Lecture given at the

WCS Workshop on Land Change Modeling for REDD

October 25– 29, 2010

Wildlife Conservation Society - Bronx Zoo
Bronx, New York, USA

Hosted by

Clark Labs and the Wildlife Conservation Society

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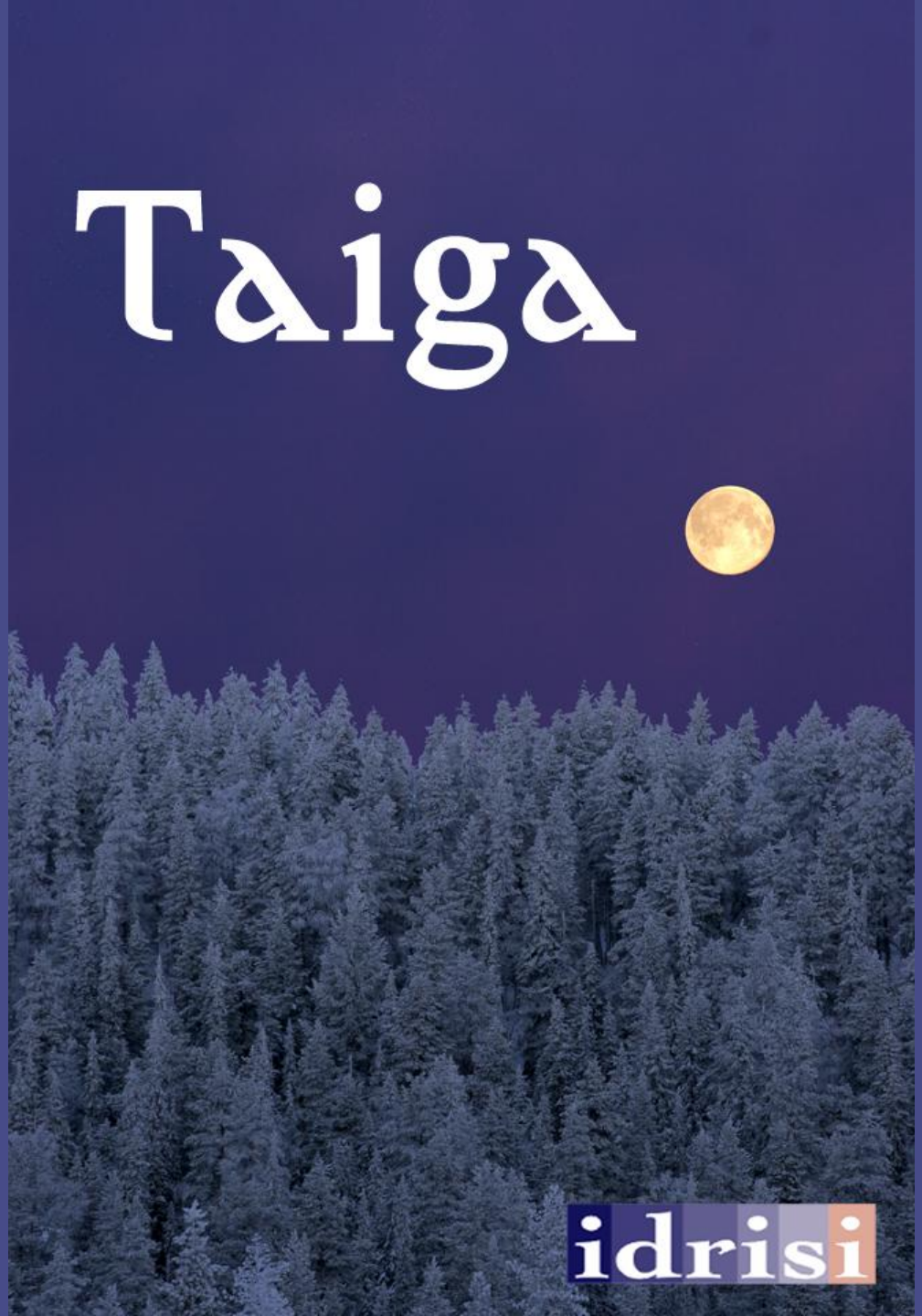
Taiga



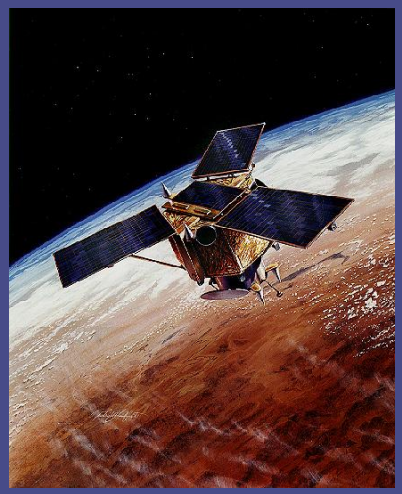
Introduction to Remote Sensing

In this section you will learn:

