IMAGE CLASSIFICATION

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IMAGE CLASSIFICATION

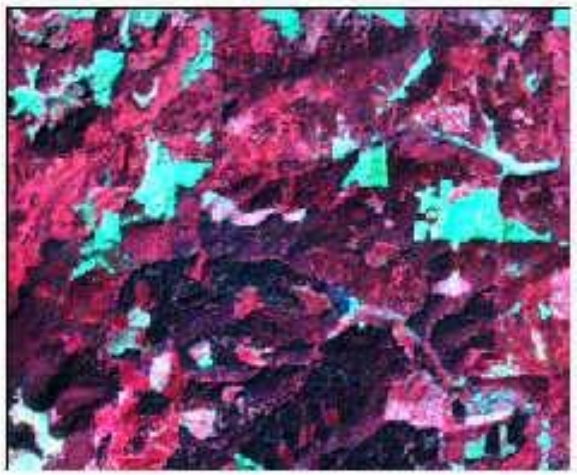
- Why classify?
- Make sense of a landscape
  - Place landscape into categories (classes)
    - Forest, Agriculture, Water, etc
- Classification scheme = structure of classes
  - Depends on needs of users

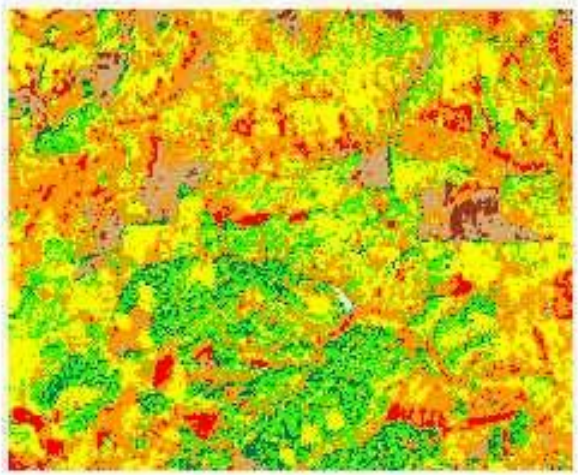
Example Uses

- Provide context
  - Landscape planning or assessment
  - Research projects
- Drive models
  - Global carbon budgets
  - Meteorology
  - Biodiversity

Example: Near Mary's Peak

- Derived from a 1988 Landsat TM image
- Distinguish types of forest





Classification: Critical Point

- LAND COVER not necessarily equivalent to LAND USE
  - We focus on what's there: LAND COVER
  - Many users are interested in how what's there is being used: LAND USE
- Example
  - Grass is land cover; pasture and recreational parks are *land uses* of grass

Classification

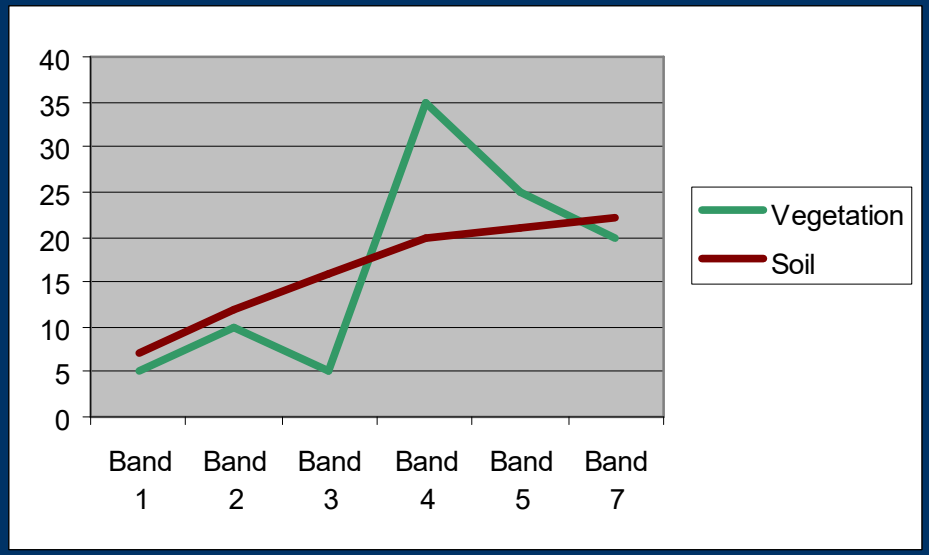
TODAY'S PLAN

- Basic strategy for classifying remotely-sensed images using spectral information
- Supervised Classification
- Unsupervised Classification
- Lab 4

Next class: Important considerations when classifying; improving classifications; assessing accuracy of classified maps

Basic Strategy: How do you do it?

