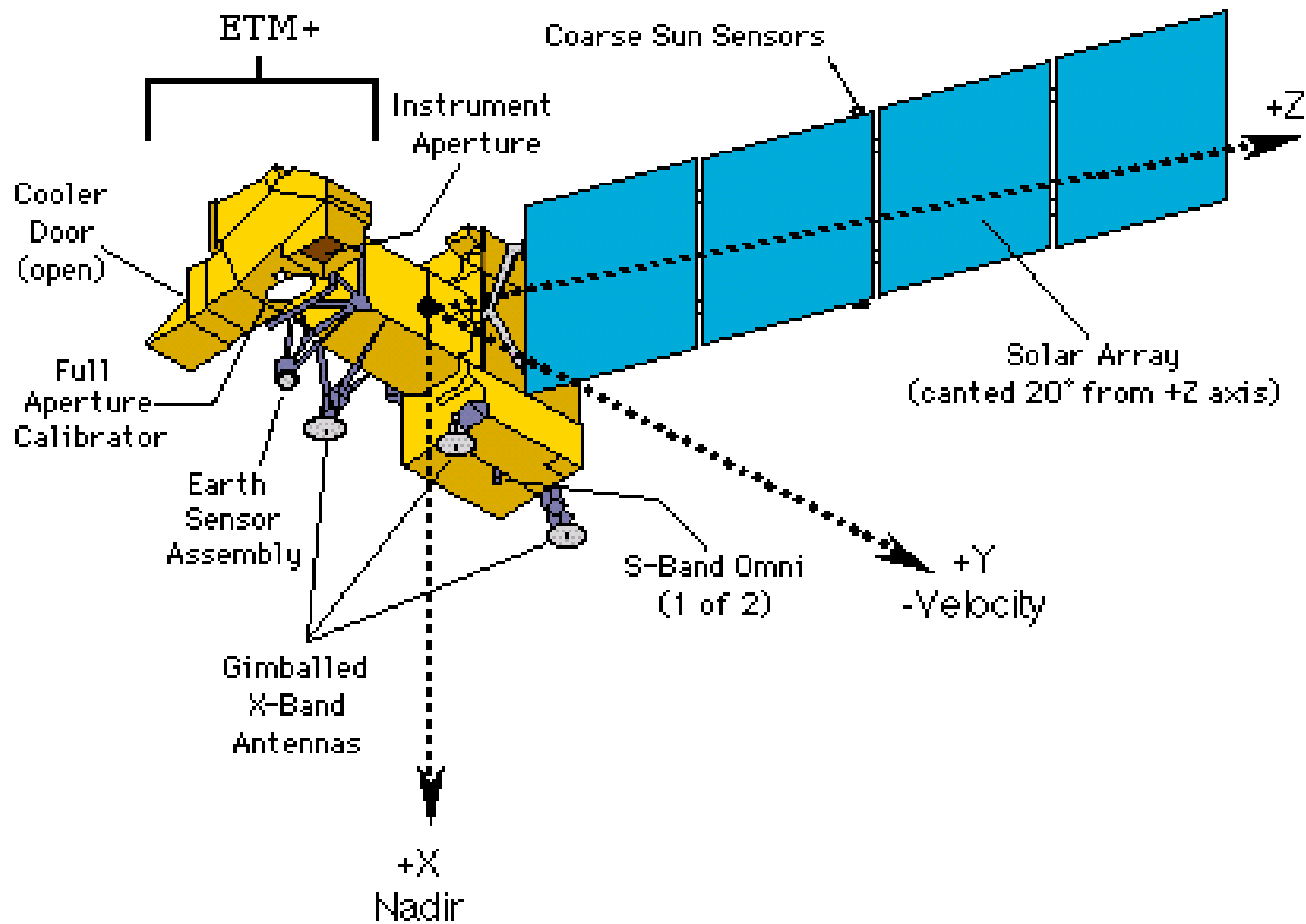
<http://www.geo.mtu.edu/~gbluth/Teaching/GE4150/ge4150.html>

History and other useful information:

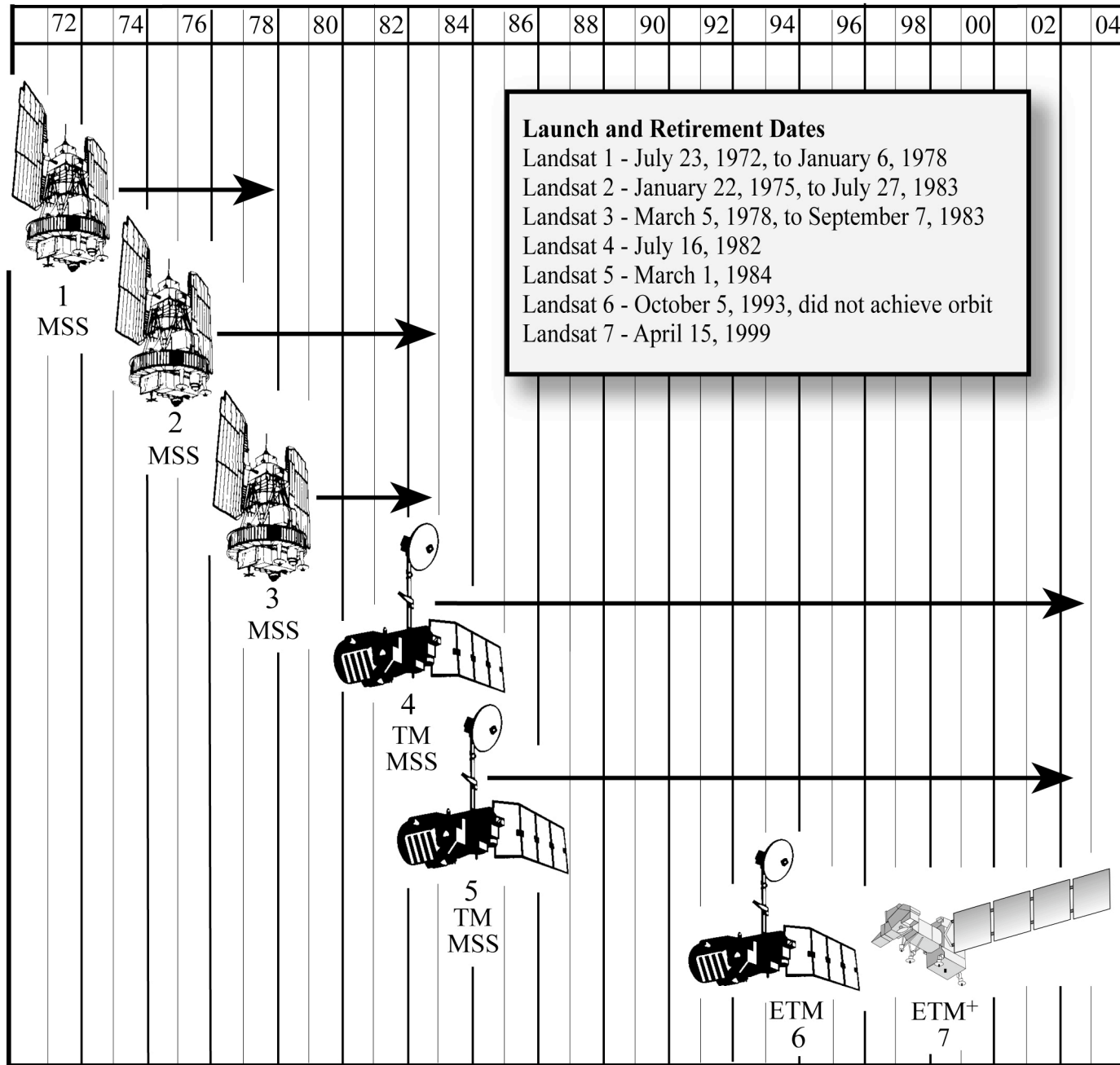
www.geocomm.com/features/sensor/landsat7

