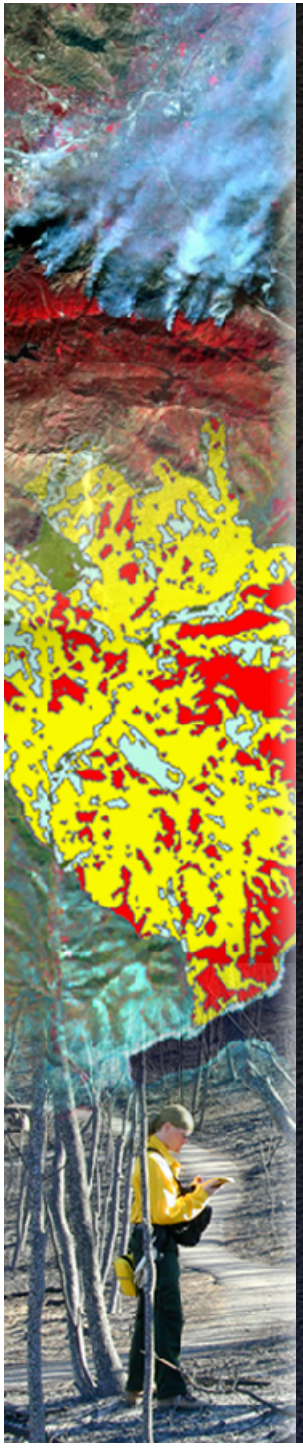


Digital Remote Sensing

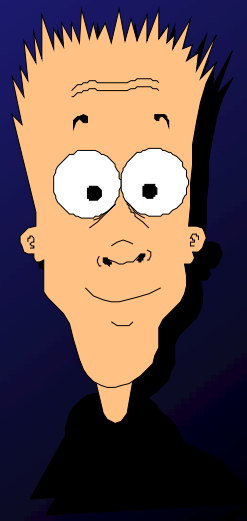
Part 1: An Introduction

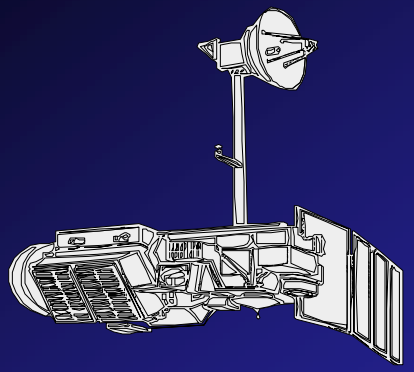
Topics

- Electromagnetic (EM) Energy and the EM spectrum
- Introduction to Spectral Signatures
  - Healthy vegetation
  - Burned areas

What is Remote Sensing?

Remote Sensing can be defined as: the collection and interpretation of information about objects based on the measurement of electromagnetic energy reflected or emitted from those objects.