- Use radiometric properties of remote sensor
- Different objects have different spectral signatures

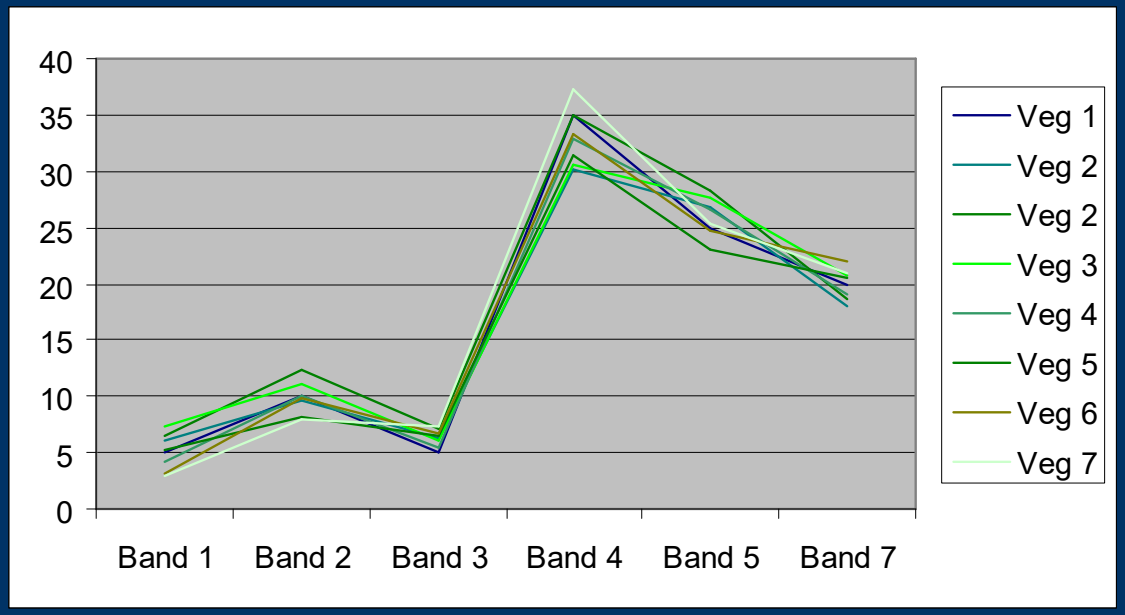


Basic Strategy: How do you do it?

- In an easy world, all “Vegetation” pixels would have exactly the same spectral signature
- Then we could just say that any pixel in an image with that signature was vegetation
- We’d do the same for soil, etc. and end up with a map of classes

Basic Strategy: How do you do it?

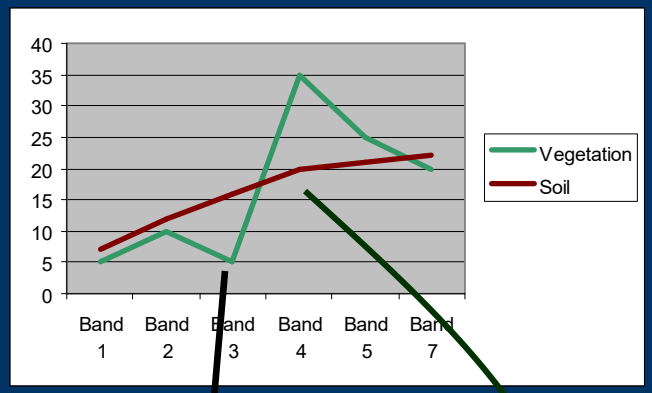
But in reality, that isn't the case. Looking at several pixels with vegetation, you'd see variety in spectral signatures.



The same would happen for other types of pixels, as well.

