



## Geospatial Tools and Water Quality

Water quality protection programs depend on reliable characterization of the natural system in which water resources function. The use of geospatial tools including Geographic Information Systems (GIS) and Geographic Positioning Satellite (GPS) systems with digital databases is a step forward in improving our ability to effectively manage those resources. Geographic Information Systems (GIS) coupled with the availability of digital data sets allow for modeling water quality impacts over extensive areas with a minimal amount of time and effort.

Geographic Positioning Satellite (GPS) tools allow easy and accurate location of monitored data or research results relative to data generated with a computer model.

The following information describes geospatial programs, materials, tools, and educational opportunities available through the participating universities in the Northern Plains and Mountains Regional Water Quality Program. The maps show a variety of possible presentations of data.

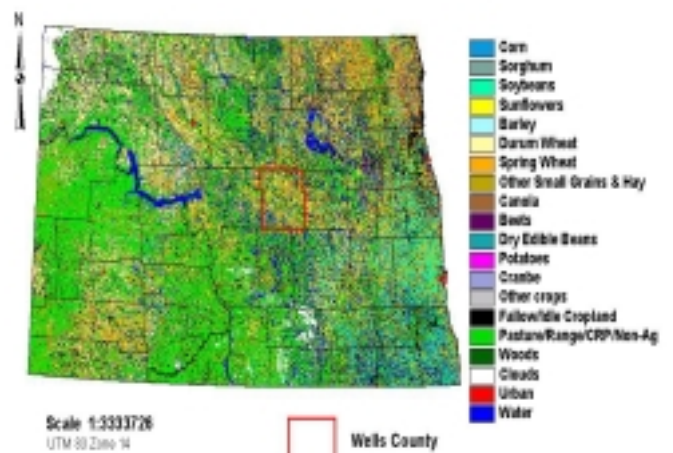
## Water Resource Assessment

GIS is used to evaluate conditions that may potentially contribute to water quality degradation. Database accessibility is an important aspect of water resource assessment.

In North Dakota resource surveys use GIS to estimate potential impacts to both groundwater and surface water. North Dakota State University (NDSU) and the North Dakota Agricultural Statistics Service (NDASS) share resources to develop and distribute the annual landuse map that is available at: <http://www.ageng.ndsu.nodak.edu/geodata/documents/>.

Colorado State University (CSU) provides developed groundwater leaching maps for the Colorado Department of Agriculture.

### North Dakota Landuse 2001 from NASS\* LandSat Database

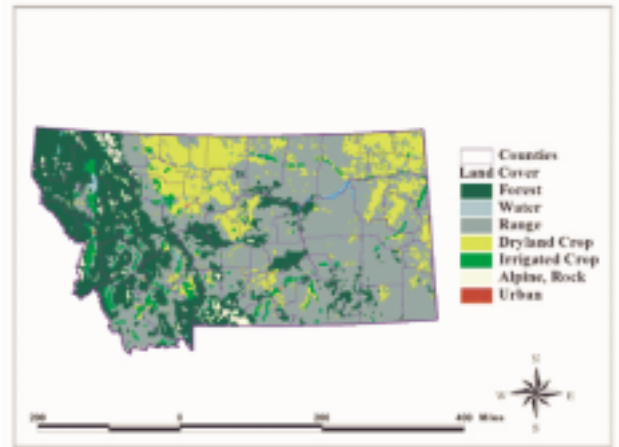


NDSU and the US Fish & Wildlife Service collaborate to use water resource assessment tools for endangered species protection and Integrated Pest Management (IPM) plans for local management areas. Techniques for wetland assessment via remote sensing are being developed at NDSU in the Animal and Range Department :  
([Edward.Dekeyser@ndsu.nodak.edu](mailto:Edward.Dekeyser@ndsu.nodak.edu)).

