

Dr. Kerry Hartman
Mandan, ND

May 9, 2010



NASA SPACE GRANT PRESENTATION



Title:

**Utilizing Remote Sensing to
Investigate the Surface
Impacts of Oil Development
on the Fort Berthold Indian
Reservation.**




Project Description:

Science Faculty at Fort Berthold Community College and USGS personnel from the EROS Center will train, mentor, and assist students utilizing Remote Sensing data to begin assessing the “Footprint” of oil development activities on the landscape of the Fort Berthold Indian Reservation.



Project Goals


- - To produce reliable data regarding the quantities of habitat and surface area utilized for oil exploration and development in the 5 County area surrounding and including the Fort Berthold Indian Reservation over the past decade.
 - To create a baseline database of information regarding the environmental impacts of surface activities of oil Development on the Fort Berthold Indian Reservation.
 - To enhance the utilization of NASA Earth system science concepts in the FBCC Science Geospatial research projects though integrating the system approach to Earth science and the Native American cultural view of Mother Earth,
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Background:

The Fort Berthold Indian Reservation is centered in the middle of the Bakken Formation.


According to the U.S. Geological Survey's assessment (April 2008), the Bakken Formation is the largest "continuous" oil accumulation the agency has every assessed and is larger than all other current U.S. Geological Survey oil assessments in the lower 48 states.

