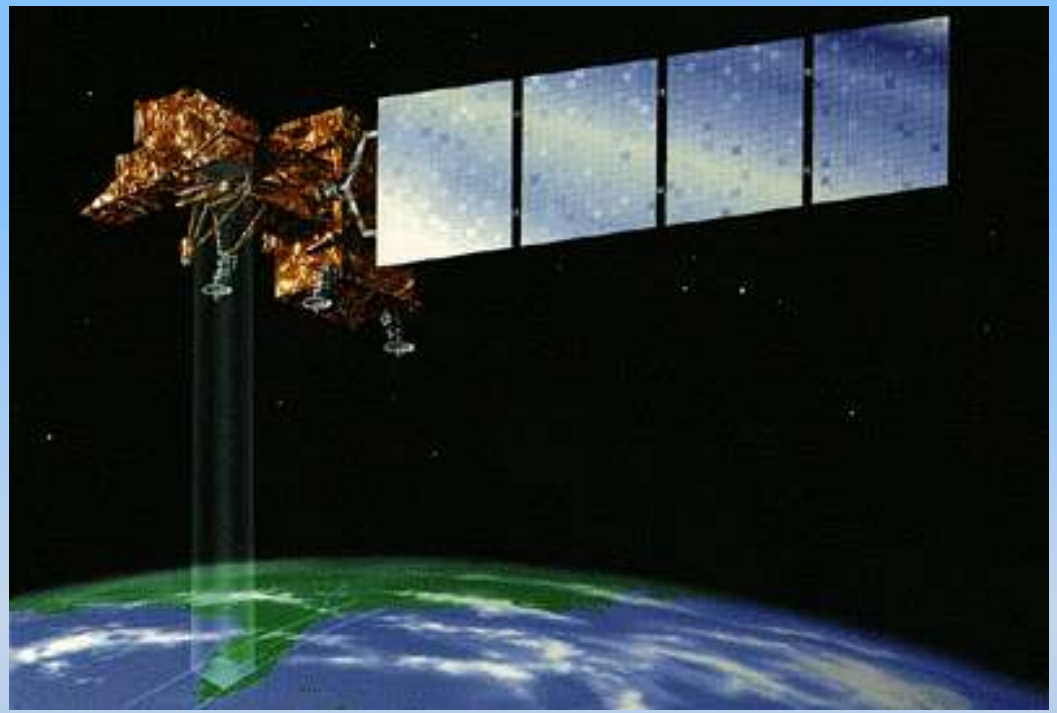
Use of LANDSAT Satellite Imaging to Assess Historical Water Usage



Trevor Hutton
Office of Columbia River
WA Department of Ecology

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What is LANDSAT?

- Earth Observing Satellite
- Visible, Infrared, and Thermal Spectral Bands
- Historical Archive from mid-1980's
- http://landsat.usgs.gov

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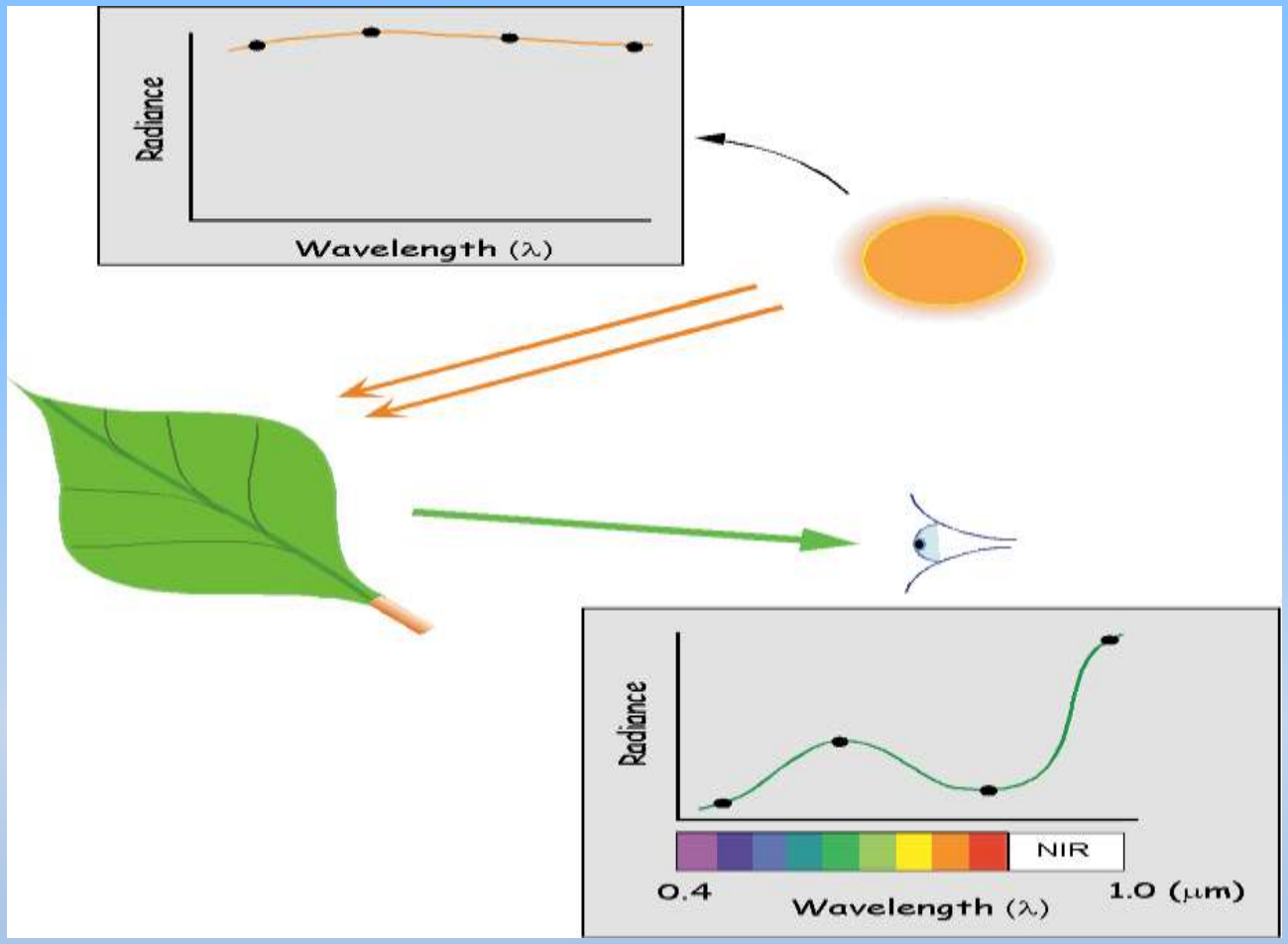
Basics of Remote Sensing