Landsat NASA: <http://landsat.gsfc.nasa.gov/>

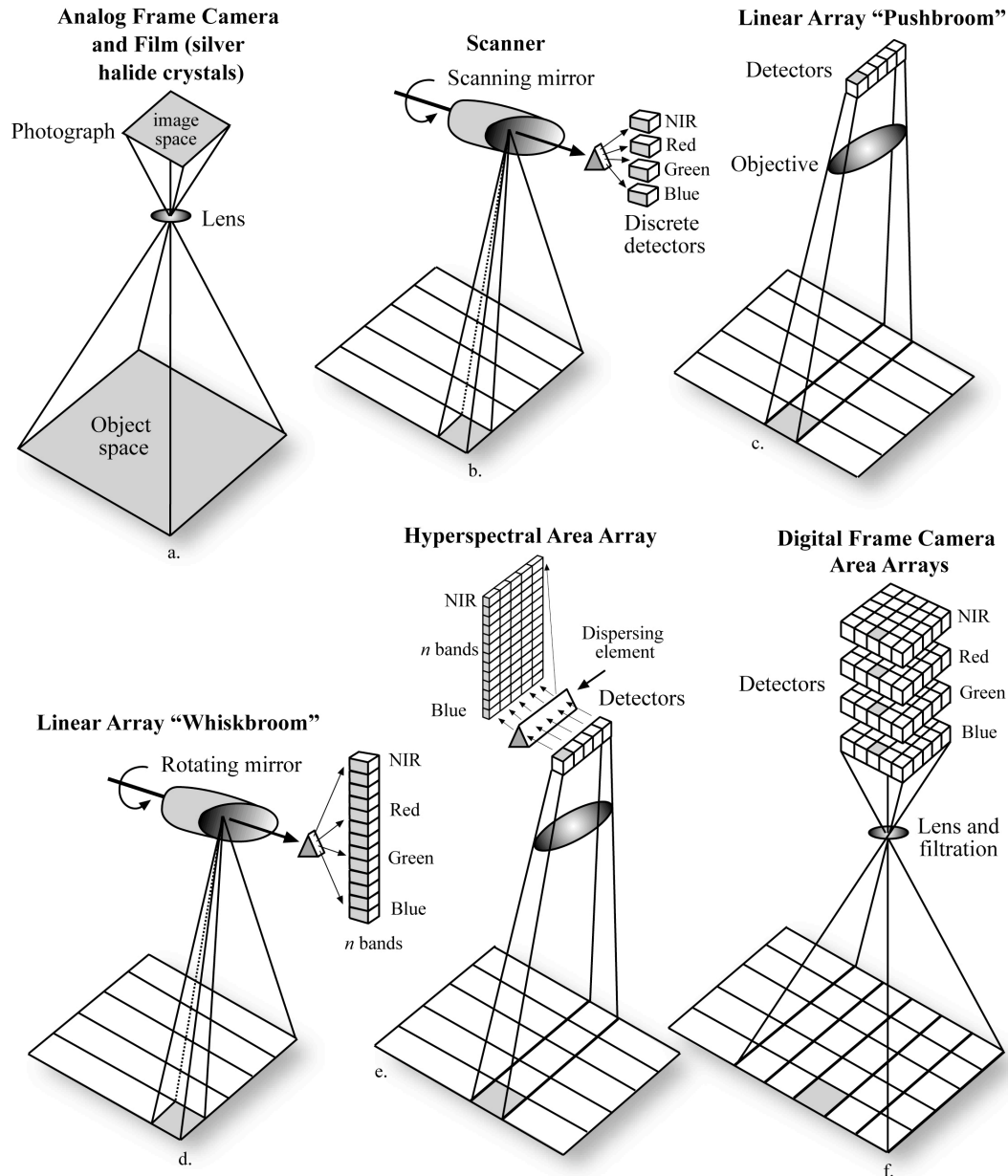
Landsat USGS: <http://landsat.usgs.gov/index.php>



