Leveraging Remotely Sensed Data for International Projects

What's out there, what's free, and how can I use it?

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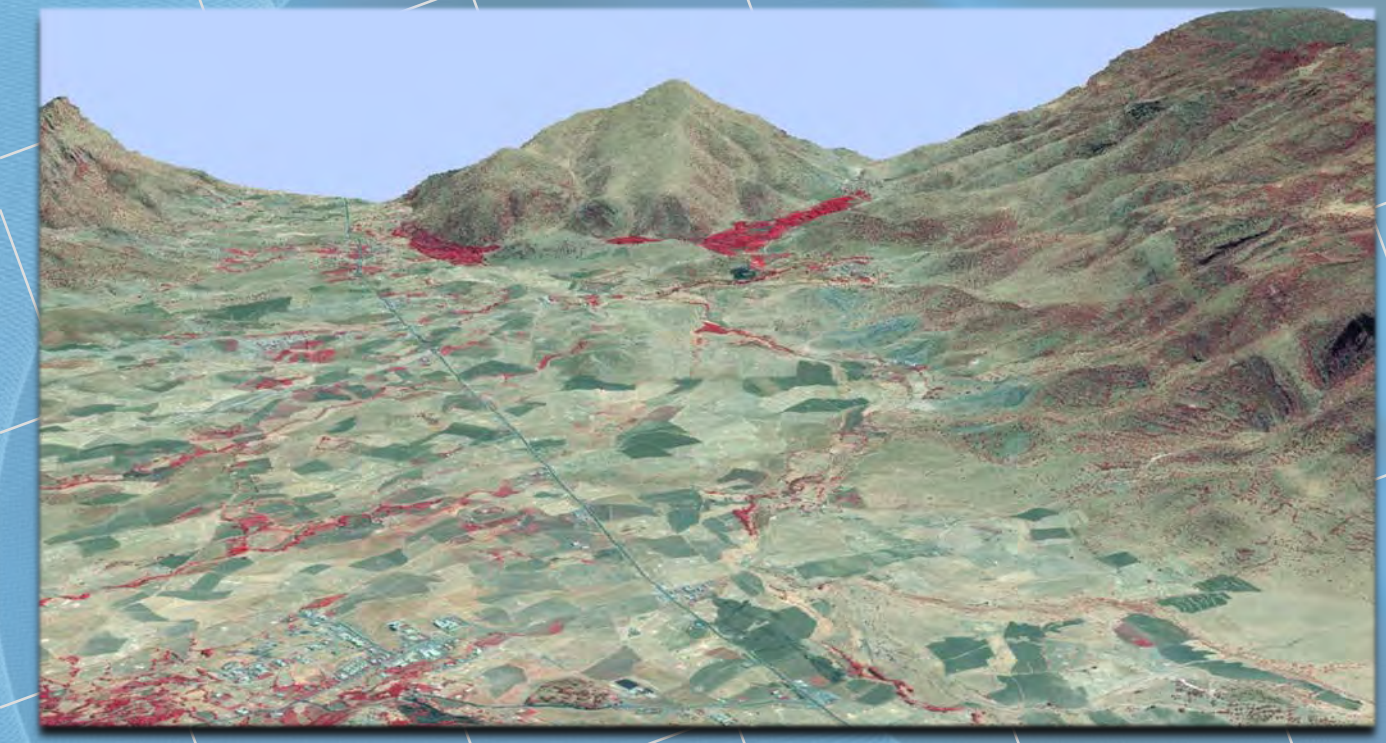
5/14/2013



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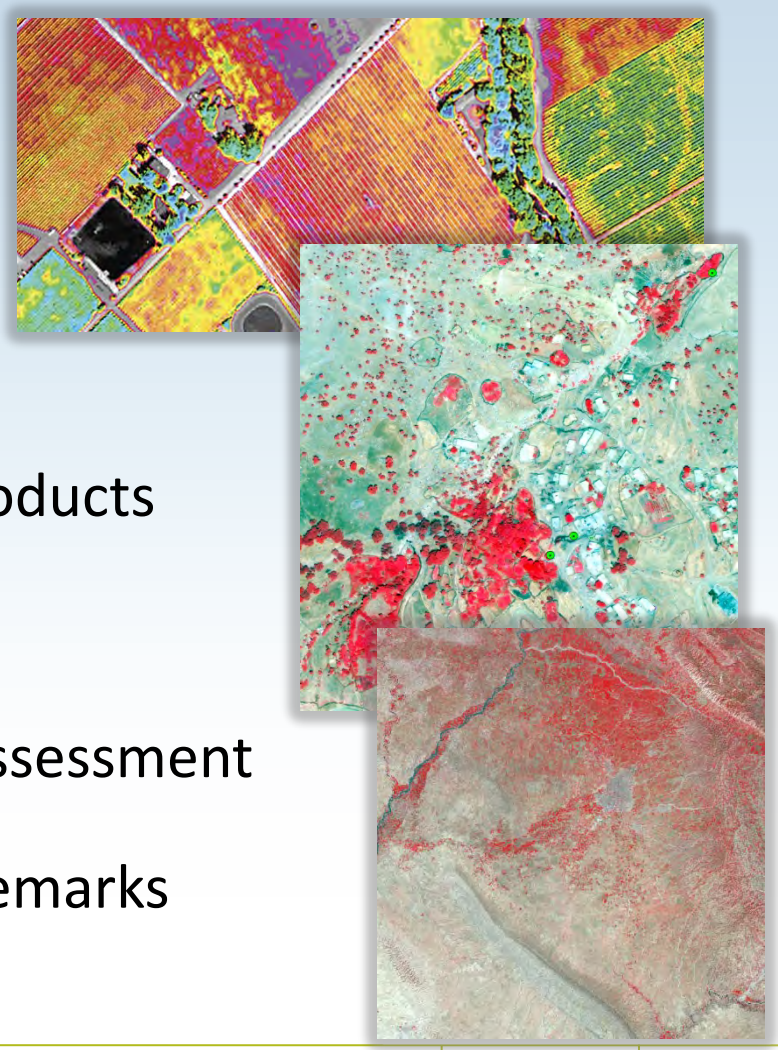
Outline

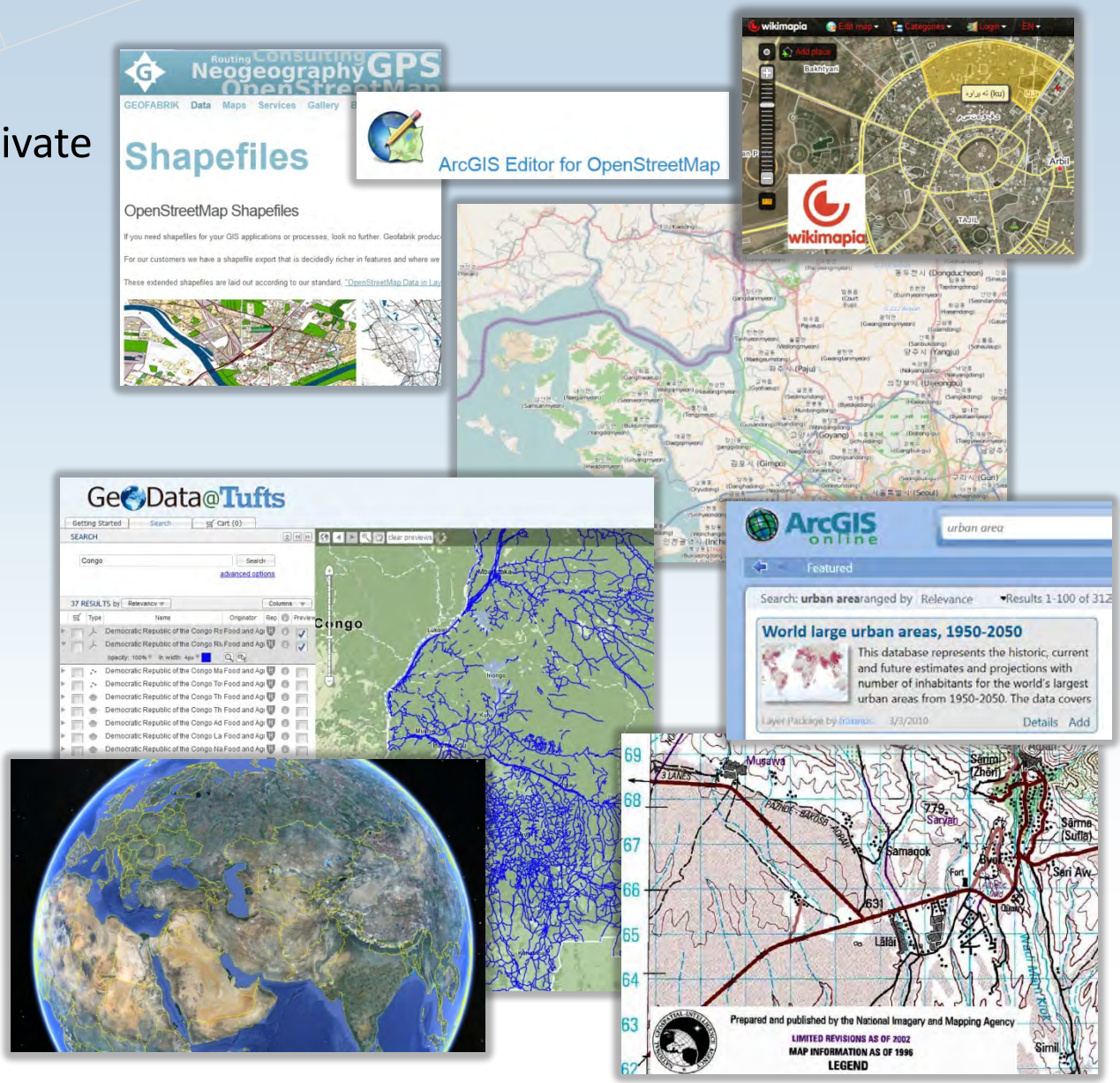
- International GIS – What's out there?
- Remotely sensed data options
- Where can I get this stuff?
- Overview of sensors. Landsat, ASTER.
- Case studies, custom toolsets, and products
- High resolution imagery
- High res imagery for environmental assessment
- What the future holds… Concluding remarks



What's Out There?

