

EGM310 – Remote Sensing and GIS

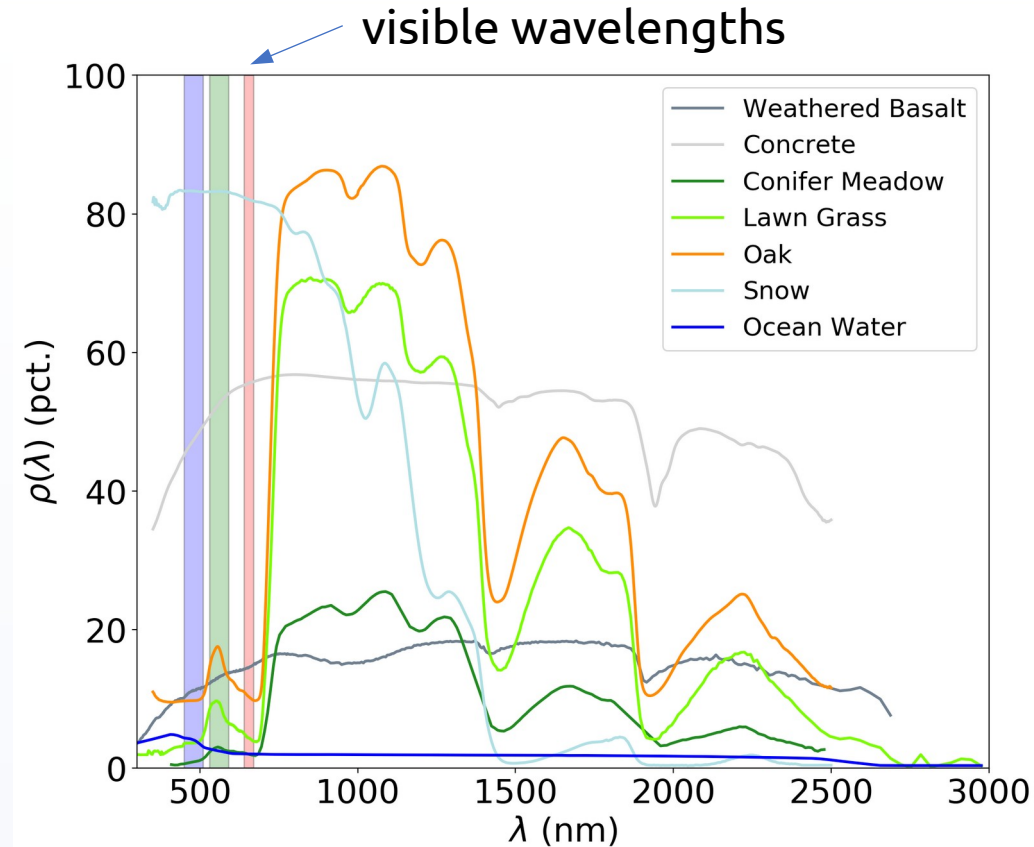
Week 9, Part 5: Spectral Properties

- **Recall:** reflectance depends on:
 - Surface properties (i.e., roughness)
 - Chemical composition
 - Viewing angle
 - Angle of illumination
 - **Examples:**
 - Most (healthy) plant leaves appear green (absorption of red, green)
 - Water color changes with depth (absorption of longer wavelengths, transmission, sediment/particles)
- ⇒ In other words, objects reflect differently at different wavelengths.



Some definitions

- **Spectral reflectance** (ρ_λ): the reflectance of a surface for a given λ
- **Spectral signature**: the pattern of spectral reflectance across the EM spectrum
- **Spectral response curve**: the graph of a spectral signature
- Can use these to differentiate between surfaces/objects

