

# Natural Resource Assessments in Afghanistan Supported by High Resolution Digital Elevation Modeling and Multi-spectral Image Analysis

Peter G. Chirico  
USGS  
Earth Surface Processes Team  
12201 Sunrise Valley Drive  
Reston, VA 20192  
[pchirico@usgs.gov](mailto:pchirico@usgs.gov)



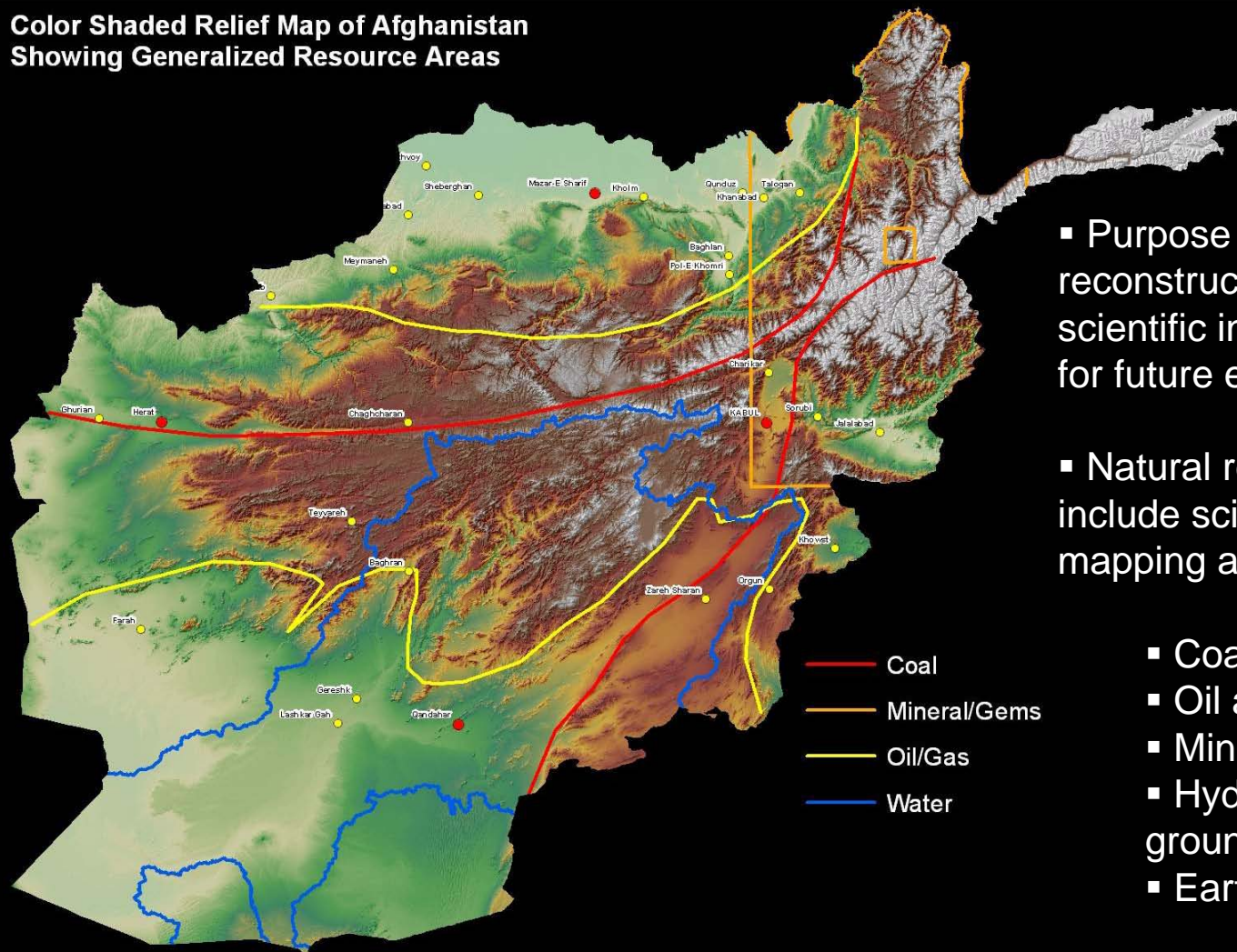