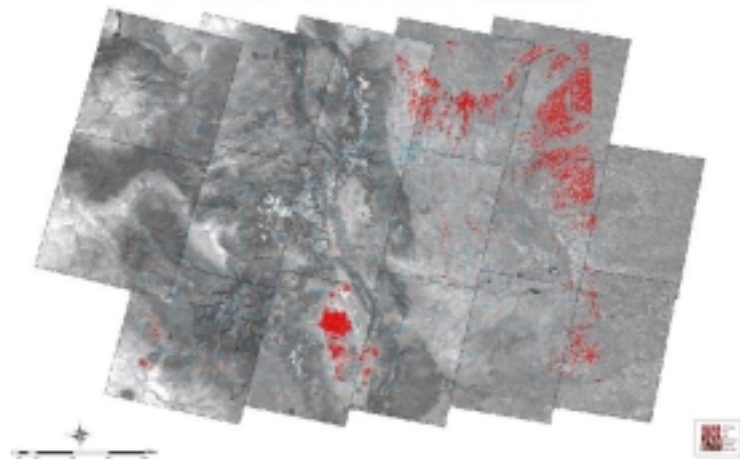
Montana State University (MSU) delivers land resource information through the Montana Agricultural Potential System (MAPS) at: <http://www.montana.edu/places/maps/index.html> MAPS has 150 attributes (e.g. land cover, precipitation, temperature, soils, and relief) related to land resources that can be displayed for any area in Montana. Data extracted using MAPS may be processed to assist with a variety of natural resource management issues including water resource contamination.

CSU has developed satellite imagery derived maps of center pivot irrigation in Colorado with funding from EPA Region 8 to help improve knowledge of irrigation distribution and relationship to ground water resources. Additionally, CSU has worked with the USGS to develop a GIS method for developing pesticide specific leaching maps of the state.

## Montana Land Cover



Center Pivots in Colorado over Millennium Mosaic™



# Geospatial Education and Outreach

Universities in the Northern Plains and Mountains Region recognize their important role in education and training programs focused on geospatial concepts and tools. Before information can be generated and assessed in a geospatial format a basic understanding of geospatial concepts and tools is essential.

MSU maintains a GPS Laboratory that provides on-line slide courses, GPS mapping workshops and a full semester course “GPS Fundamentals and Applications in Mapping” ([http://www.montana.edu/places/gps/main\\_gps.html](http://www.montana.edu/places/gps/main_gps.html)).

Outreach programs at NDSU include online training and workshops related to remote sensing and landuse databases:

(<http://www.ageng.ndsu.nodak.edu/geodata/documents/outreach1.htm>).

South Dakota State University (SDSU) provides direct geospatial assistance to agricultural producers through organized learning groups, on-farm research and geospatial data collection:  
([Cheryl\\_Reese@sdstate.edu](mailto:Cheryl_Reese@sdstate.edu)).

The Precision Agriculture Consortium at SDSU delivers a geospatial technologies program for K-12 teachers, including summer workshops:

(<http://www.engineering.sdstate.edu/~erc/ORS/este/details.htm>).

NDSU offers several courses that allow students to gain knowledge and skill with geospatial applications, "Geographic Information Systems I and II"

([Robert.Arthur@ndsu.nodak.edu](mailto:Robert.Arthur@ndsu.nodak.edu)),

"Geographic Information Systems/Range Survey"

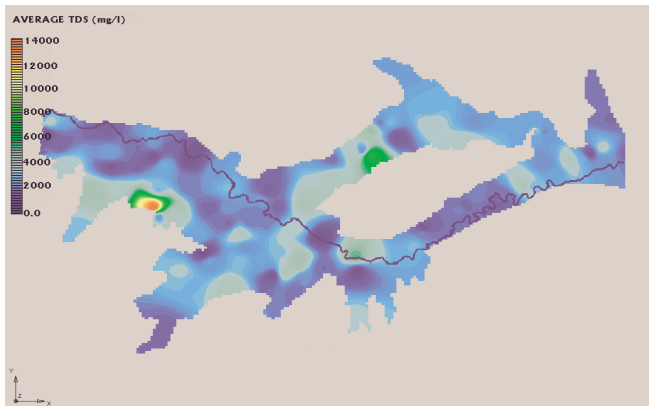
([mario.biondini@ndsu.nodak.edu](mailto:mario.biondini@ndsu.nodak.edu)), and

"Site Specific Agriculture"

([Lowell.Disrud@ndsu.nodak.edu](mailto:Lowell.Disrud@ndsu.nodak.edu)).