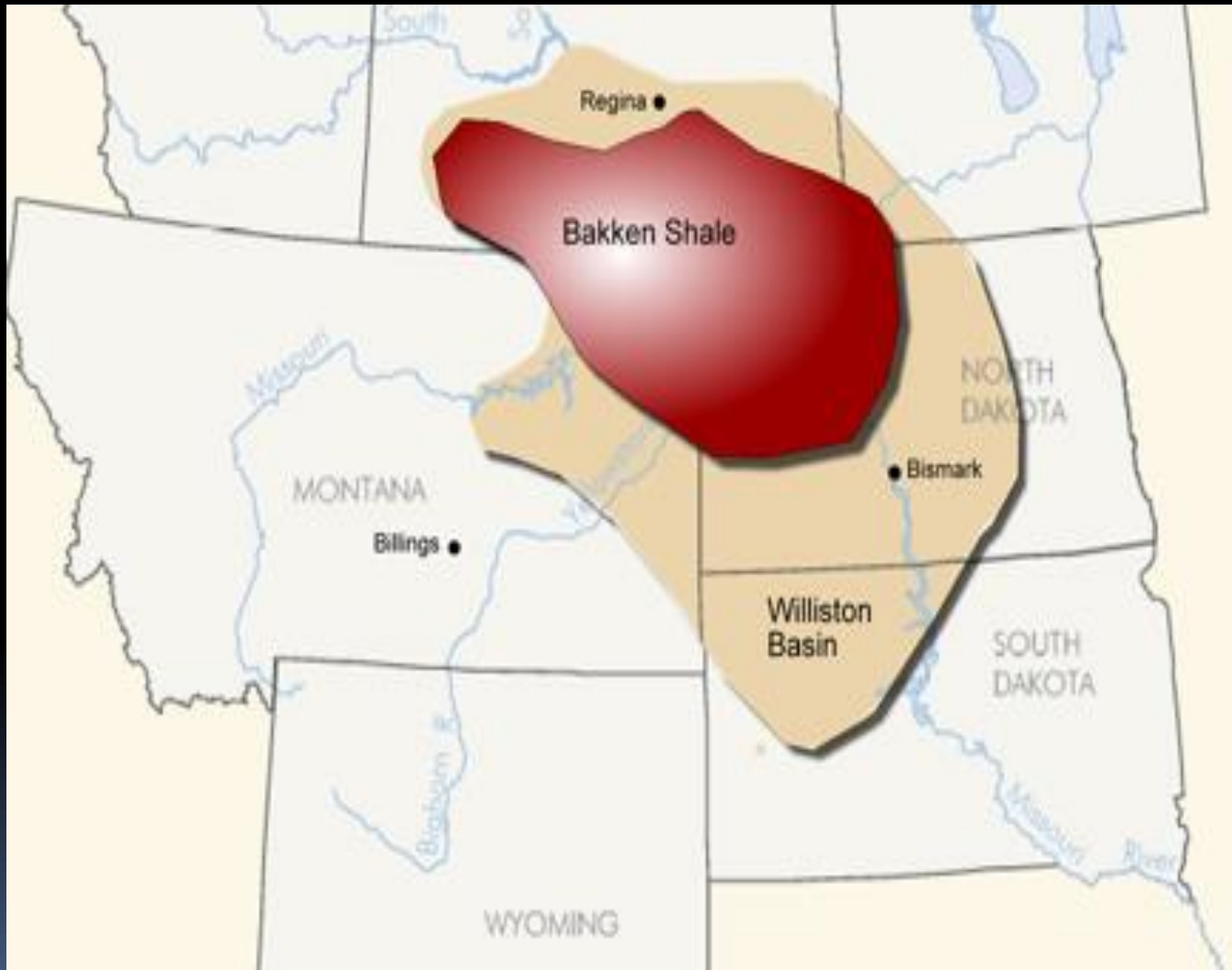


The U.S. Geological Survey estimates that new horizontal drilling techniques may allow up to 4.3 billion previously inaccessible barrels of oil to be recovered from the 10,000-foot-deep Bakken.



Background cont.

- According to the government officials, the Bakken Oil Formation will play a key role in the U.S. quest for energy independence. The Mandan, Hidatsa and Arikara Nation is working with the various oil companies and Bureau of Indian Affairs to increase oil leasing opportunities for both the Tribe and individual tribal members who possess mineral rights to the oil beneath their land holdings.
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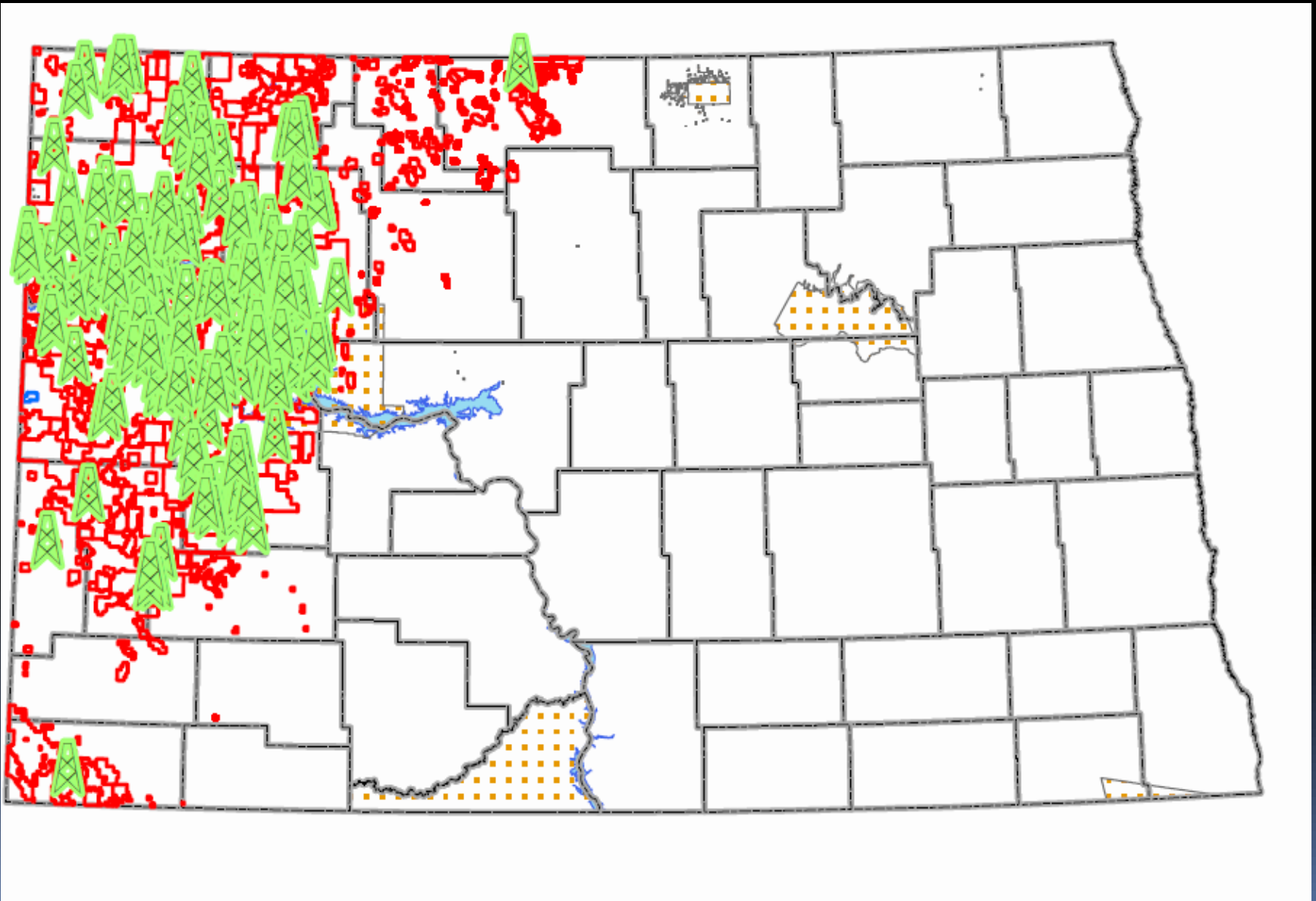


