

**National Geospatial Management Center ... Moving into the Future**

**2011 National Cooperative Soil Survey Conference (Asheville NC)**

May 23, 2011

**“Geospatial Technology to  
Support NRCS and  
NCSS”**

**Tommie Parham, Director**

National Geospatial  
Management Center (NGMC)



# NGMC Presentation Outline

- NGMC Mission & Direction
- H. H. Bennett Insight
- Global Position System
- Elevation (LiDAR IFSAR)
- Imagery

# NGMC Presentation Outline

- Geospatial Data Management
- Cache Tile
- CDSI Support
- GeoObserver

# National Geospatial Management Center (NMGC)

## Mission

To provide consumers with accessible, always available, up-to-date, authoritative, and trusted geospatial data and value-added cartography and geospatial services:

## Key Services

- Mapping sciences (cartography, GIS, remote sensing, PNT technology)
- Aerial photography, elevation data, imagery, remote sensing, global positioning systems, training
- Natural resources data, geospatial technology, National Resources Inventory
- **Provide support for Soil Survey**, Engineering, Conservation Planning (CDSI), and Other agency programs
- Geospatial Data Warehousing & Distribution

# National Geospatial Report

A Multi-Level Agency Evaluation of  
USDA-NRCS Geospatial Assets and Activities  
With Findings and Recommendations for  
Geospatial Implementation

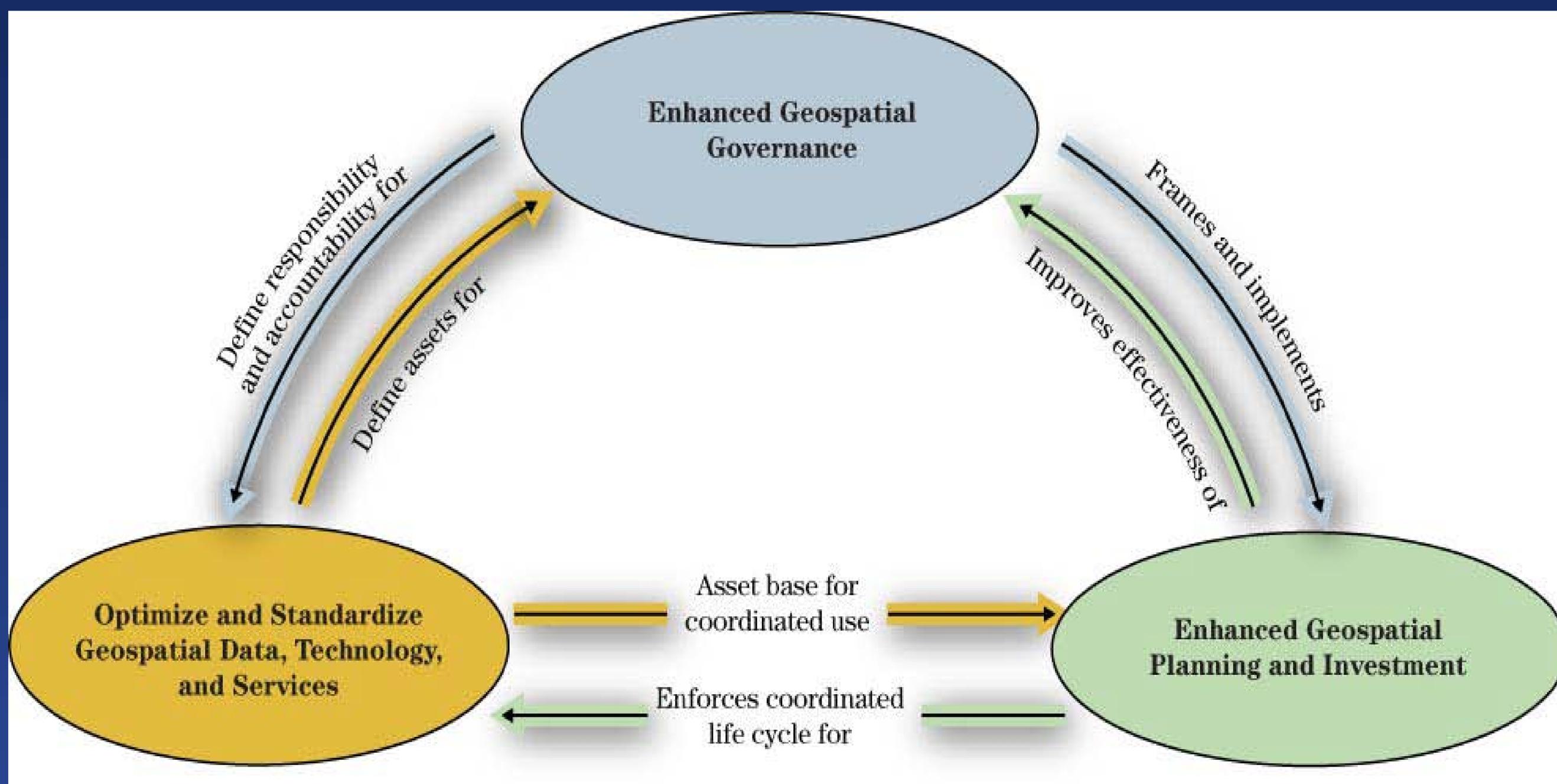


Led by  
National Cartography & Geospatial Center  
Fort Worth, Texas

June 2008

- In 2007 NRCS began a multi-level Agency evaluation of NRCS geospatial assets and activities with findings and recommendations for geospatial implementation
- 1 Year in development
- Completed June 2008

# Geospatial Framework



# Hugh Hammond Bennett



“Soil has long been confused with land. It is but one part of land. For conservation purposes, land must be regarded in terms of all its component parts: soil, slope, climate, susceptibility to depreciation by erosion, over-cropping or other processes of deterioration.”

# Chapters in “Elements of Soil Conservation” by Hugh Hammond Bennett

1. The Erosion Problem in the United States
2. Extent of Erosion
3. Effects of Erosion
4. How Erosion Takes Place
5. Rates of Erosion and Runoff
6. Climate and Soil Erosion
7. Rainfall Penetration
8. A National Program of Soil Conservation
9. Planning for Conservation of Soil and Water
10. Use of Vegetation in Soil and Water Conservation
11. Contouring
12. Terracing

**Understanding and scientific use of terrain slopes is vital to soil conservation and other founding principles of the SCS and NRCS.**

# Chapters in “Elements of Soil Conservation” by Hugh Hammond Bennett (continued)

13. Channels and Outlets
14. Gully Control
15. Control of Erosion on Stream Banks
16. Water Spreading
17. Wildlife and Soil Conservation
18. Farm Ponds for Water Storage
19. Stubble-mulch Farming
20. Farm Drainage
21. Farm Irrigation
22. The Place of Trees and Shrubs in Soil and Water Conservation
23. Upstream Flood Control

**Good science matters as much in 2011 as it did in 1935 ...**

**The difference is that we now have “mission critical” HRED unheard of in 1935.**

# NGMC GPS Next Generation Announcement (2009)

- Performance summaries, open sky and challenged environments
- Video demonstration of technology use in-field
- Released to states May 2009

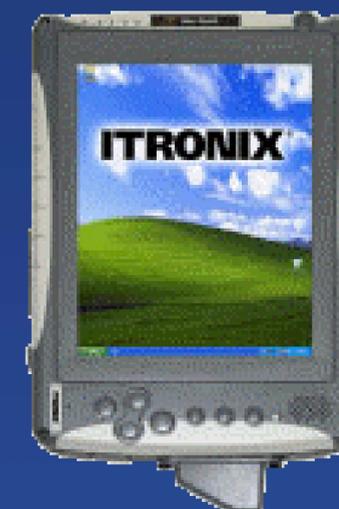


# Issues with handheld devices – NGMC experience

- Outdoor display visibility
- Environmental extremes
- Limited display area
- Relatively slow processor
- Limited memory

# Issues with tablet devices – NGMC experience

- Environmental extremes
- Display territory
- Outdoor display visibility
- Weight
- Cost



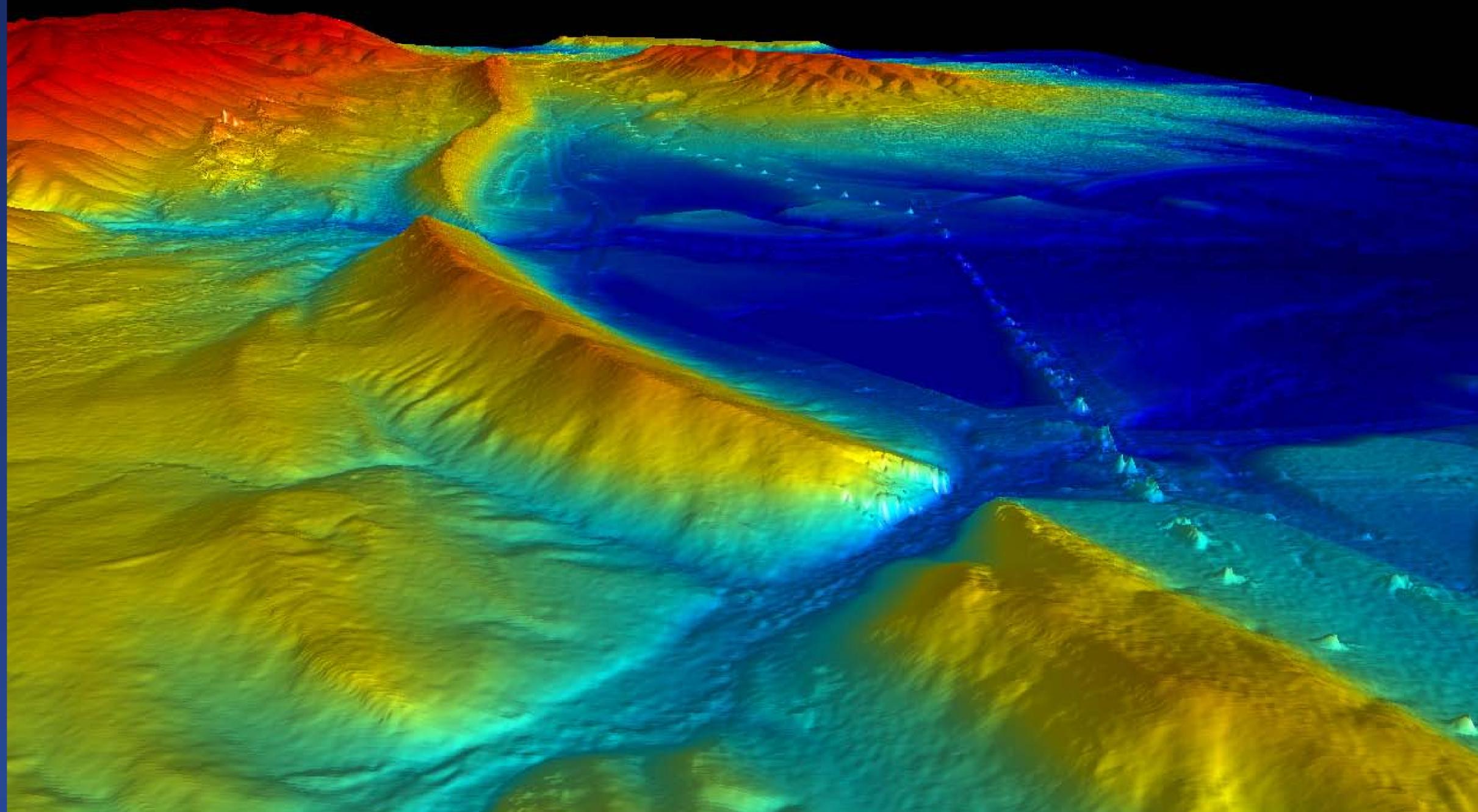
# Issues with GPS integration

- GPS performance
- Accessibility to augmentations
- Orientation of antenna
- Upgrade to new GPS signals and GNSS
  - L2C and L5 GPS
  - GLONASS, Compass, Galileo GNSS