**Afghanistan  
Engineer District**



U.S. Department of the Interior  
U.S. Geological Survey

# USGS/USAID Natural Resource Assessments

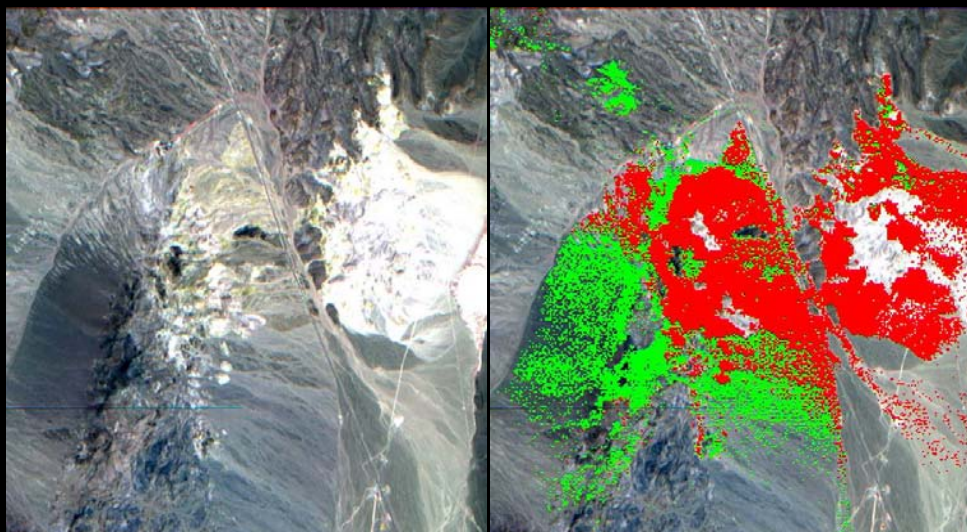
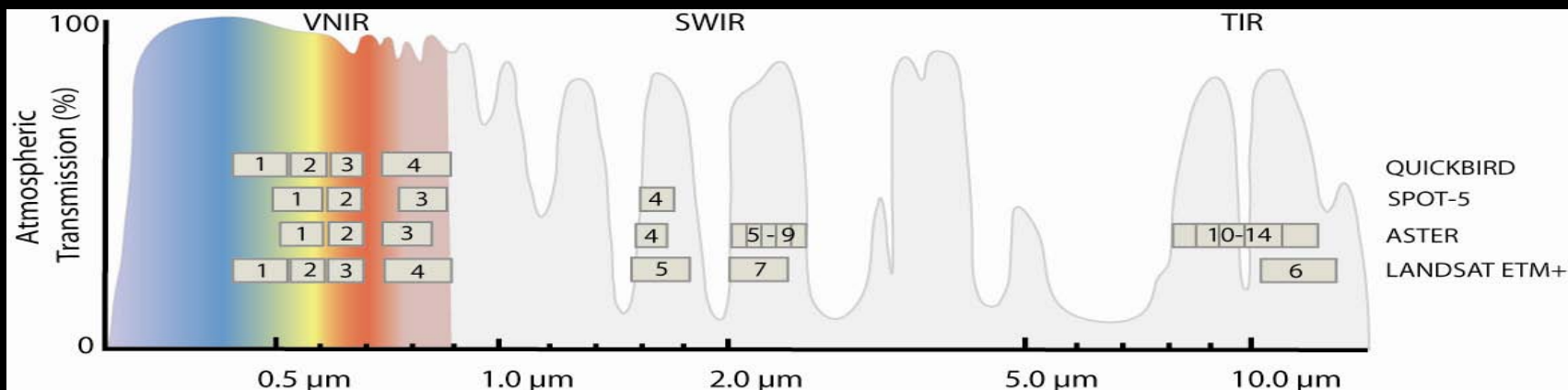
Color Shaded Relief Map of Afghanistan  
Showing Generalized Resource Areas