Fort Berthold

North Dakota: American Indian Reservations



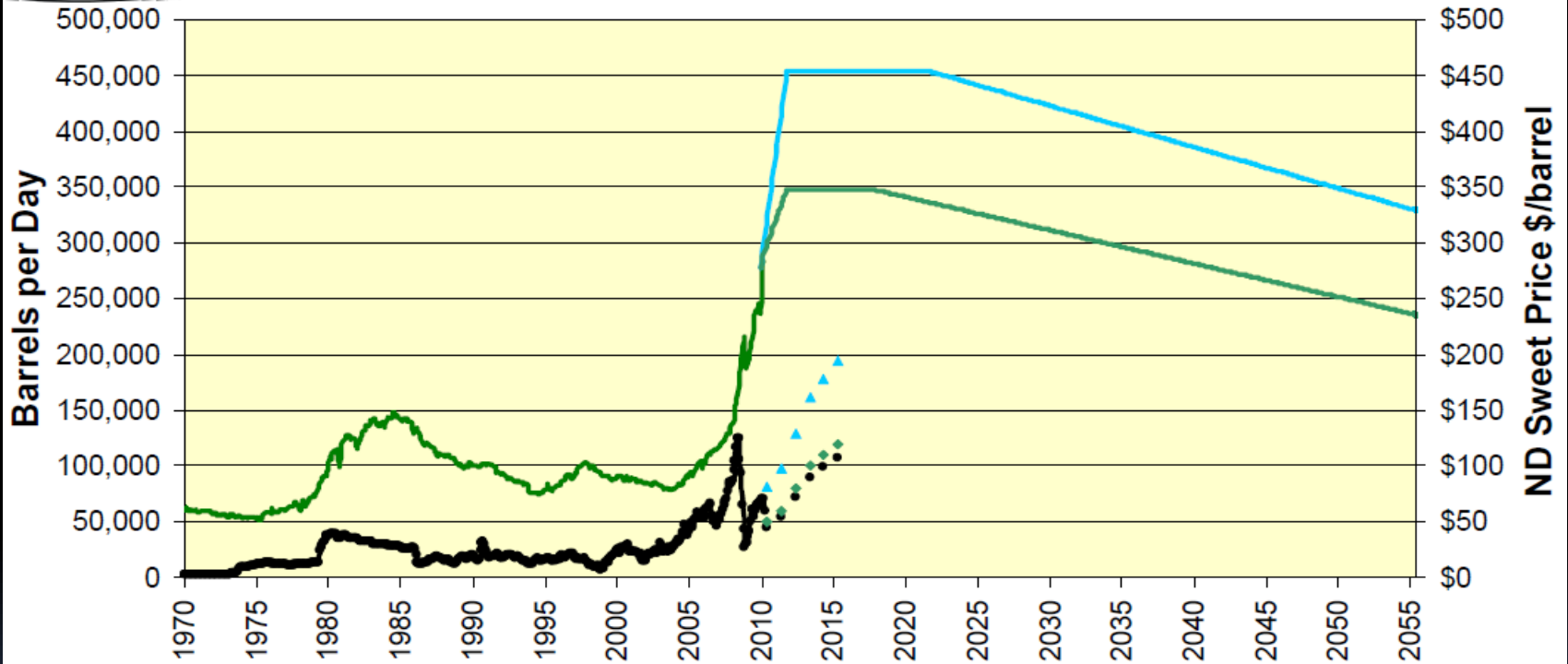
ND Rigs 4/11/11



BAKKEN FUTURE???