- **Definition of Remote Sensing**
- **Optical Imagery and Spectral Reflectances**
- **Satellite Imagery**
- **Creating a Composite Image**
- **Image Classification**

Remote Sensing

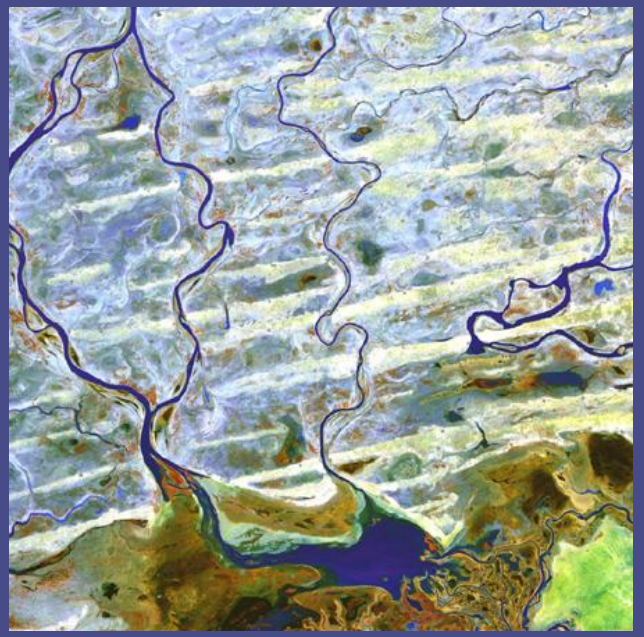
Remote sensing refers to the gathering of information about the environment by measuring the interaction between electromagnetic energy and the materials of which the environment is composed.



Optical Imagery and Spectral Reflectance

Energy Source

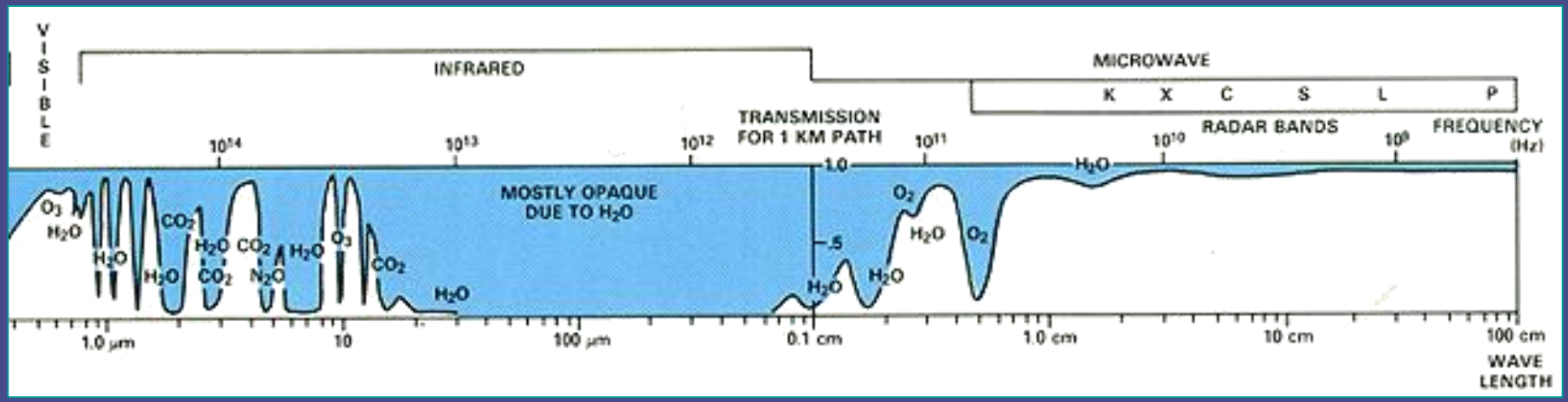
- Passive sensors use reflected solar radiation