- Purpose is to support reconstruction activities by providing scientific information and foundation for future economic activities.
- Natural resource assessments include scientific investigations and mapping activities for:
  - Coal
  - Oil and natural gas
  - Minerals
  - Hydrologic resources – groundwater and surface water
  - Earthquake and flood hazards

# Natural Resource Assessments Require Remote Sensing and GIS

Spectral Resolution of Quickbird, Landsat 7 ETM+, and ASTER and band ratios used for mineral mapping

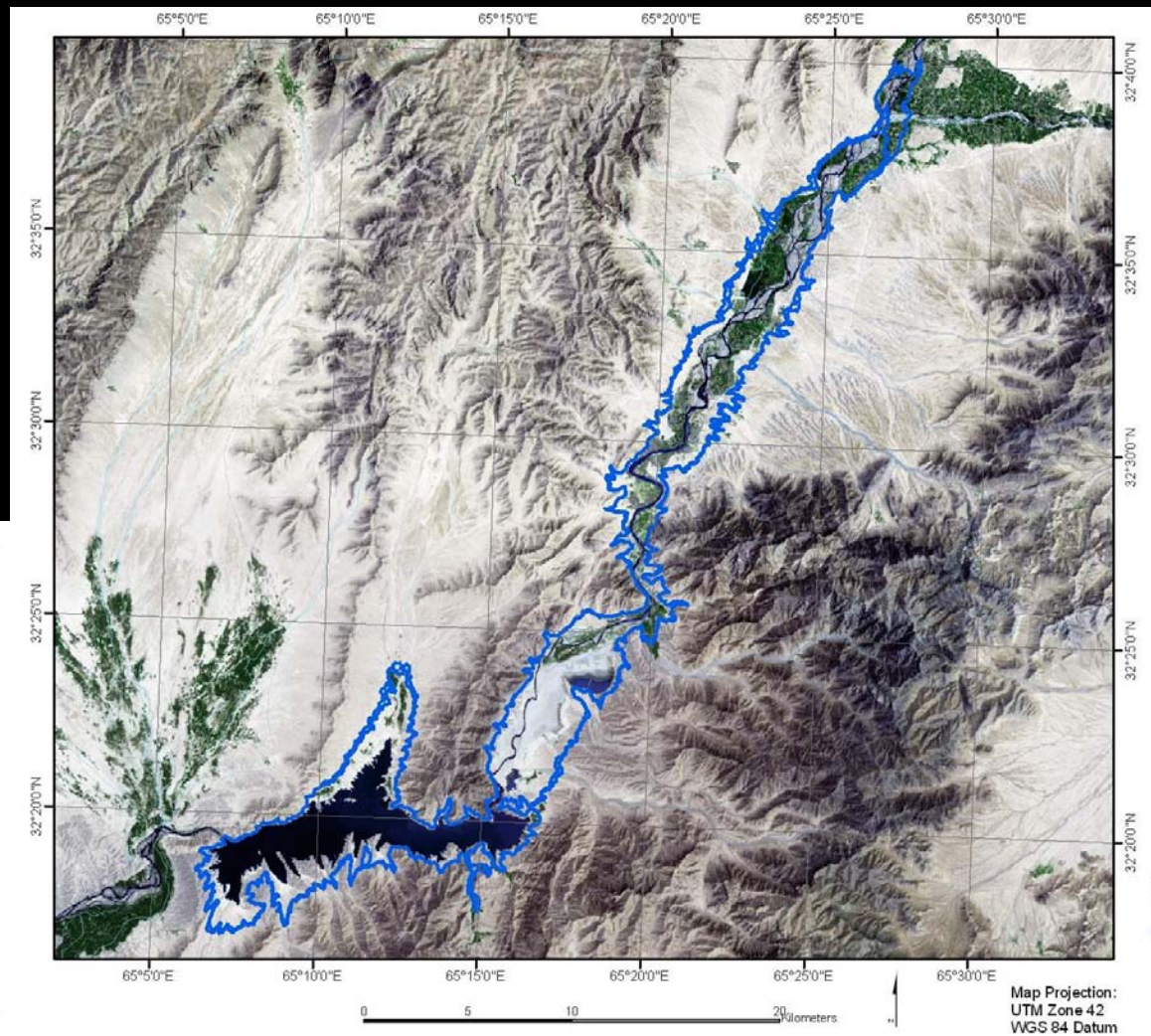