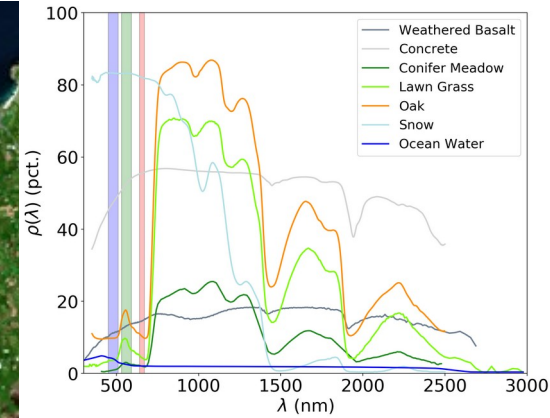


Measuring spectral properties

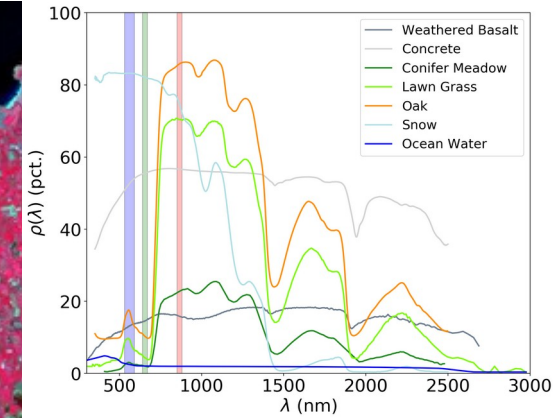
- In the field (or lab), use a **spectrometer** to get spectral signature of surface
- Spectrometer:
 - Takes incoming light, breaks into spectral components
 - Records reflectance at different wavelengths (ρ_λ)
 - Often need multiple measurements of multiple surfaces
- Can also use a **hyperspectral** camera
- Some satellite sensors have large numbers of bands, too



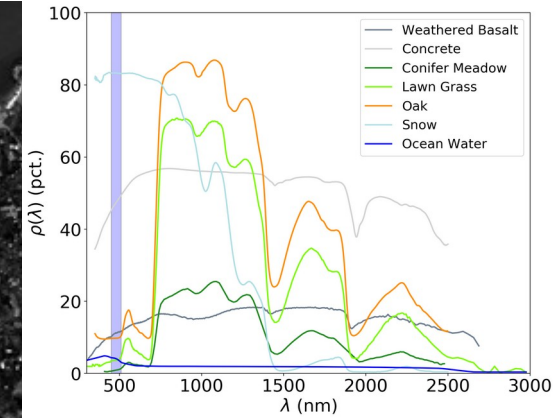
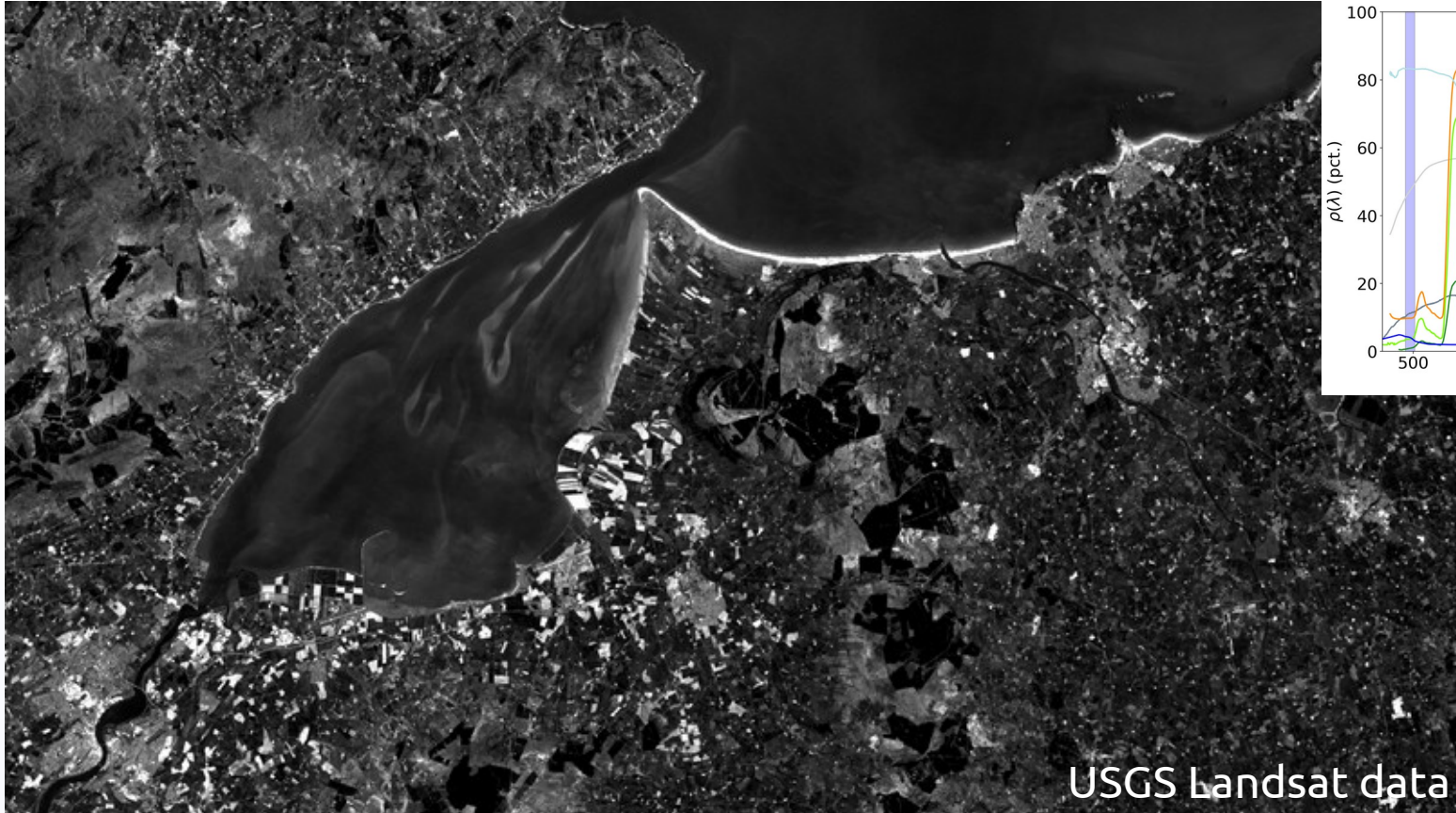
"True-colour" image