Optical Imagery and Spectral Reflectance

Wavelength

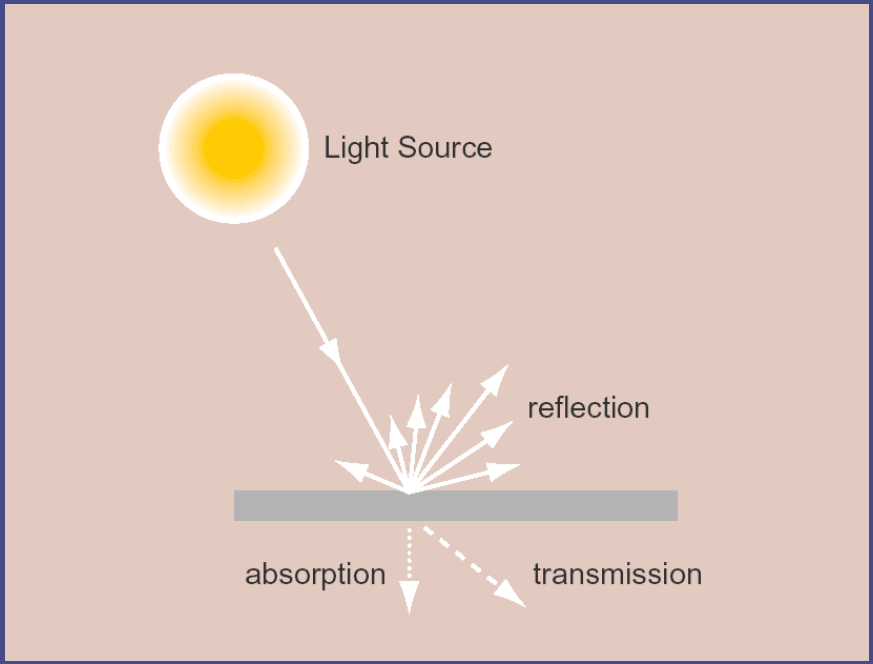
- Electromagnetic Spectrum
- Atmospheric Windows



Optical Imagery and Spectral Reflectance

Interaction Mechanisms

- Reflection
  - Diffuse
  - Specular
- Absorption
- Transmission

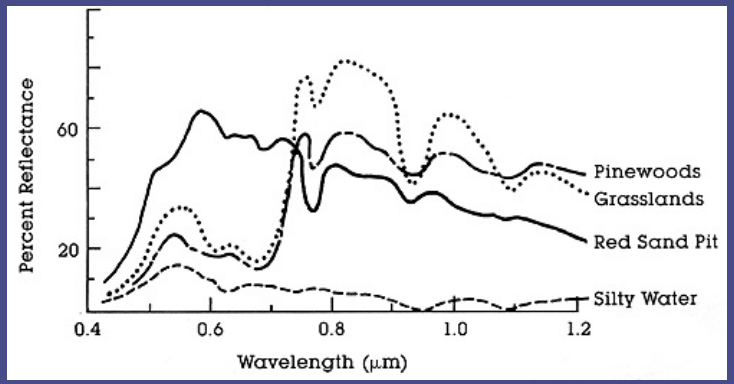


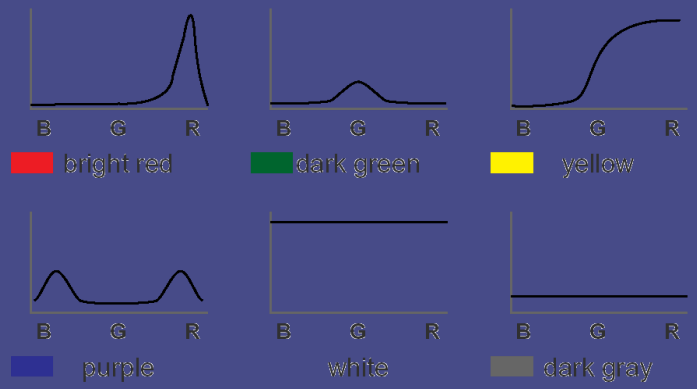
… amount depends on what material and where in the electromagnetic spectrum

Optical Imagery and Spectral Reflectance

Spectral Response Patterns (Signatures)

- A description of the degree to which energy is reflected in different areas of the spectrum.





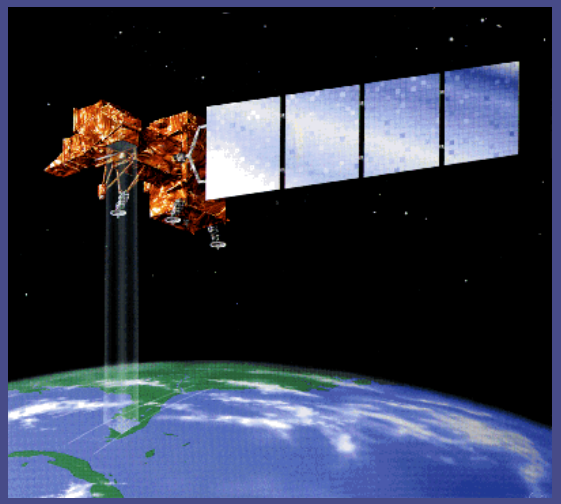
… amount depends on what material and where in the electromagnetic spectrum