**ASTER BAND RATIO AND RBD IMAGES**

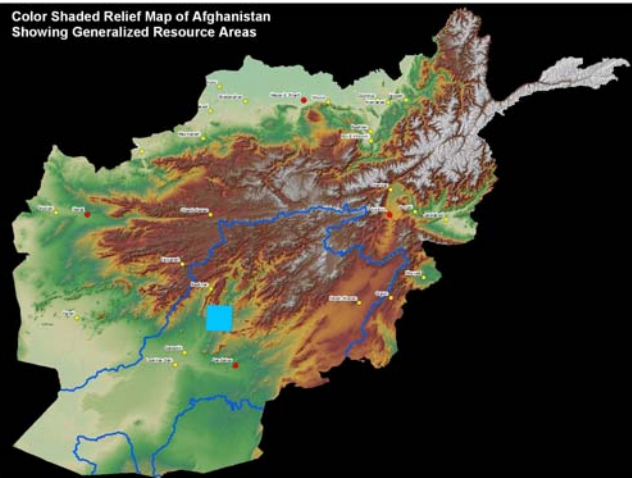
- B3/B2 - VEGETATION
- B2/B1 - Fe<sup>3+</sup>
- (B4+B6) / B5 - ALUNITE, KAOLINITE
- (B5+B7) / B6 - MUSCOVITE, SMECTITE-ILLITE, SERICITE
- (B7+B9) / B8 - CARBONATE, EPIDOTE, CHLORITE
- B14 / B12 - QUARTZ-RICH ROCKS

# Kajakai Dam and Spillway Level Increase: Location and Plan

- Kajakai Dam and Reservoir in Helmand and Uruzgan Provinces, SW Afghanistan



Color Shaded Relief Map of Afghanistan Showing Generalized Resource Areas



# Kajakai Dam and Spillway Level Increase

- Terrain Visualization of Kajakai Dam



Image Credit: Digital Globe, Inc.