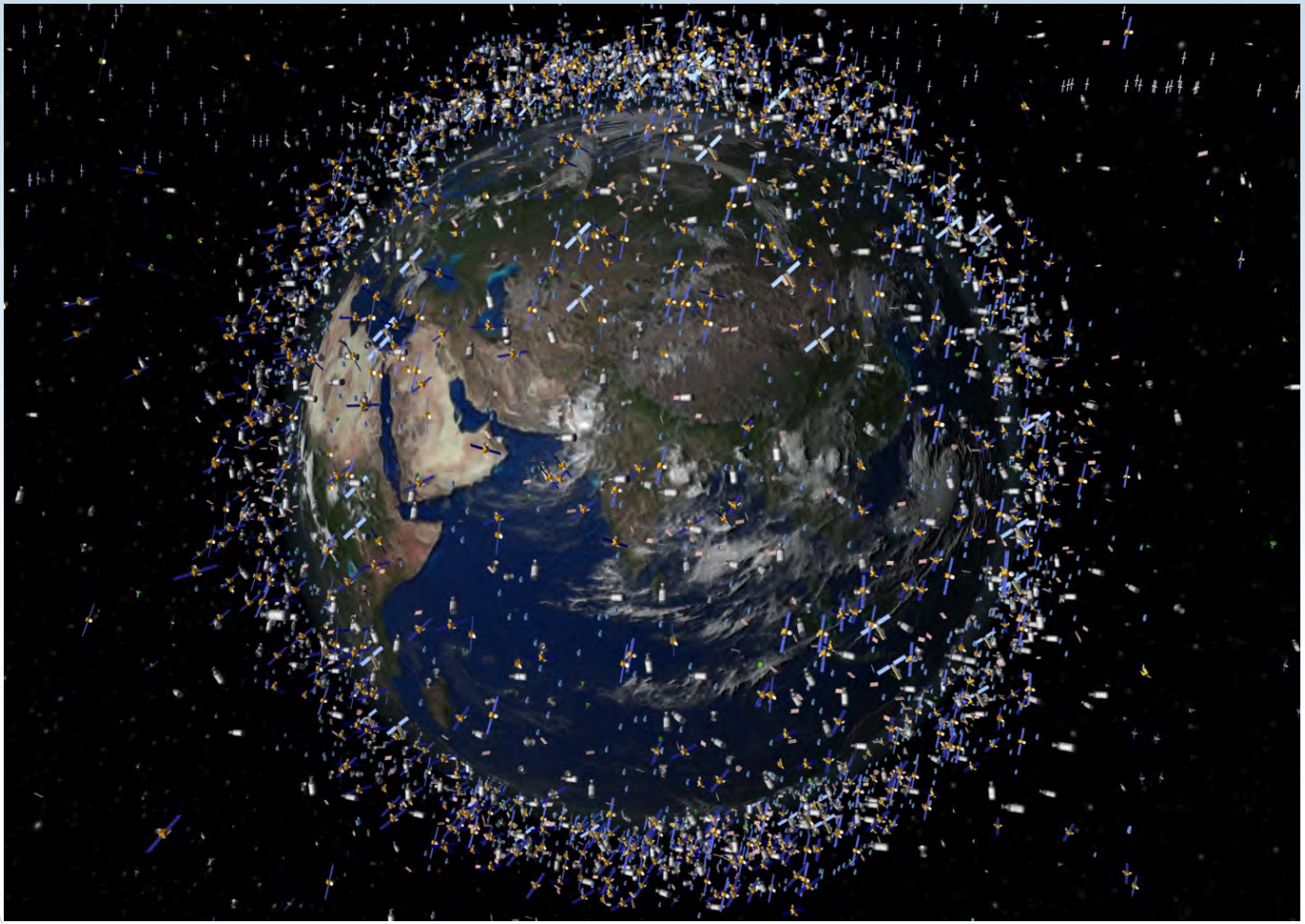
- Open Databases, Govt, private
- OSM, Crowdsourced
- Education, Non-Profits
- ArcGIS Online
- Military, Top Secret
- Reach out locally
- Extract your own info

Imagery!



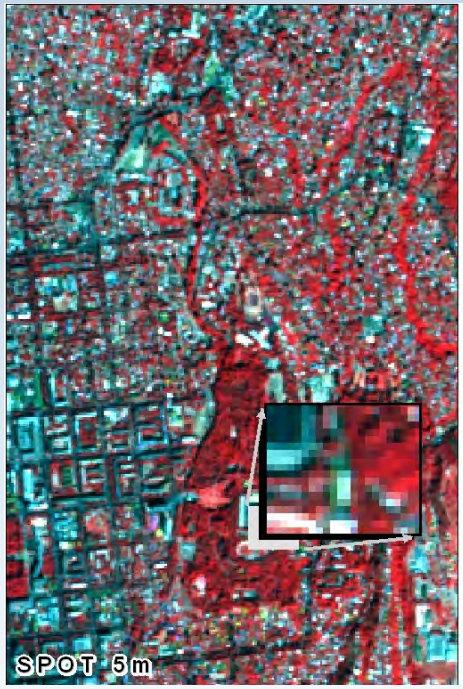
Satellite Data

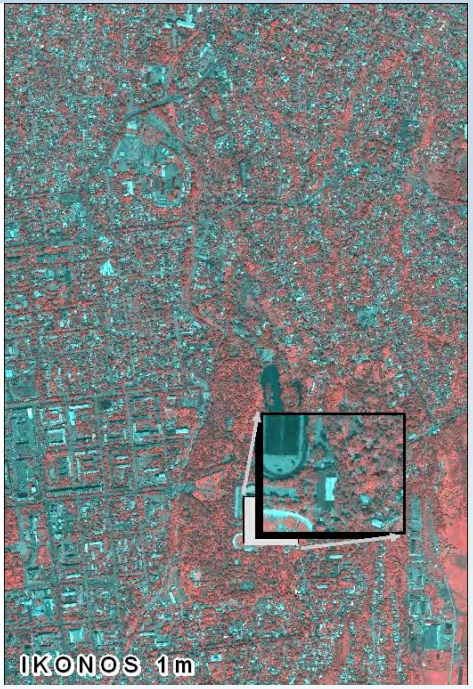
- Amazing amount of remote sensing data out there
- With the right knowledge and tools, an extremely powerful resource.



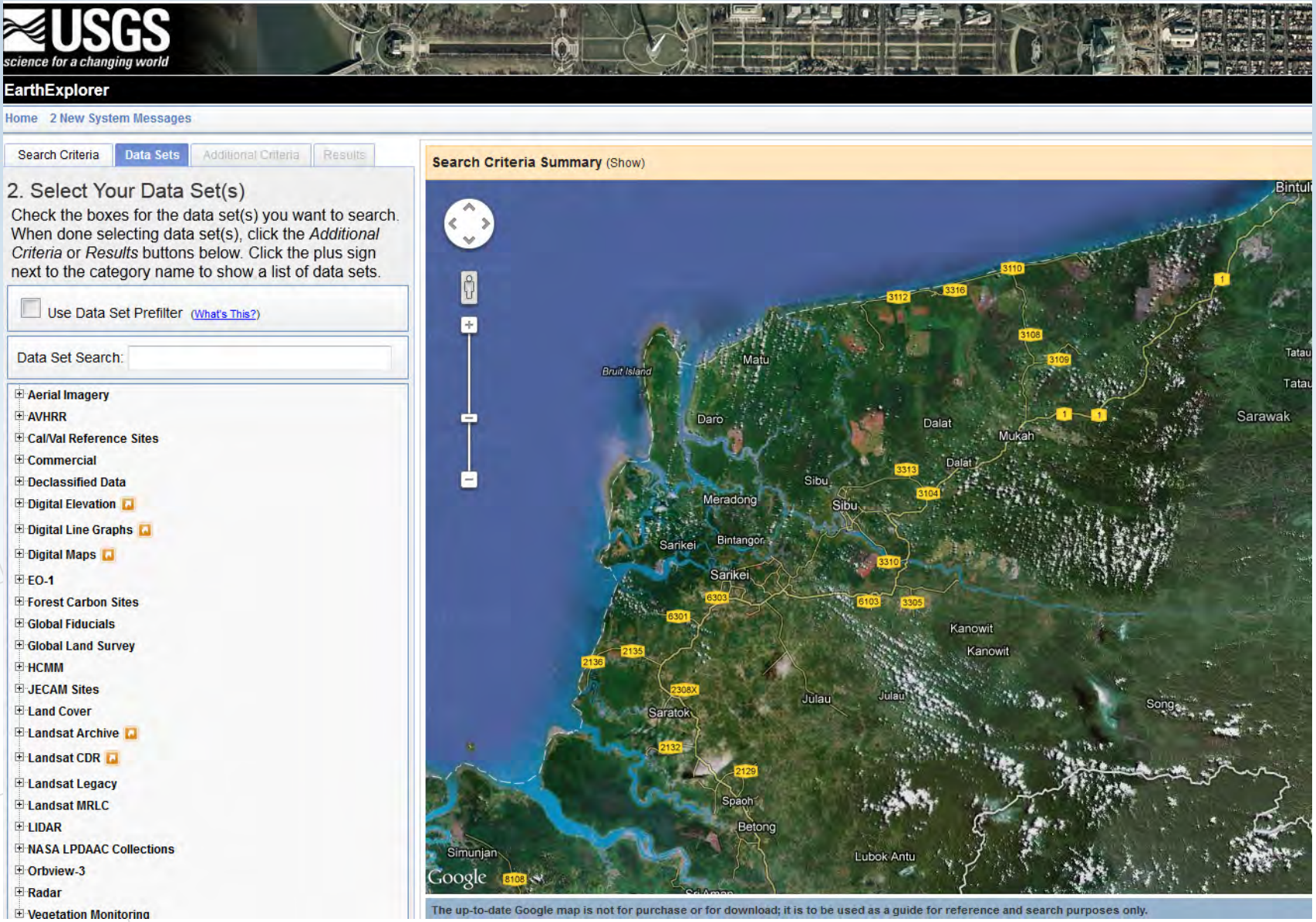
What's out there?