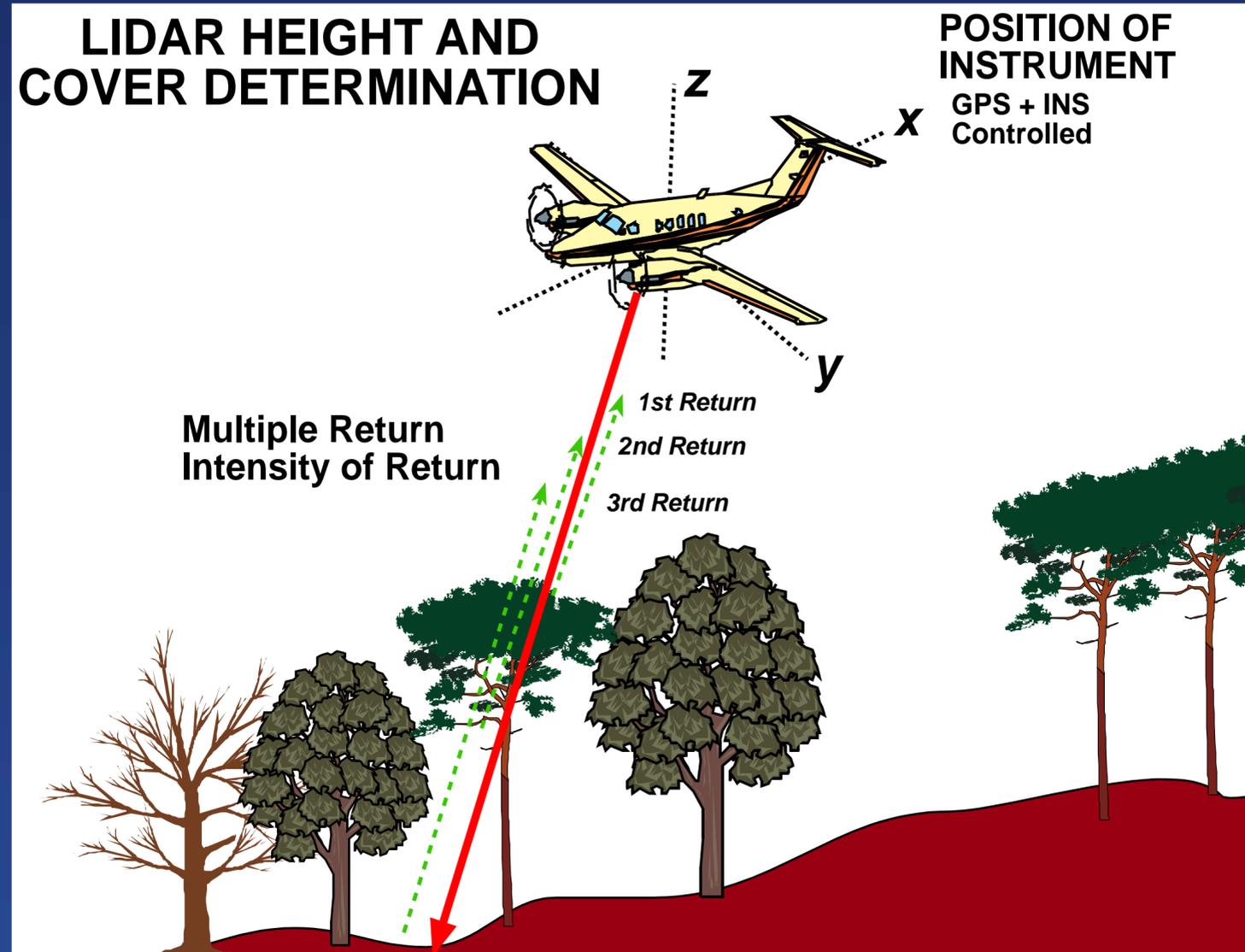
# Opportunities

- Integration of some kind of in-field GPS collect / edit in Mobile Planner
- Increased signals, improved signal processing (L2C, L5, GNSS)
- Integration of Inertial Movement Units (IMU) into handhelds & tablets for challenging environments