Civil Commercial Imagery Evaluation Workshop

March 14-16, 2006

USFWS National Wildlife Visitors Center, Laurel MD

# Kajakai Dam and Spillway Level Increase: SRTM Elevation Data

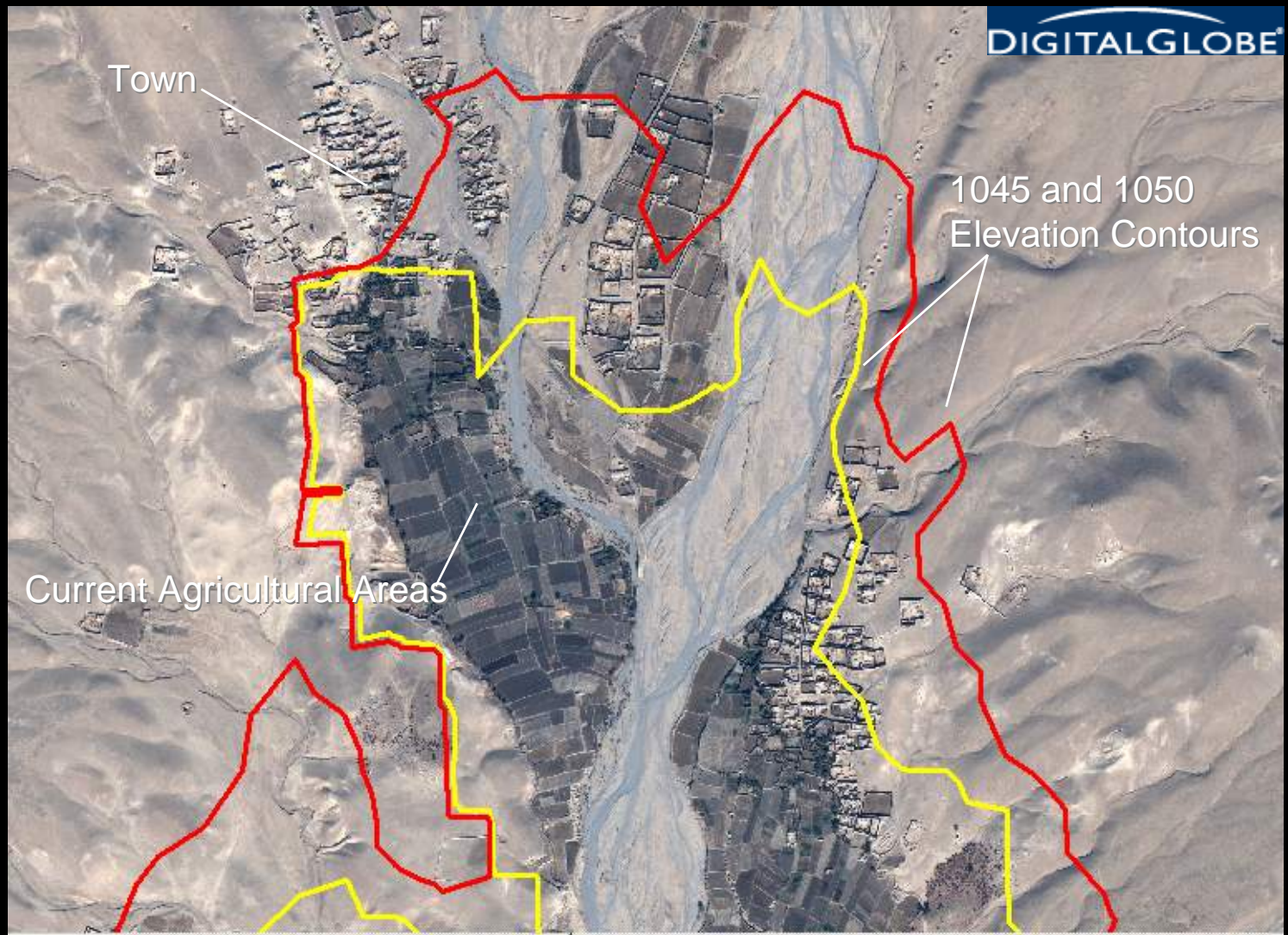


Image Credit: Digital Globe, Inc.

Civil Commercial Imagery Evaluation Workshop

March 14-16, 2006

USFWS National Wildlife Visitors Center, Laurel MD

# Need for More Accurate and Refined Elevation Model



Image Credit: Digital Globe, Inc.