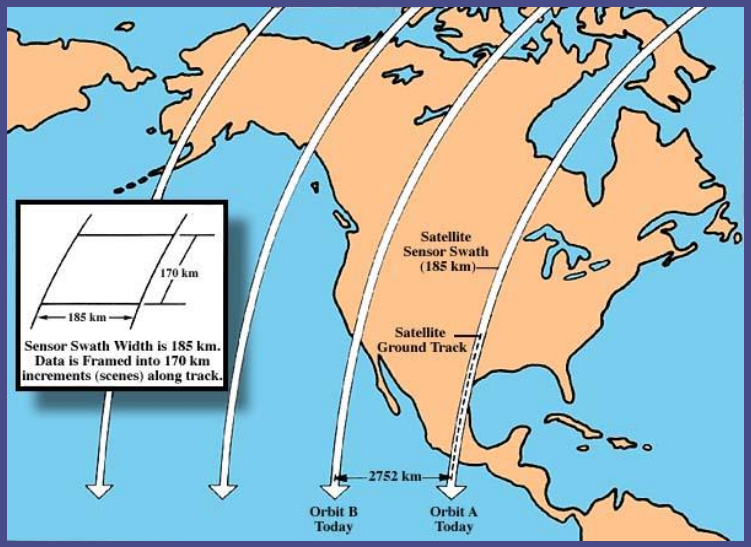
Satellite Imagery

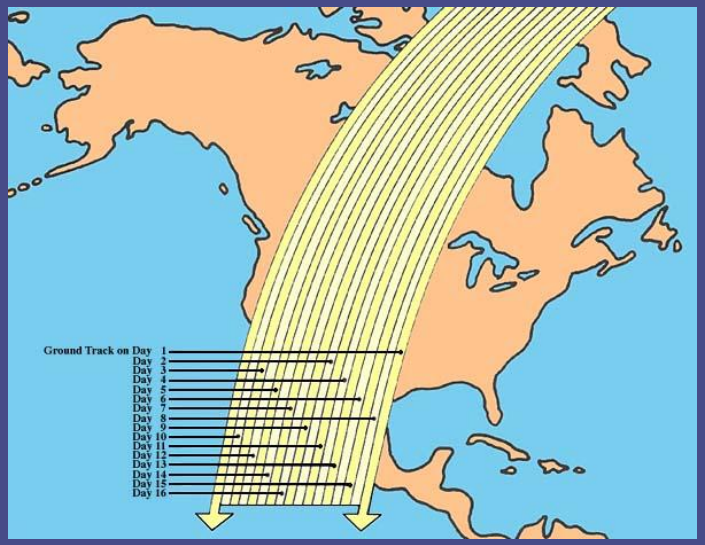
LANDSAT

- Orbit - 16 day repeat cycle

Landsat 1	1972	Landsat 2	1975
Landsat 3	1978	Landsat 4	1982
Landsat 5	1984	Landsat 6	lost
Landsat 7	1999		