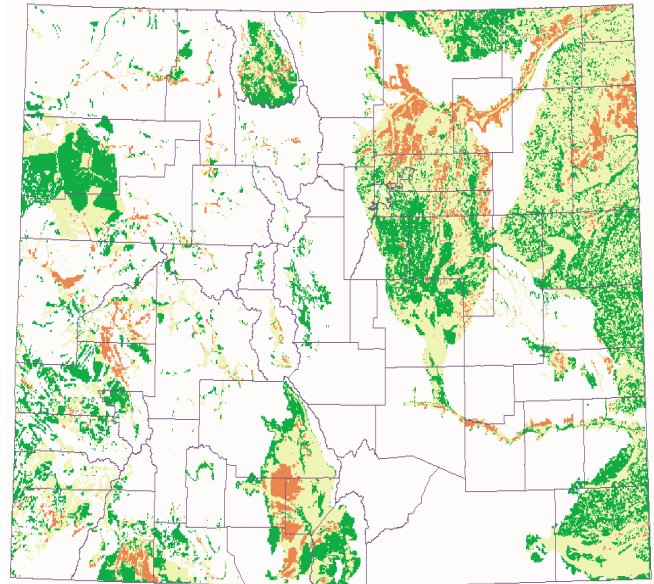
Producers in North Dakota are provided training in using the online pesticide/groundwater assessment at Pesticide Applicator Certification meetings ([sfox@ndsuext.nodak.edu](mailto:sfox@ndsuext.nodak.edu)).

## Arkansas River Water Table Salinity 2001

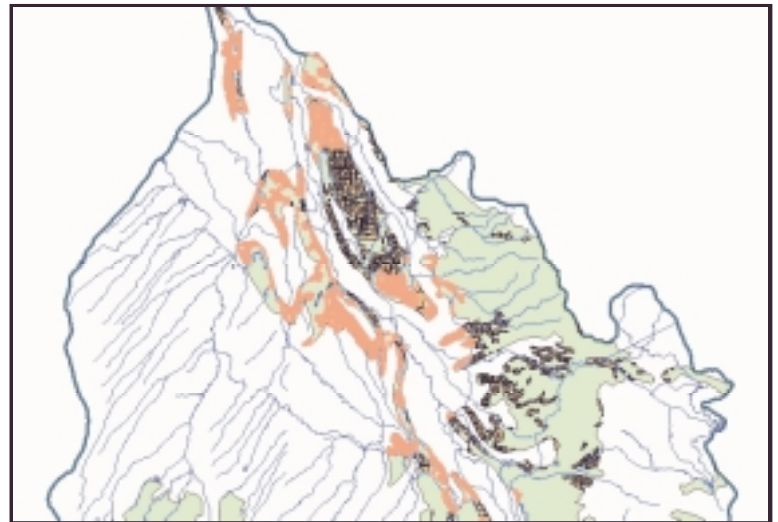


Other NDSU outreach programs include training workshops on ESRI products, GPS equipment, and a project oriented program combining Personal Digital Assistant (PDA), remote sensing products, and GPS technologies ([jnowatzk@ndsuext.nodak.edu](mailto:jnowatzk@ndsuext.nodak.edu)).

## Aquifer Sensitivity in Colorado



CSU offers the courses "GIS in Agriculture", "Principles & Components of Precision Farming", and "Applications of GIS and Remote Sensing in Agriculture" (<http://lamar.colostate.edu/~rkhosla/Teaching/TeachingContent.html>).



**Model output showing parcels in the lower Uncompahgre basin with high selenium leaching potential due to irrigation**