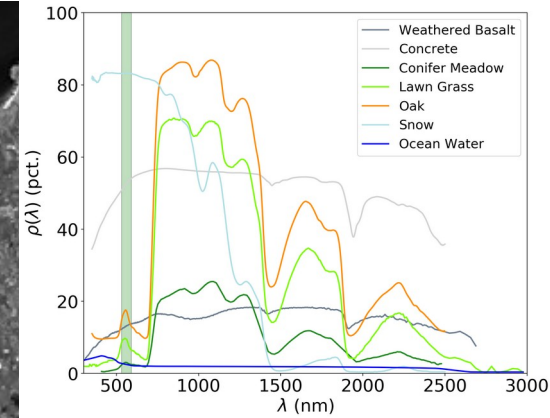
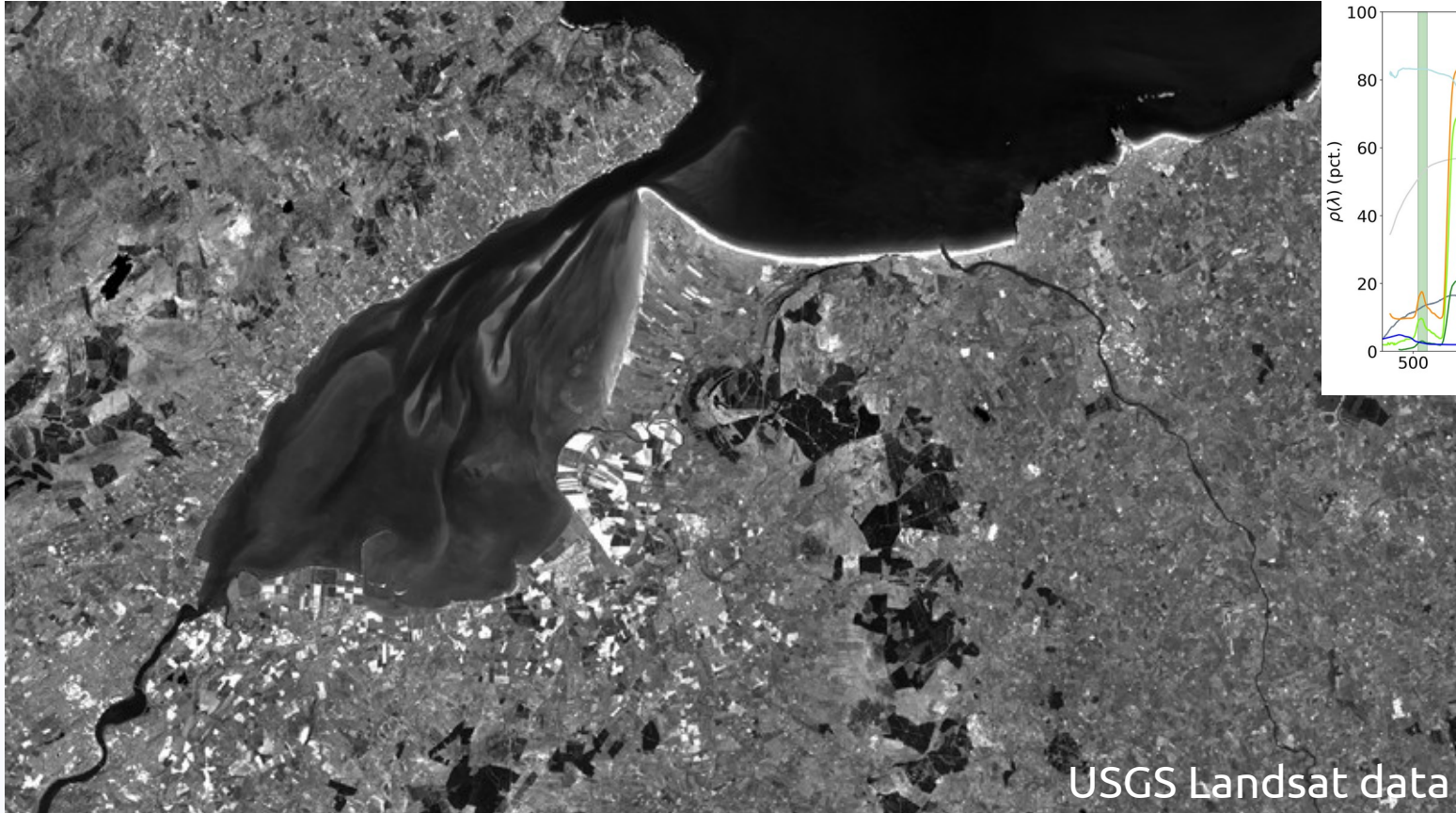
"False-colour" image