Chronological Launch and Retirement History of the Landsat Satellites

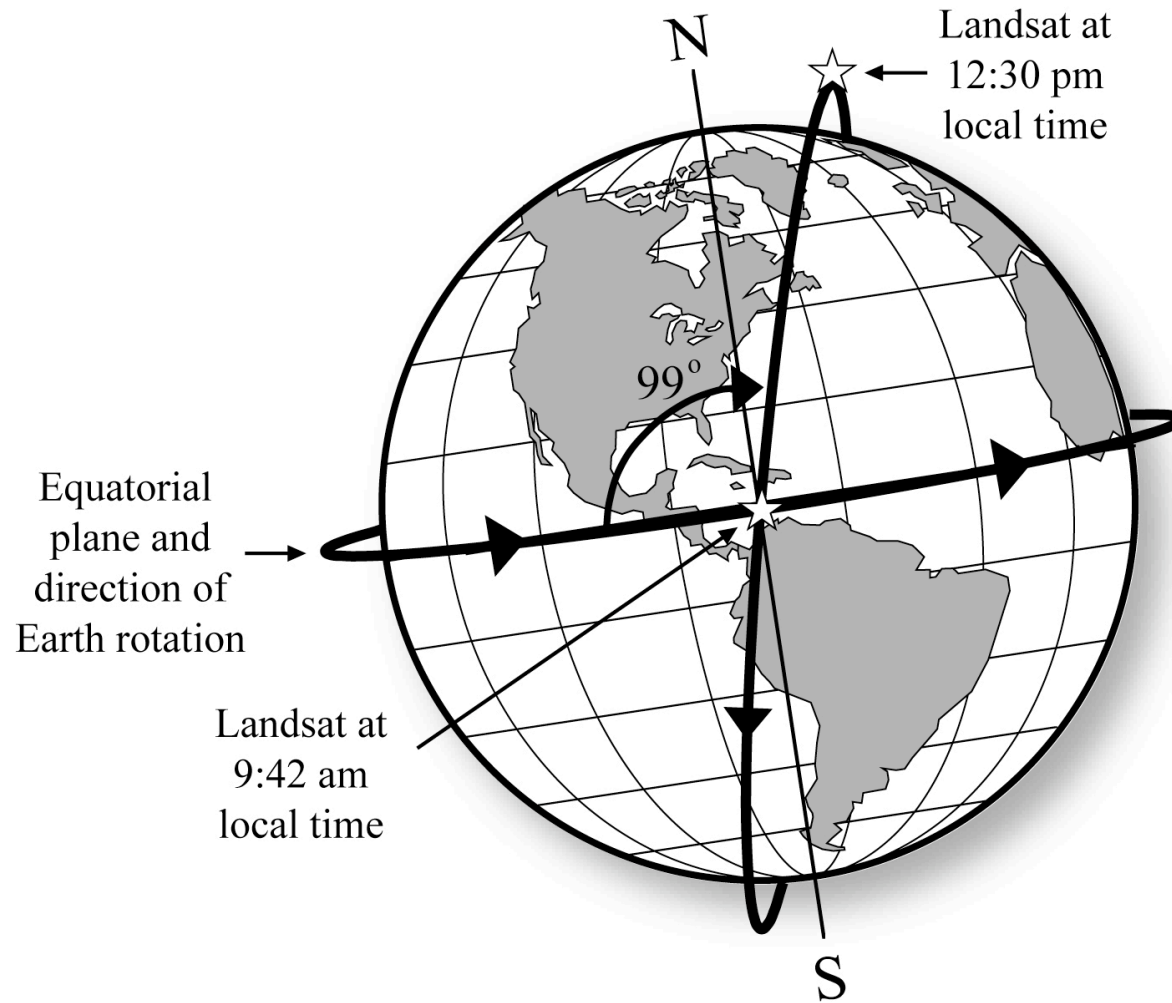


Remote Sensing Systems Used to Collect Multispectral and Hyperspectral Imagery



Remote Sensing System used for Multispectral and Hyperspectral Data Collection

Inclination of the Landsat Orbit to Maintain A Sun-synchronous Orbit



Sensor Resolutions

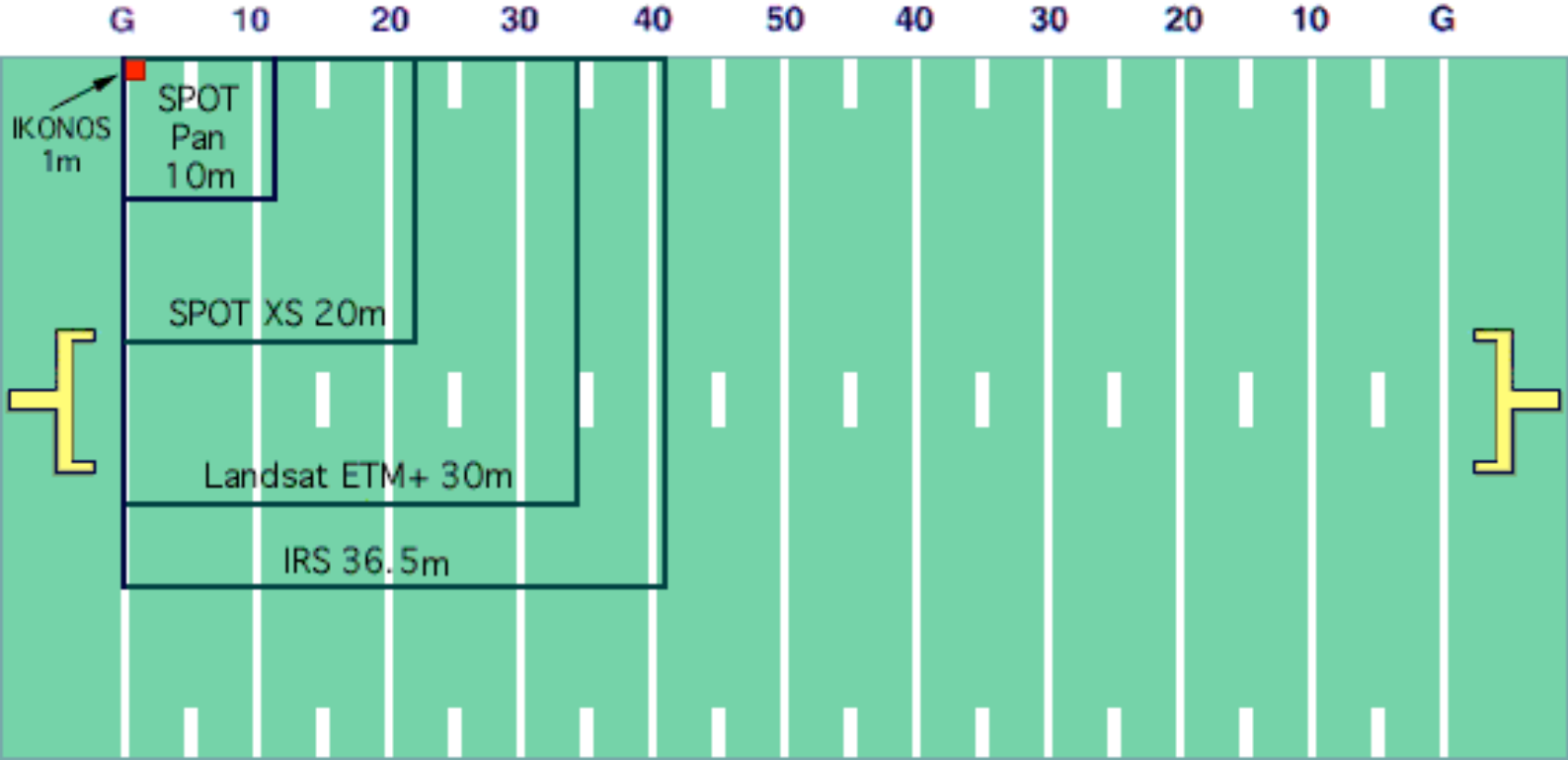
Spatial: what is the size of the “footprint” on the surface?
What is the smallest thing you can detect?