Thanks to Robin Weeks

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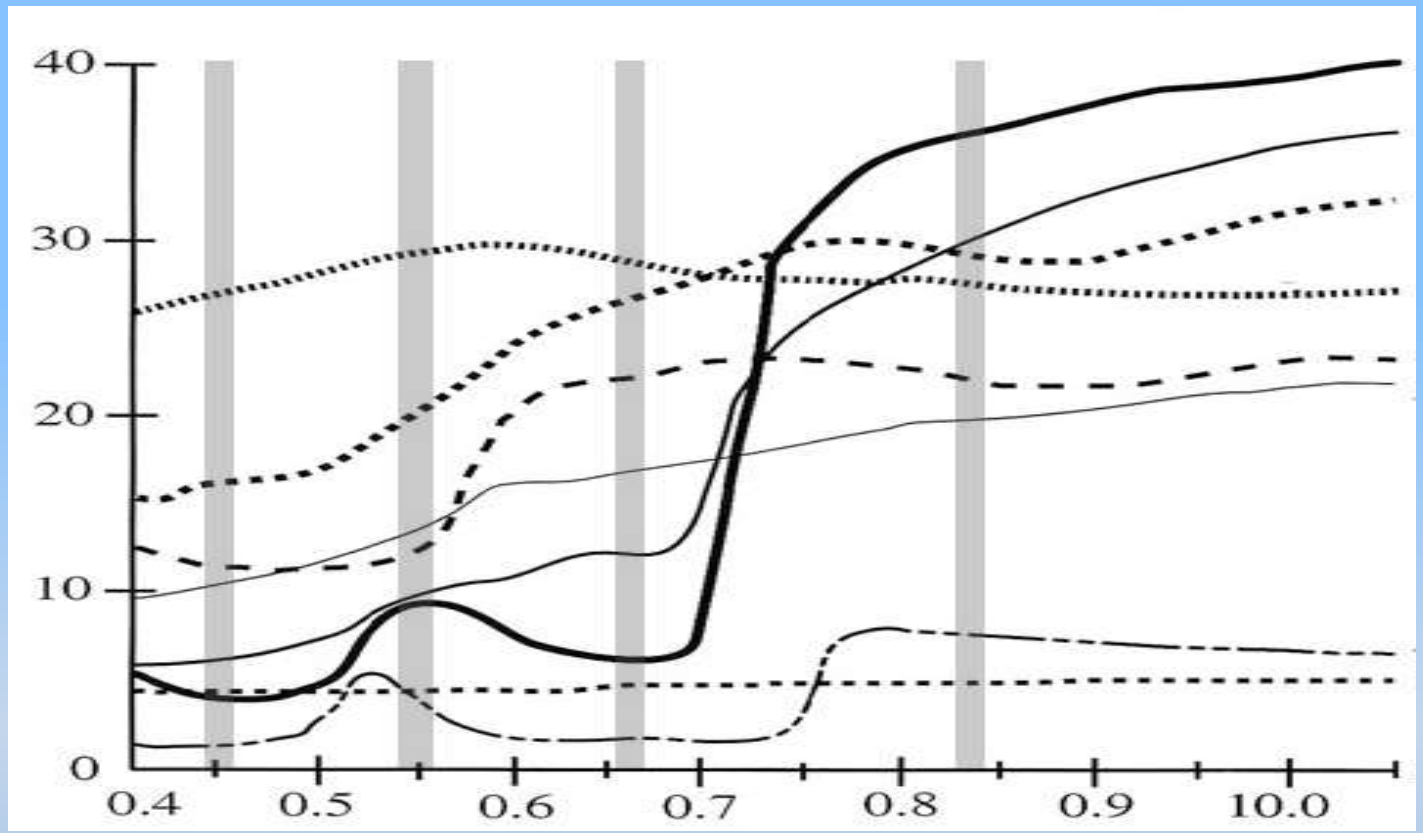
Spectral Signatures



Healthy grass

Concrete

Astroturf

wavelength

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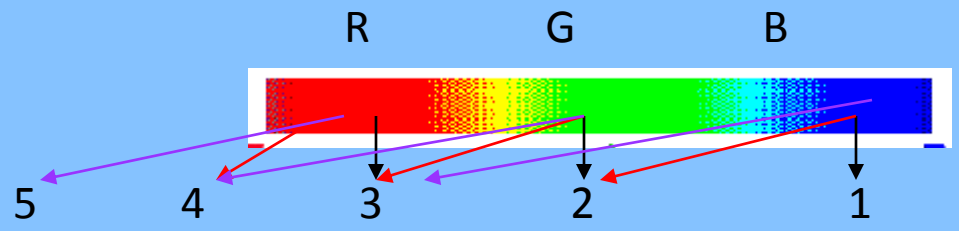