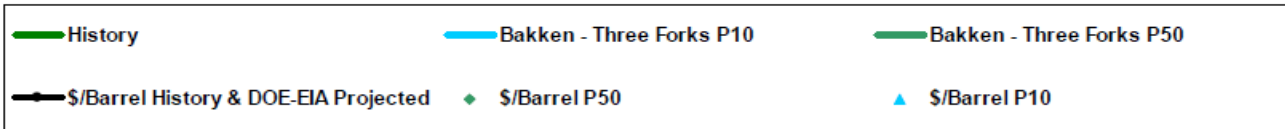
North Dakota Oil Production and Price



1,500 Bakken and Three Forks wells drilled and completed

20,000 potential new wells possible in thermal mature area

4.9 to 7.2 billion barrels = \$350 – 500 billion



Fraggin' Frackin'



Future??

- Met with 12 most active Bakken / Three Forks operators
 - 2010 → drilling plans
 - 74 Dec 2009 → 120 rigs June 2010
- Reviewed completion reports
 - Spud to spud time 25 → 20 days
 - 15 wells / year / rig = 1,500 to 1,800 wells per year for 10 to 15 years
 - Water use 1.5 million – 4.0 million gal / well
 - Drill year round, fracture 8-10 months / year

Tribal Sovereignty and Environmental issues

- According to Ranco and Saugee (2007), tribal environmental sovereignty can and should address the issues of due process in the context of environmental regulation within tribal borders in a way that support American Indian tribal sovereignty.
- Tribal members themselves must become knowledgeable about the environmental impacts of the oil development in order for the Tribes to continue to be stewards of their own land.
- Galloway (1995) acknowledges that Tribes developing their own environmental standards provides them the capability to include culturally specific uses of resources.
- Weaver (1996) recognizes that incorporating standards with culturally specific uses of resources is an important aspect of self-determination, sovereignty, and therefore, tribal survival.
- **Thus, this NASA Research grant will focus on developing a repository of baseline data regarding the environmental impacts of the oil development that includes cultural aspects of the Mandan, Hidatsa and Arikara Nation.**



Methodology I

- FBCC Faculty along with Dr. Eric Wood from the USGS EROS Center will assist students with all aspects of their Geospatial research
- Students will learn research methodology and choose a research project to complete relative to the ND NASA Space grant project during the summer months with a paid internship.
- Students will prepare the results of their research for presentation at a State or National Student Research Conference

Draft Study Plan


- **Estimate land disturbed by oil and gas exploration**
- Determine study area and sampling process
 - NW reservation
 - area with grassland (now or recently)
 - north of river and west of agricultural area
 - Get existing LULC ; imagery for area
- NLCD 2006, any other
- Landsat, AWIFS, ASTER, MODIS products, NAIP, other air photos
- Sampling
- Determine what LU and LC you want to classify. Establish a key.
- Conduct unsupervised classification; using ERDAS Imagine
- From unsupervised classification and imagery, determine what you know and don't know about the landscape
- Determine (label) classes from classification and imagery; field check known and unknown polygons

Draft Plan (cont)

- Obtain land cover data (current) for sample areas
 - - In each class, randomly generate 20-40 geo-referenced points to be field checked (i.e., student goes to that point using handheld GPS unit, determines LULC, takes digital photo(s), enters data into logbook).
 - Using portion of field data conduct supervised classification
 - Run accuracy assessment with remaining sample data and/or manual method
 - Address errors with post-processing, additional field data
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- (Note: can hand digitize pads, roads, disturbed areas. Put in GIS, determine areas.)

Methodology II

- Students and Faculty will be trained on the application of standard image processing software and techniques to conduct a baseline land use / land cover classification of the Ft. Berthold Reservation.
- Imagery used will include Landsat scenes, both current and historical (acquired prior to oil and gas exploration), from the USGS EROS Landsat archive; USDA North Dakota NAIP orthoimagery; aerial photography where available, and any other imagery available from Tribal resource management agencies.
- Upon completion of a current baseline LULC classification, a historical classification will be undertaken to establish recent LULC change caused by or related to oil development. The ND GAP Project will be utilized for this, along with other historical archives including Tribal Elders and others sources.
- Long-range work plans will be established to undertake periodic updates of the classifications to function as a Reservation-wide monitoring system.