Temporal: how often does the sensor collect data of a
given location?

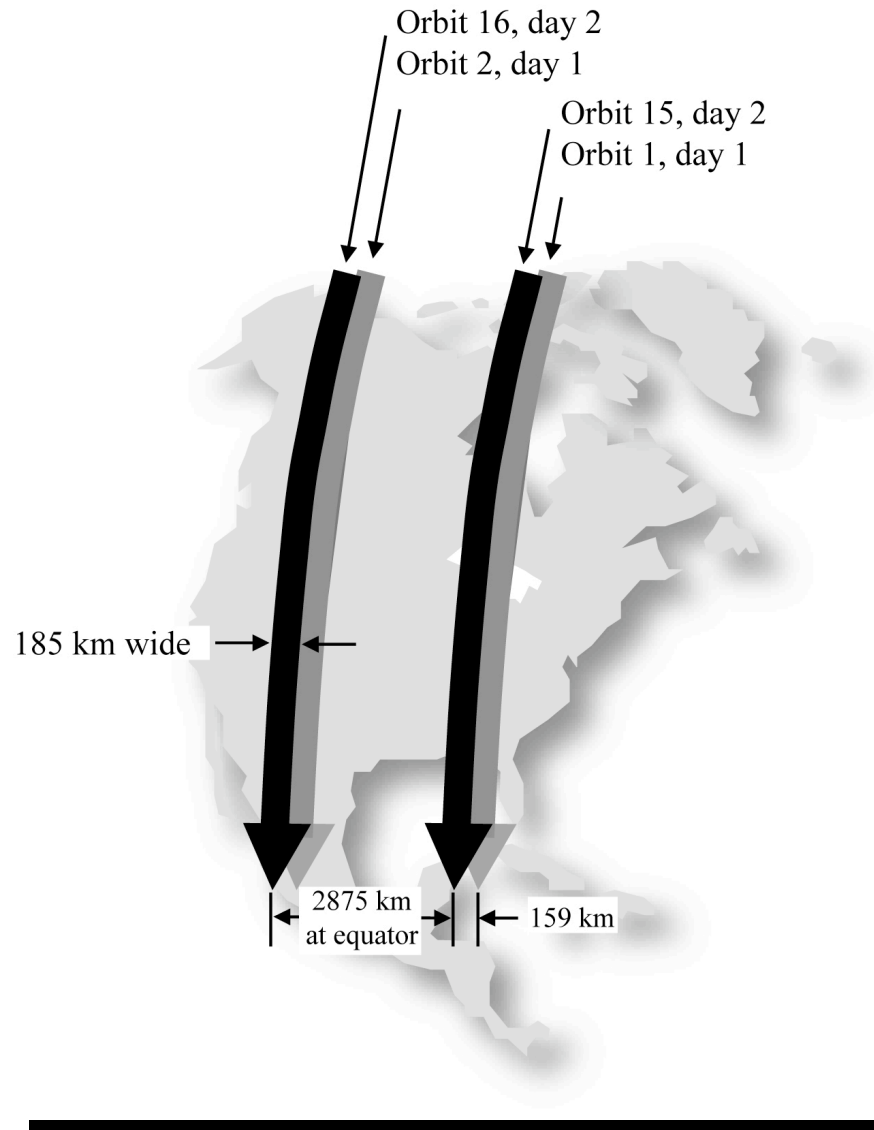
Spectral: what parts of the electromagnetic spectrum are
being used? What is the “spectral width” of each
channel?

Radiometric: how many levels of intensity can you
measure?