# SPOT5 2.5m Resolution Panchromatic Image Stereo Collection

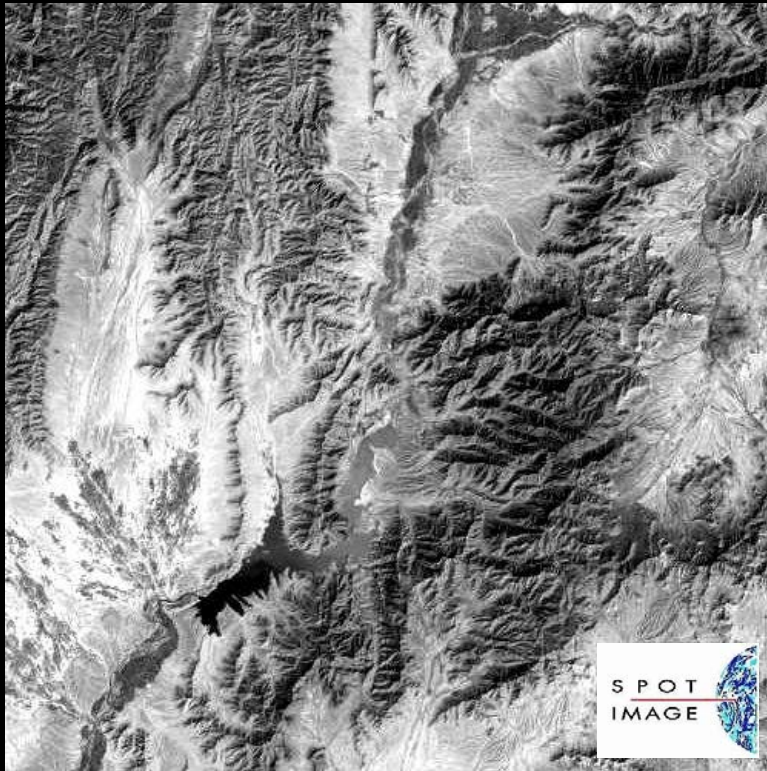


Image date 02/26/06

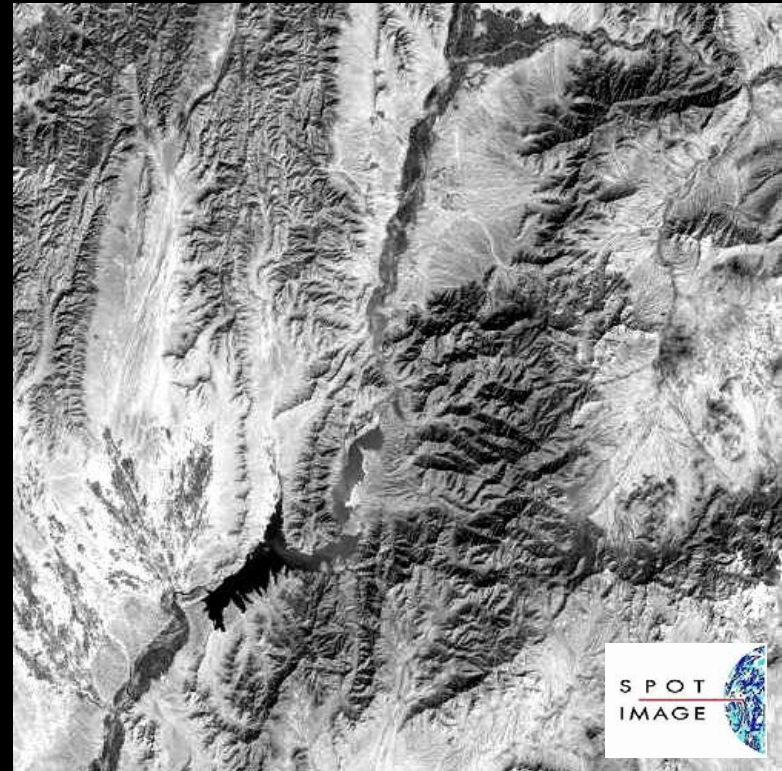
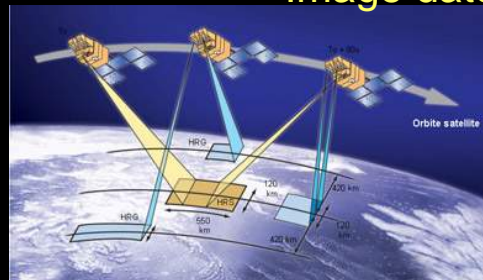
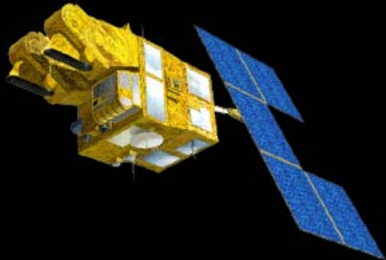