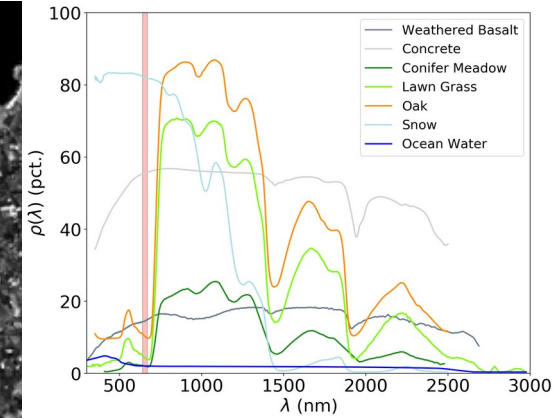
Visible Blue (450-510 nm)



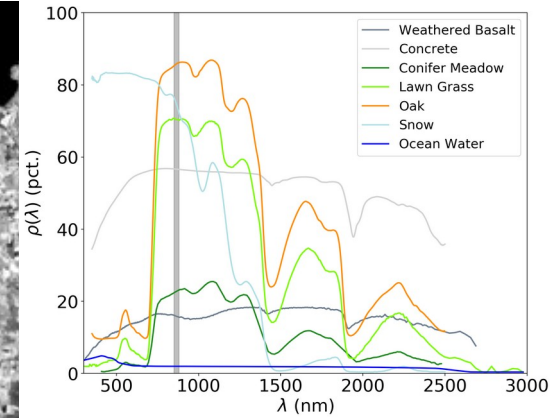
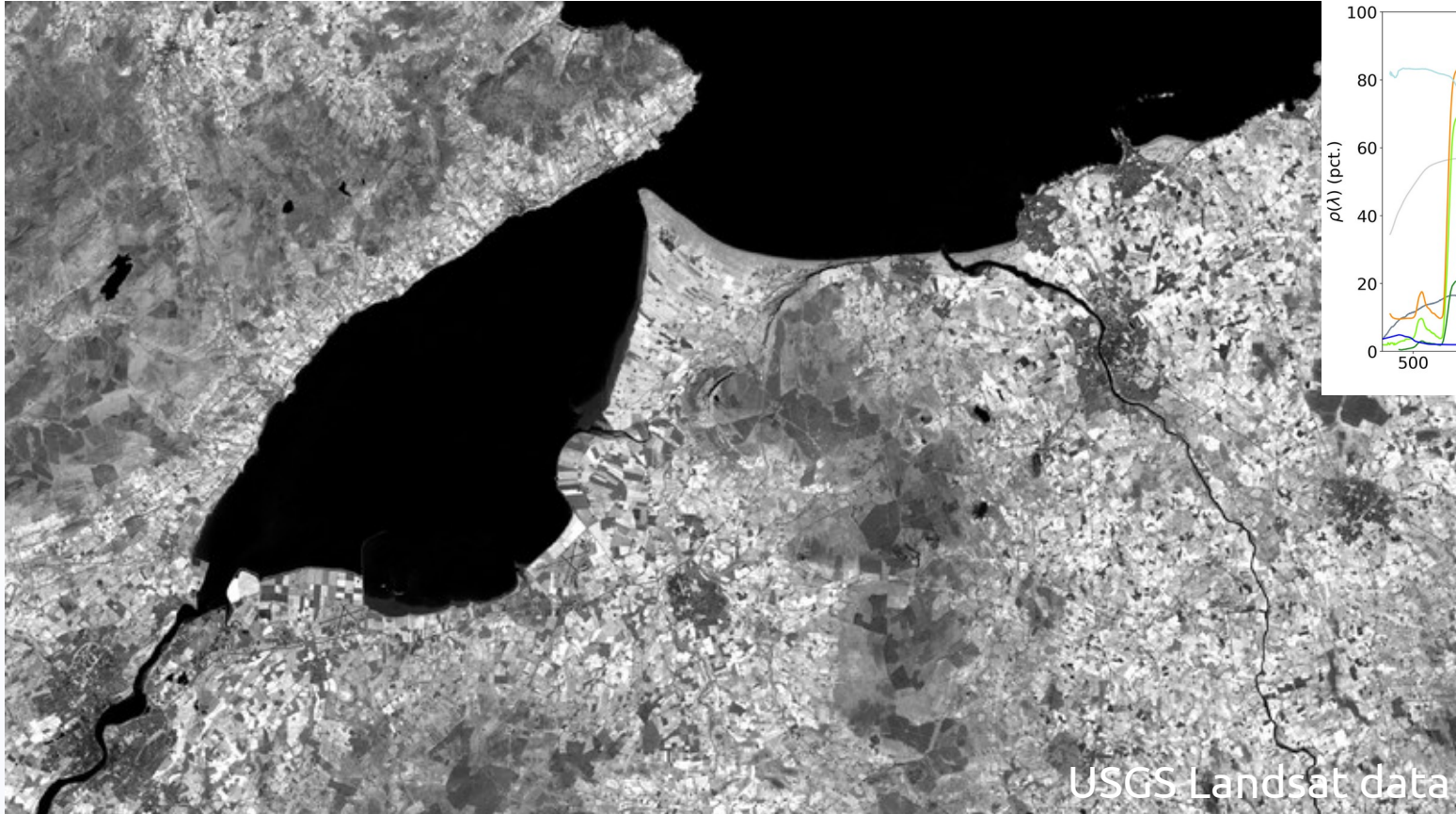
Visible Green (530-590 nm)