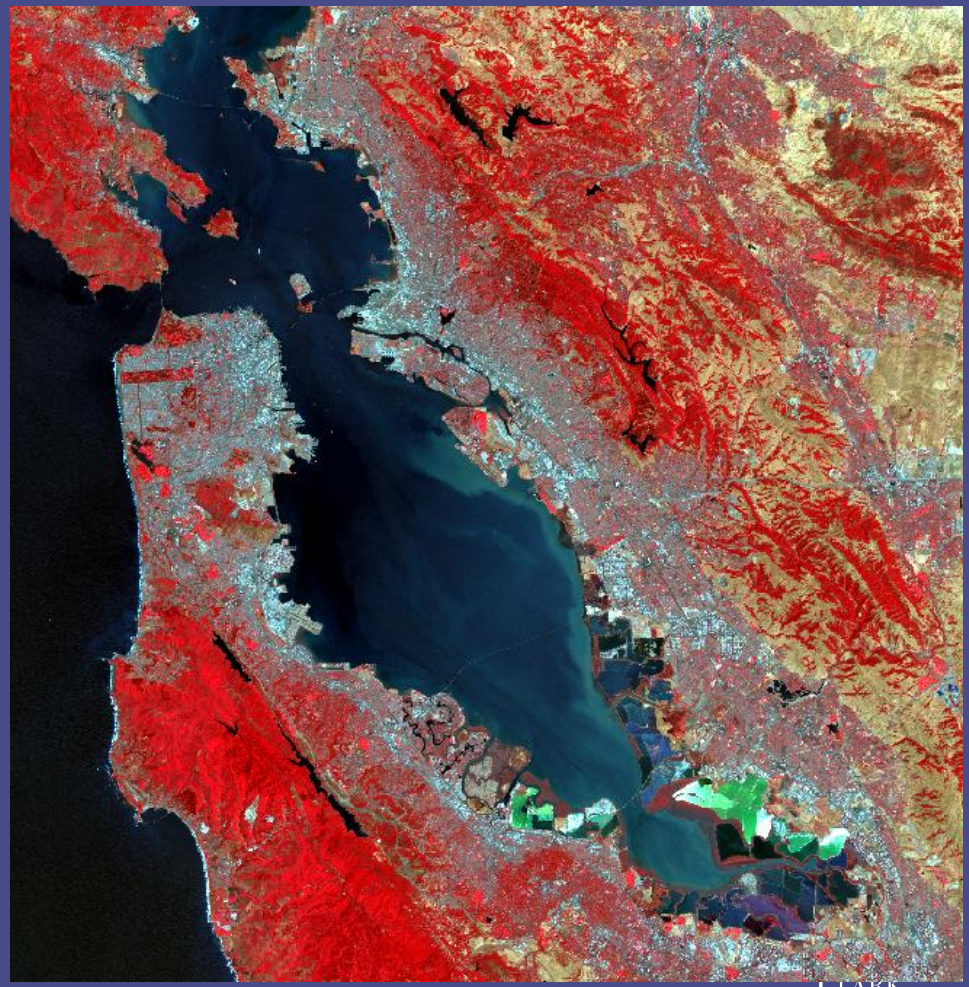
Satellite Imagery

LANDSAT

- TM

Band 1	0.45 – 0.52 µm
Band 2	0.52 – 0.60 µm
Band 3	0.63 – 0.69 µm
Band 4	0.76 – 0.90 µm
Band 5	1.55 – 1.75 µm
Band 6	10.4 – 12.5 µm
Band 7	2.08 – 2.35 µm

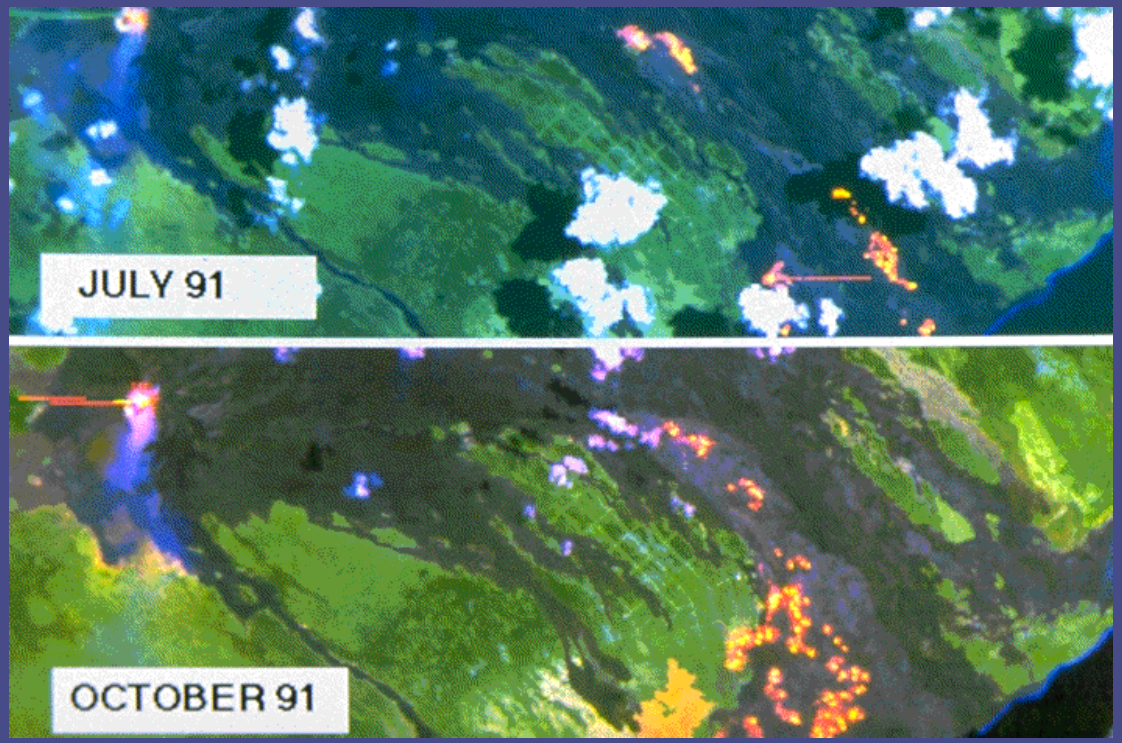
- 30 m Bands 1-5 and 7
- 120 m Band 6
- 185 km coverage
- 16 line scan