Band Combinations

R,G,B
3,2,1

R,G,B
4,3,2

R,G,B
5,4,3

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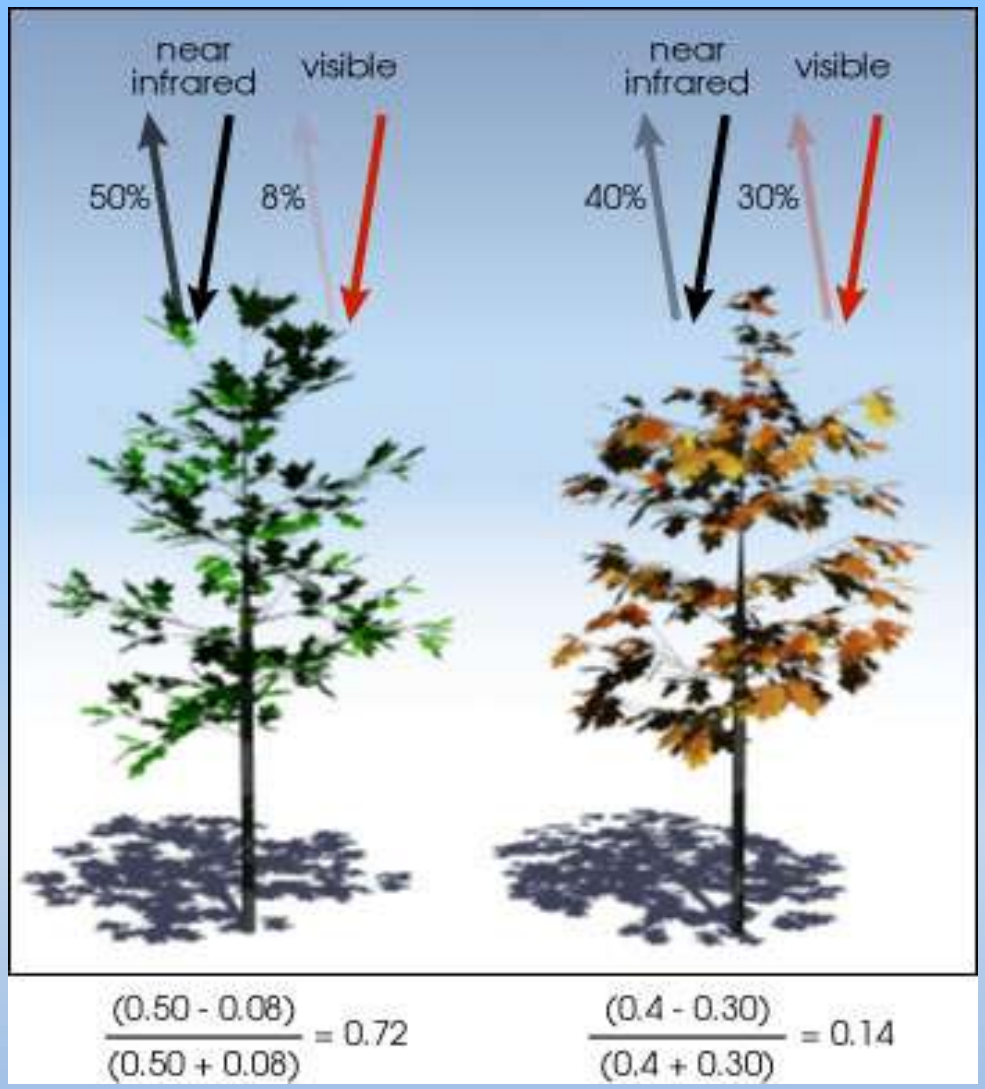
NDVI



(courtesy http://earthobservatory.nasa.gov)

When using LANDSAT:

$$\text{NDVI} = \frac{\text{Band 4 - Band 3}}{\text{Band 4 + Band 3}}$$

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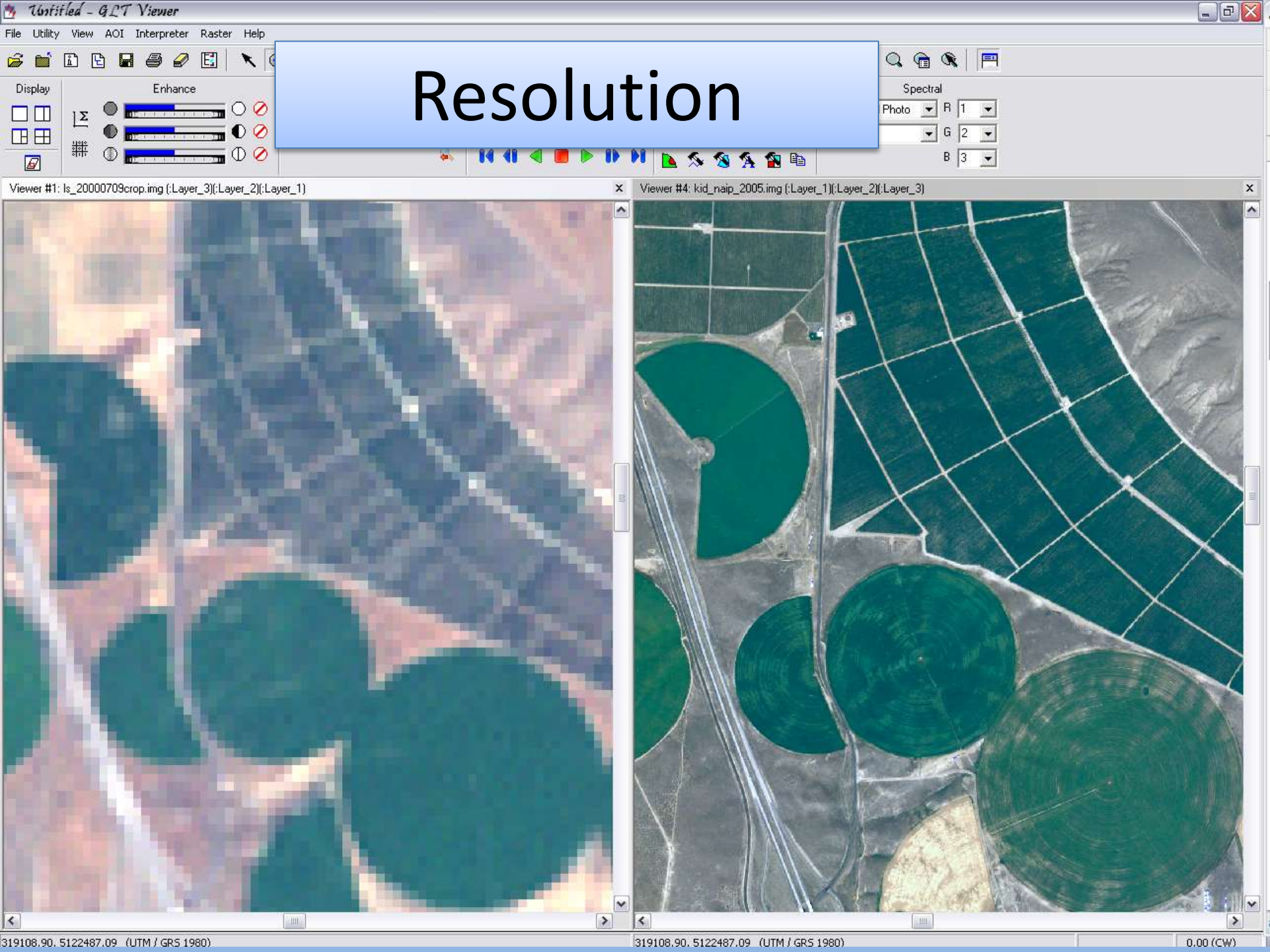
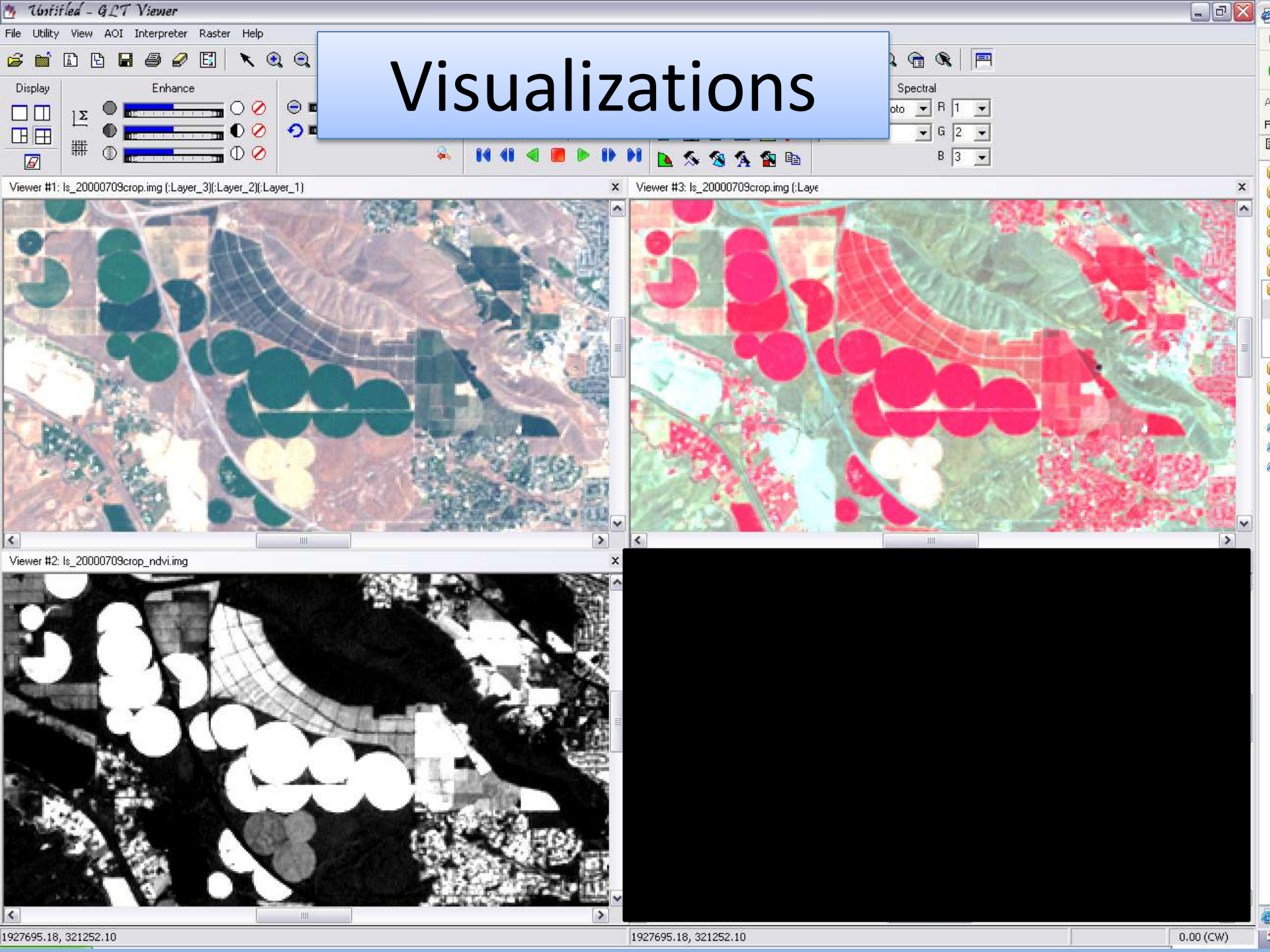
Resolution