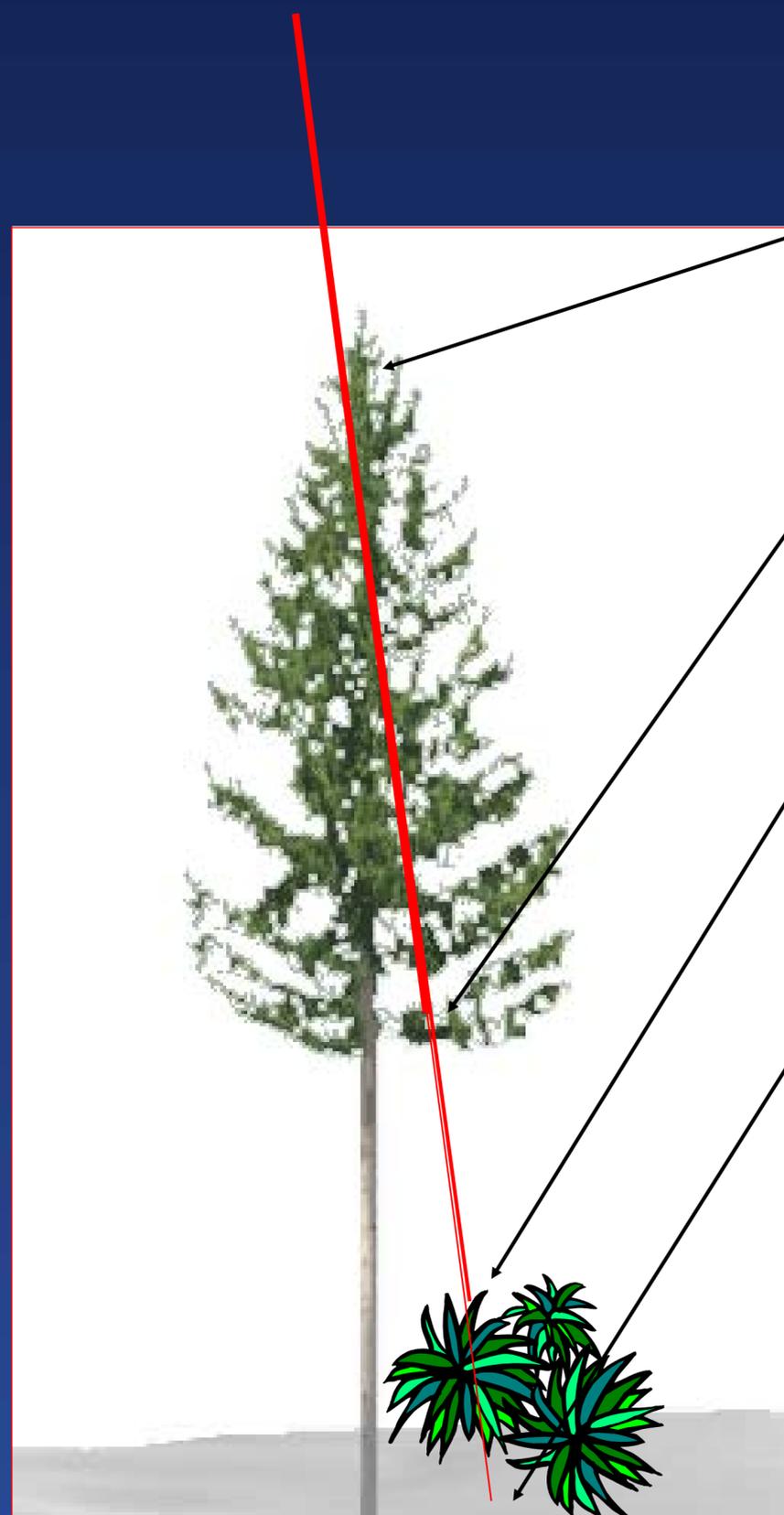
# Intermap IFSAR Project



# Light Detection and Ranging (LiDAR)



# Multiple returns per pulse



First return,  
top of canopy

Second return,  
base of canopy

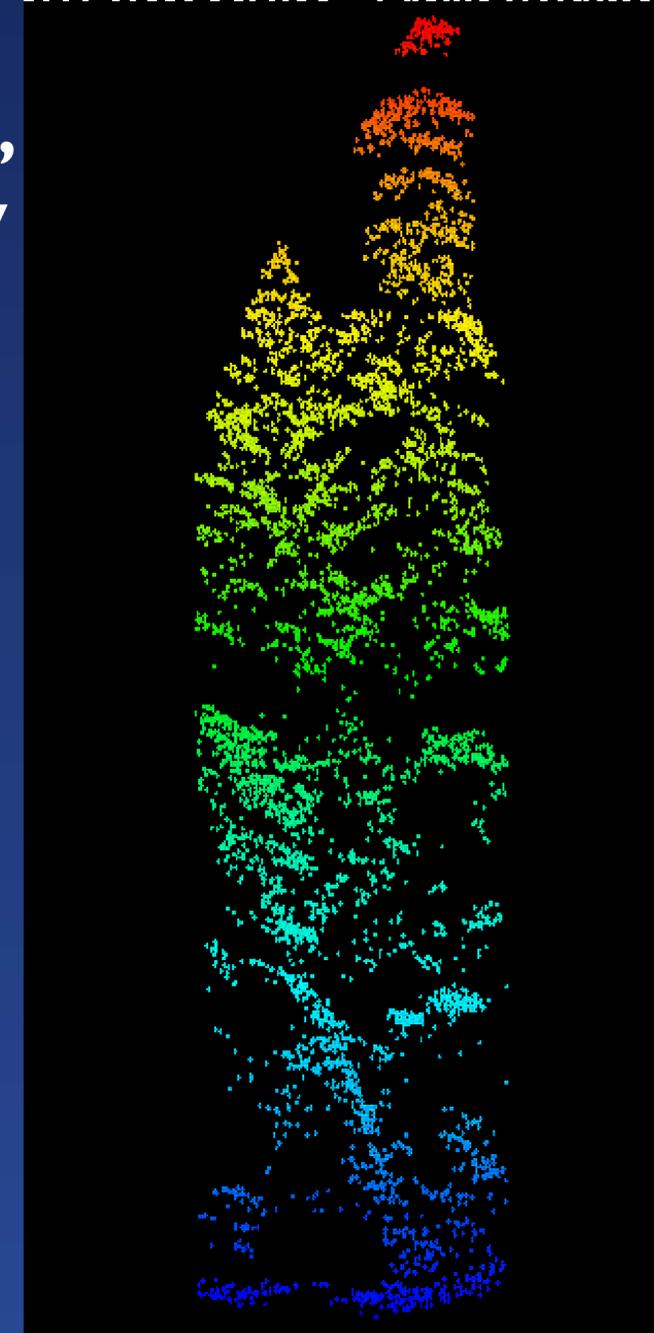
Third return,  
understory

Last return,  
ground

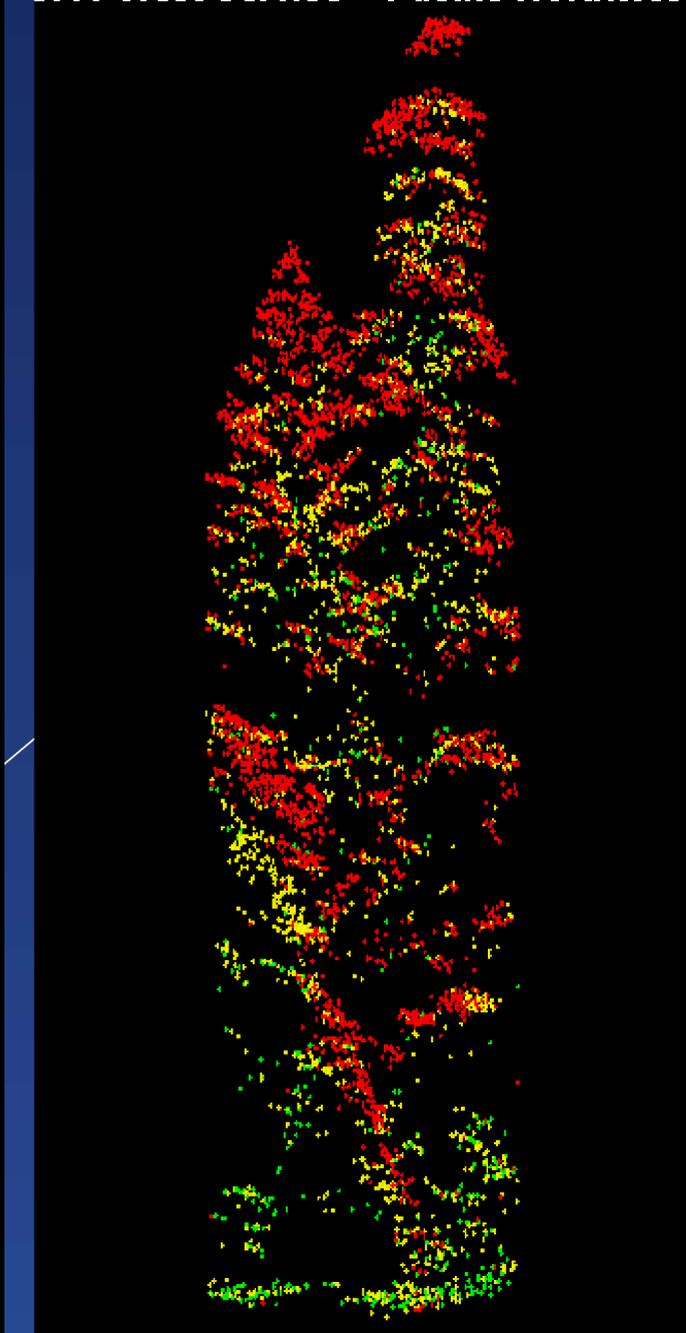
Point cloud images trees in 3-D detail

Left image colored by height, right by  
return number

DA Forest Service -- Pacific Northwes



DA Forest Service -- Pacific Northwes

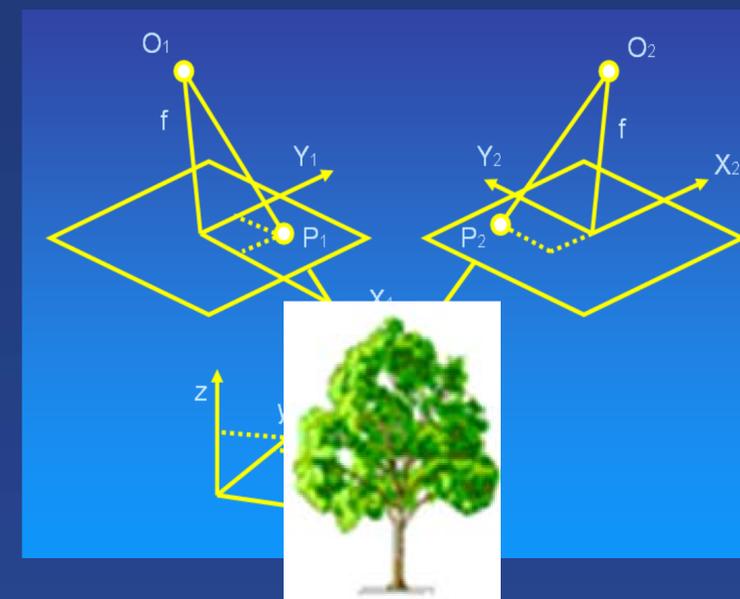


# LiDAR major advantage



**LiDAR only needs to see the ground from one view.**

**Photogrammetry requires stereo perspective; trees block dual views.**



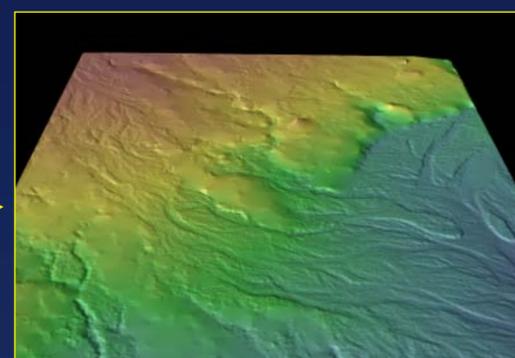
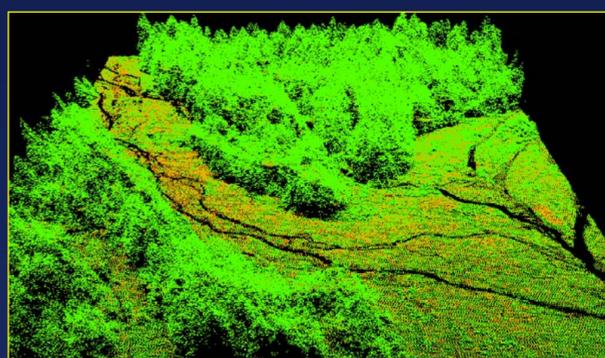
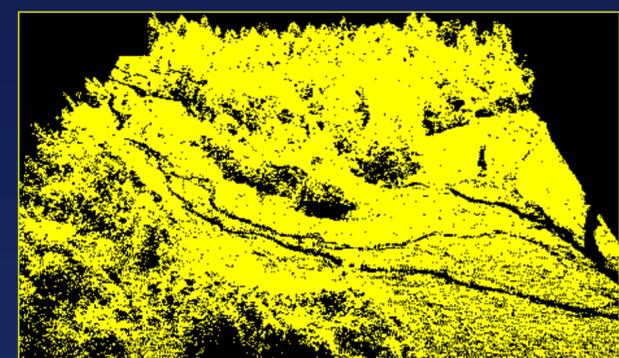


# **NRCS & USGS Partnership**

## **Data Delivery & Provisioning Services**

# Elevation Data and GIS Application for NRCS

- Model landscape surfaces
- Derivatives products include
  - Hill shade
  - Slope aspect
  - Slope gradient
  - slope curvature
  - spatial analysis for water movement
  - soil erosion
  - soil genesis and geomorphic models



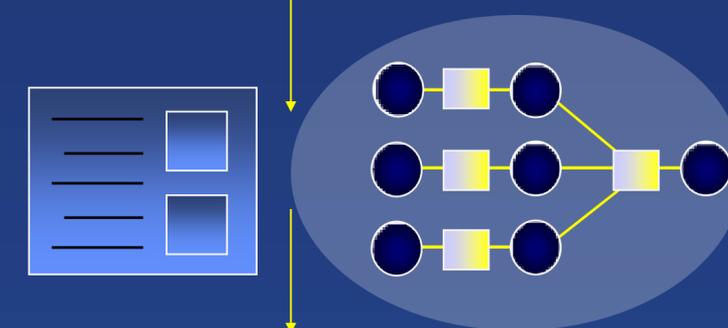
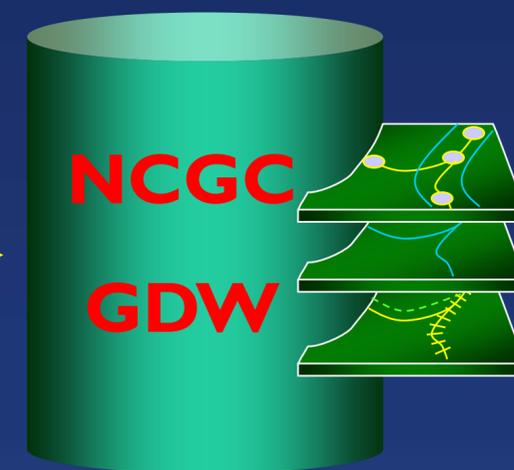
Raw Points (las)

