

Using Remote Sensing-based Measures to Assess NRCS Program Impacts in Michigan



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SUMMARY

For the USDA-CSREES Grant, researchers at MTRI and the University of Michigan are using satellite imagery and NASA-derived data products to assess the impacts of farming programs administered and managed by the USDA's Natural Resources Conservation Service (NRCS). The study area consists of agricultural lands in Michigan, predominantly in its Lower Peninsula. The goal of the project is to develop and use remote sensing-based tools to evaluate the impacts of NRCS conservation practices on environmental quality. We are developing remote sensing and spatial data analysis methods to assist in conservation program effectiveness assessment by: 1) Developing program evaluation products derived through remote sensing & GIS; 2) Accounting or controlling for land cover/use influences in assessing NRCS program effectiveness.

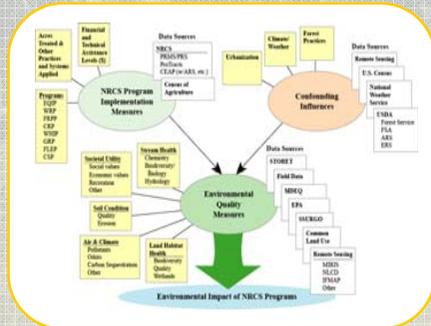
The following products are being investigated under this project and are described in the poster: Remote sensing-mapped conservation tillage practices based on crop residue sensing; quantification of changes in natural stream buffers with land cover map products; estimation of lake clarity using remote sensing; assessment of remote sensing-derived aerosols for conservation program assessment; and use of remote sensing for modeling and assessing soil carbon sequestration.

To complete the many, diverse tasks of the project, a broad range of optical sensors and data products are being used as sources of imagery and data. The full suite of sensors is expected to include Landsat, ASTER, MODIS, AVHRRS, and possibly SPOT. For some inputs, such as natural buffers, similar spectral bands will be used from a multitude of sensors having different spatial resolutions to investigate the effects of scale. For studying crop residue, sensors having differences in both spectral response and spatial resolution will be tested. Finally, specialized data products have been investigated for some inputs, such as the MODIS Aerosol Product to measure particulates.

Project Goal:

USDA-NRCS supports conservation farming practices through funding programs and technical assistance to farmers to address a variety of natural resource concerns. The project goal is to develop methods to use spatial data, including remote sensing data, to help assess the effectiveness of USDA conservation programs in addressing resource concerns.

Background:



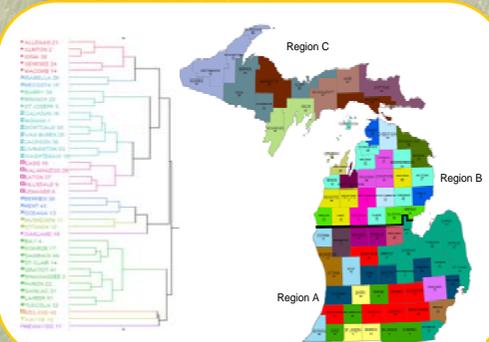
The figure above depicts the conceptual approach developed under a separate project to assess NRCS conservation programs. This project provides spatial data for inputs for the lower oval, the environmental quality measures, such as conservation tillage assessment, and the right oval, the influences outside of the NRCS activity that confound the assessment approach, such as land cover variability.

Accounting for Land Cover Variability



County clustering:

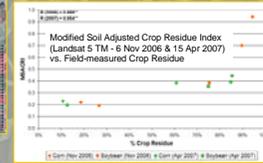
Below: To control for differences in land cover, county clusters (colors) were identified and mapped for each Michigan geographic region based on similarity in land cover characteristics and hydrology.



Environmental Measures Initial Results

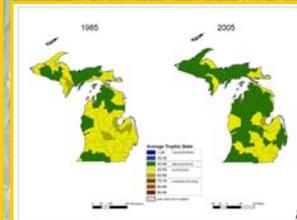
Assessing conservation tillage:

Left: Field and remote sensing data are used to develop tillage practice maps. **Below:** Initial results are encouraging for using Landsat for tillage assessment



Mapping lake clarity:

Right: Comparison of remote sensing-derived Trophic State Index (TSI as SDT) for 1985 and 2005 by watershed (7-digit HUC)



Next steps:

Additional products to be investigated and completed include maps of crop rotation across the crop regions of Lower Michigan using MODIS-derived crop type, improved soil erosion model results with improved land cover data, and mapped measures of land habitat and fragmentation using NOAA/C-CAP land cover data (see center image).