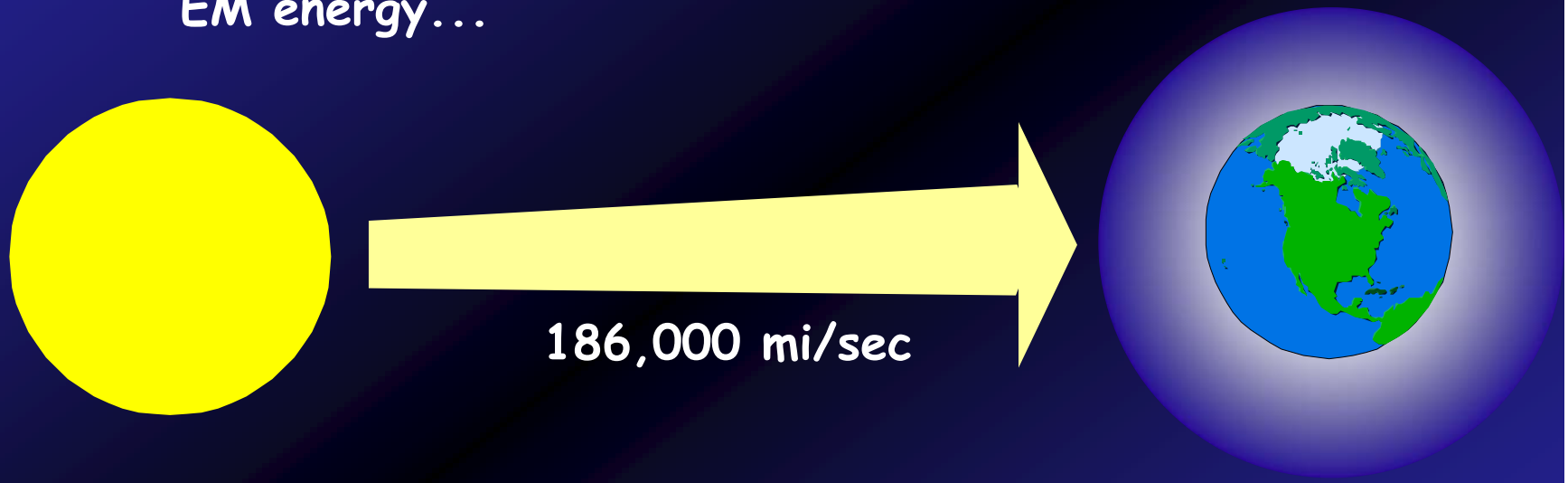




We can collect remotely sensed data in a number of ways: Our eyes are sensitive to a portion of the EM spectrum, airborne and spaceborne sensors can carry instruments to record EM energy...

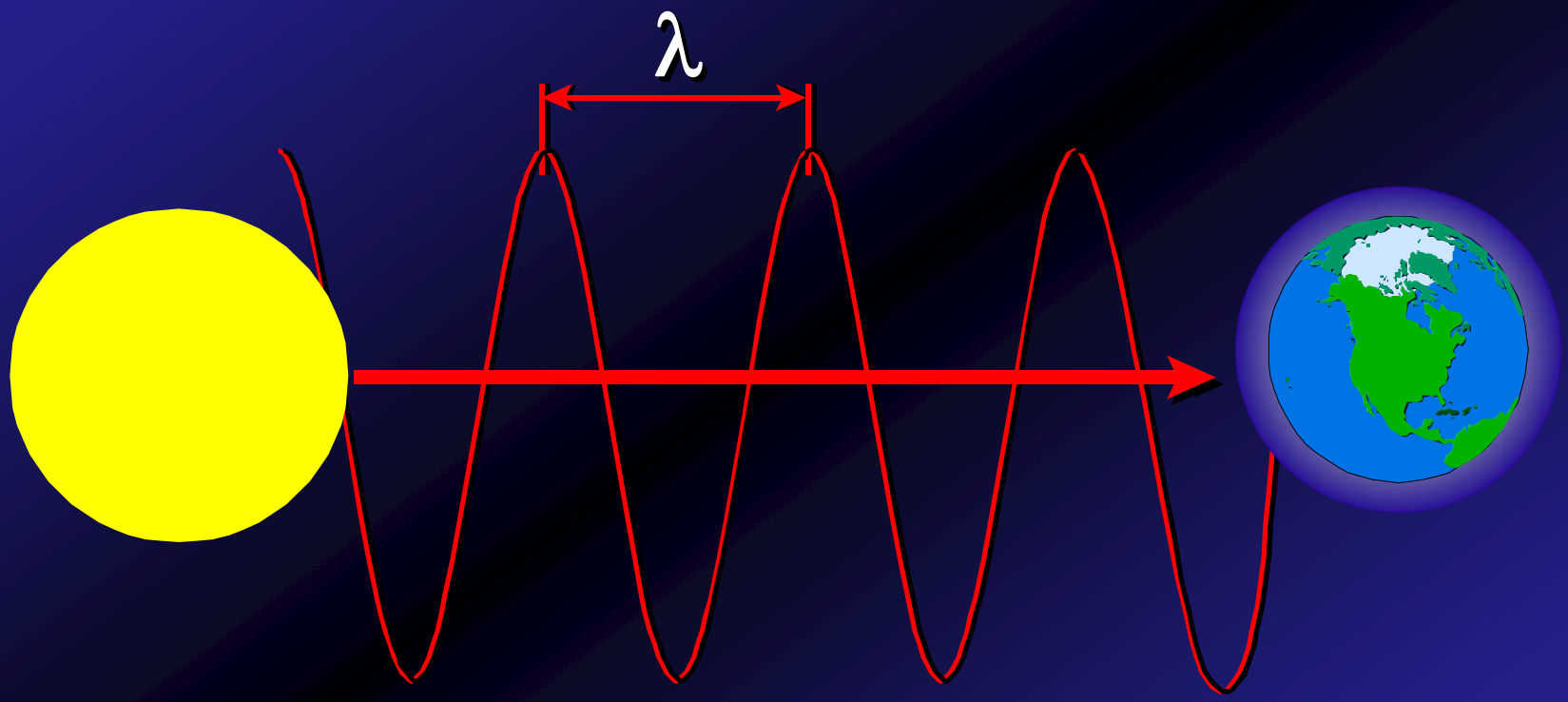
What is EM Energy?

The sun is our primary source of EM energy...