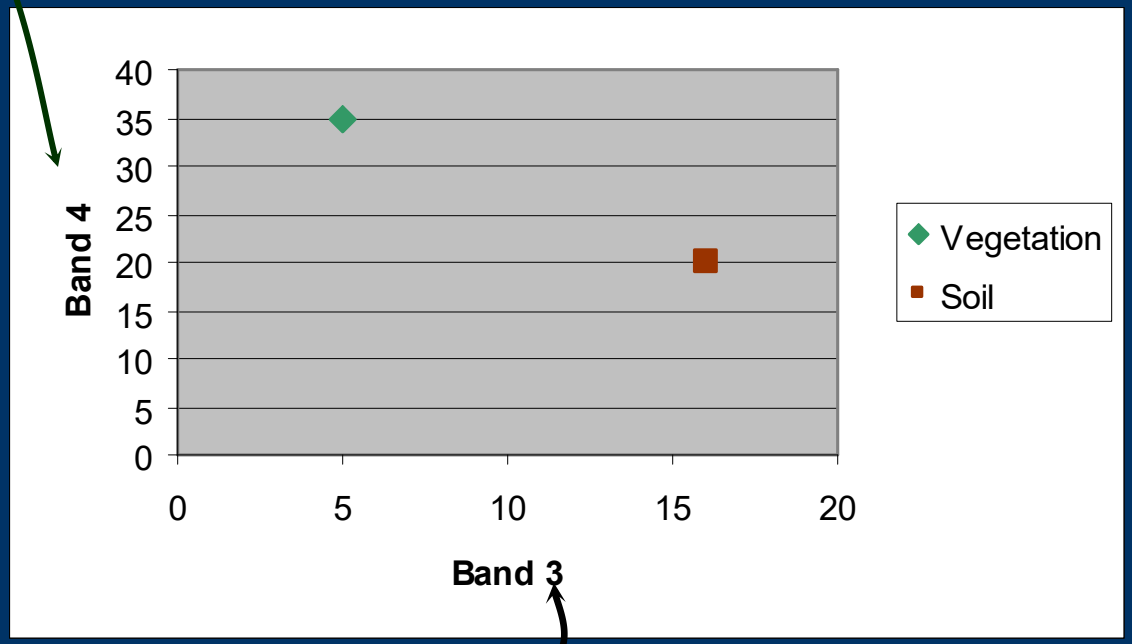
The Classification Trick: Deal with variability

- Different ways of dealing with the variability lead to different ways of classifying images
- To talk about this, we need to look at spectral signatures a little differently



Think of a pixel's reflectance in 2-dimensional space. The pixel occupies a point in that space.

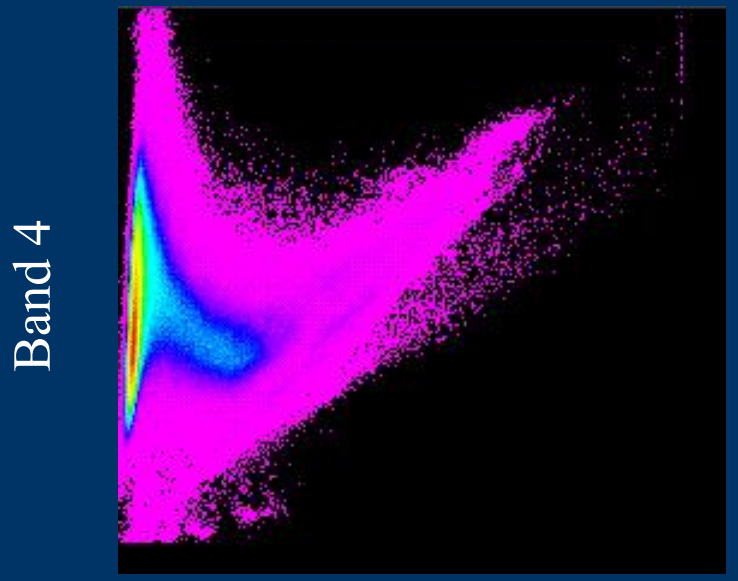
The vegetation pixel and the soil pixels occupy different points in 2-d space