- Take your pick. 40cm to 5km.
- One band to dozens.
- Consider Scale and Extent! Often times 'Less is More'
- Sensor Characteristics: Spatial and spectral resolution, frequency, swath.
- You can't have it all!





Where can I get it?



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EarthExplorer: http://earthexplorer.usgs.gov/

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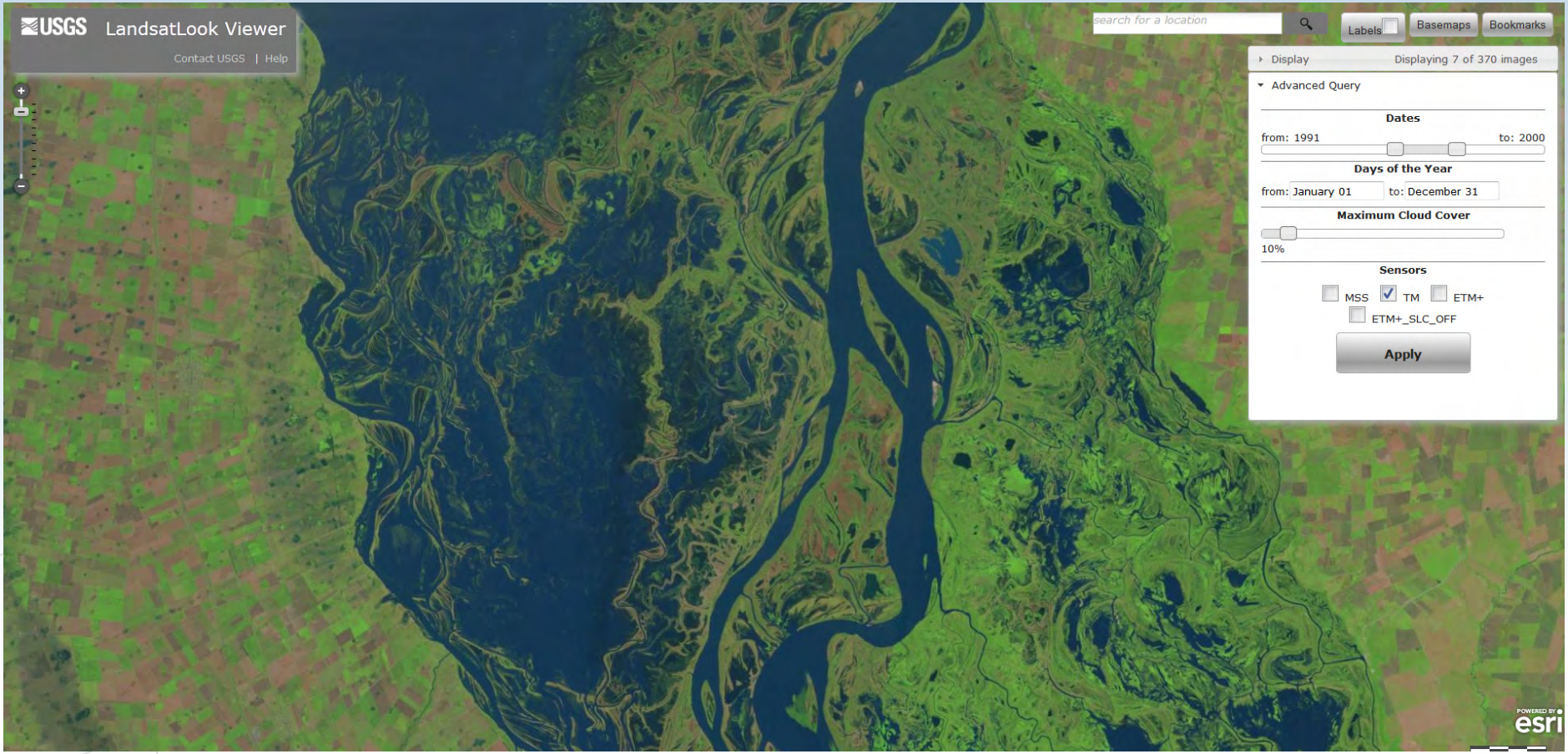

LandsatLook: http://landsatlook.usgs.gov/

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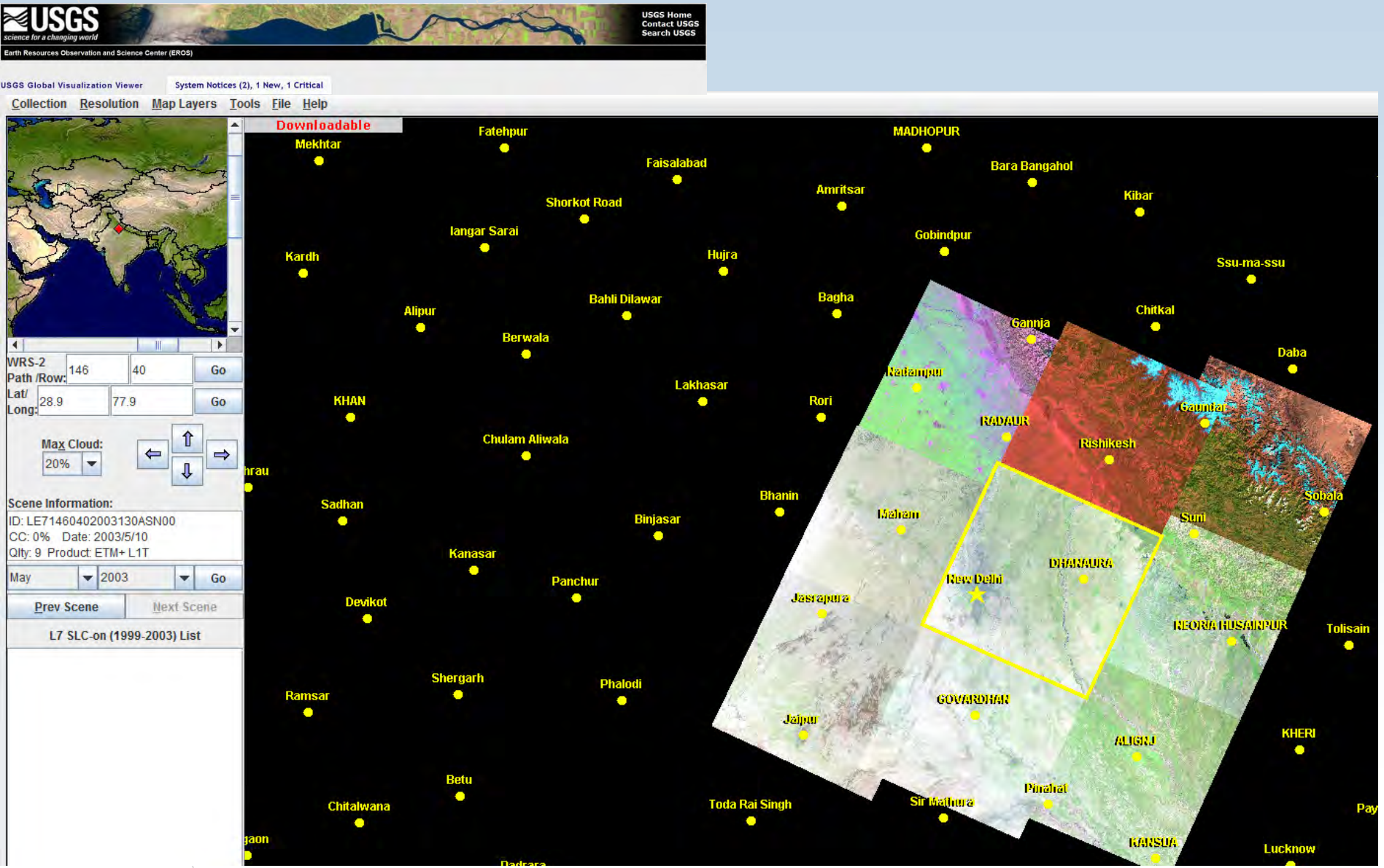
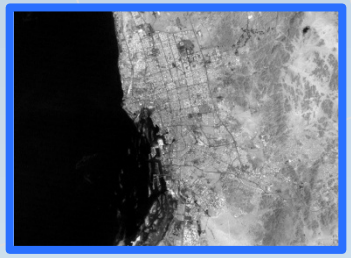


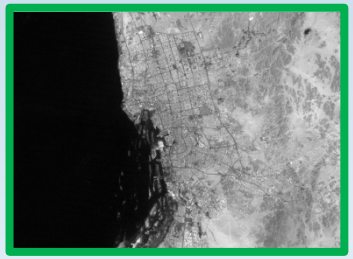
Landsat

- 1972 – Present
- 8 band
- 15-60m pixel resolution
- 16 day repeat
- Excellent Compromise on spatial, temporal, and spectral resolution.

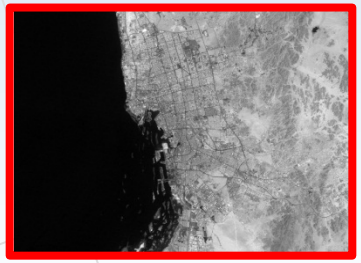
Landsat



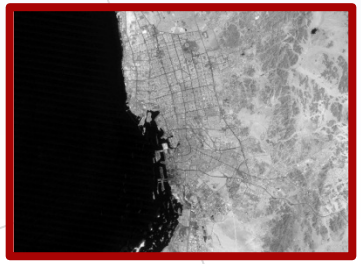
Band 1 (0.45-0.52 µm, blue-green). Aquatic, Sediment, noisy.