What is EM Energy?

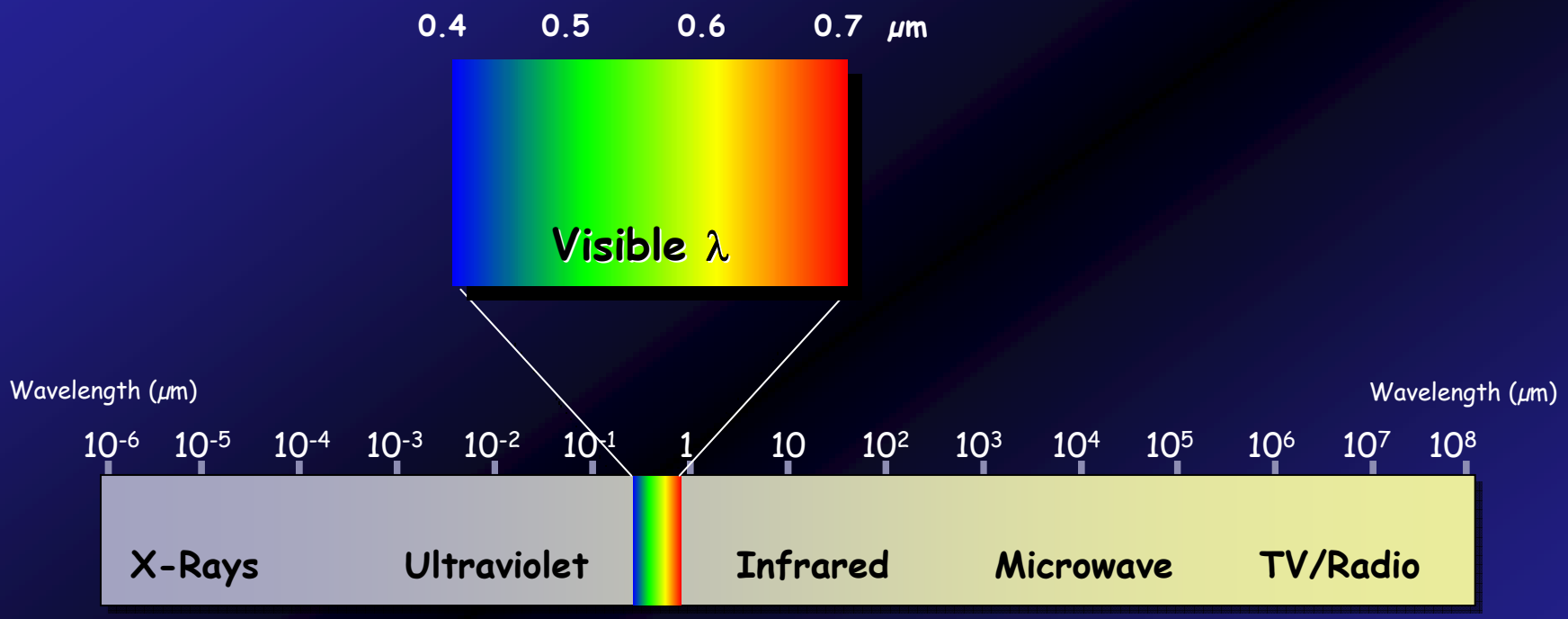
EM Energy Travels as a Wave...



Wavelength (λ) = the distance between wave crests.