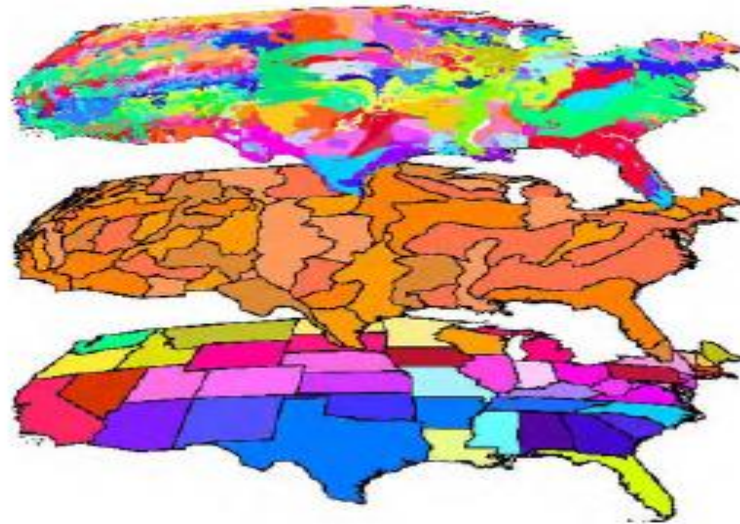
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- Students and Faculty will also be assisted in their efforts by personnel from the Three Affiliated Tribes. Offices included may be the Cultural Preservation Office, the Energy Office, and the Natural Resources Department. Tribal Elders will also be interviewed for their historical and cultural knowledge.

GAP Project



A Gap Analysis of North Dakota

April 2005 Final Report



A GEOGRAPHIC APPROACH TO PLANNING FOR BIOLOGICAL DIVERSITY

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

**THE NORTH DAKOTA □
GAP ANALYSIS PROJECT □
FINAL REPORT
April 2005**

**Laurence L. Strong, Principal Investigator
U.S. Geological Survey, Northern Prairie Wildlife Research Center
Jamestown, North Dakota 58401**

**Thomas H. Sklebar, Research Assistant
U.S. Geological Survey, Northern Prairie Wildlife Research Center
Jamestown, North Dakota 58401**

**Kevin E. Kermes, Research Assistant
U.S. Geological Survey, Northern Prairie Wildlife Research Center
Jamestown, North Dakota 58401**

**Contract Administration Through:
U.S. Geological Survey, Northern Prairie Wildlife Research Center
Jamestown, North Dakota 58401**

**Submitted by:
Laurence L. Strong**



GAP History and Purpose

- The North Dakota Gap Analysis Project (ND-GAP) was initiated in 1998 by Northern Prairie Wildlife Research Center with funding from the National Gap Analysis Program (GAP) of the U.S. Geological Survey.
- The project was a cooperative effort among more than 30 federal, state, Native American, and private conservation organizations in North Dakota (ND) (Table 1). resources.
- The ND-GAP is a preliminary step toward more detailed efforts and studies needed for long-term planning for biodiversity conservation in ND.



GAP MISSION

- **The mission of the GAP is to prevent conservation crises by providing conservation assessments of biotic elements (plant communities and native animal species) and to facilitate the application of this information to land management activities.**
- This is accomplished through the following five objectives
- (1) map actual land cover as closely as possible to the alliance level of the National Vegetation Classification System (FGDC 1997),
- (2) map the predicted distribution of those terrestrial vertebrates and selected other taxa that spend any important part of their life history in the project area and for which adequate distributional habitats, associations, and mapped habitat variables are available,
- (3) document the representation of natural vegetation communities and animal species in areas managed for the long-term maintenance of biodiversity,
- (4) make all GAP project information available to the public and those charged with land use research, policy, planning, and management, and
- (5) build institutional cooperation in the application of this information to state and regional management activities.