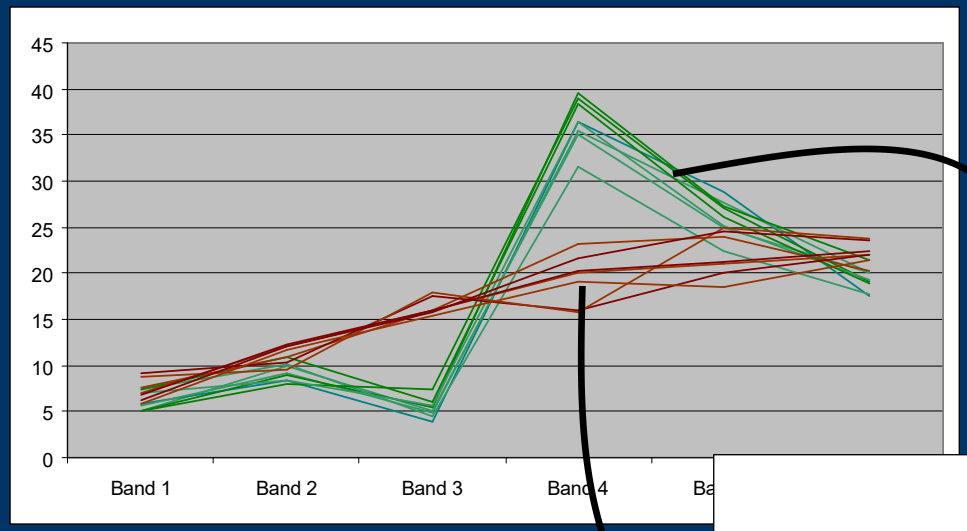
- In a Landsat scene, instead of two dimensions, we have six spectral dimensions
- Each pixel represents a point in 6-dimensional space
- To be generic to any sensor, we say **"n-dimensional"** space
- For examples that follow, we use 2-d space to illustrate, but principles apply to any n-dimensional space

Feature space image

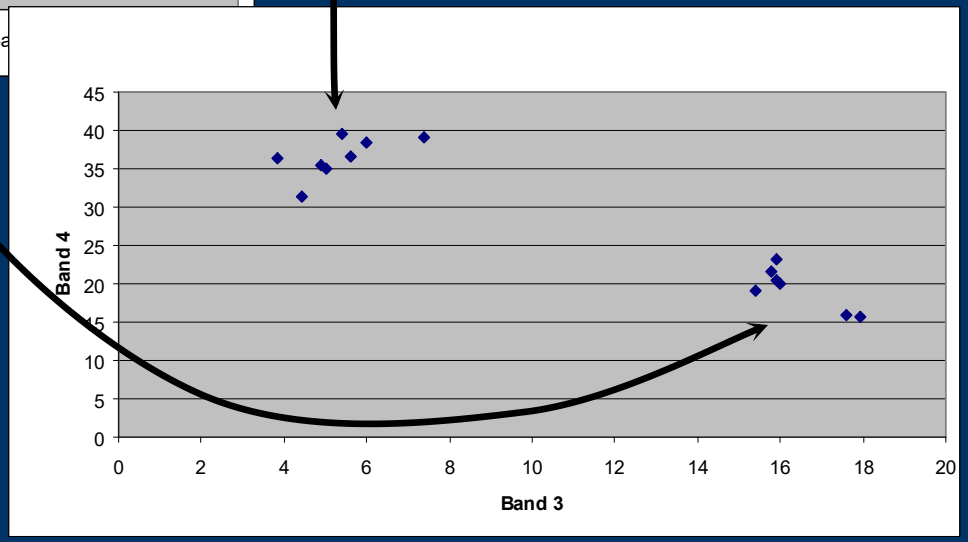
- A graphical representation of the pixels by plotting 2 bands vs. each other
- For a 6-band Landsat image, there are 15 feature space images