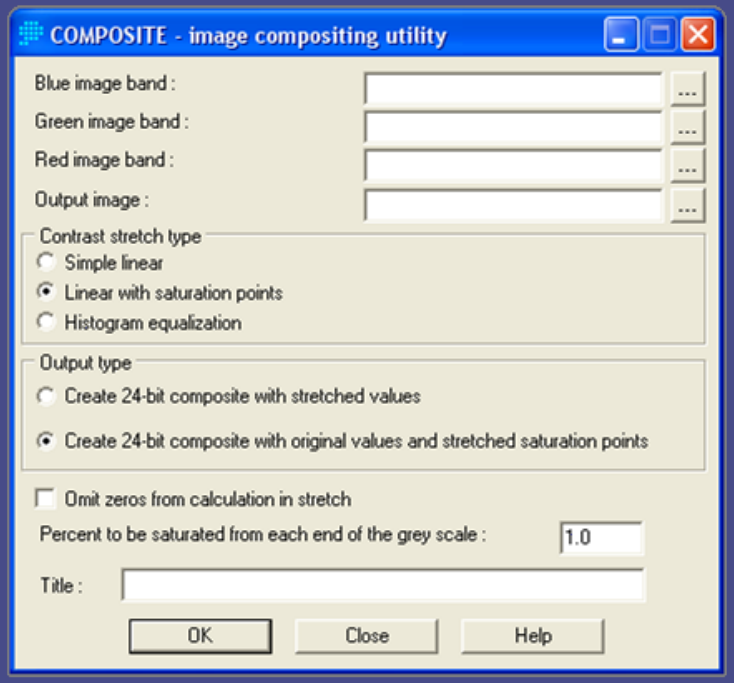
Satellite Imagery

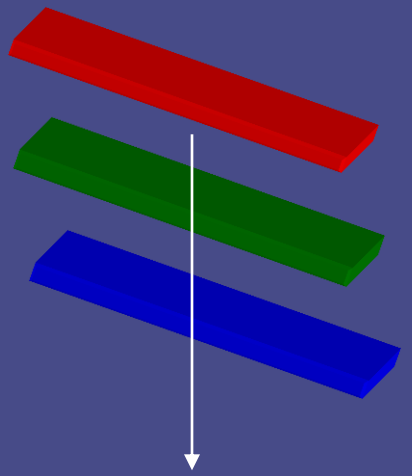
LANDSAT

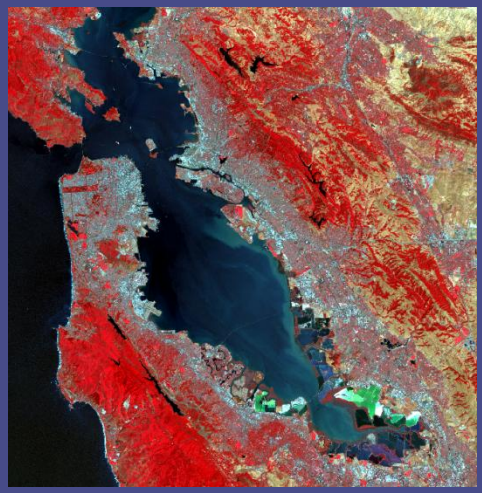
- ETM+
  - Band 6 low and high gain
  - Pan 0.50 – 0.90 μm
- 60 m Band 6
- 15 m Pan



Creating a Composite Image







Composite: produces a 24-bit color composite image from three bands of byte binary imagery for display and visual analysis.