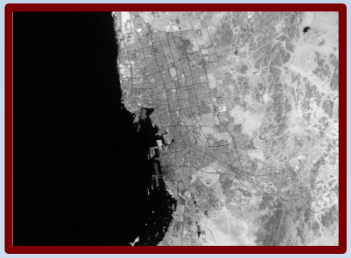
Band 2 (0.52-0.60 µm, green).



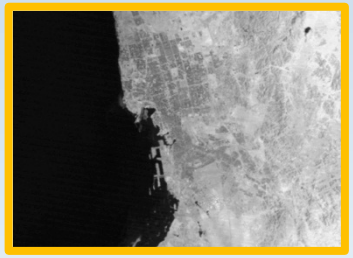
Band 3 (0.63-0.69 µm, red). Diff. between soil and veg.



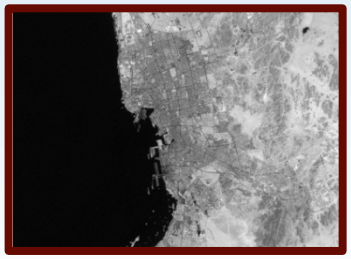
Band 4 (0.76-0.90 µm, NIR). Veg. Water/Land.



Band 5 (1.55-1.75 µm, Mid-IR). Moisture Veg and Soil.



Band 6 (10.40-12.50 µm, Thermal-IR). Surface Temp.



Band 7 (2.08-2.35 µm, Mid-IR). Veg Moisture. Soil/Geology.

Landsat

3,2,1. True Color

5,4,1. Agriculture. Irrigation. Geology.

4,3,2. Water and veg enhancement

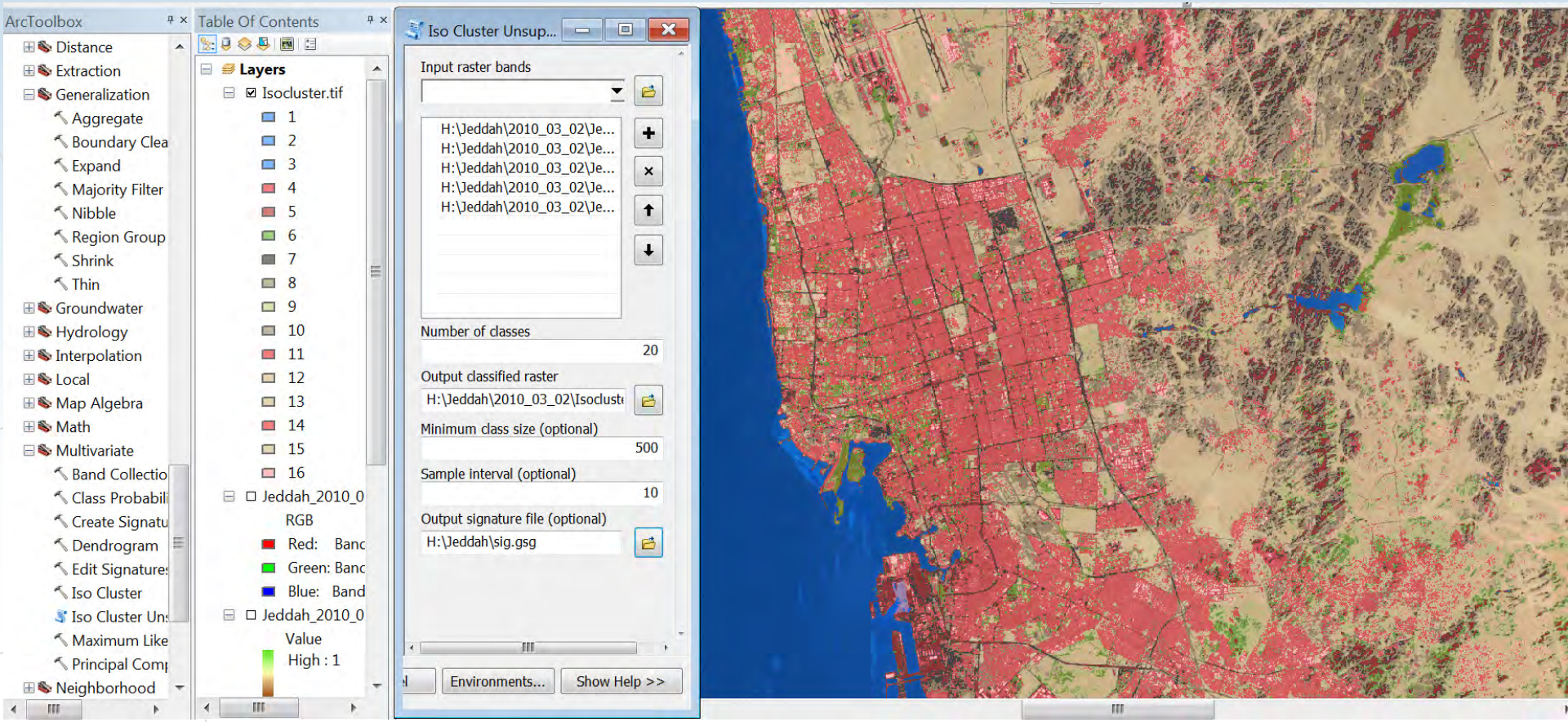
7,4,2. Veg differences. Geology.

Applications and uses

- Land Cover, Land Cover Change
- Analysis of vegetation, surficial hydrology, impervious surface
- Feature extraction
- General Base Mapping

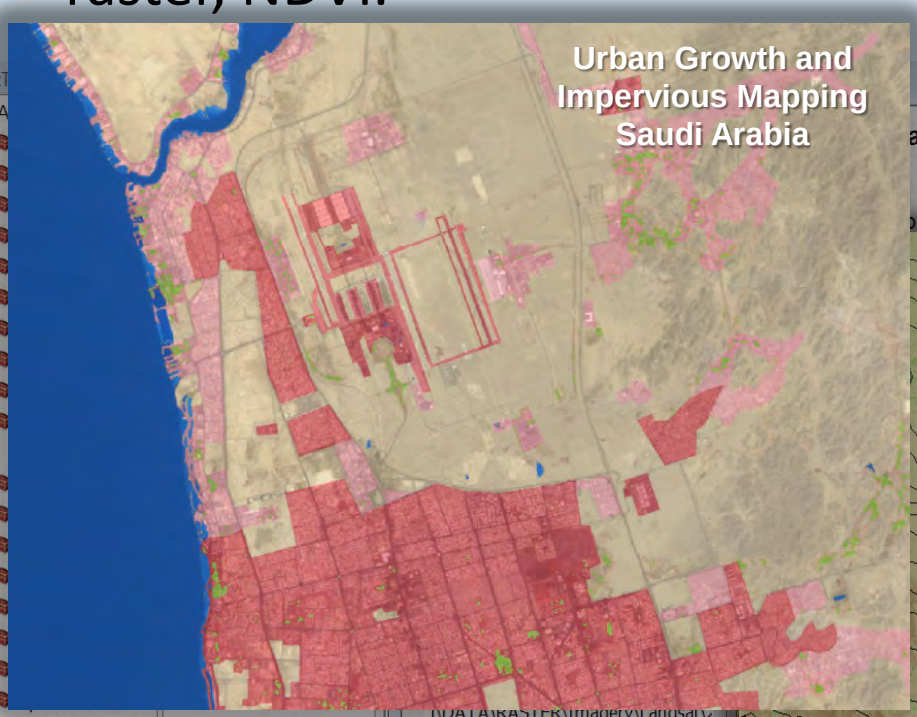
Toolsets

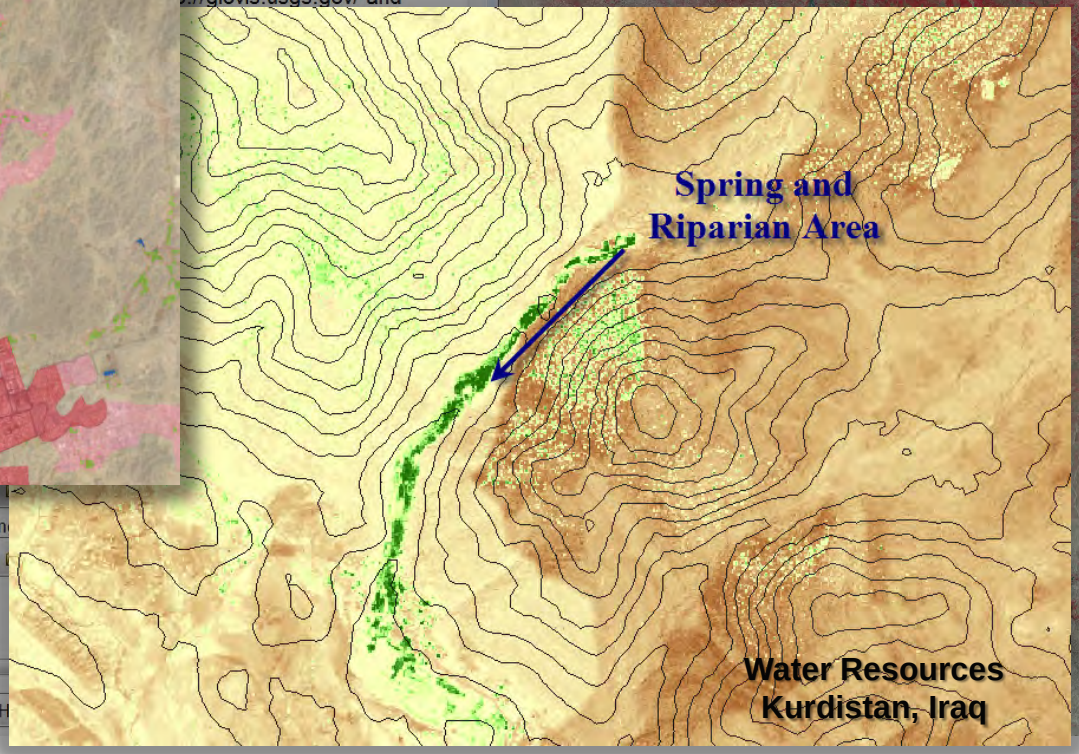
- Out of the box tools in ArcGIS's Spatial Analyst
- Combination of Multivariate toolset and Generalization. (Boundary Clean > Region Group > Nibble)