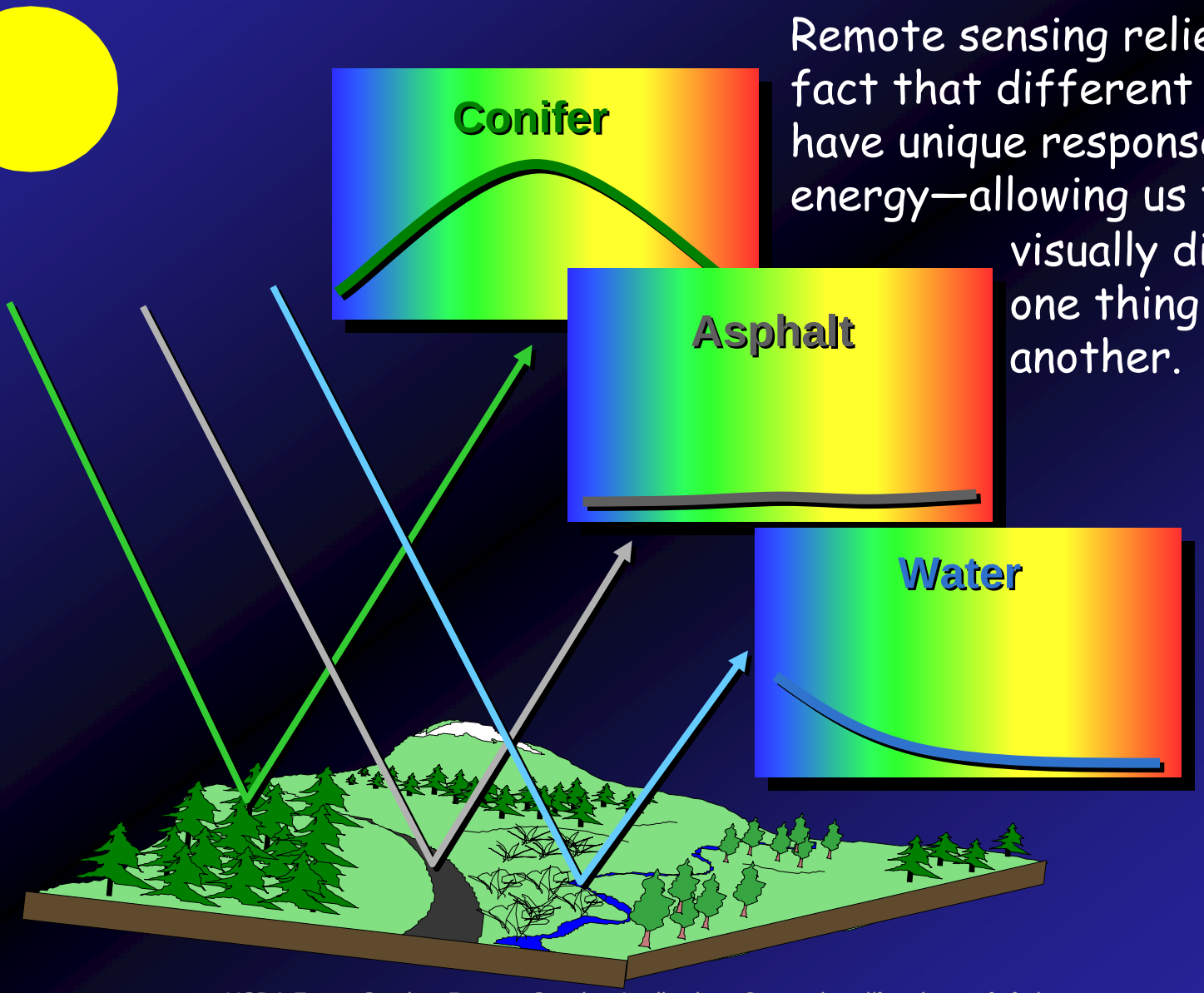
Wavelengths are usually measured in microns (μm)

What is EM Energy?



EM energy is a continuum which we (somewhat arbitrarily) classify according to wavelength. Wavelengths extend from very, very short (cosmic and X rays) to very, very long (thermal, radar, etc...).