Image date 02/27/06

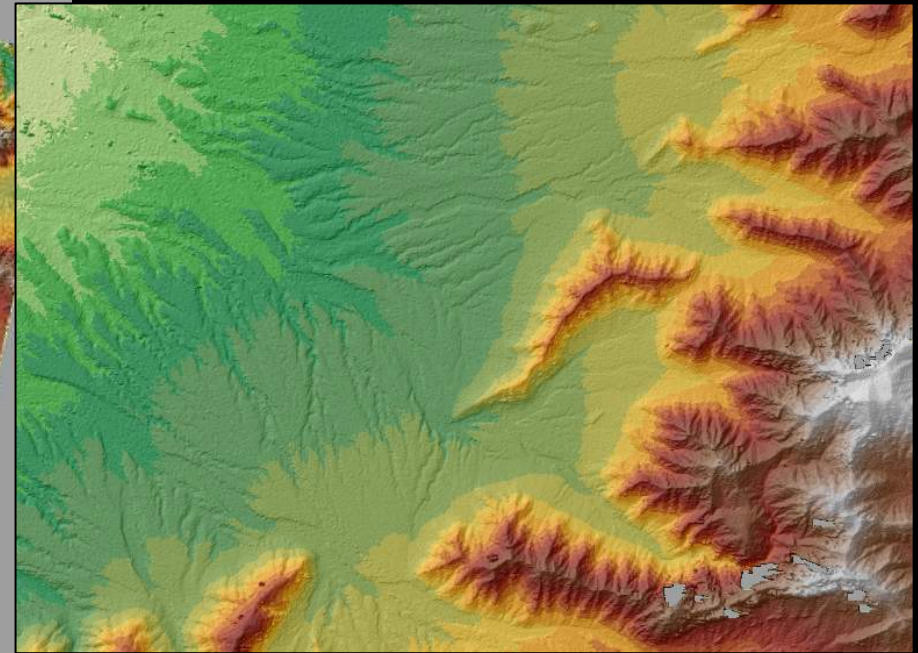
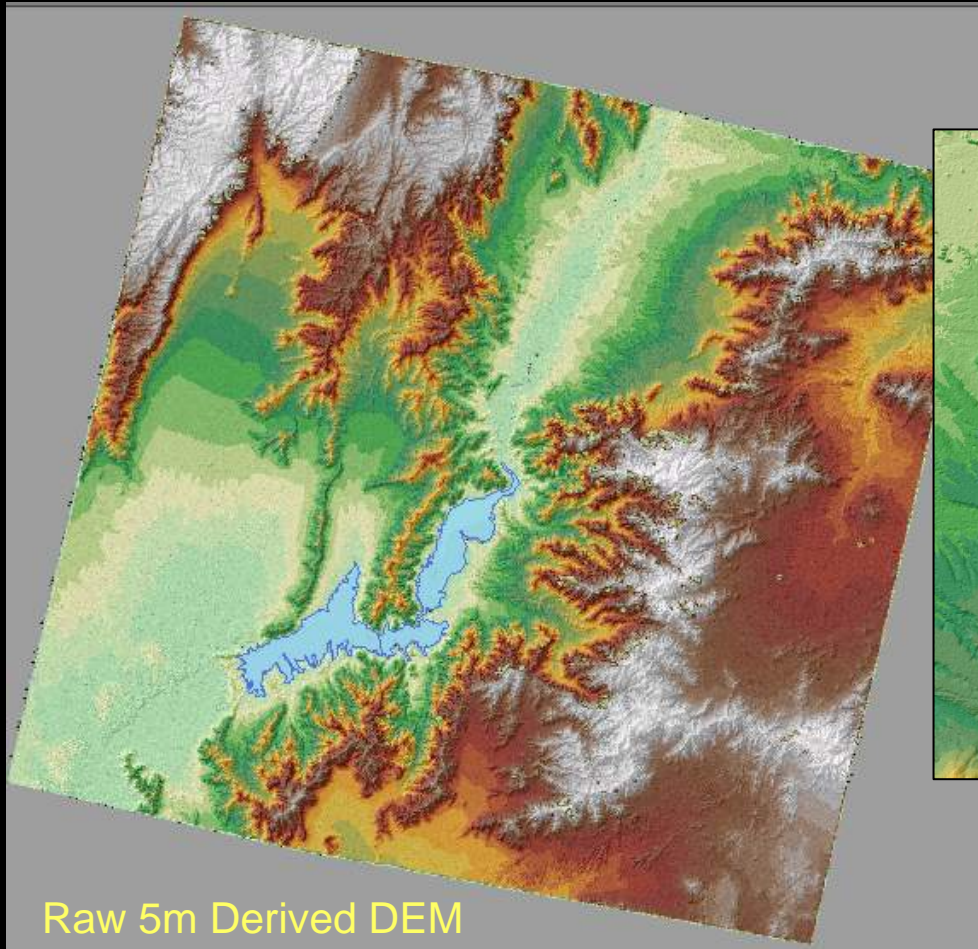
Image Credit:  
SPOT Image  
Corporation