Basic Strategy: Dealing with variability



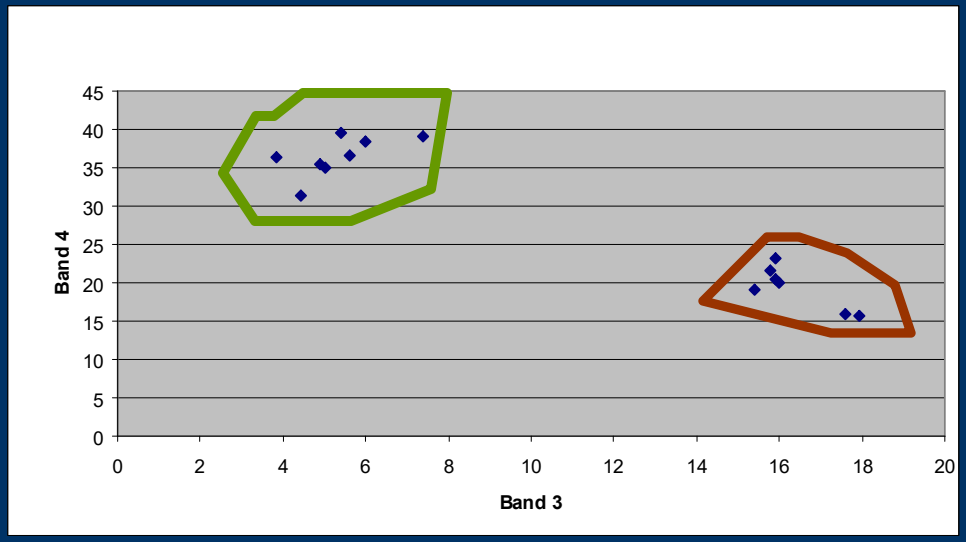
With variability, the vegetation pixels now occupy a region, not a point, of n-dimensional space



Soil pixels occupy a different region of n-dimensional space

Basic strategy: Dealing with variability

- Classification:
  - Delineate boundaries of classes in n-dimensional space
  - Assign class names to pixels using those boundaries