Processing using  
LiDAR software

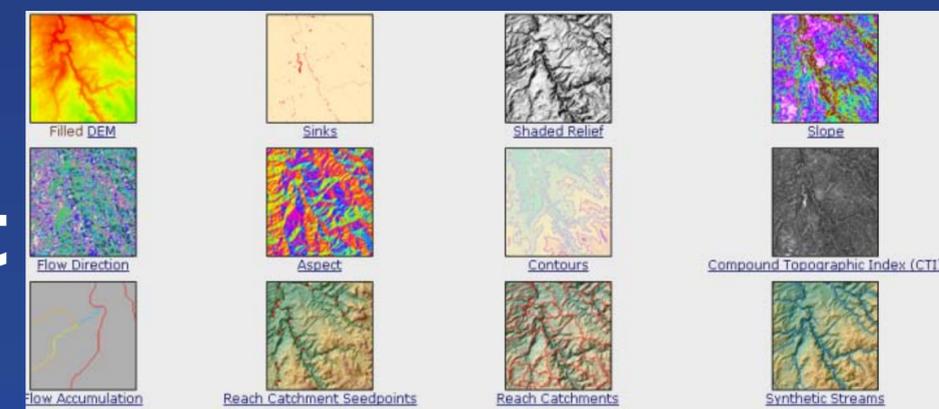
Bare Earth

NED Oracle ArcSDE

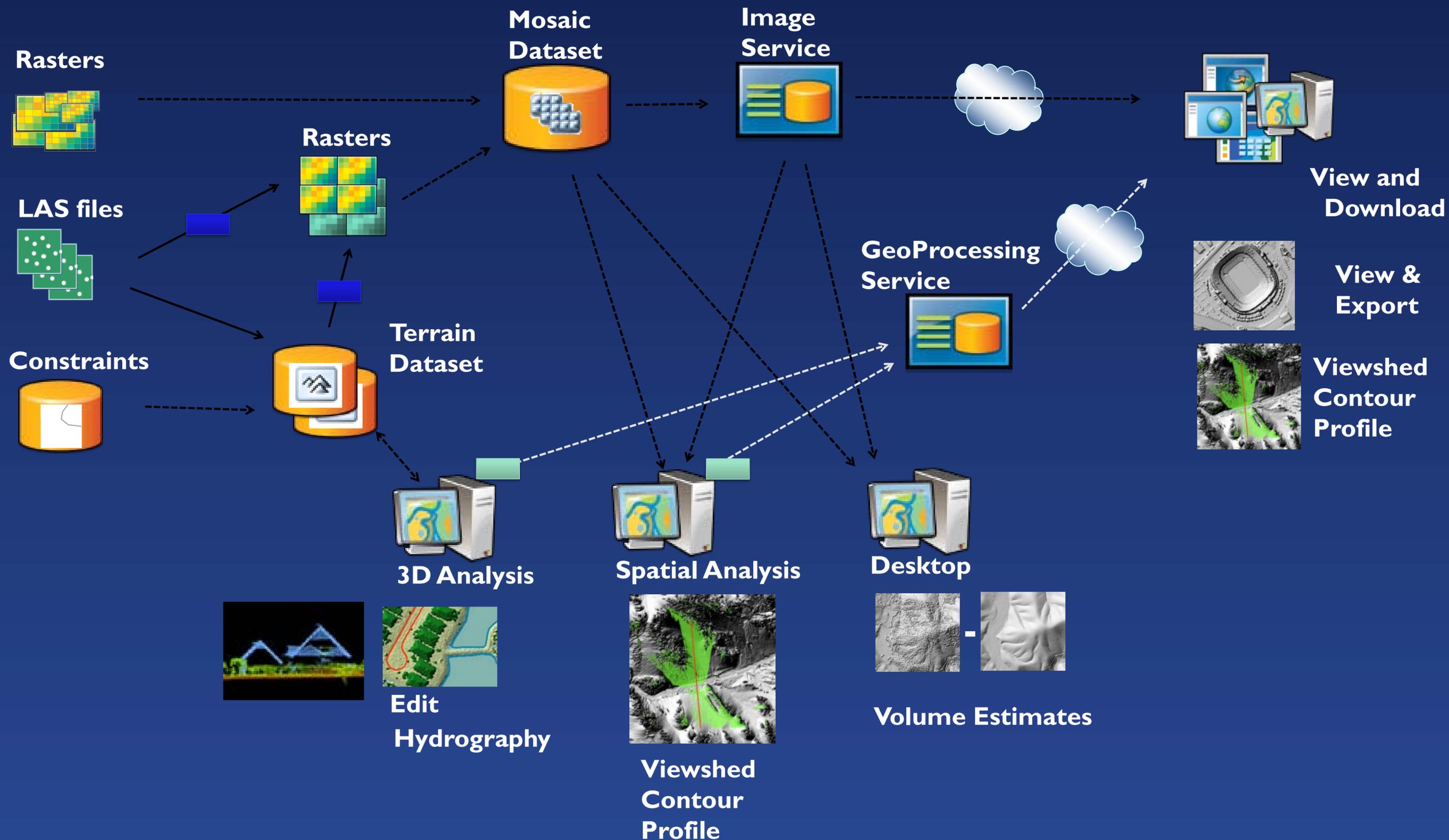
Process Models  
Derivatives  
ArcGIS Server



# LiDAR Elevation Data Management



# Making Lidar and Elevation Accessible



# State Geology Layer



United States Department of Agriculture  
Natural Resources Conservation Service

# GEOSPATIAL DATA GATEWAY

Home | Login | Check Order | Status Maps | News | Data Policy | FAQ | Help | Admin | Contact Us

Search

**Browse by Subject**

- ▶ Natural Resources Conservation Service
- ▶ Farm Services Agency
- ▶ Rural Development
- ▶ National Cartography & Geospatial Center (NCGC)
- ▶ Aerial Photography Field Office (APFO)
- ▶ Web Soil Survey
- ▶ Soil Data Mart
- ▶ Geospatial One Stop
- ▶ APFO Customer Order Entry System
- ▶ USGS Maps, Imagery and Publications
- ▶ National Atlas
- ▶ National Map Viewer 2.0
- ▶ US Census Bureau Geography
- ▶ Download 2009 TIGER/Line Shapefiles
- ▶ eFOTG

You are here: Home

## Welcome to GDG



the one stop source for environmental and natural resource data

The Geospatial Data Gateway (GDG) is the One Stop Source for environmental and natural resources data, at anytime, from anywhere, to anyone. The Gateway allows you to choose your area of interest, browse and select data from our catalog, customize the format, and have it downloaded or shipped on CD or DVD.

This service is made available through a close partnership between the three Service Center Agencies ([SCA](#)); Natural Resources Conservation Service ([NRCS](#)), Farm Service Agency ([FSA](#)), and Rural Development ([RD](#)).

### System Status



Please Note:  
6/2/2010 9:29:07 AM MST:



**GET DATA**

Place a Data Order **GDG**

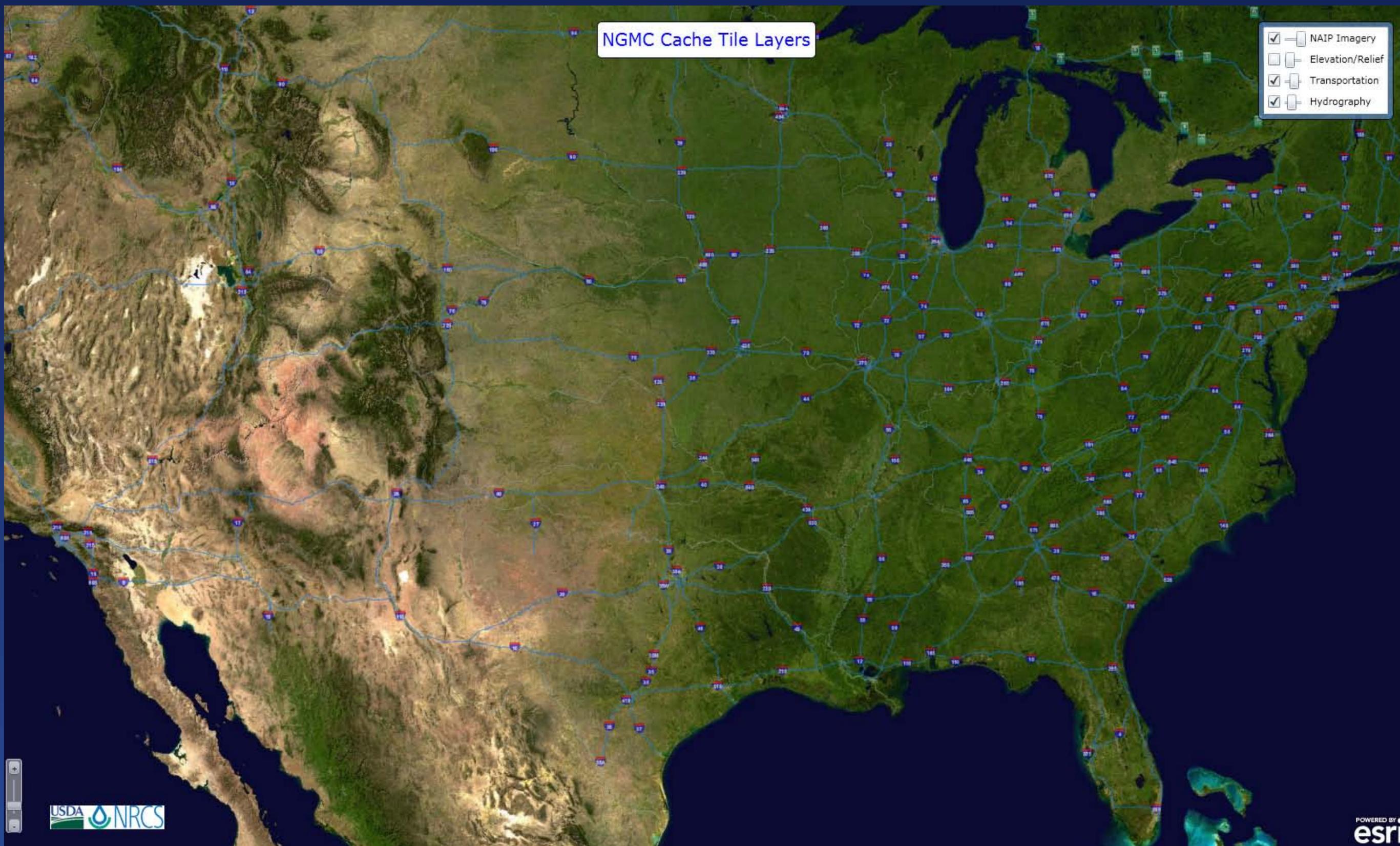
### I Want To...