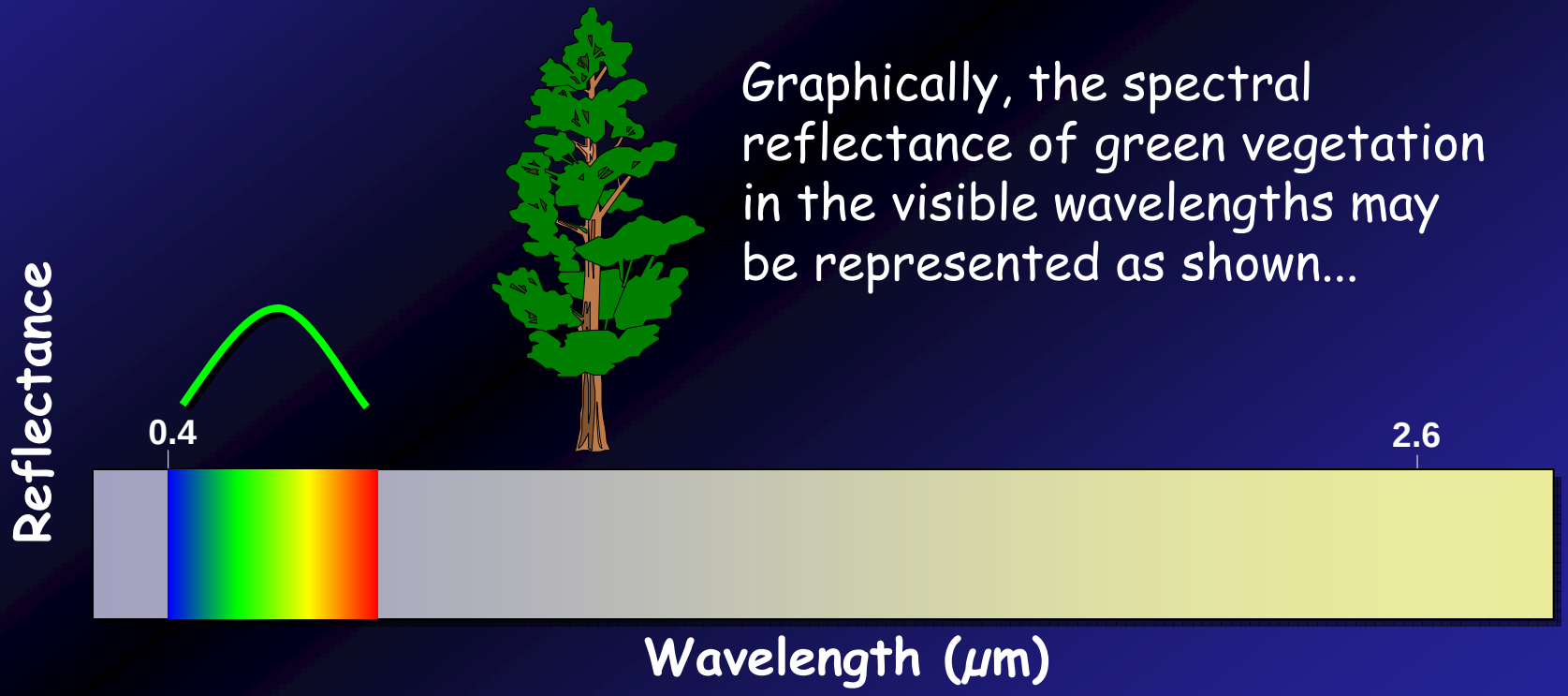
Remote Sensing and EM Energy



Remote sensing relies on the fact that different targets have unique responses to EM energy—allowing us to visually distinguish one thing from another.

Response to EM Energy

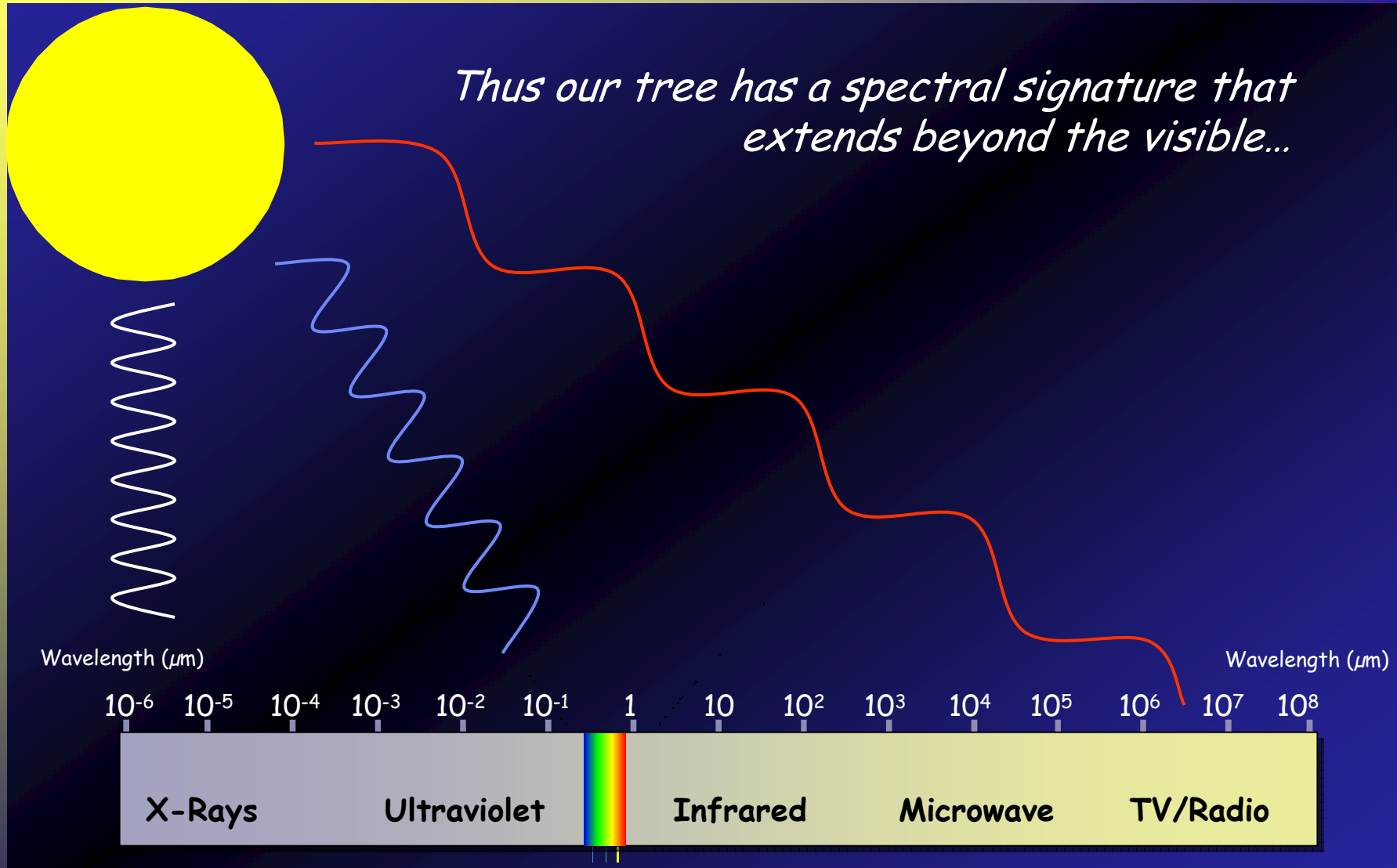
Spectral Response Curves, aka Spectral Reflectance Curves, aka Spectral Signatures...