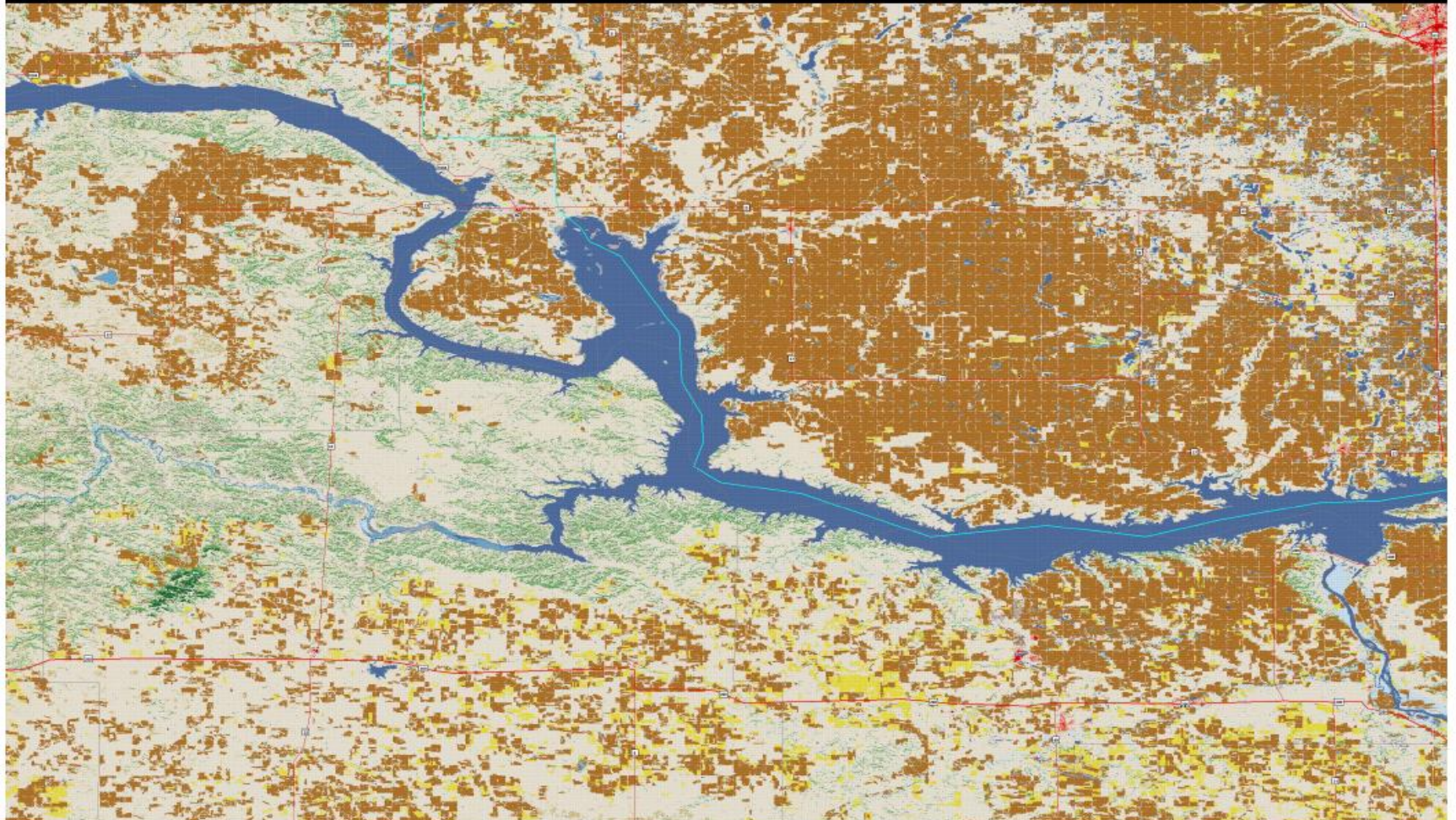
ND INFO:

- North Dakota ranks 17th among the 50 states in area,
- 3rd in total cropland harvested,
- 47th in human population with 642,200 residents in 2000 (NDASS 2001).
- Of the 70,702 miles² of surface area in ND, 2.5% is water and 4.3% is owned by the federal government.
- **The 65,917 miles² of non-federal land in ND consists of 58.6% cropland, 24.5% rangeland, 2.8% pasture land, 1% forest land, and 3.2 % developed land (NRCS 2000).**

Databases

- <http://www.mrlc.gov/>
- <http://www.nd.gov/gis/>
- <http://nationalmap.gov/>
- <http://edcsns17.cr.usgs.gov/NewEarthExplorer/>
- And more!

From MRLC.gov



U.S. Department of the Interior || Not accurate for measurement purposes. || Visit us at <http://gisdata.usgs.net>

U.S. Geological Survey || Images are derived from *The National Map Seamless Server*

2005 Data