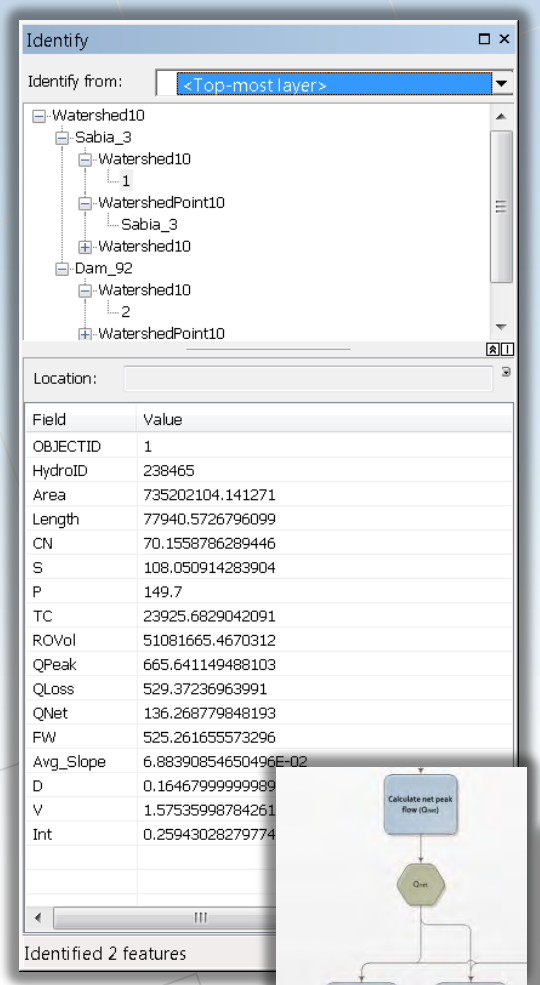
Toolsets

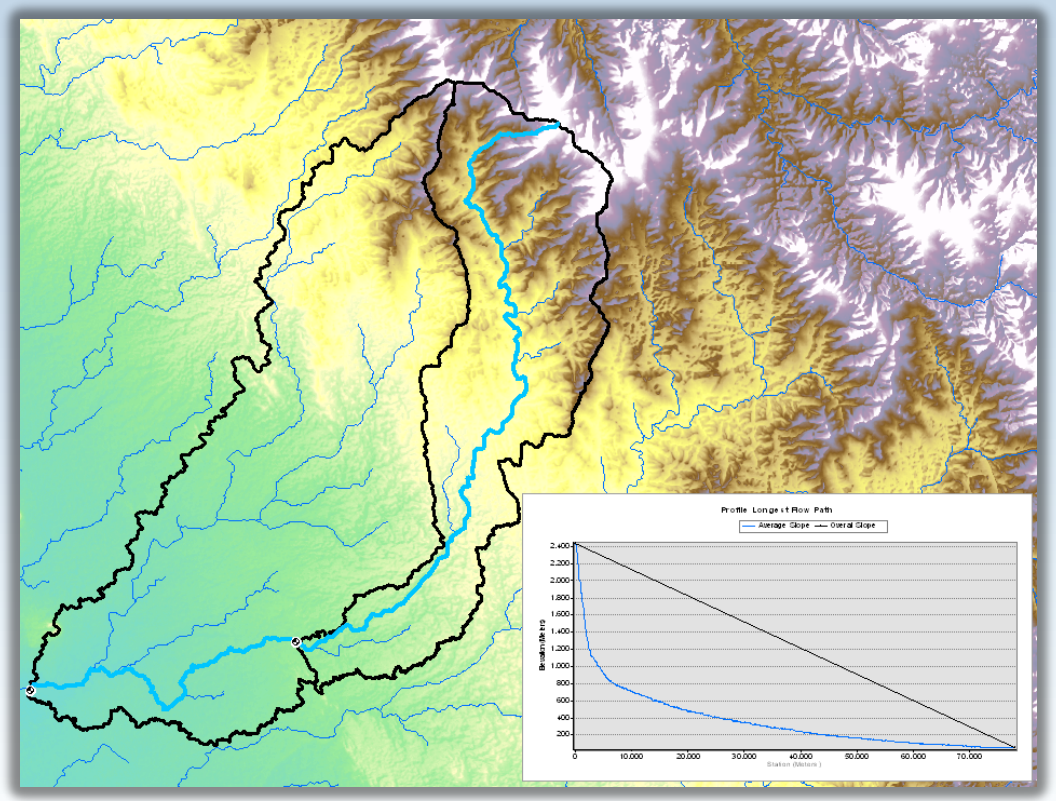
- Custom Toolbox to process raw Landsat data from USGS.
- Composites Bands, exports 6 band raster, 4 band pan sharpened raster, NDVI.

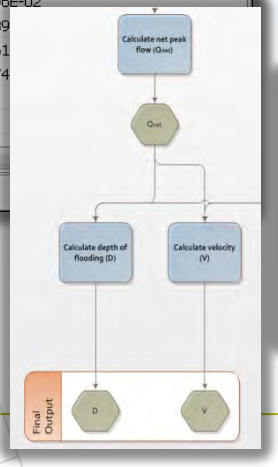




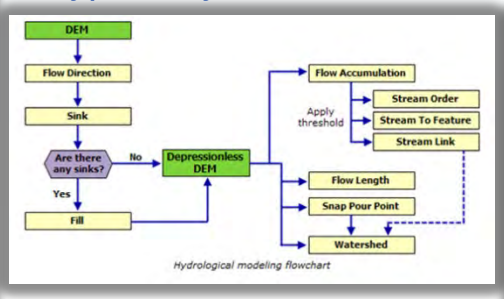
ASTER DEM for Hydro Tools



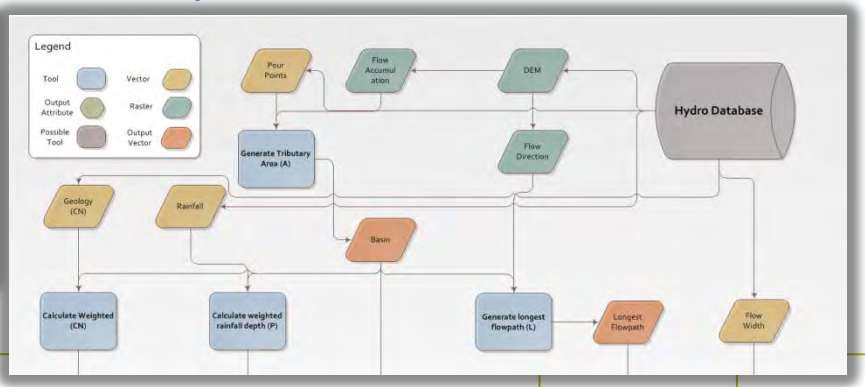




Typical Hydro

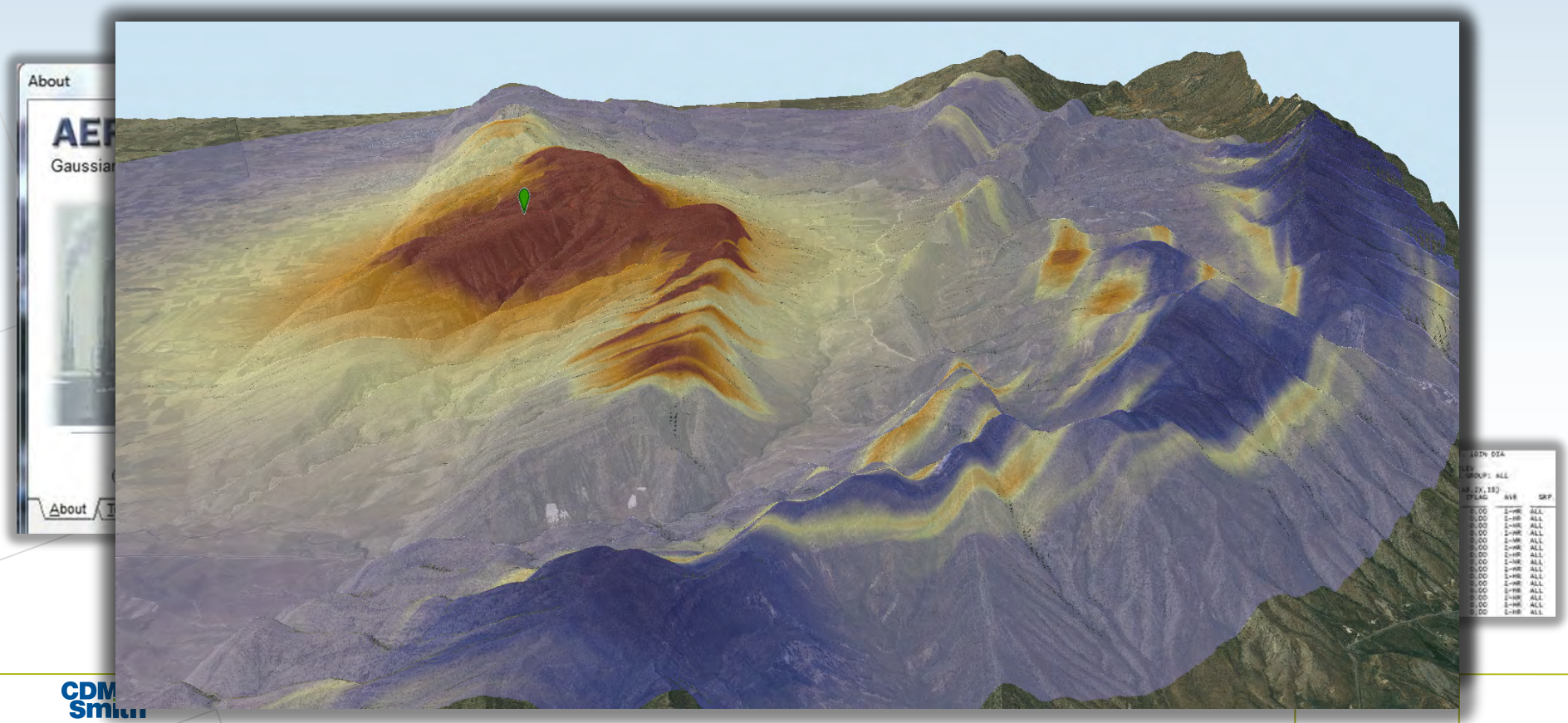


Custom Hydro



ASTER DEM for Air Dispersion Modeling

- AERMOD – Atmospheric dispersion modeling system
- Models plumes and plume dispersion
- Used for many EPA regulatory projects
- FORTRAN based, pretty clunky, not visually appealing



High Resolution Imagery
This stuff's not free!