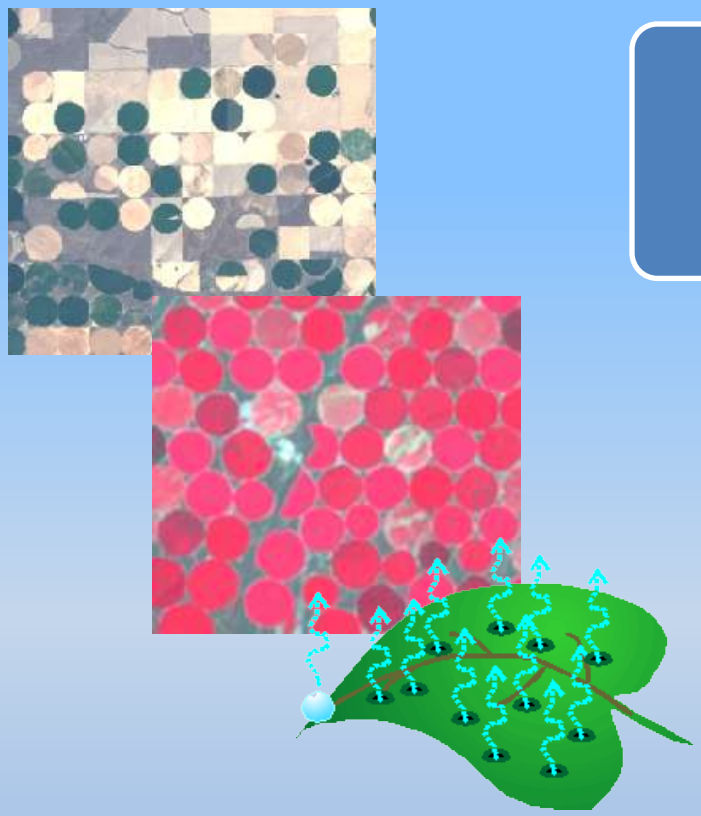

Untitled - GLT Viewer
File Utility View AOI Interpreter Raster Help
Display
Enhance
Spectral
Photo
R 1
G 2
B 3
Viewer #1: ls_20000709crop.img (:Layer_3)(:Layer_2)(:Layer_1)
Viewer #4: kid_naip_2005.img (:Layer_1)(:Layer_2)(:Layer_3)
319108.90, 5122487.09 (UTM / GRS 1980)
319108.90, 5122487.09 (UTM / GRS 1980)
0.00 (CW)

Visualizations



Using Imagery to Define Water Use

3 Tiers:



- Presence of Irrigation
- Delineation & Estimation using WIG Values
- Evapotranspiration Modeling

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Use by Water Resources

- Historical - Extent and Validity
- Land Use
- Verification of Fallowed Lands (Trust Water)
- Technical Assistance and Enforcement

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Limitations

- Locale
  - Wet vs. Dry Climate
- Resolution
  - 30 Meter Pixels

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Limitations

- Data Gaps
  - Dependent on Weather
- Currently Inactive Satellites
  - Mechanical Failures
  - Funding Issues

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Future Use

- METRIC Modeling
  - University of Idaho and others have developed models to move beyond a presence/absence approach
  - Now able to accurately quantify consumptive use from imagery
  - Currently utilized by several states in the arid West