- Order by County/Countries
- Order by State
- Order by Place
- Order by Bounding Rectangle (Latitude and Longitude)
- Order by Interactive Map - Custom Area Of Interest(AOI)
- Find Available Data for

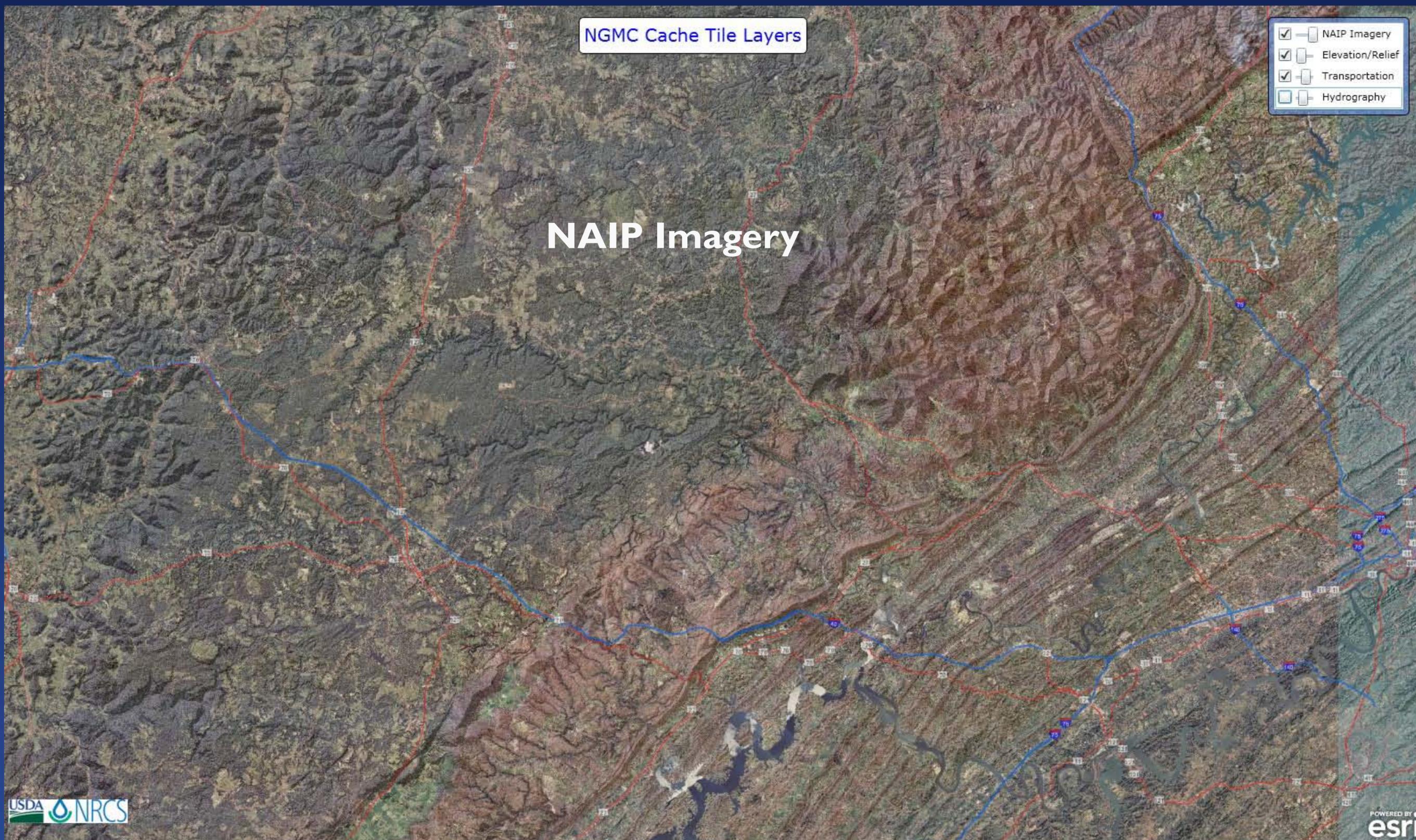
# NGMC Cache Tile Service

Slides

# NGMC Cache Tile Service



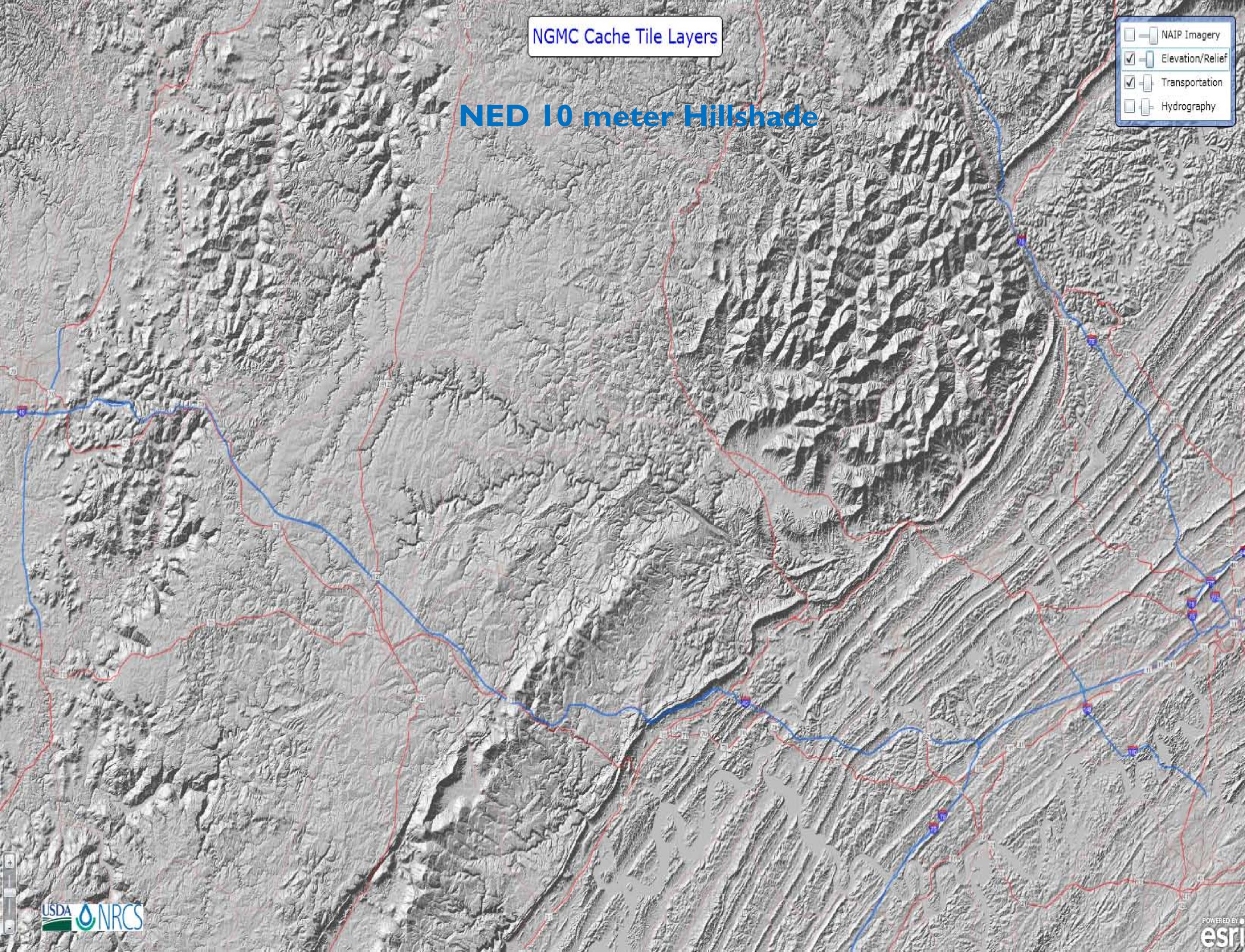
# Eastern Oklahoma



NGMC Cache Tile Layers

# NED 10 meter Hillshade

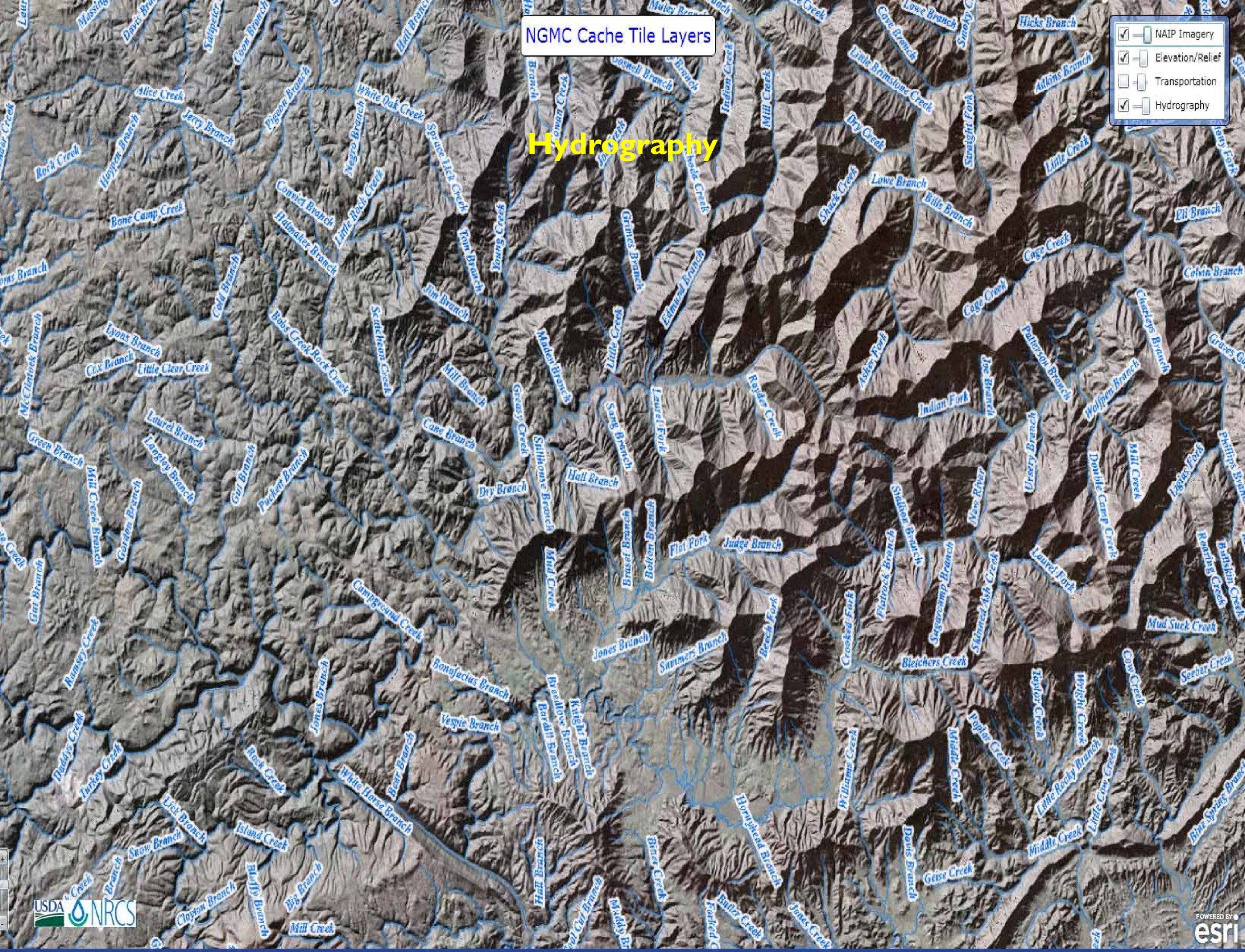
- NAIP Imagery
- Elevation/Relief
- Transportation
- Hydrography