Spatial Resolution - 30m

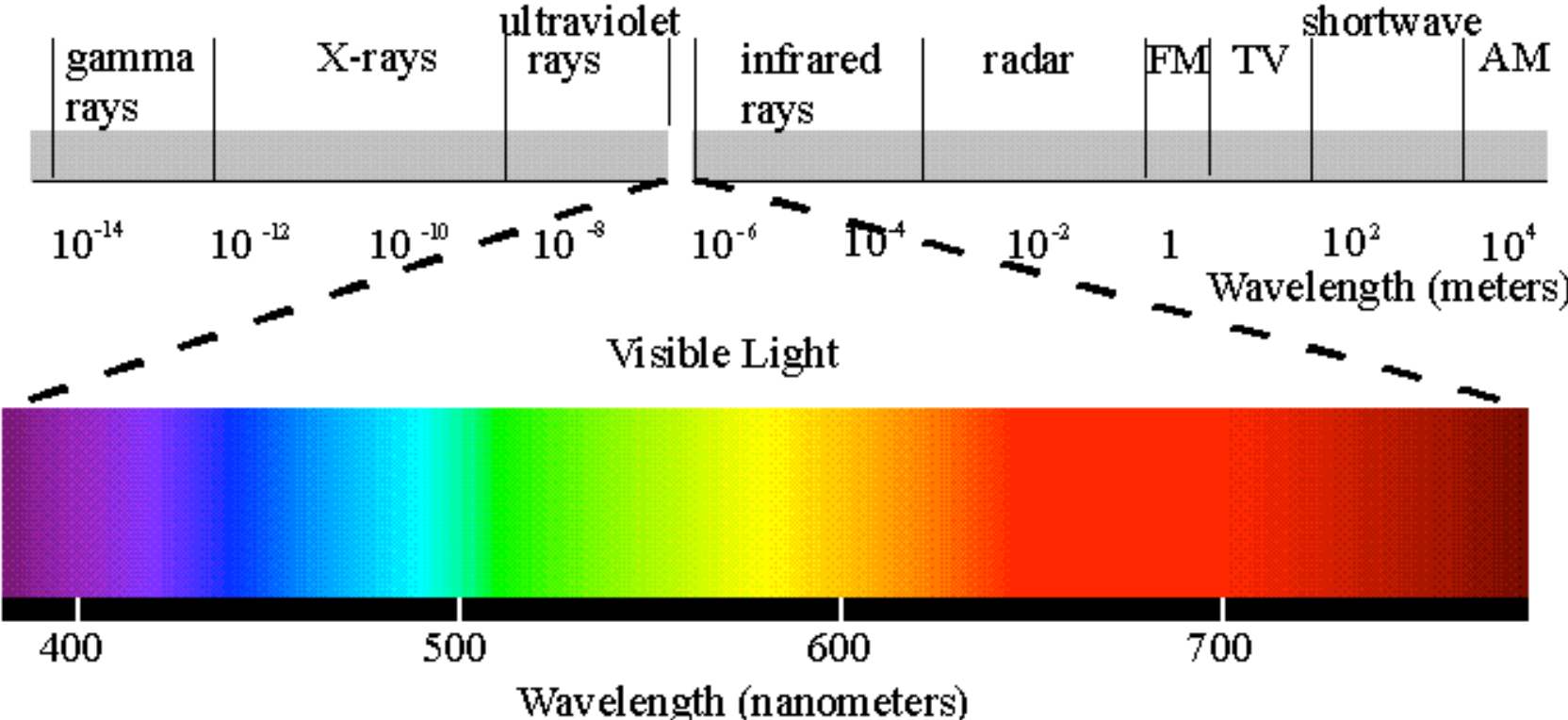


Landsat Multispectral Scanning System (MSS) Orbit



**Temporal
Resolution -
16 days**

Spectral Resolution - 3 vis, 4 IR, 1 pan



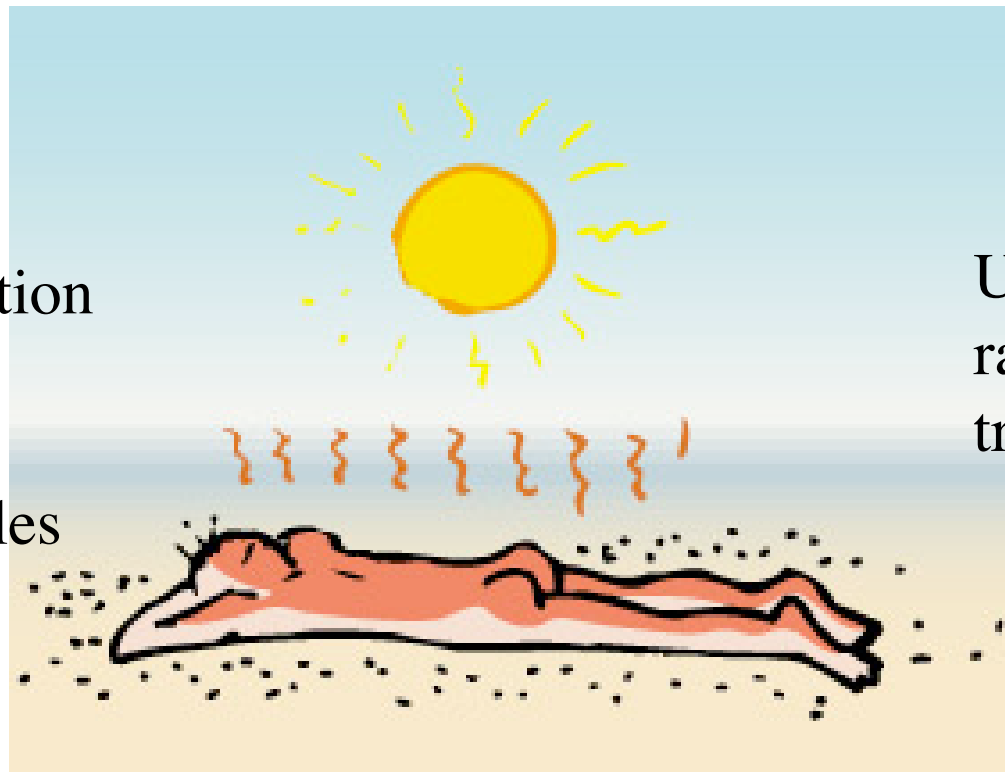
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[Visual Stimulus](#)