Graphically, the spectral reflectance of green vegetation in the visible wavelengths may be represented as shown...

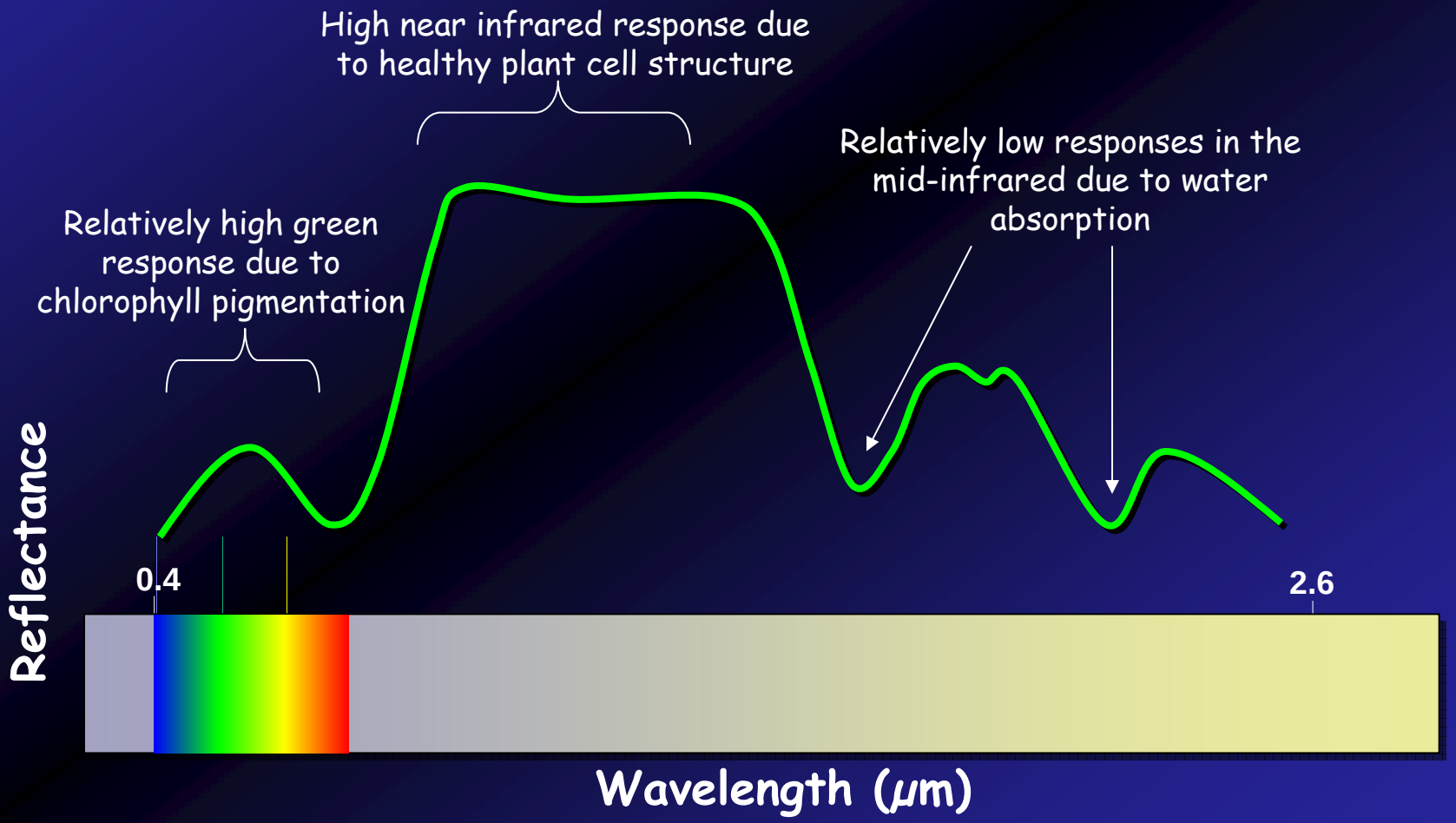
The Sun Emits a Full Spectrum of EM Energy