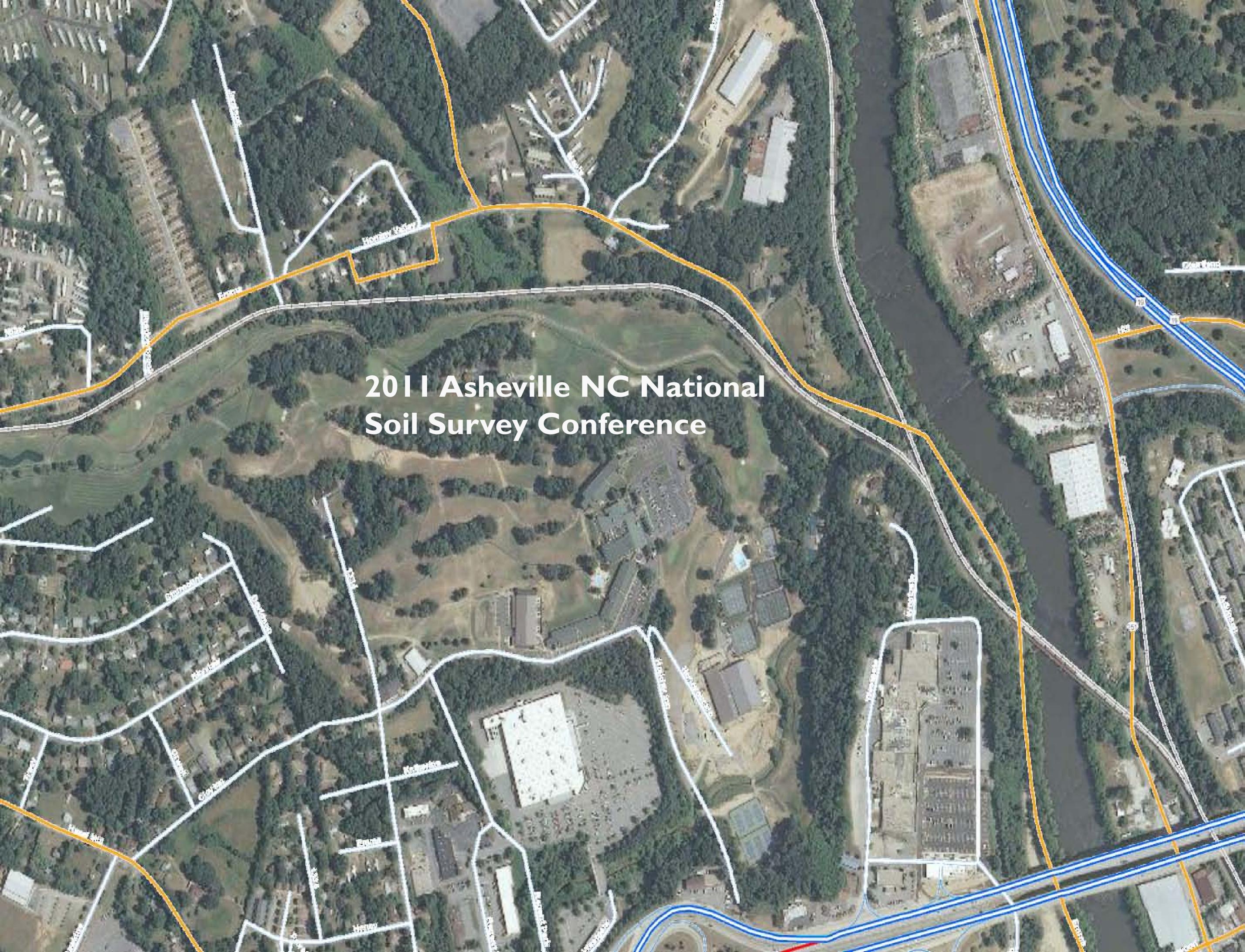


# NGMC Cache Tile Layers

- NAIP Imagery
- Elevation/Relief
- Transportation
- Hydrography

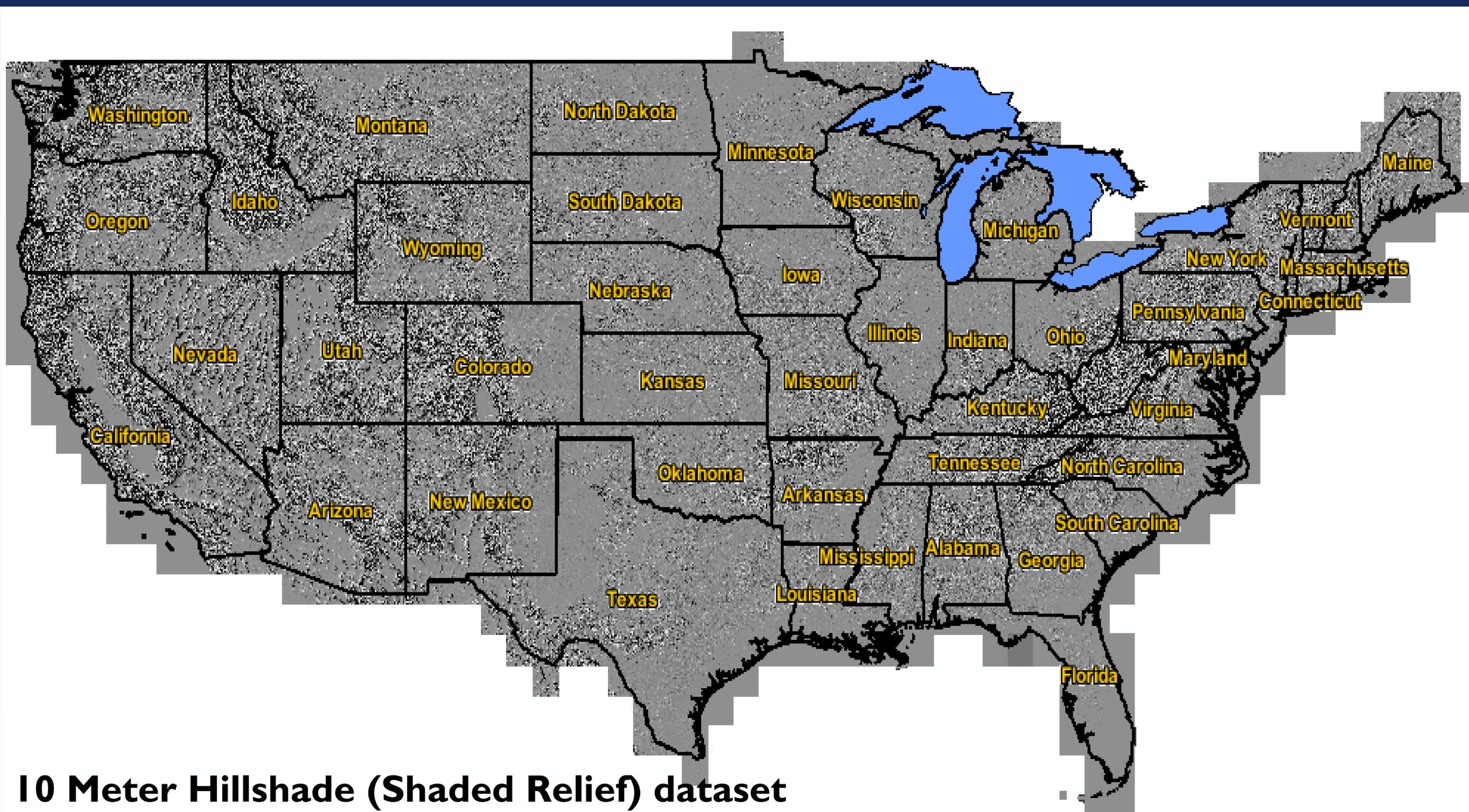
## Hydrography





**2011 Asheville NC National  
Soil Survey Conference**

## Elevation Data - Hillshade

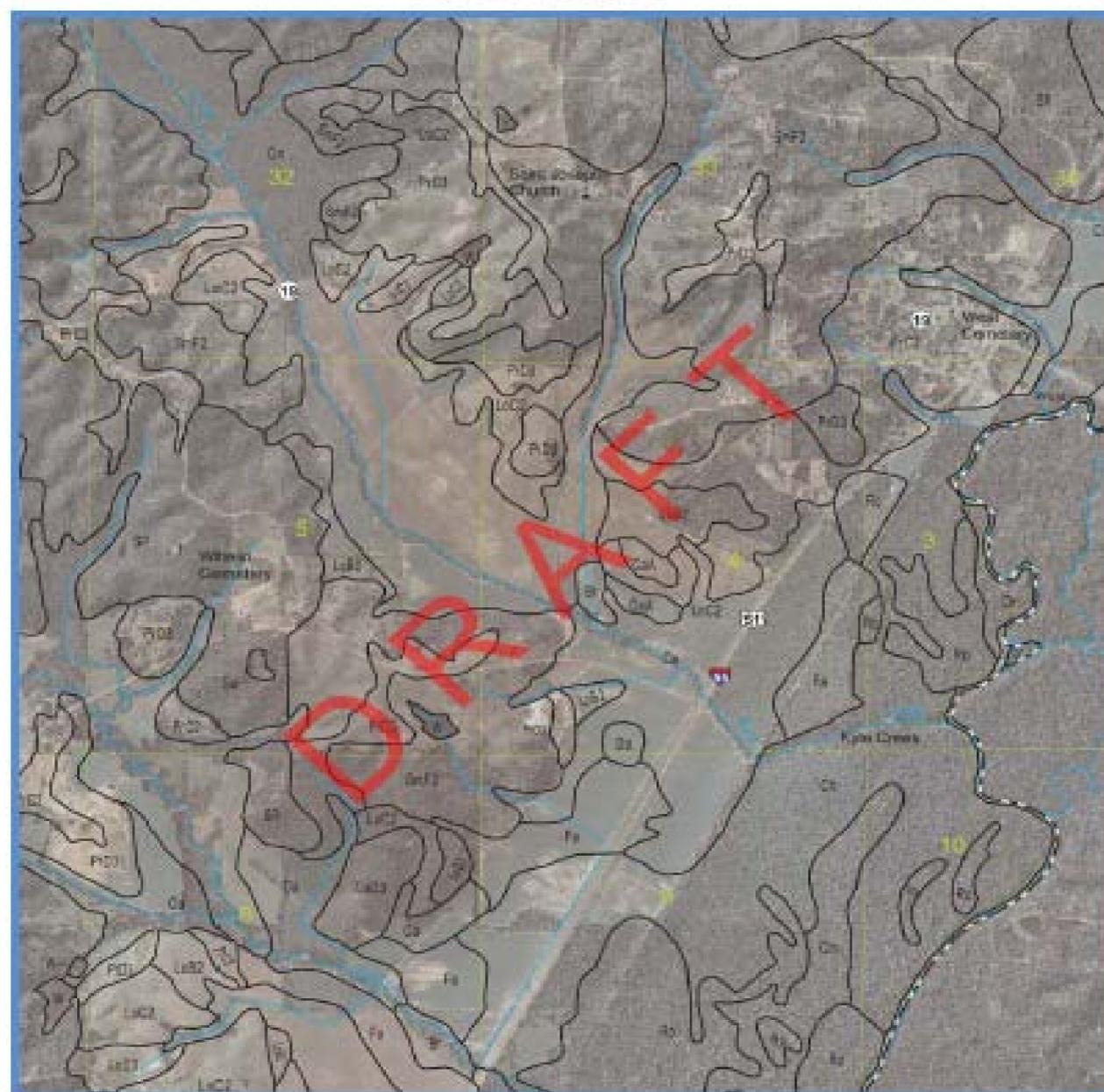


**10 Meter Hillshade (Shaded Relief) dataset**

## Digital Map Finishing – Print on Demand and User Guide

- States will be enabled to create digital map finished products locally.
- New method uses Arc Map to create maps.
- High quality soil survey map products are used for soil survey and conservation planning.

### Digital Map Finishing and Print on Demand Maps User Guide



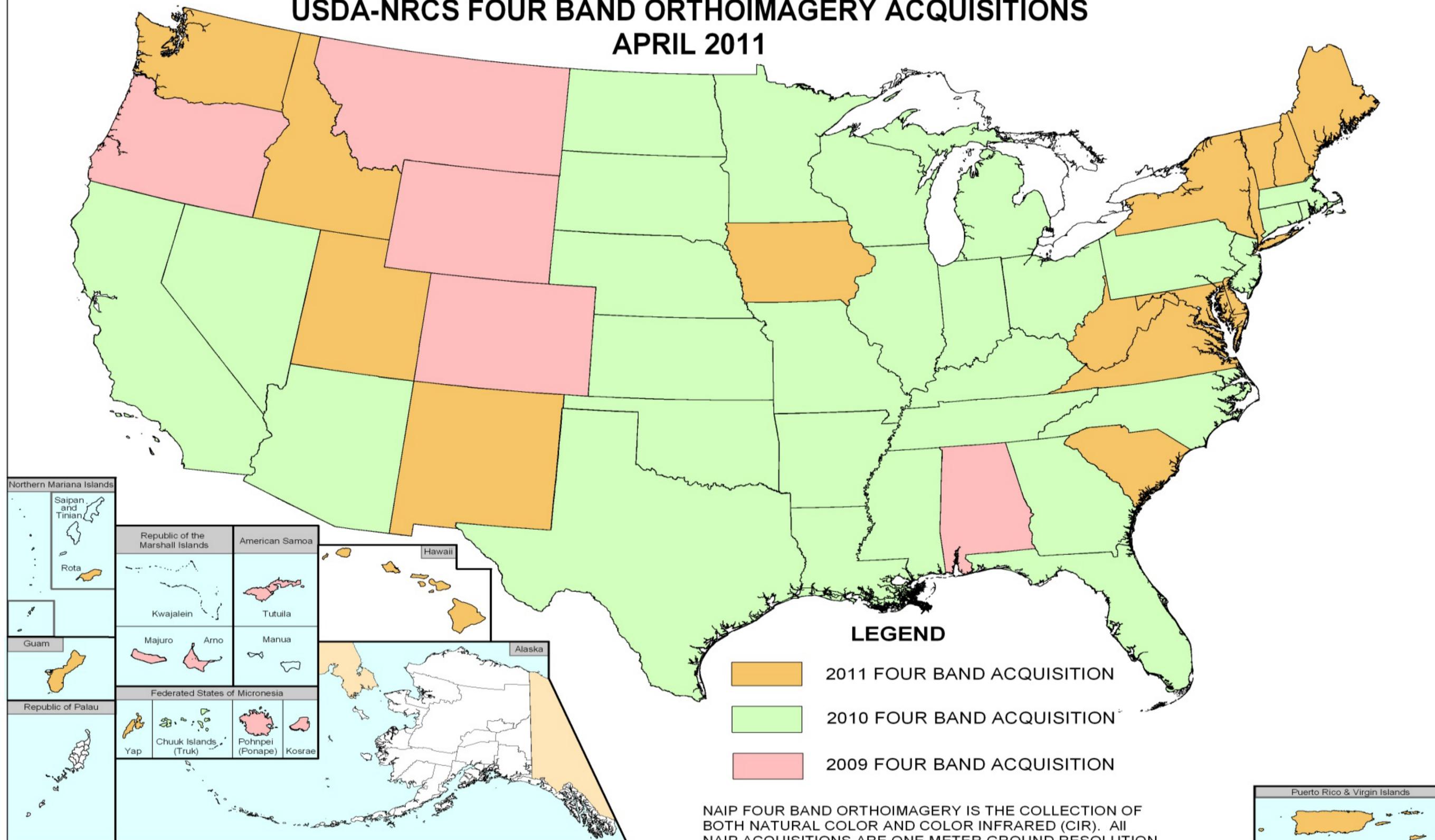
# 2011 Imagery Acquisitions

- NAIP imagery for lower 48 states
- Alaska imagery for soil survey
- Hawaii and Pacific Basin 2010
- Puerto Rico and Virgin Islands