Burning on a Cloudy Day

-skin is more sensitive to IR than UV radiation

Infrared radiation
absorbed
(blocked) by
water molecules



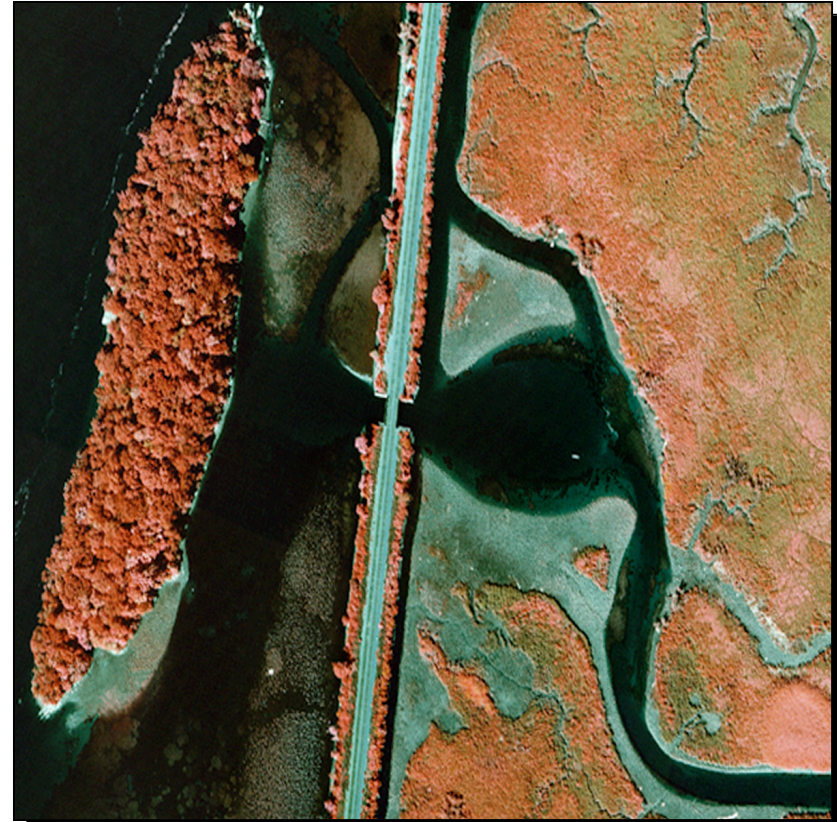
Ultraviolet
radiation
transmitted

So, infrared wavelengths do not give much
information about water characteristics

Aerial Photography



Normal Color



False-color Infrared
Using Wratten #12 filter

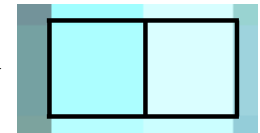
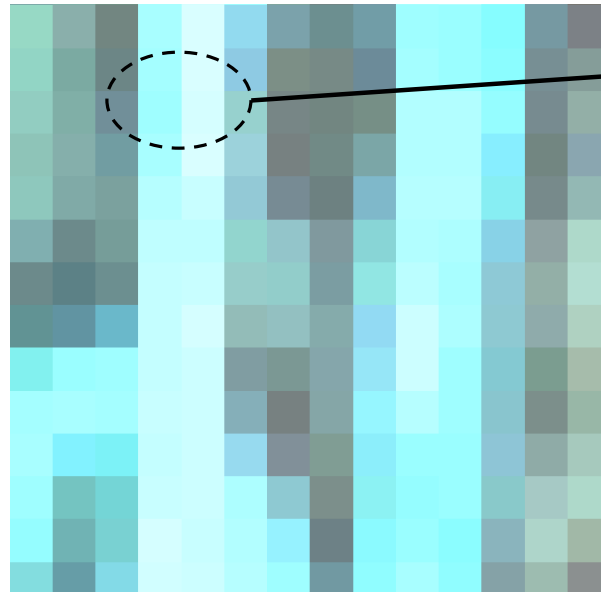
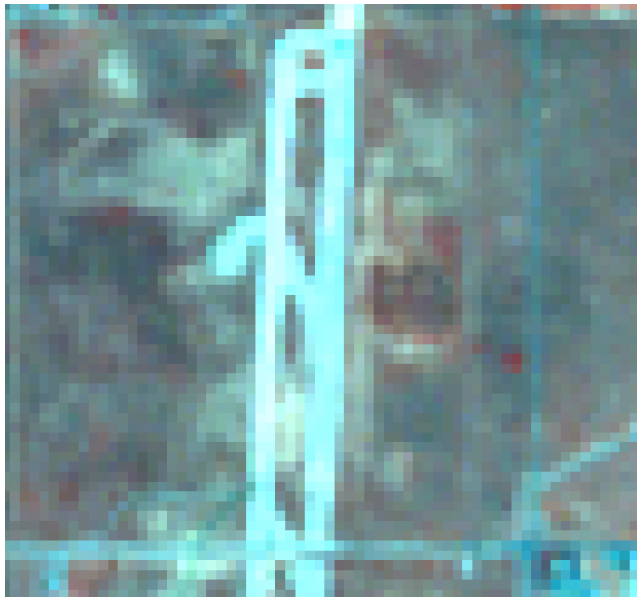
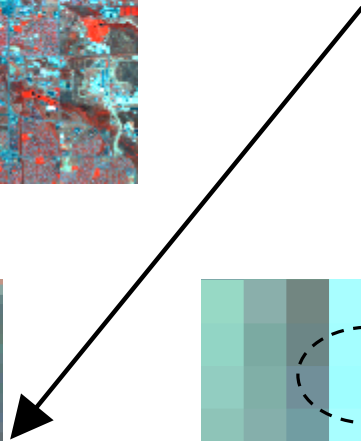
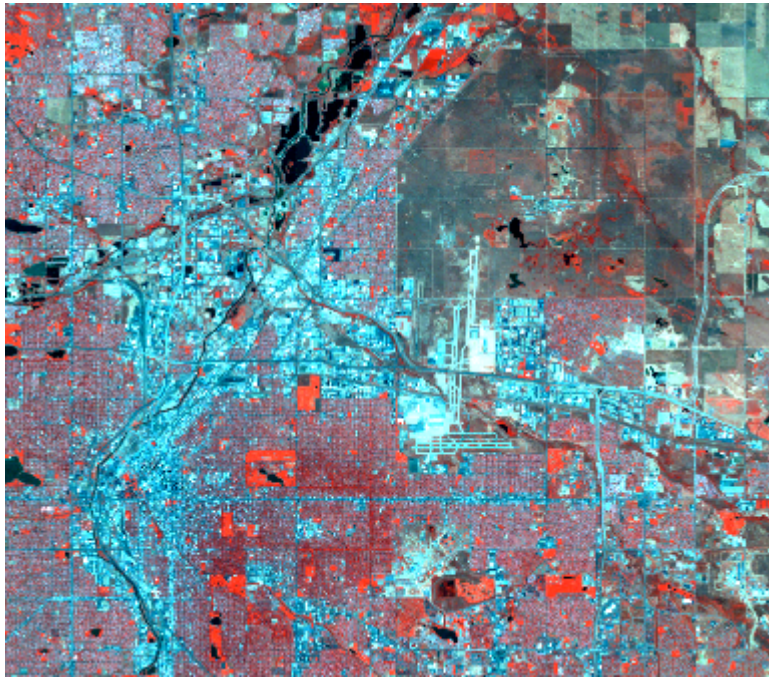
Identifying Targets