# SPOT Derived 5m Resolution DEM

---

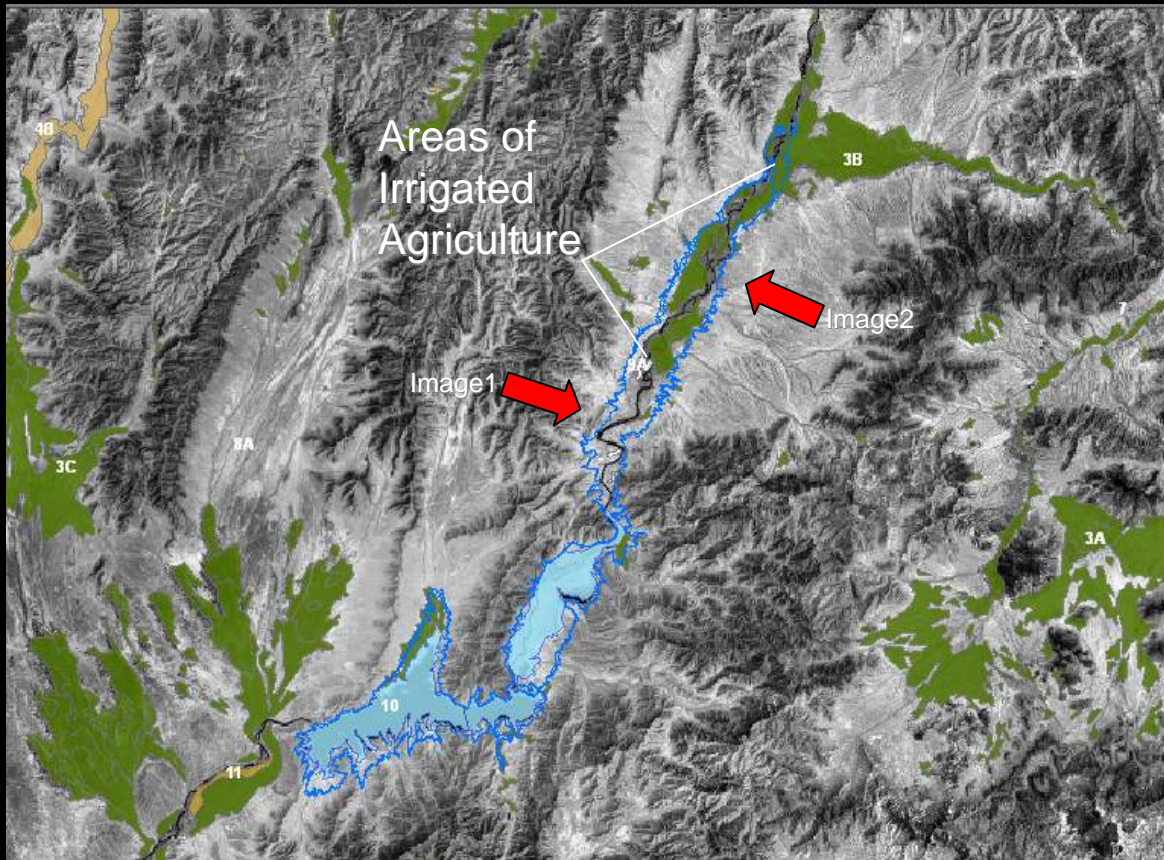


# Qualitative Elevation Comparison Results



Image Credit: Digital Globe, Inc.

# New Reservoir Impact to Landuse/Landcover



Landsat Image



Image1



Image2

# Conclusion



**Peter G. Chirico**  
**USGS**  
**Earth Surface Processes Team**  
**12201 Sunrise Valley Drive**  
**Reston, VA 20192**  
[pchirico@usgs.gov](mailto:pchirico@usgs.gov)