Rapid Land Use and Land Cover Database Development
Utility of the Land Use and Land Cover Database

- Socio-Economic
- Climate Change
- Water Quantity
- Water Quality
Overview of the Mapping Approach

Goal: Develop a LULC time-series database for years 2000-2013

• Produce crop type LULC data for years 2000, 2002-2004
• Utilize existing crop type LULC data for years 2001, 2005, 2006-2013
• Create value-added products from crop type LULC data
  • Produce field level LULC representation (2001, 2005-2010 completed)
  • Map Irrigation Status (methodology developed; running pilot on 2005 data)

• A Hybrid Hierarchical Classification
  1. Produce a general LULC map (Level I) using multi-seasonal Landsat TM imagery and an unsupervised classification (ISODATA) approach

  2. Produce crop type map (Level II) using annual MODIS NDVI time-series imagery and a supervised classification approach (Decision Tree)
     • Farm Market ID data used for image classification training and validation
1. Produce General Land Cover Maps

Image Acquisition & Processing

Multitemporal Landsat TM data

Image Classification

Grass/Crop

Urban

Water

Woodland

Two Stage Generalization

Using MMUs

Using CLUs

Mosaic Maps

Accuracy Assessment
Status of General LULC for 2002/2003
2. Produce Crop Type Maps Using a Decision Tree Classifier

- Extract Cropland Pixels from MODIS Imagery
- Supervised Classification
  - 80/20% data split for model training & validation
  - Independent sample used for formal accuracy assessment
- Process Training Data From Farm Market ID
- Resample & Generalization
- Reassign Crop Pixels to Crop Subclasses
- Accuracy Assessment

Wardlow & Egbert, 2008
Dominant Crop Types
Average multi-temporal NDVI profiles for Kansas
Overview of Existing LULC Data

In-house LULC:
• 2001 & 2005 derived from MODIS & TM imagery

USDA NASS Cropland Data Layer (CDL):
• 2006-2010 and ongoing
• Consistent, replicable methodology allows for inter-annual comparisons
Limitations of the Cropland Data Layer

• Noise in the data
  - NASS does not generalize or smooth the data to remove speckling affects
  - Cumulatively, the speckling produces misleading information of proportions of LULC or LULC change
Value Added LULC: Field Level Representation

- 2001, 2005-2010 completed, but models can be ran using newly acquired 2008 field boundaries from Farm Market ID.
Limitations of Existing LULC Data

- Irrigation Status Not Mapped
  - NASS reports irrigation acreages at the county-level in tabular form
  - Spatial representation provides opportunities for multi-scale analysis
Mapping Irrigation Status

For each crop type, for each county:

• Use USDA NASS reported acreages to restrict the spatial extent mapped as irrigated

• Use Maximum NDVI over the growing season to identify irrigated cropland

• Use buffers around points of diversion and irrigation canals to restrict locations of irrigated lands
NDVI

Corn (Irrigated) — Corn (Non-Irrigated) — Winter Wheat (Irrigated) — Winter Wheat (Non-Irrigated)
Example: Subset of Republic County

- Extract Points of Diversion and Canals Used for Irrigation
- Buffer Points of Diversion and Canals by 1000m
Extract Cropland Intersecting Buffer

Extract peak NDVI
Resample to 30-meter
Extract Corn From Cropland Map

Calculate Mean Maximum NDVI for Corn Each Field
Identify Peak NDVI Thresholds Matching Reported Acreage

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Apply NDVI Threshold To Create Irrigated Corn
Upcoming Year

- Finalize and apply methodology for mapping irrigation status
- Complete 2002/2003 General LULC Map
- Map Crop Types for years 2000, 2002 - 2004