General composition: wet, dry, vegetated, pavement
(agriculture, water, urban)

Shape: round, square, oval, irregular
(racetrack, river, geologic structure)

Size: 1-2 pixels, many pixels
(highway, city block)

Spectral signature: quantified signals
(types of soil, vegetation, rock/mineral)



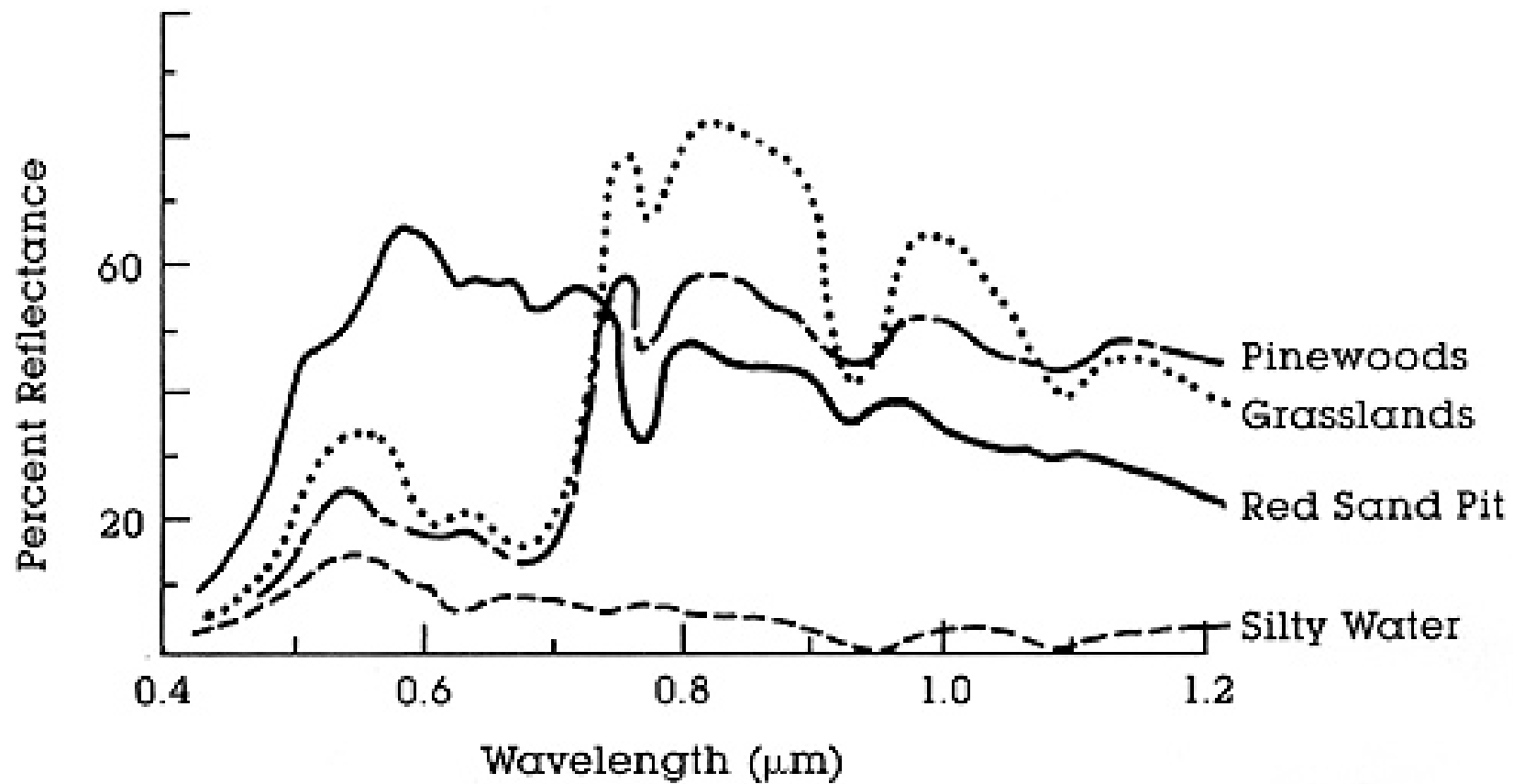
1 pixel = 30 meters

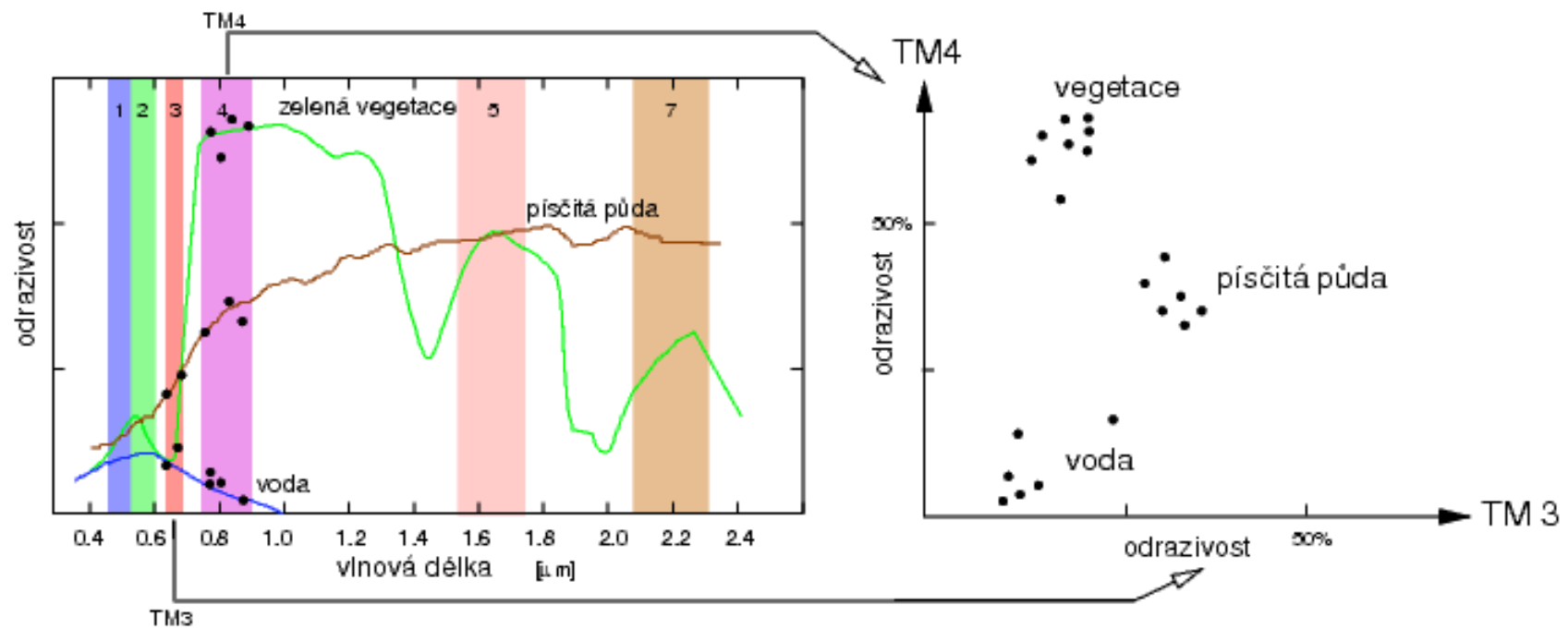
...How wide is the Denver Airport runway?