- Useful for site characterization, environmental assessments, base mapping, field activities, feature extraction.
- For many projects it's worth the $$$

Platform		Sensor	Spatial Scales - extent - pixel size	Spectral Resolution and Range	Radiometric Resolution	Temporal Resolution - repeat frequency - time of acquisition	Source(s) for Data
high spatial resolution multi spectral		QuickBIrd 2 IKONOS GeoEye-1	**Extremely fine** (local) **Extent:** 25sqkm+, 49sqkm+ **GRE:** 0.5-1m (pan) or 1.64-4m (multi)	> 100 nm **Medium range:** 400-920nm **# Bands:** 4	**High:** 11 bit (2048 levels)	morning 3 days Programmable	**Geoimage** **Quickbird** www.digitalglobe.com **IKONOS** www.geoeye.com **GeoEye-1** www.geoeye.com
		Rapid Eye	High: (local, province, region) **Extent:** 77km swath at nadir **GRE:** 5m	> 100 nm **Medium range:** 440-850nm **#Bands:** 5	**Medium:** 12bit	Derived product from SPOT5	**RapidEye** www.rapideye.de **Geoimage** www.geoimage.com.au **AAMHatch** www.aamhatch.com
		WorldView-1	**Extremely fine** (local) **Extent:** 25sqkm+ **GRE:** 0.5m (pan)	> 100 nm **Medium range:** 400-900nm **# Bands:** 1	**High:** 11 bit (2048 levels)	morning 3 days Programmable	**Geoimage** **WorldView-1** www.digitalglobe.com
		WorldView-2	**Extremely fine** (local) **Extent:** 25sqkm+ **GRE:** 0.5m (pan) or 1.84m (multi)	> 100 nm **Medium range:** 400-1050nm **# Bands:** 8	**HIgh:** 11 bit (2048 levels)	Not yet operational, launch scheduled for October 2009	**Geoimage** **WorldView-2** www.digitalglobe.com

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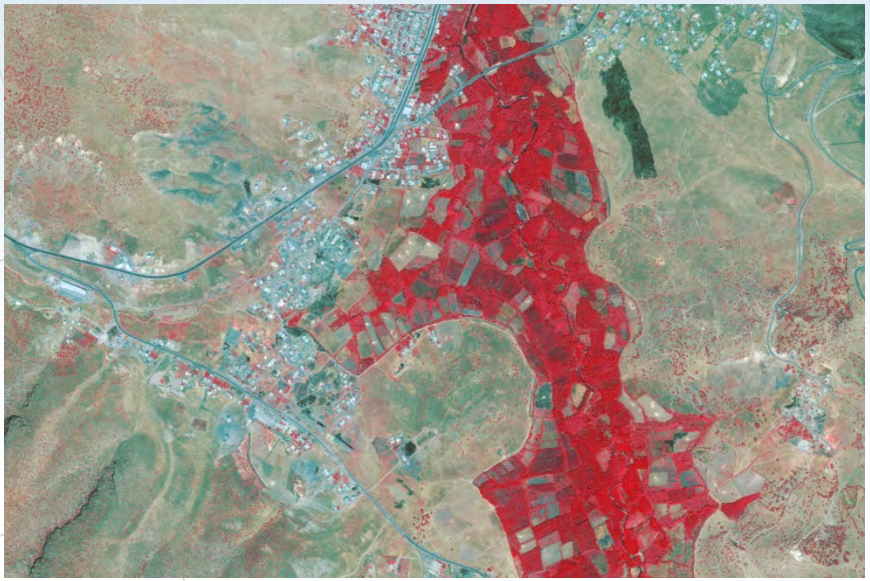
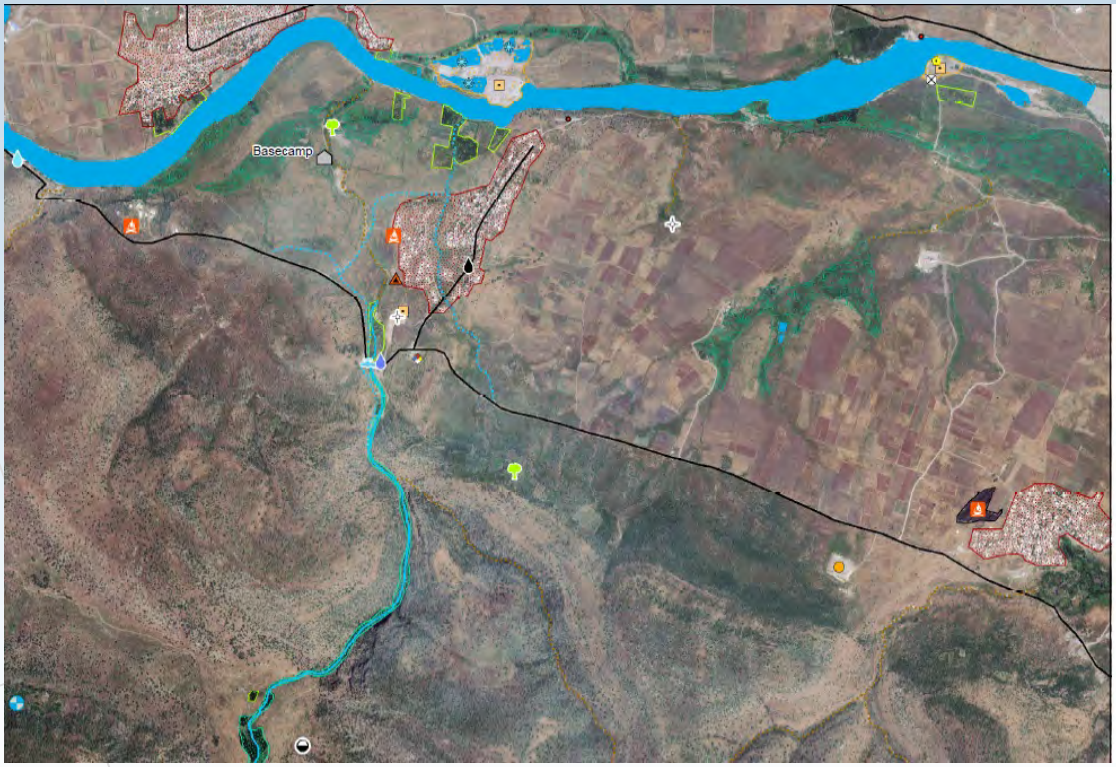
Case Study: WV2 Imagery Kurdistan

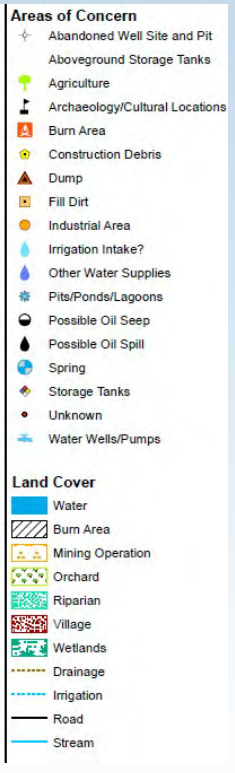
- Oil and Gas companies in the process of exploration. Working with local environmental agencies to document baseline conditions.
- Imagery initially purchased for base mapping. Now multiple products and applications.

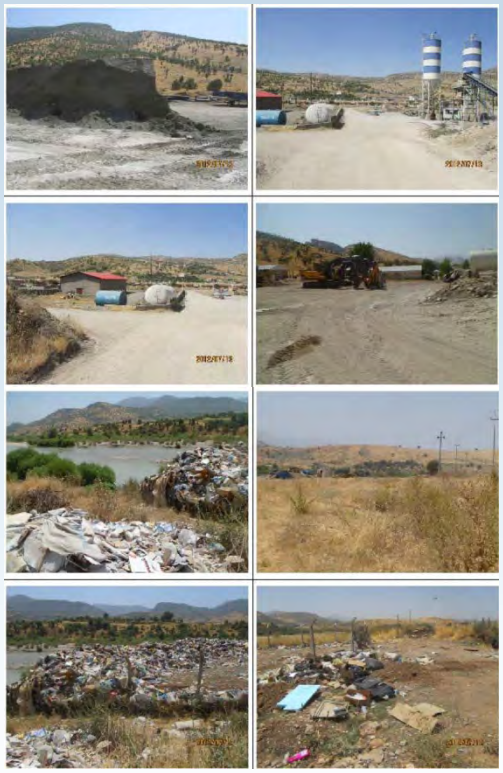


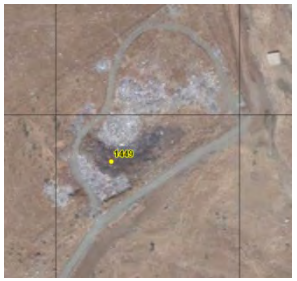
Case Study: WV2 Imagery Kurdistan

- Image screening for areas of concern. Baseline conditions.