US DEPARTMENT OF AGRICULTURE

NATURAL RESOURCES CONSERVATION SERVICE

## USDA-NRCS FOUR BAND ORTHOIMAGERY ACQUISITIONS APRIL 2011



### LEGEND

- 2011 FOUR BAND ACQUISITION
- 2010 FOUR BAND ACQUISITION
- 2009 FOUR BAND ACQUISITION

NAIP FOUR BAND ORTHOIMAGERY IS THE COLLECTION OF BOTH NATURAL COLOR AND COLOR INFRARED (CIR). ALL NAIP ACQUISITIONS ARE ONE METER GROUND RESOLUTION.

Source: USDA NRCS National Cartography & Geospatial Center, Fort Worth, Texas 2011.



# FA Ranking Pilot and Other CDSI Work

1. Create Symbology



2. Prepare National layers for analysis purposes

3. Receive State layers and process

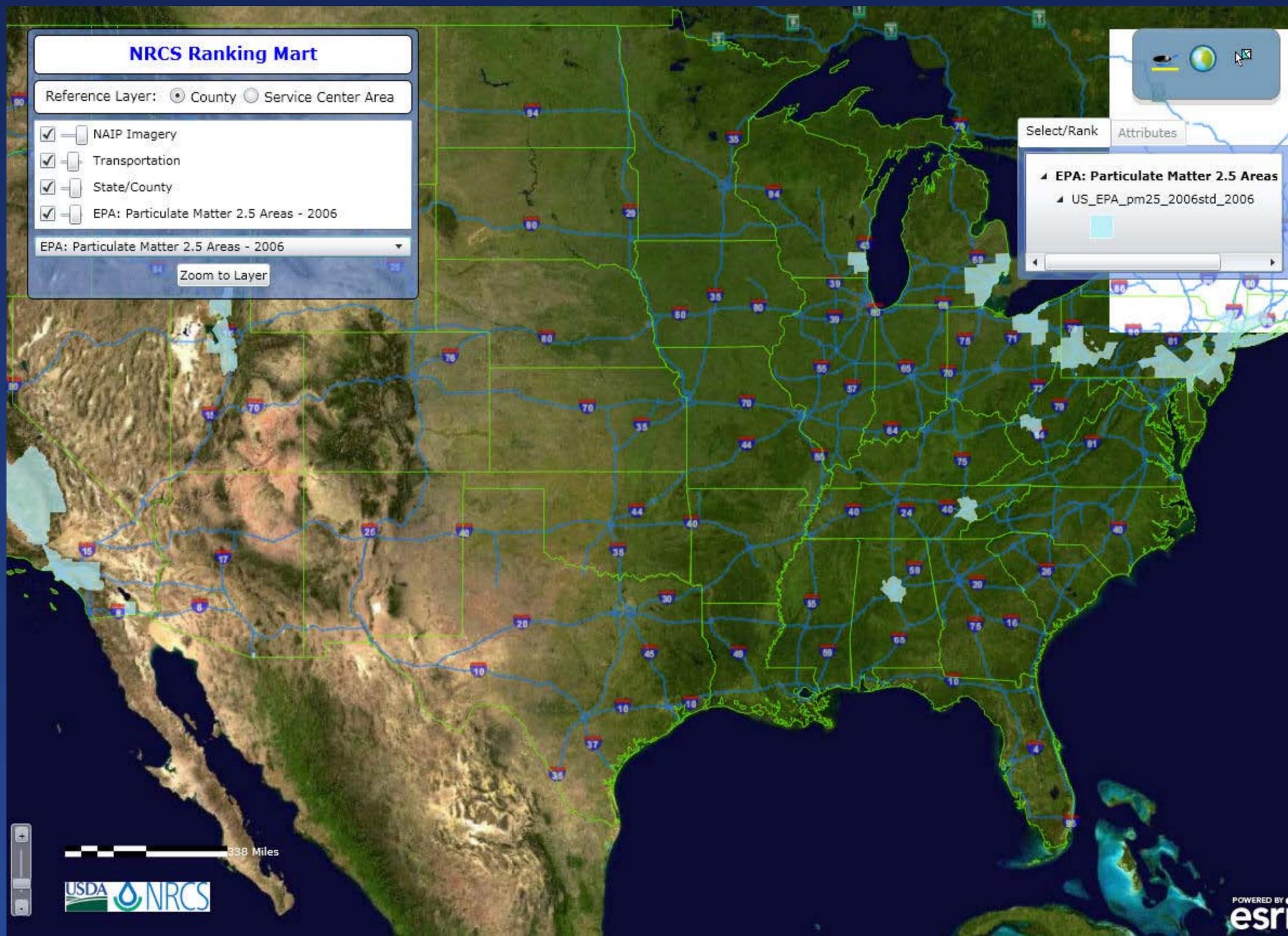
4. How to Access the Data

5. Other ongoing CDSI work

## 4. Accessing the Data –

### NRCS Ranking Mart

<http://web1.ftw.nrcs.usda.gov/nrcsrankingmart2/>



## Registry of Web Services – USDA GeoPortal

Access to more 50 Web Services

Step One, Log on to:

<http://ncgcweb.ftw.nrcs.usda.gov/>

Step Two,

In the Search GeoPortal window  
enter a data theme, Example:

“Elevation,” and Click the Go Button!

The screenshot shows the USDA GeoPortal homepage. At the top, there is a header with the USDA logo and the text 'United States Department of Agriculture' and 'GeoPortal'. Below the header is a navigation bar with links for 'Home', 'About GeoPortal', 'Help', and 'Contact Us'. The main content area is divided into several sections:

- Search GeoPortal:** A search box containing the word 'elevation' and a 'Go' button.
- GeoObserver:** A section with a dropdown menu showing 'Easements'.
- Data Themes:** A section with a dropdown menu showing 'Climate', 'Elevation', 'Easements', 'Hydrography', 'Imagery', and 'Soils'.
- Communities:** A section with a dropdown menu showing 'Conservation Delivery Streamlining Initiative' and 'Major Land Resource Areas'.
- Welcome to GeoPortal:** A central text area with the heading 'Welcome to GeoPortal' and two paragraphs of text. The first paragraph states: 'The USDA GeoPortal provides an entry point to access remote sensing, geospatial static and in-situ data, information, tools, and services.' The second paragraph states: 'The USDA GeoPortal provides two main ways to initiate a search for geospatial resources:' followed by a bulleted list:
  - Free Text - Enter terms into the search field
  - Browse via Theme, Program Areas or Community - Filter resources in the left side menu according to the program or community needs
- I Want To...:** A section with a dropdown menu showing 'Find GeoData', 'Use ArcMap to Find GeoData', and 'Order Maps, Media or Photographs'.
- More Data Resources:** A section with a dropdown menu showing 'geodata.gov' and 'Geospatial Data Gateway'.
- Services:** A section with a dropdown menu showing 'Live Data'.

At the bottom of the page, there is a footer with links for 'USDA.gov | NCGC | APFO', 'FOIA | Accessibility Statement | Privacy Policy | Nondiscrimination Statement | Information Quality | FirstGov | White House'.

**NAIP 2010, Northeast Minnesota**  
**What ground features can you identify easier with CIR Imagery?**

Natural Color (Bands 1,2,3)

Color Infrared/CIR (Bands 2,3,4)



**Ground Feature Type**

- 1) Hydric Soil with Vegetation
- 2) Hydric Soil with Submerged Vegetation
- 3) Mixed Hardwood/Coniferous Forests
- 4) Hardwood Forest
- 5) Coniferous Forest



stressed vs  
mature crop

WorldView-2  
land covers  
Salton Sea  
Feb 20, 2010

CacheTiles - Windows Internet Explorer

File Edit View Favorites Tools Help

Convert Select

http://web1.ftw.nrcs.usda.gov/cachetiles/

Live Search

CacheTiles U.S. Department of Agriculture

**NRCS-NGMC  
Web Map Services**

NGMC Cache Tile Layers

- NAIP Imagery
- Elevation/Relief
- Transportation
- Hydrography

USDA NRCS

POWERED BY esri

Local intranet 100%

Done

The image is a screenshot of a web browser displaying a map service. The browser window is titled "CacheTiles - Windows Internet Explorer" and shows the URL "http://web1.ftw.nrcs.usda.gov/cachetiles/". The map itself is a terrain visualization with a color gradient from green to brown. A legend box in the upper right corner lists four layers: "NAIP Imagery" (checked), "Elevation/Relief" (checked), "Transportation" (unchecked), and "Hydrography" (unchecked). The text "NRCS-NGMC Web Map Services" is overlaid in red on the left side of the map, and "NGMC Cache Tile Layers" is in a white box above the legend. The bottom of the browser shows the status bar with "Local intranet" and "100%".

**Data management experts stress that data life cycle management is not a product, but a comprehensive approach to managing an organization's data, involving procedures and practices as well as applications.**

**The goal is to provide the foundation for mapping, visualization, analysis, and distribution.**

## Data Lifecycle Stages

Stage 1 - Define

Stage 2 -

Inventory/Evaluate

Stage 3 - Obtain

Stage 4 - Access

Stage 5 - Maintain

Stage 6 - Use/Evaluate

Stage 7 - Archive



## *How does this approach eliminate or minimize risk?*

- **RISK** - Duplication of geospatial information and databases  
**Solution** - Inventory all NRCS geodatabases at a national, state and local level and analyze the results to ensure we do not have duplication
- **RISK** - Poor quality or inadequate geospatial information  
**Solution** - QA/QC all warehouse data and check all themes for completeness and accuracy. The measure of success would be how many errors are found and how fast they would be corrected
- **RISK** - Inability to access and use geospatial information across NRCS business lines  
**Solution** - Geodatabase designs with custom map and data services that are multipurpose. Easements are an example. We have one database with separate services for monitoring, RSL activities, and public requests

PRIORITY DATABASES NEEDED TO SUPPORT CONSERVATION ASSISTANCE PROCESSES:

**Essential**

- 1. Ortho Imagery
- 2. Common Land Units
- 3. Planned Land Units for Customers
- 4. Soils
- 5. DRGs (topographic maps)

**Important**

- 6. Practice Locations (from NCPDB)
- 7. Hydrography (streams, water)
- 8. Elevation Data (processes DEM)
- 9. Hydrologic Units
- 10. FEMA (100 year floodplains)
- 11. State-Specific T&E/cultural resource/other databases (subject to state availability)
- 12. Wetlands (NWI, wetland determinations)
- 13. Roads
- 14. CRP and WRP Easement Boundaries

**Useful**

- 15. State/County/PLS Boundaries
- 16. Natural Resource Feature Data (e.g. sinkholes)
- 17. Water Quality Impairment Data (303d)
- 18. Geology
- 19. Utilities (but only if kept current)
- 20. MLRA
- 21. Federal lands
- 22. Source Water Areas, Aquifer Recharge areas

# NGMC Geodatabases Quality Improvements

- NRCS Dam Sites
- Easements
- Public Land Survey
- Administrative Boundaries



## A Tool for Streamlining Geospatial Data Management

# GeoObserver

### Background

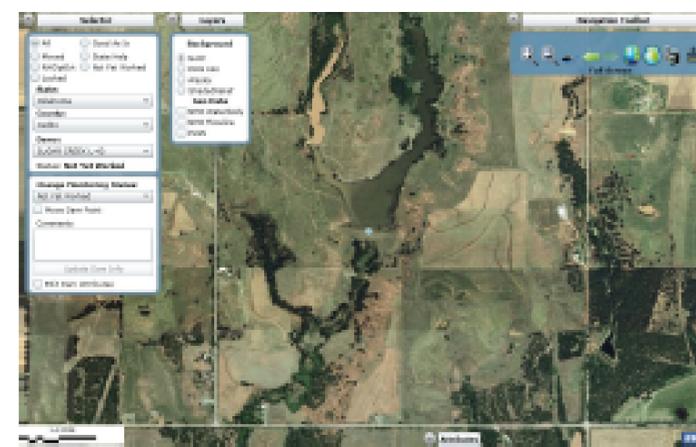
- GeoObserver is based on requirements defined for the Remote Sensing Toolkit (RSTK) to support the National Resource Inventory (NRI) program
- RSTK was originally developed as an ArcGIS extension to be run on user's desktops. With the availability of geospatial web services and web mapping technologies, GeoObserver was enhanced to utilize these capabilities
- Implemented using COTS geospatial tools and web mapping technologies
- Components utilized from the IDEA-Map geospatial reporting application
- Currently being used as a generic, configurable, geospatial data management tool

### Features

- Streamlines local geospatial data management by utilizing web based data storage and access
- Allows navigation by spatial features or attribute fields
- Supports side by side visual comparisons of multiple years of the same data/images
- Supports the QA/QC of existing geospatial data to produce nationally consistent geospatial data
- Supports verification and updating of spatial features and tabular attributes
- Supports spatial and tabular summarization and reporting
- Supports spatial and attribute querying
- Supports web based geoprocessing functions and models
- Configurable for specific program and project views

### Uses

- Streamlining of geospatial data management
- Visualization and mashups of national geospatial data sets
- Review of geospatial data for national consistency and quality
- Remote sensing and data collection
- Easement and dams compliance and monitoring



### Access GeoObserver for Streamlining Geospatial Data Management Tool

- In Internet Explorer, go to <http://ncgcweb.ftw.nrcs.usda.gov/geoobserver>
- Restricted to authorized personnel. Requires eAuthentication level II access, a CCE-certified computer, and USDA network connectivity

# SSRA Planning

- Disasters (MS River Flood)
- Google Fusion - NSSC
- Cloud Computing - NGMC  
– ESRI, Amazon, USDA
- Solutions for large data sets

# *National Geospatial Management Center*



Questions?

Tommy Parham, Director, National Geospatial Management Center

[tommie.parham@ftw.usda.gov](mailto:tommie.parham@ftw.usda.gov) 817-509-3420

[Sam.brown@ftw.usda.gov](mailto:Sam.brown@ftw.usda.gov) 817-09-3401

NGMC Home Page - <http://www.ncgc.nrcs.usda.gov>