Thus our tree has a spectral signature that extends beyond the visible…



Response to EM Energy

Spectral Response Curve of Typical Vegetation From 0.4 to 2.6 µm



Spectral Response Curves

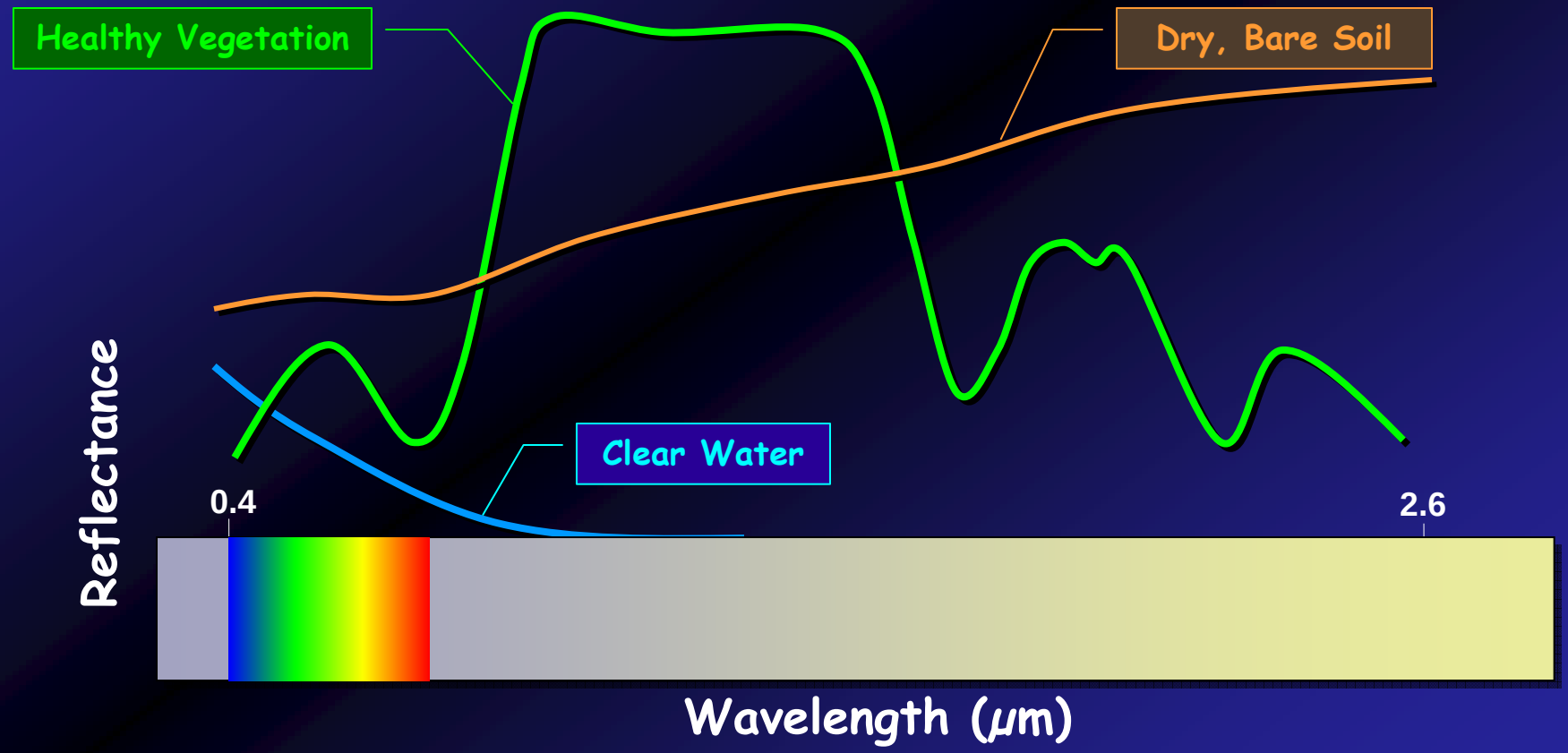
A Working Definition...