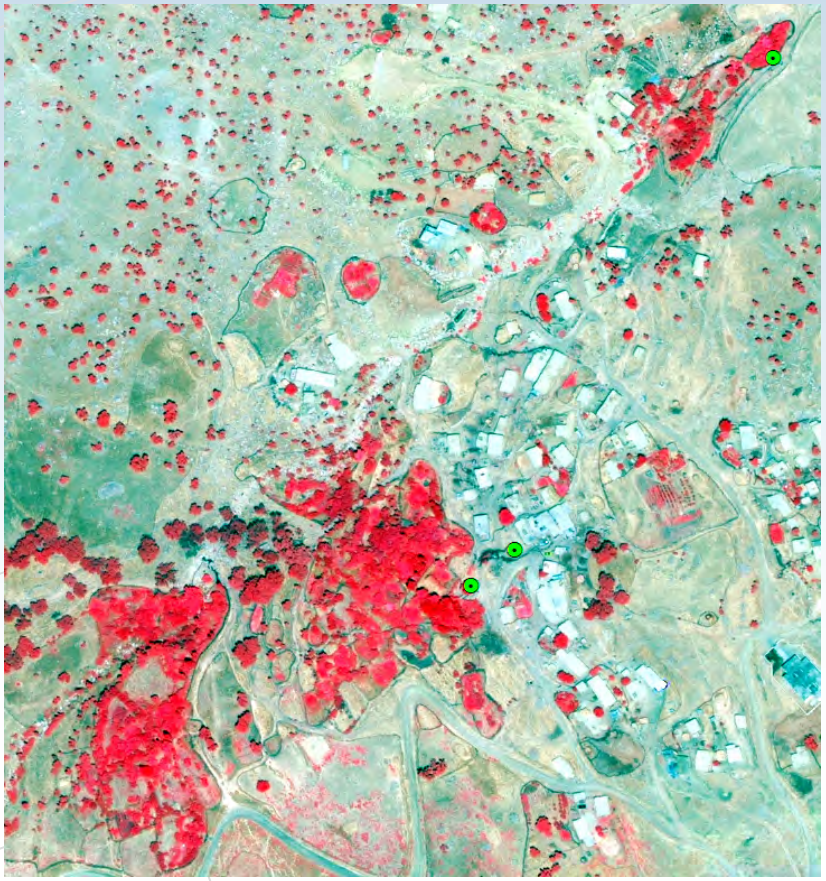


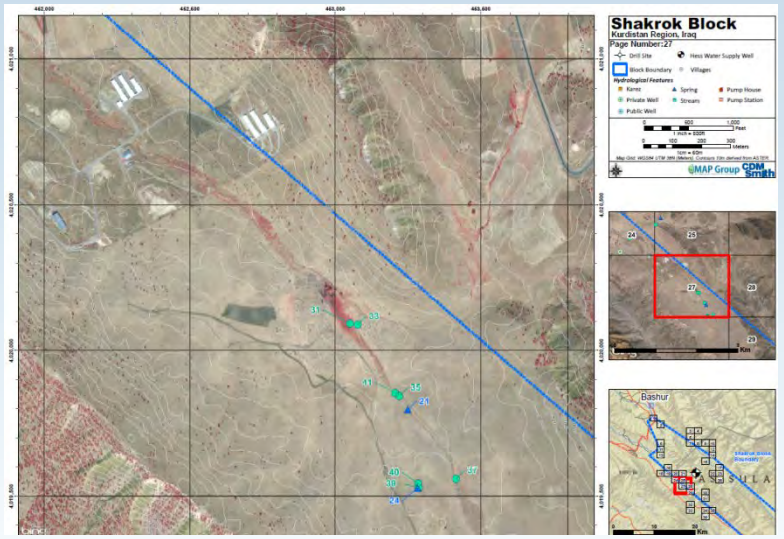


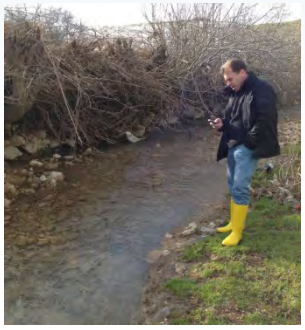


Case Study: WV2 Imagery Kurdistan

- Hydrological Assessment. Springs, surface water, riparian.
- NIR band extremely useful. Image Analysis Toolbar.