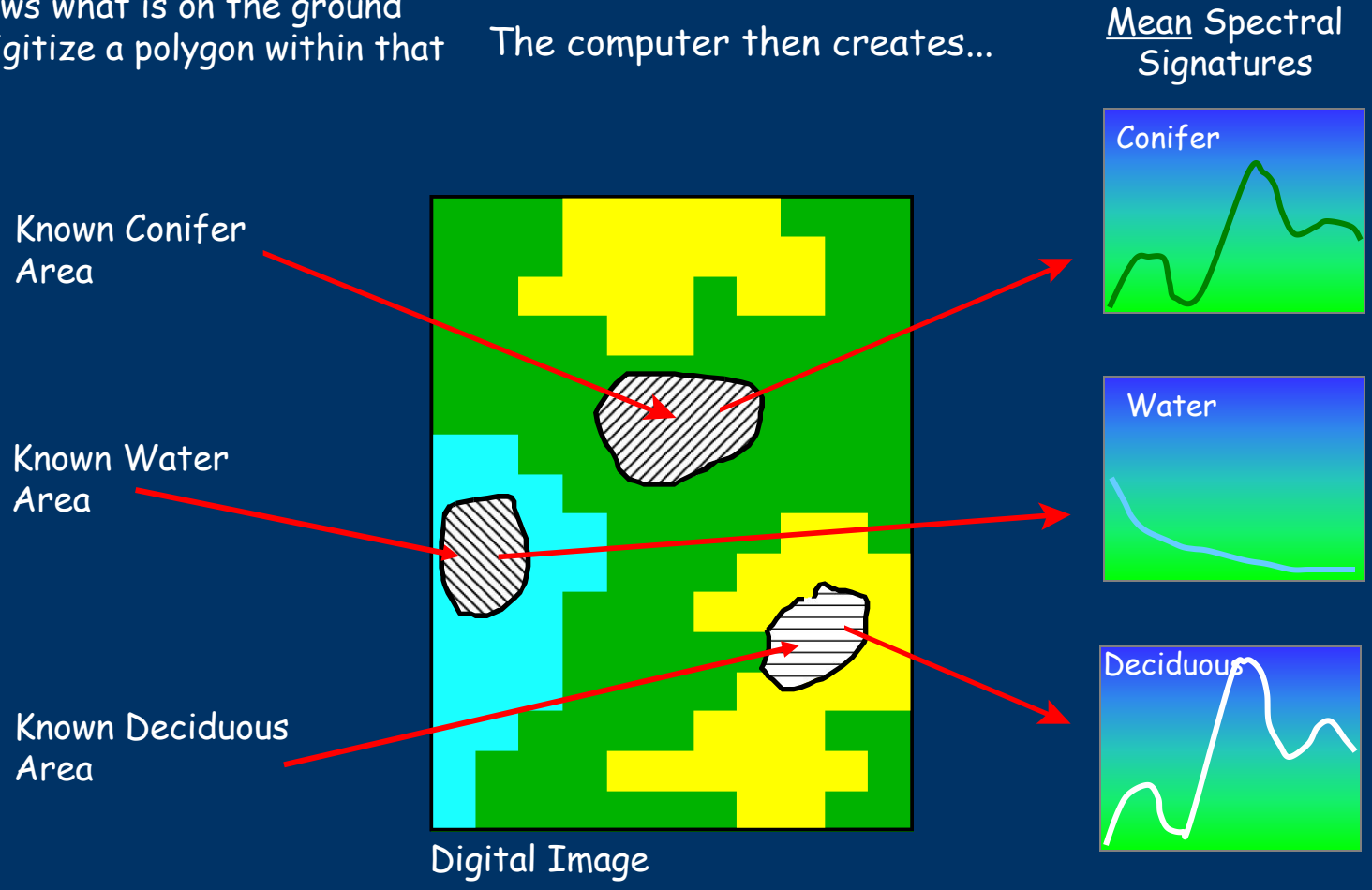
Classification Strategies

- Two basic strategies
  - Supervised classification
    - We impose our perceptions on the spectral data
  - Unsupervised classification
    - Spectral data imposes constraints on our interpretation

Supervised Classification

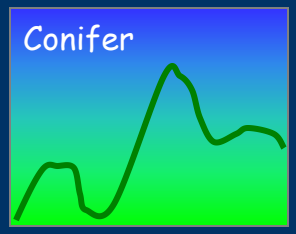
Supervised classification requires the analyst to select training areas where he/she knows what is on the ground and then digitize a polygon within that area…

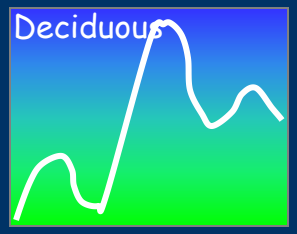
The computer then creates…

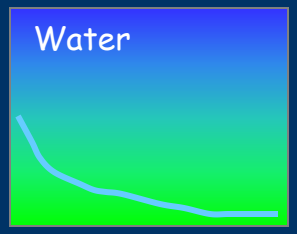


Supervised Classification

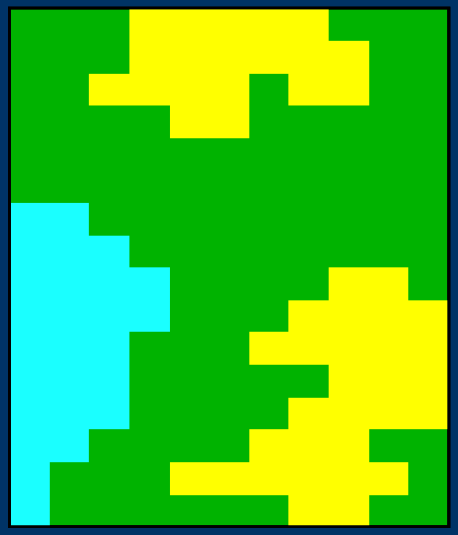
Mean Spectral Signatures



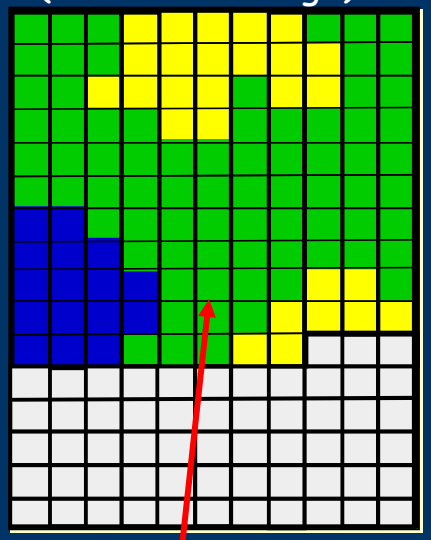


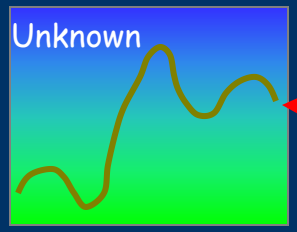


Multispectral Image



Information (Classified Image)





Spectral Signature of Next Pixel to be Classified

The Result is Information--in this case a Land Cover map...