Image Classification

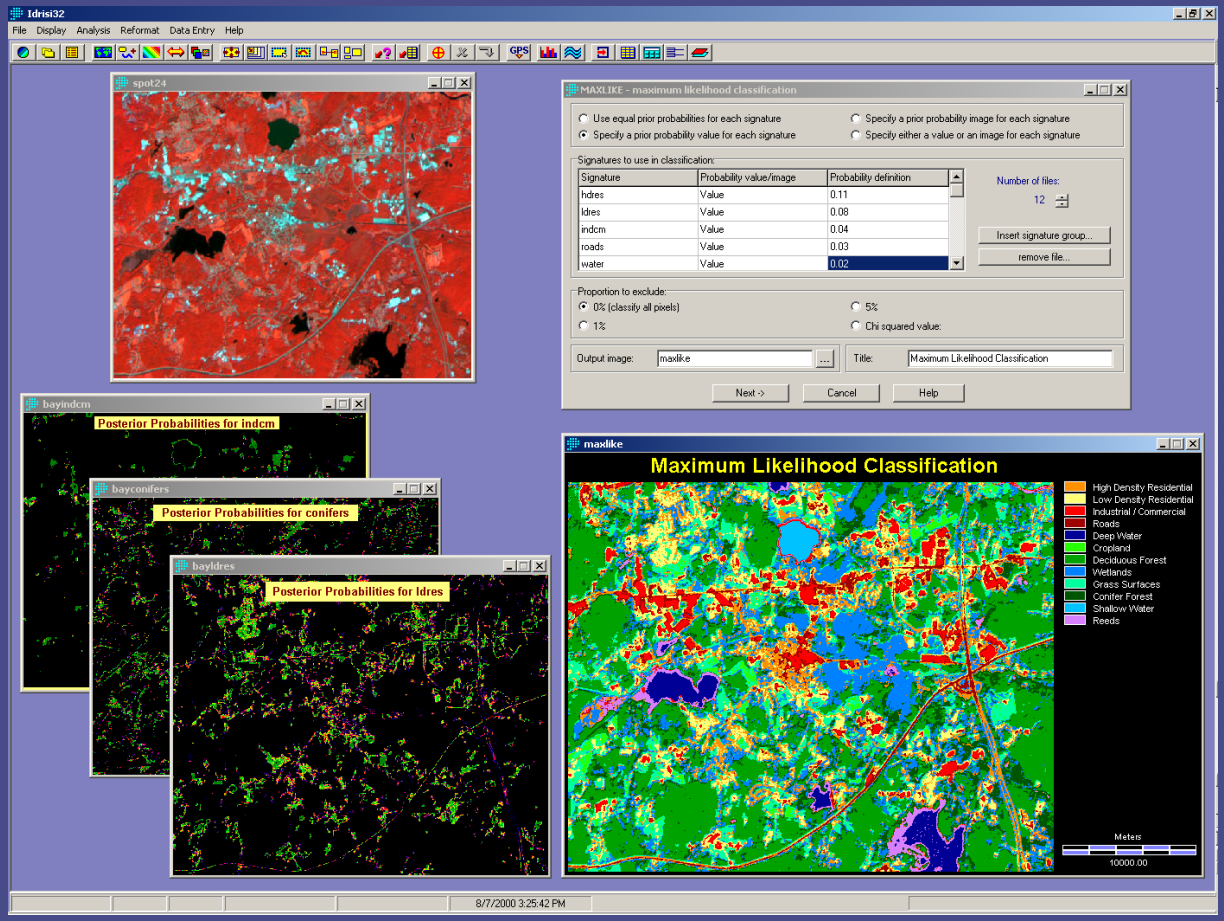
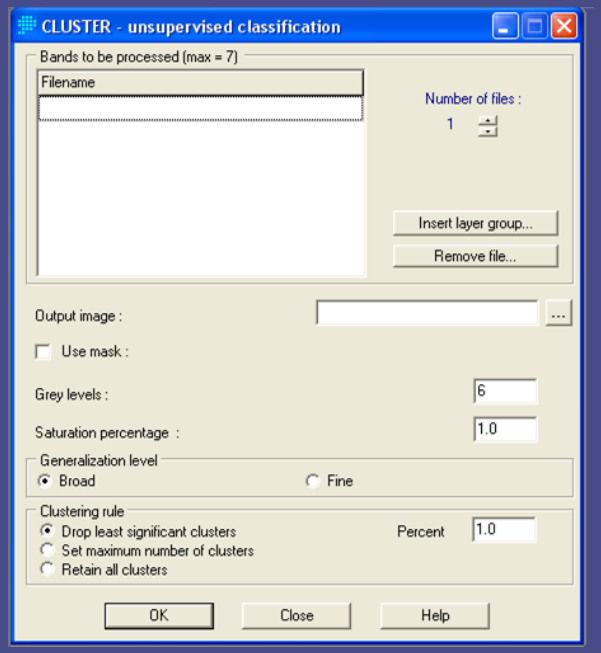
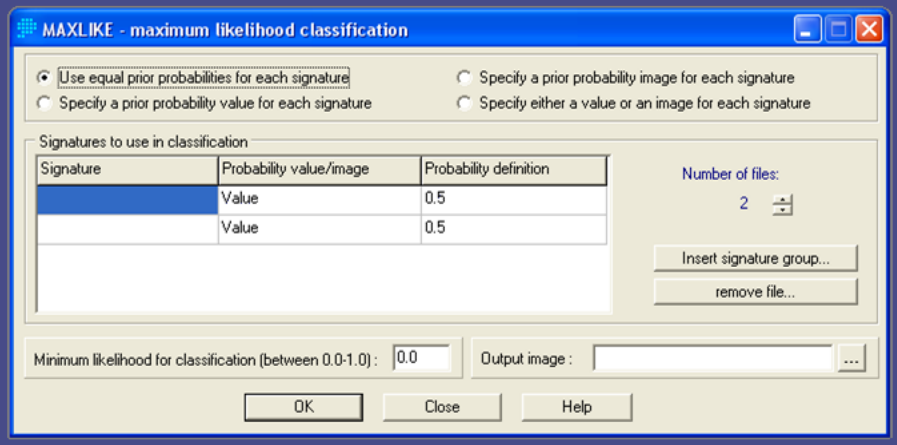