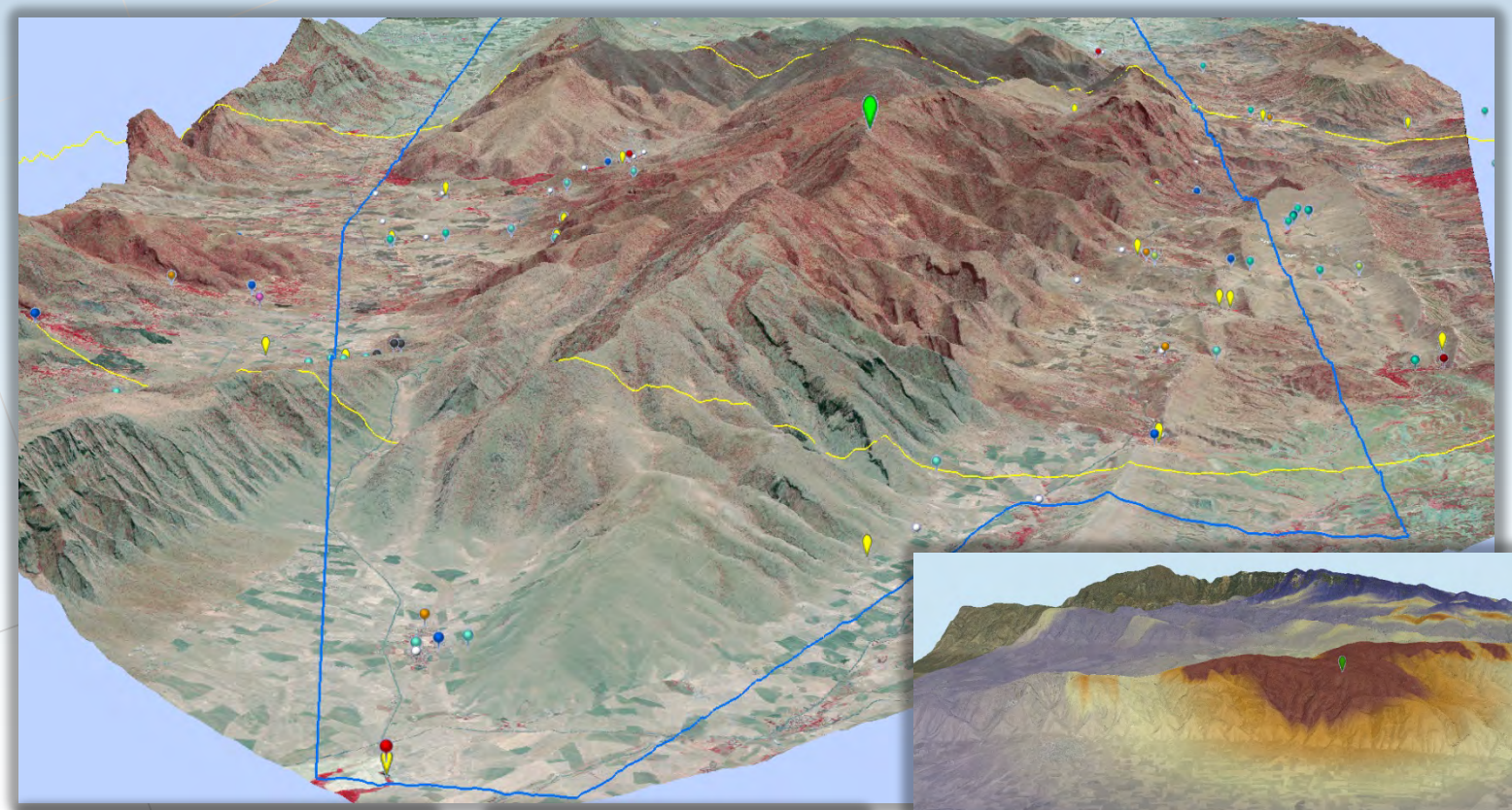


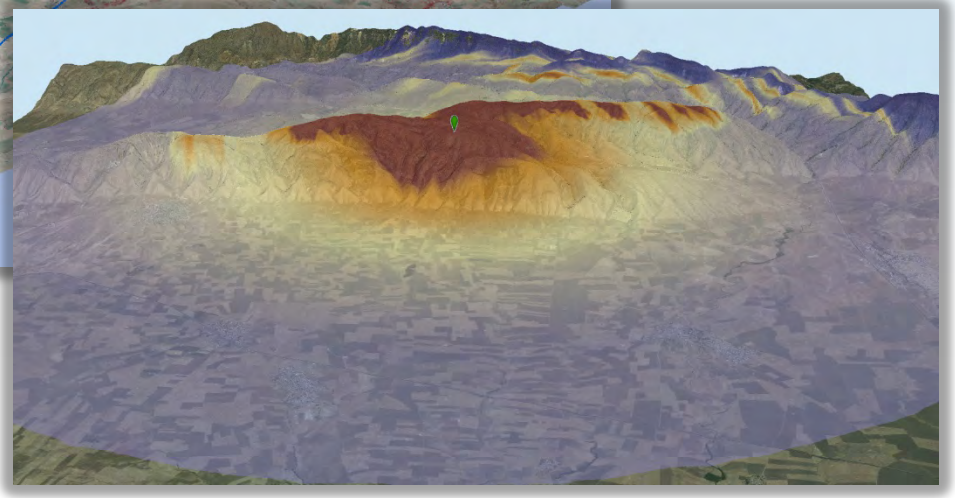


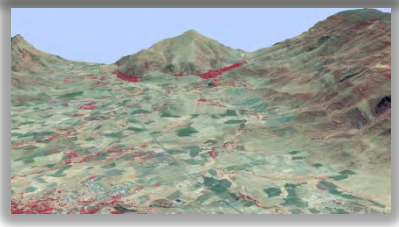


Case Study: WV2 Imagery Kurdistan

- Visualization: Satellite view to 3D, a Greater display of information

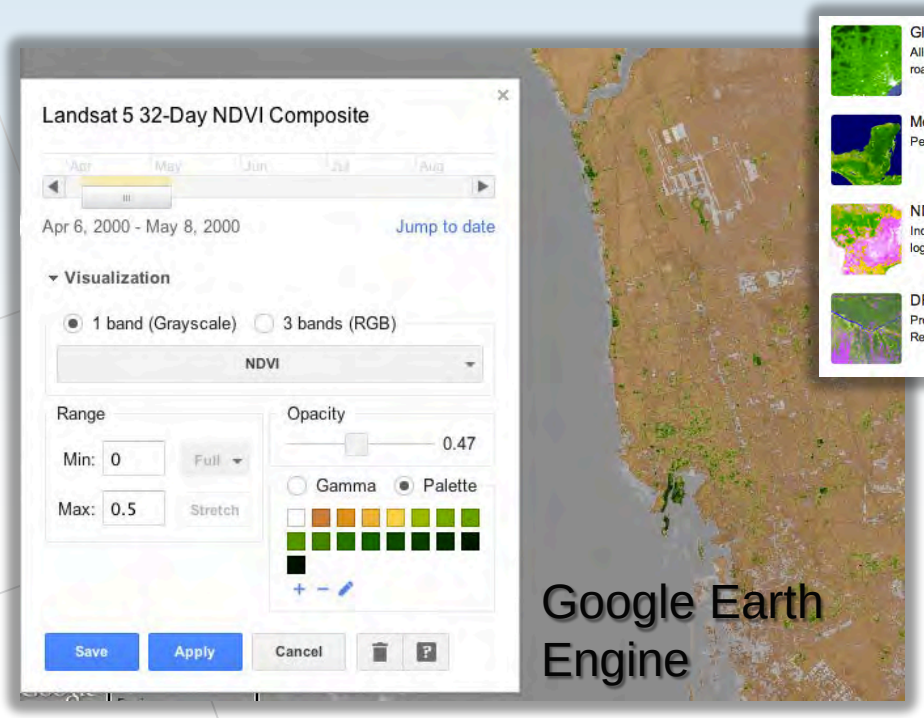


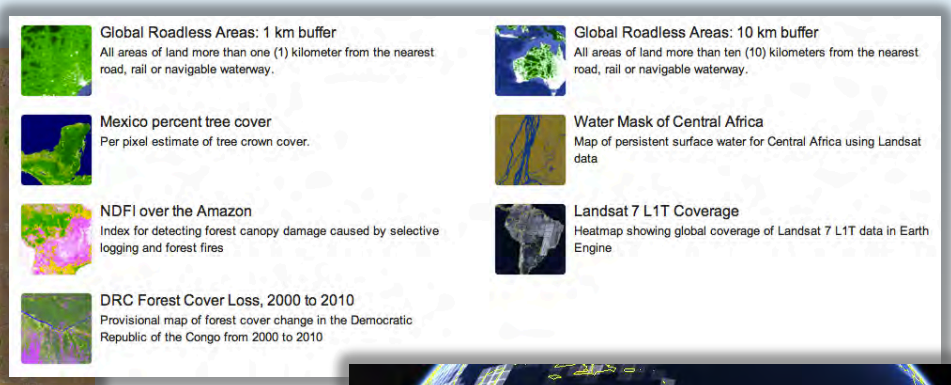


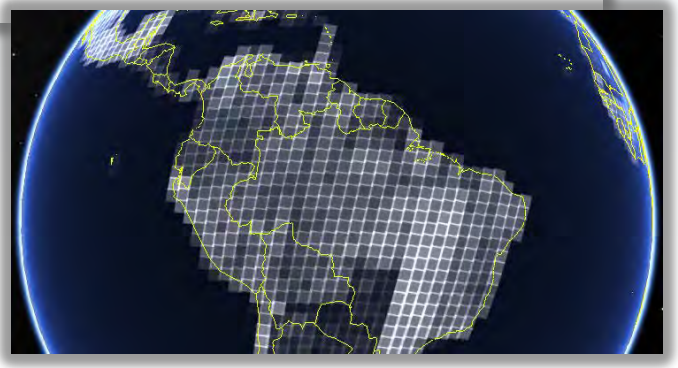


What the Future Holds…

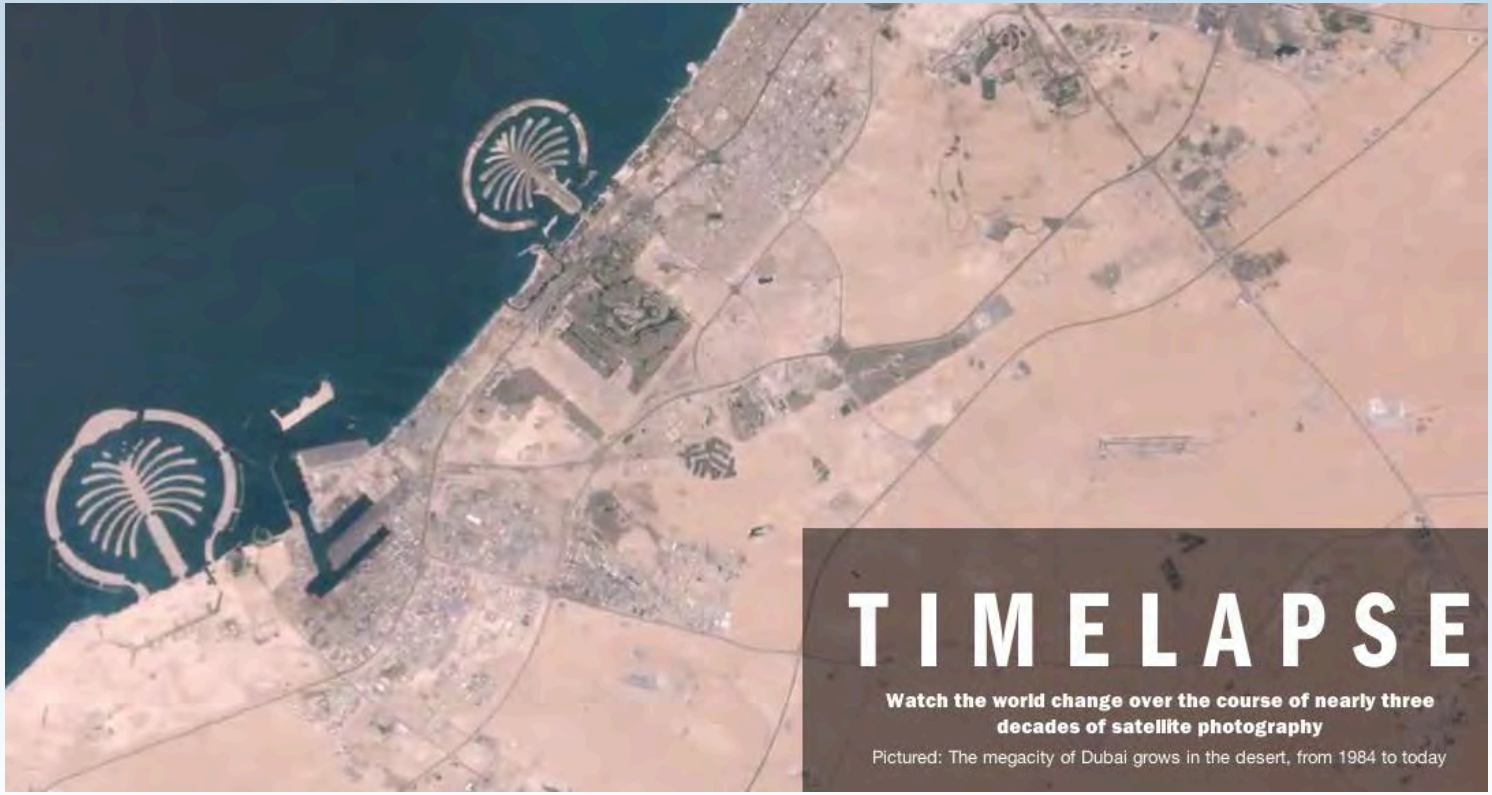
- More access to imagery (archives, govt, commercial)
- Web apps. On the fly processing, viewing, and downloads
- Remote Sensing for the GIS professional and GIS user
- Filling in data gaps in geospatial data (Raster > Vector)
- Greater understanding of our world

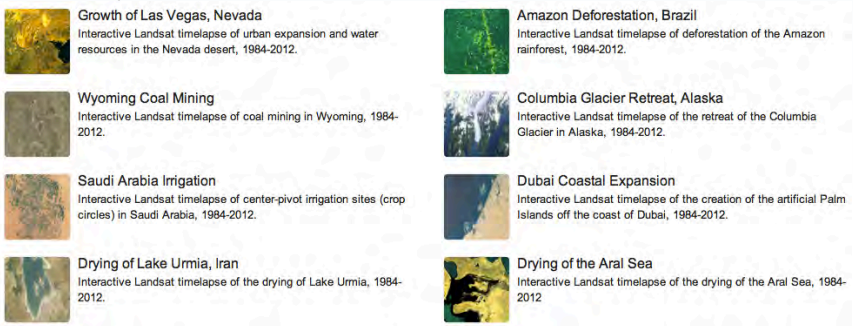






What the Future Holds…





- Dallas
- Vegas

Contact information and Resources

- **Jared Newell -** newelljd@cdmsmith.com

Resources

- EarthExplorer: http://earthexplorer.usgs.gov/
- LandsatLook: http://landsatlook.usgs.gov/
- Glovis: http://glovis.usgs.gov/
- Geofabrik (OSM): http://www.geofabrik.de/index.html
- Google Earth Engine: http://earthengine.google.org
- Google Timelapse: http://earthengine.google.org/#timelapse/
- Wikimapia: http://wikimapia.org