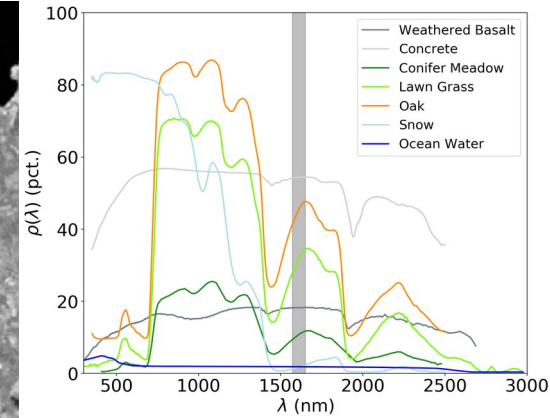
Visible Red (640-670 nm)



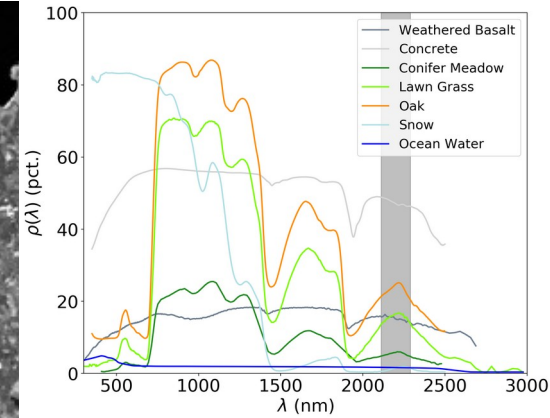
Near Infrared (850-880 nm)



Shortwave Infrared 1 (1570-1650 nm)



Shortwave Infrared 2 (2110-2290 nm)



- A surface's pattern of reflectance across the electromagnetic spectrum is its **spectral signature**
- We can use spectral signatures to differentiate between surfaces/objects (more on this later)
- Different combinations, multiple wavelengths/bands aid interpretation (e.g., Practical 1)

- Lillesand, Kiefer & Chipman – Chapter 1
- Campbell & Wynne – Chapter 2
- Mapping the Invisible [[NEON Science](#)]
- Landsat 8: Band by Band [[NASA](#)]