Image Classification

Image Classification

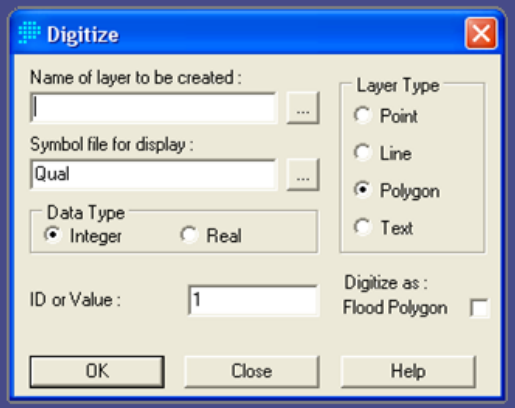


Cluster: provides an unsupervised classification of input images using a histogram peak technique.

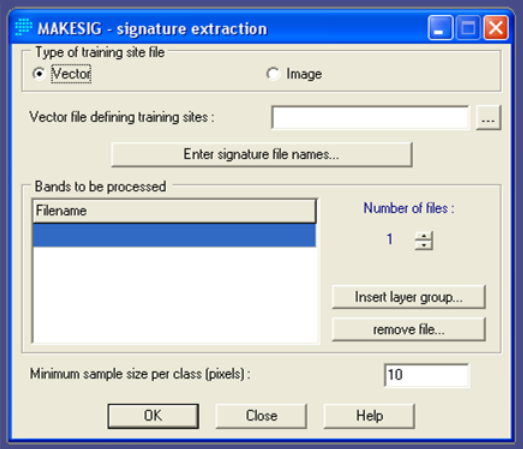


MaxLike: undertakes a Maximum Likelihood classification of remotely sensed data based on information contained in a set of signature files.

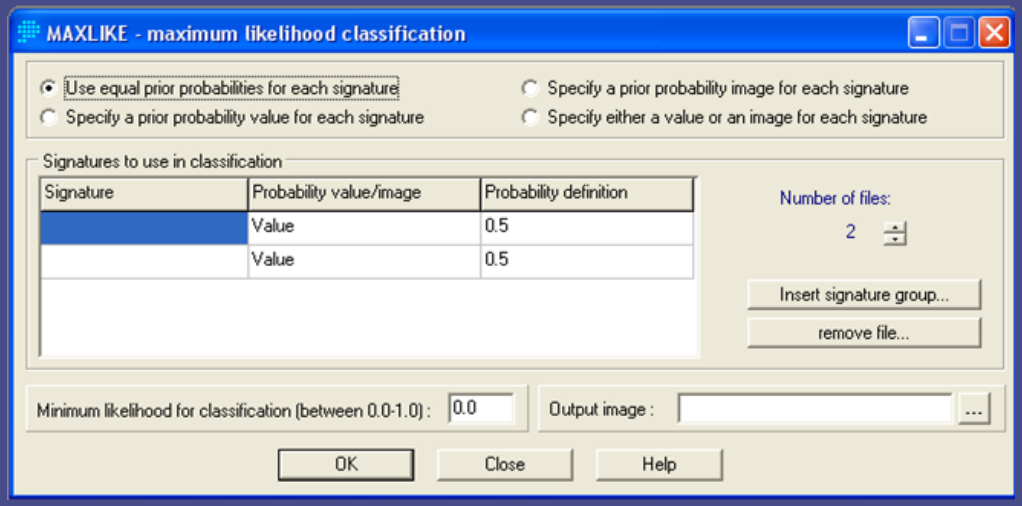
Image Classification - Supervised



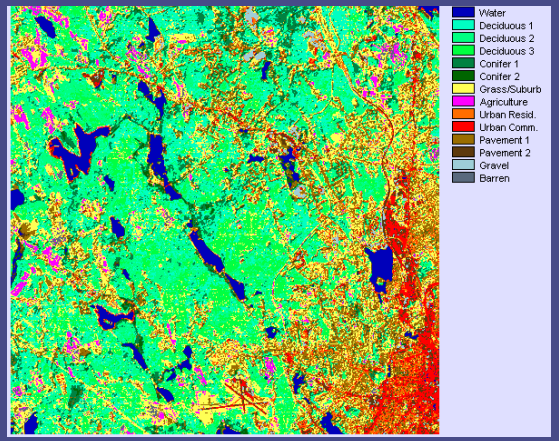
Digitize: provides the ability to digitize on screen. Polygons of land cover types are digitized over the satellite image.



A signature file is created from the digitized polygons.



Maximum Likelihood uses the signature file…



…to create a classified map.

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