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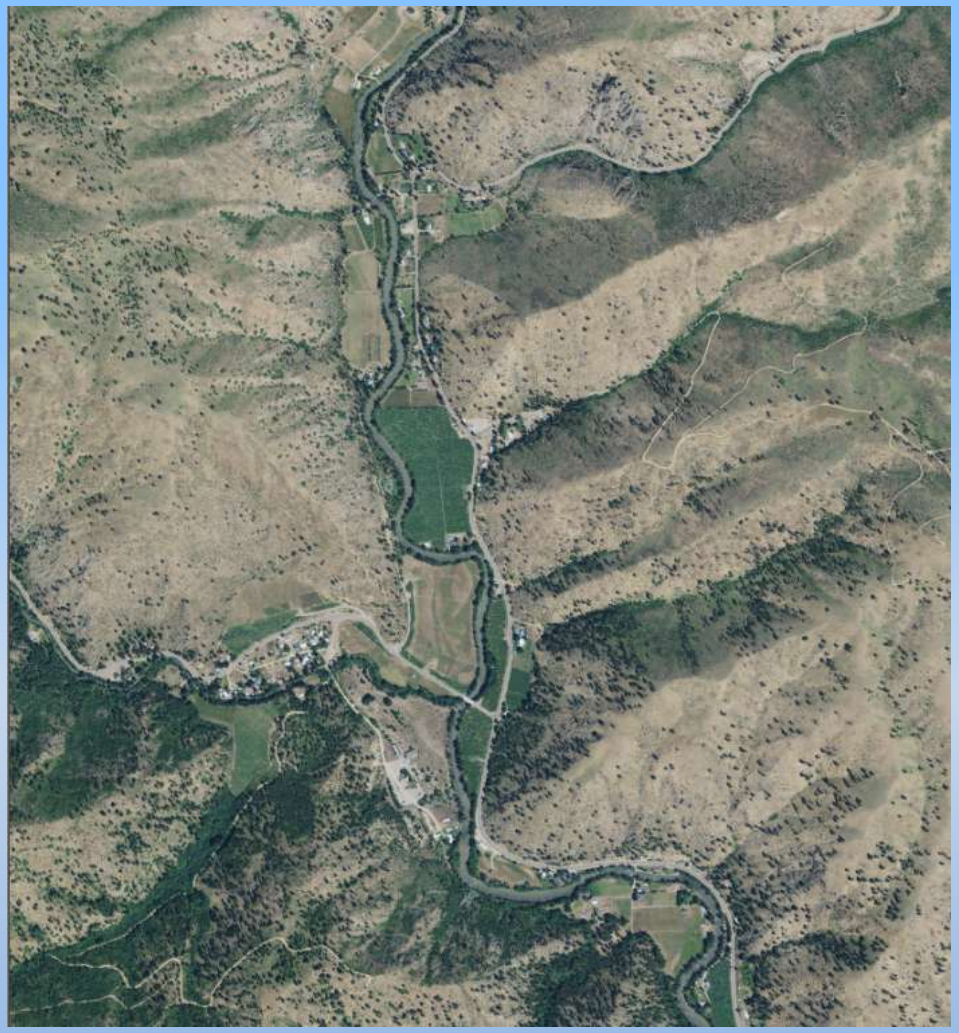
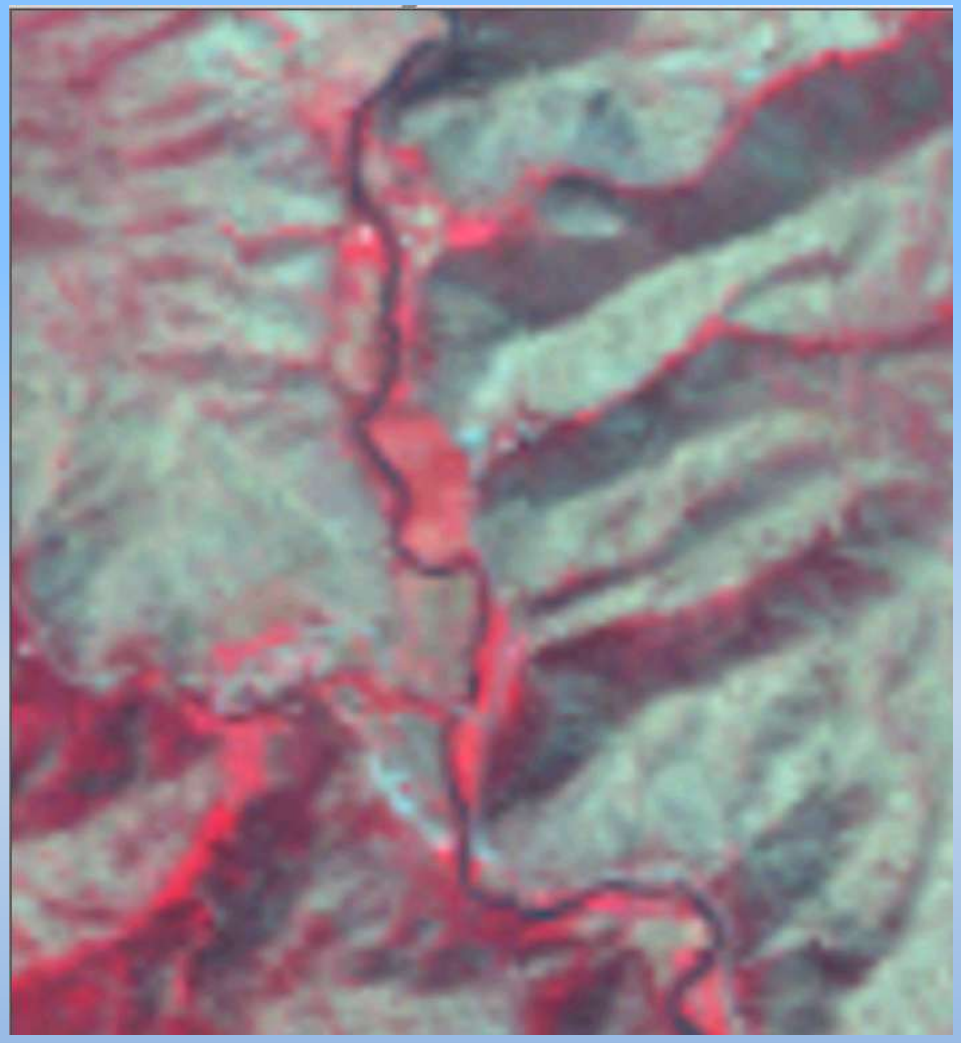