- An object's Spectral Response Curve is a representation of the reflected EM energy of that object across a portion of the EM spectrum, as the object is exposed to (our Sun's) EM radiation.

- For most purposes, Spectral Response Curves, Spectral Reflectance Curves and Spectral Signatures are synonymous.

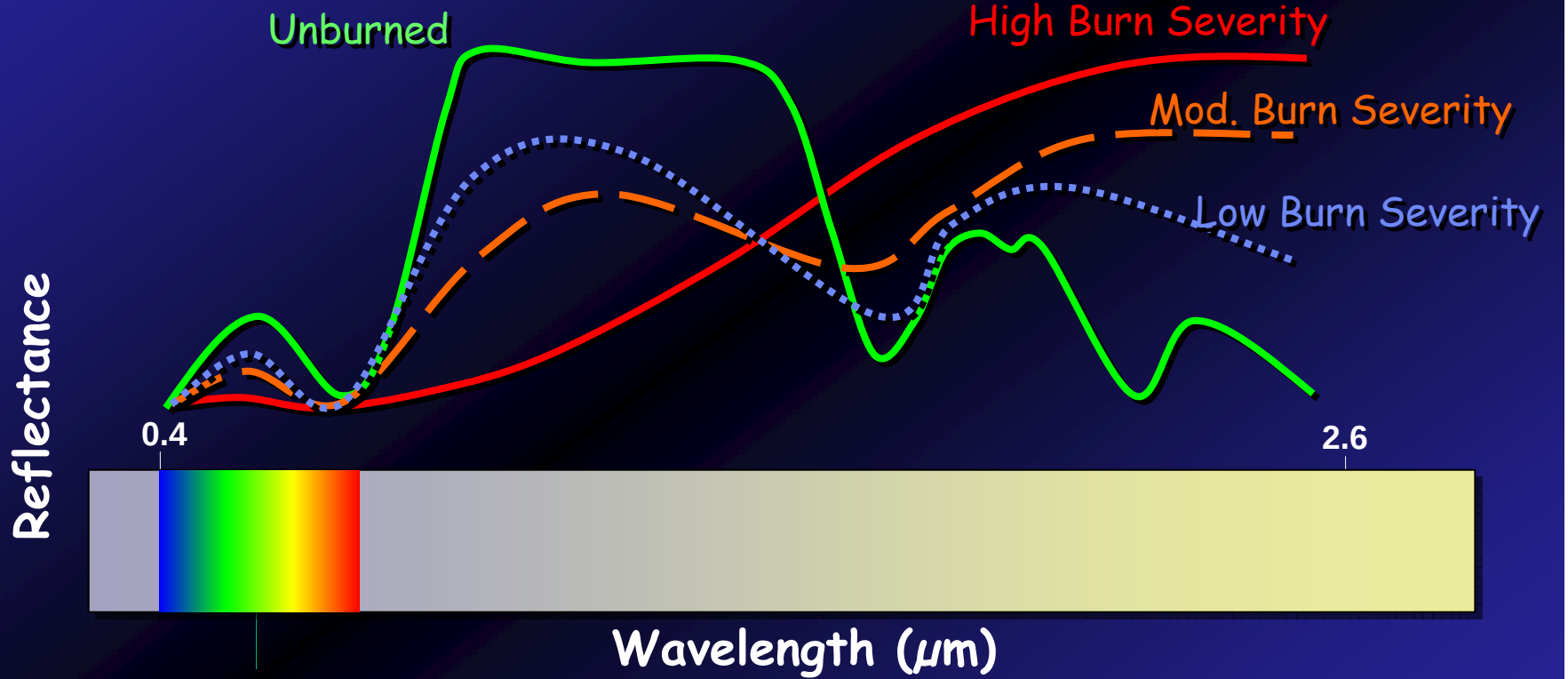
Typical Spectral Signatures

Typical Spectral Response Curves in the 0.4 to 2.6 µm Region...



Healthy Vegetation vs Burned Areas

Exploiting Spectral Response Curves



The goal of remote sensing is to take advantage of differences in spectral response curves to distinguish one thing from another.

Summary

- The Electromagnetic (EM) Spectrum and Remote Sensing
  - Fundamental to remote sensing
- Introduction to Spectral Signatures
  - Objects have differing responses to EM energy
    - Necessary for remote sensing to distinguish one thing from another
- We will revisit the EM spectrum and Spectral signatures in a subsequent discussion