What Bands to Use?

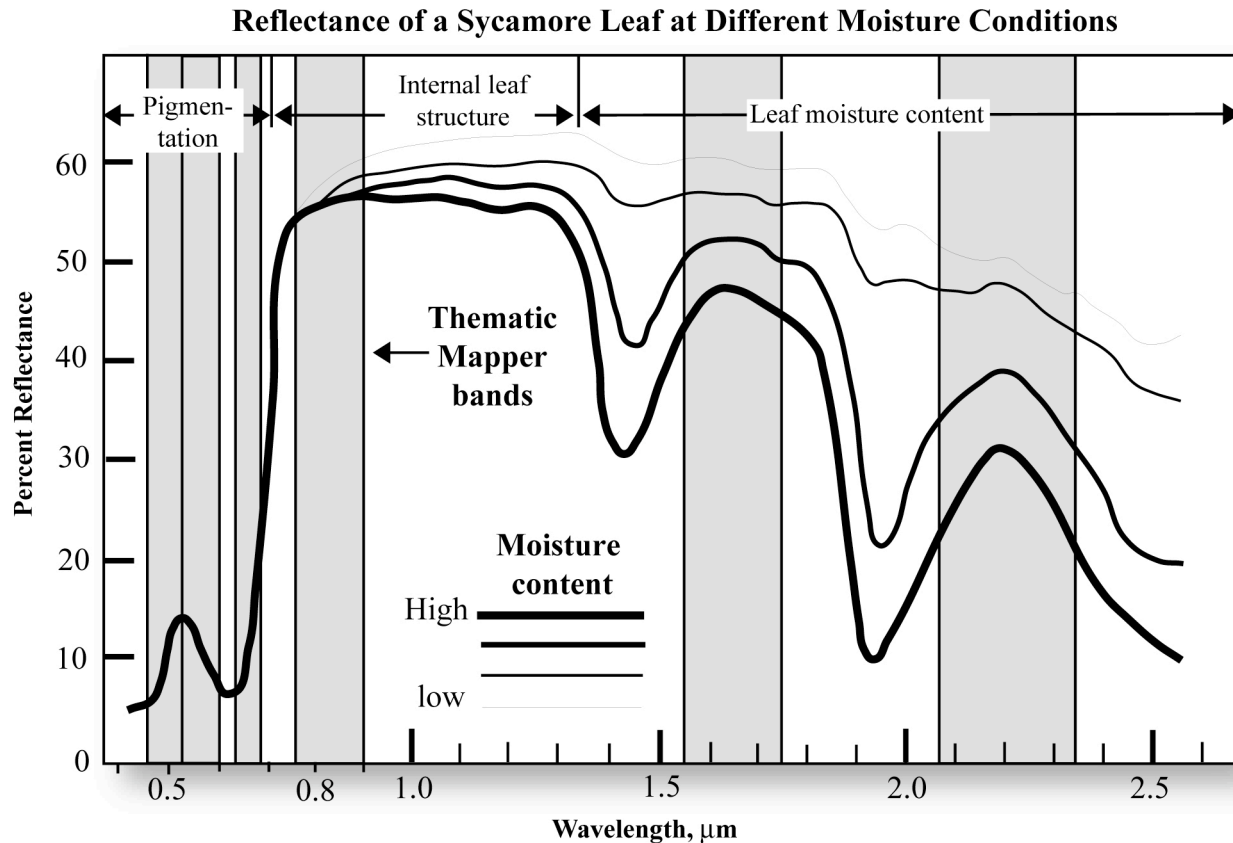
Want large differences in reflectance among different targets, to give you the most information:

- water vs land
- vegetation vs bare ground
- buildings, pavement vs vegetation





Reflectance of the Upper Surface of A Sycamore Leaf at Different Moisture Contents



Landsat 5 Thematic Mapper Data of Charleston, SC



a. Band 1.



b. Band 2.



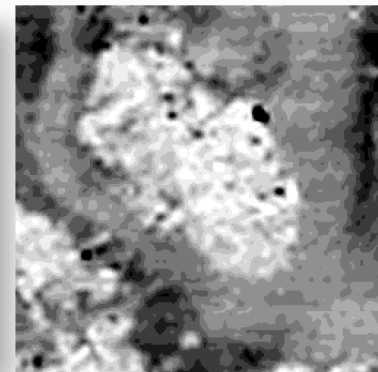
c. Band 3.



d. Band 4.



e. Band 5.



f. Band 6 (thermal infrared).



g. Band 7.

Seven Bands of Landsat
Thematic Mapper Data of
Charleston, SC, Obtained on
February 3, 1994