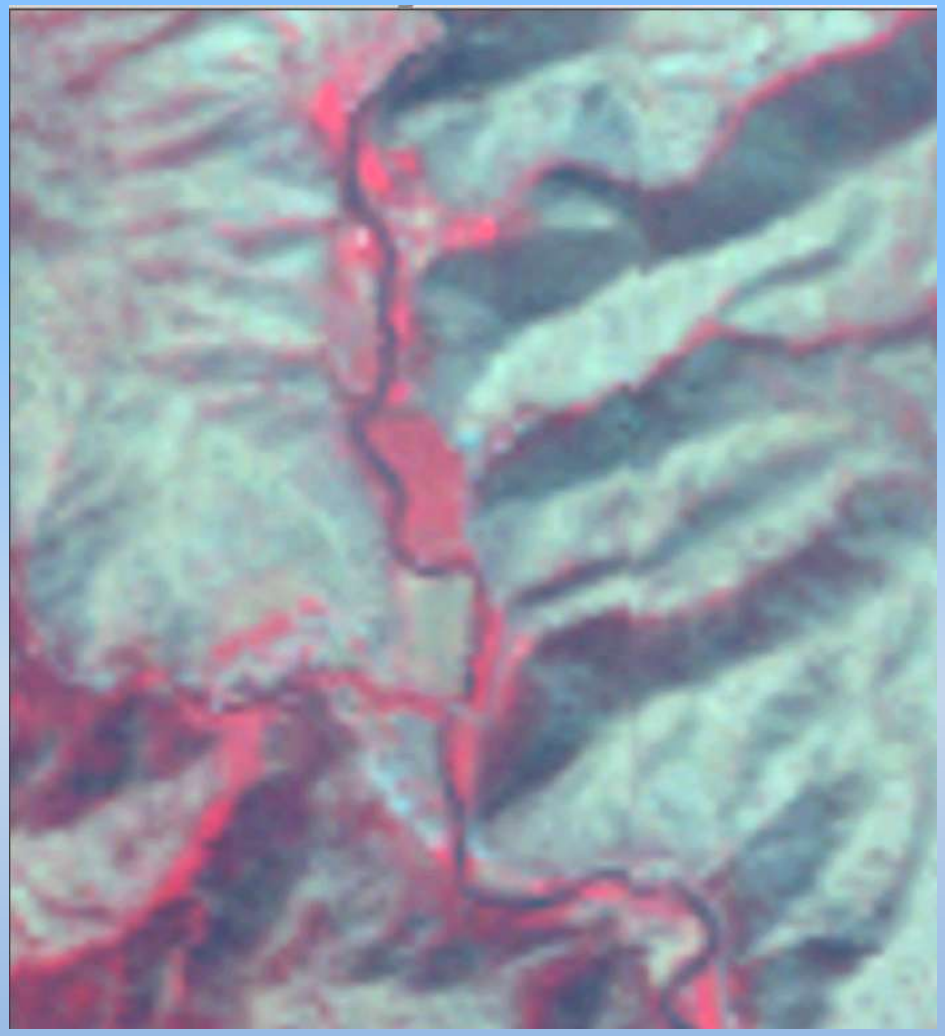
Entiat River and Mad River Confluence July 2009 imagery



Entiat River and Mad River Confluence
July 2009 imagery

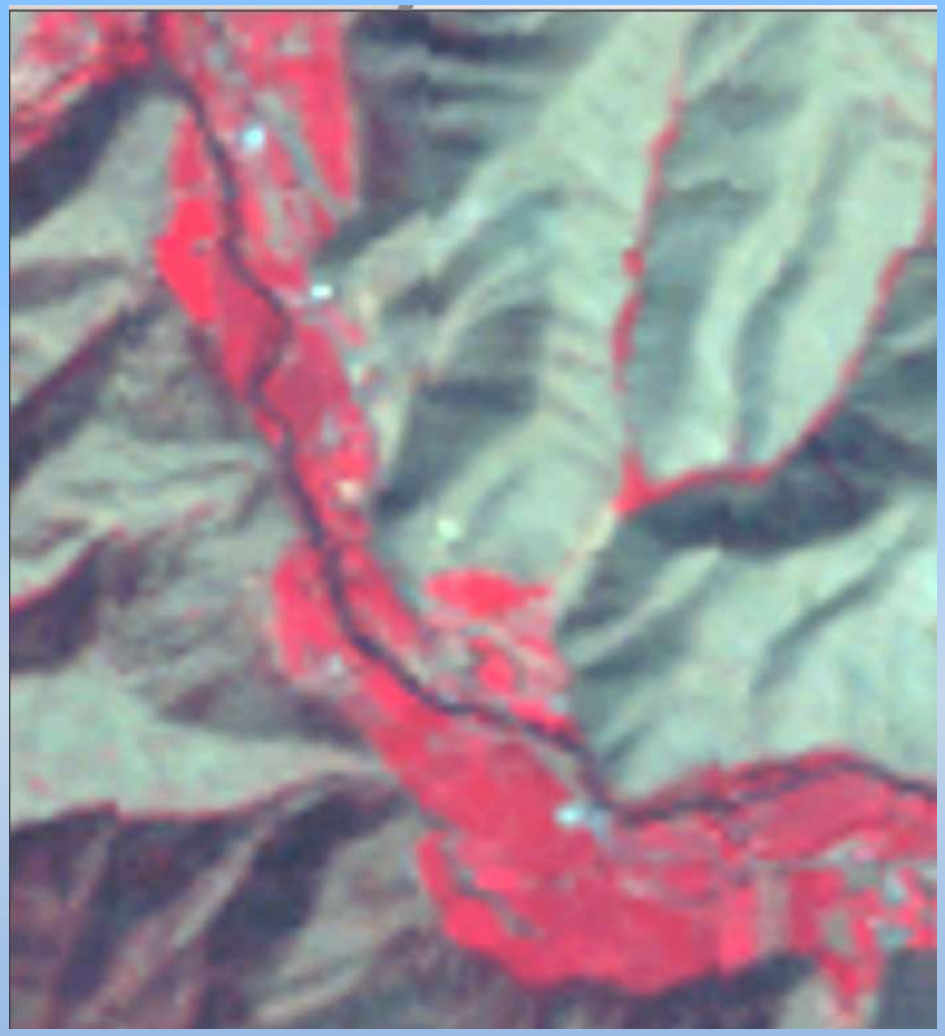


Entiat River and Mad River Confluence August 2009 imagery

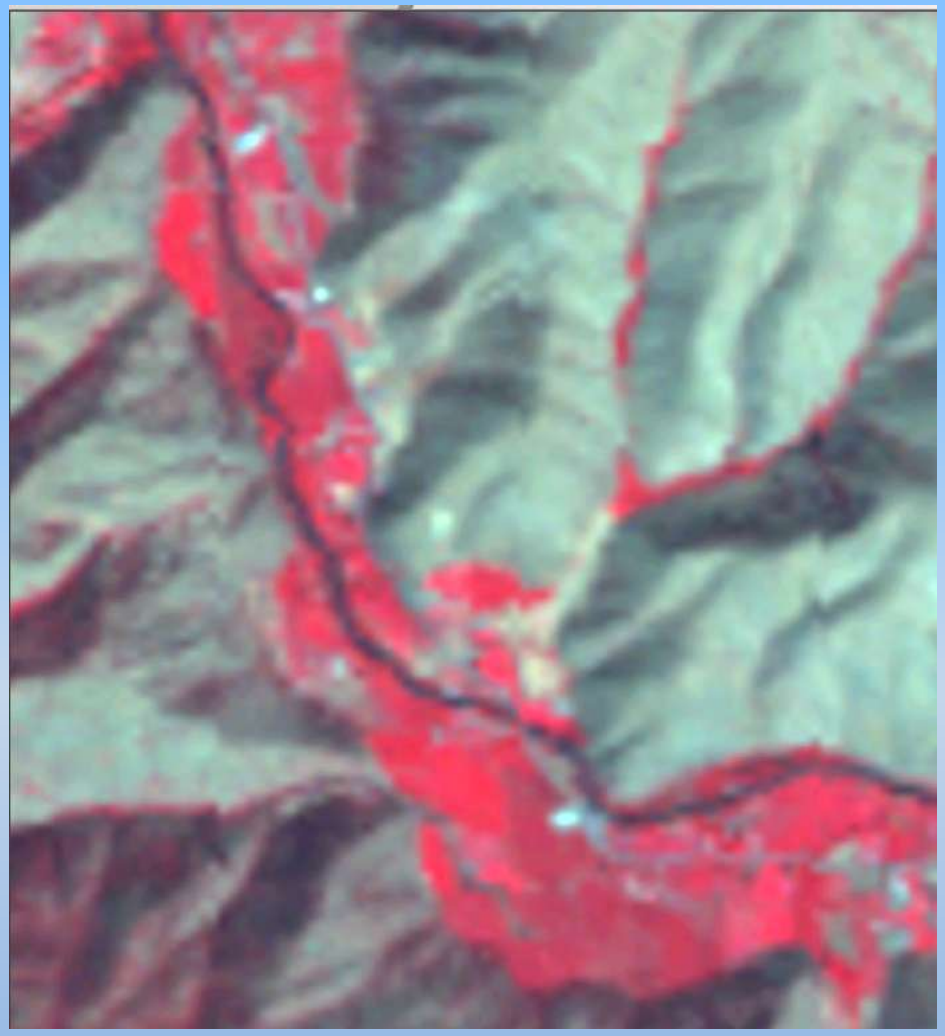


Entiat River above Keystone September 2011 imagery

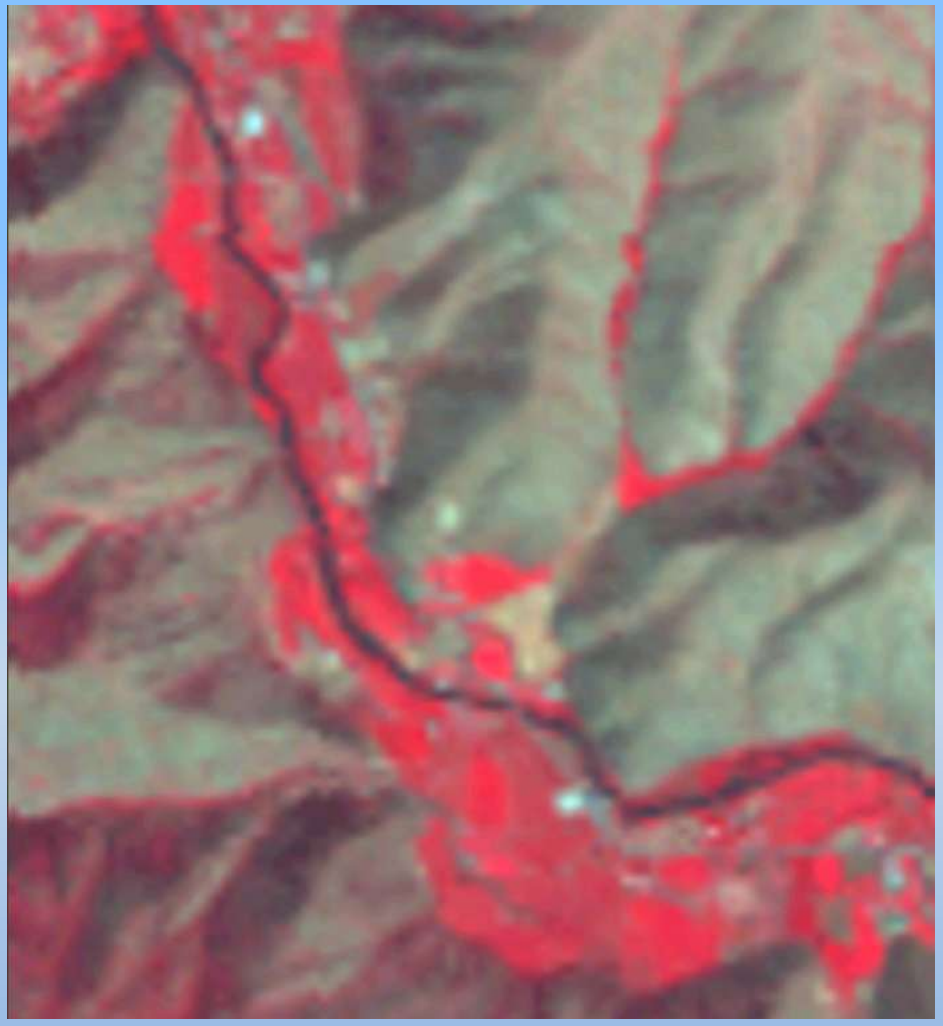
Entiat River above Keystone September 2011 imagery



Entiat River above Keystone August 2011 imagery



Entiat River above Keystone
July 2011 imagery



Questions?

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