USGS Land-Cover Trends: A focus on contemporary land-use and land-cover change within the LCCs

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The Challenge

- Land use is a pervasive driver of environmental change and has important implications related to climate, biodiversity, natural resources, and ecosystem services.
  - There are numerous different landscape changes and consequences affecting LCCs.

- We seek to address these critical challenges from a land-use/land-cover perspective – through a systematic analysis of land change dynamics that are occurring across a full range of land-use/cover types and climate and ecological settings.
  - A multi-temporal, multi-scale ecoregion-based analysis.
Land Change Science

- Has a diverse context, we are focused on:
  - LULC dynamics and landscape conservation
  - LULC and weather/climate interactions
2010 and beyond: The Land Change Science Initiative

- **National Land Change Assessment:** Analyze the scale, pace, causes, and implications of land-use/cover changes occurring across the national landscape.

- **Monitoring:** Establish a comprehensive and integrated land change monitoring system to provide regular land-cover updates needed to continue a wide range of land change research.

- **Consequences of Land Change:** Assess the societal significance and environmental impacts of past, present, and future land use and land cover change on earth systems and their associated feedbacks.

- **Scenarios and Modeling:** Develop and model scenarios of land use and land cover change to understand the vulnerability and resilience of coupled human–environment systems and the services they provide.
**General Approach**

- Designed to understand the scale, pace, causes, and consequences of US land change
  - Innovative multi-scale ecoregion framework
    - *National – biome – regional – landscape*
  - Synthesis of land use information with land cover/satellite data
  - Develop partnerships to analyze consequences of landscape change
Approach

- Assessment of the status & trends of change at periodic intervals
- Annual intervals
- 'Wall-to-wall' and sample analyses
- NLCD (validated); Landsat; random samples; targeted land systems

- Striving for spatially explicit understanding of the Colorado Front Range urban expansion (purple) onto grassland/woodlands (top) and cropland (below), 2001-2006
- Irrigated crop expansion (purple) in east-central Nebraska, 2001-2006

- Striving for spatially explicit understanding of the processes of land change across the US: Irrigated crop expansion (purple) in east-central Nebraska, 2001-2006
Recent Findings

- National-scale
  - Sectoral Gains, Losses, and Net Change
Figure – Substantial gains and losses of land cover occur at the decadal-scale. Level III ecoregions shown.
Trends in US Land Conversion across four time-intervals

Some of the most extensive land conversion dynamics for 4 time intervals between 1973-2000. Level 3 ecoregions are shown.
Recent Findings – LCCs

- Regional variability
- Temporal variability
  - Accelerating rates
- However, there is also sectoral variability (LULC categories) as well
  - Mix of expansion and decline
<table>
<thead>
<tr>
<th>LCC</th>
<th>Overall Spatial Change (percent of region)</th>
</tr>
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<tbody>
<tr>
<td>Appalachian</td>
<td>5.75</td>
</tr>
<tr>
<td>California</td>
<td>9.35</td>
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<tr>
<td>Desert</td>
<td>2.04</td>
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<tr>
<td>Eastern Tallgrass Prairie and Big Rivers</td>
<td>5.03</td>
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<tr>
<td>Great Basin</td>
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<tr>
<td>Great Northern</td>
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<tr>
<td>Great Plains</td>
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<td>Gulf Coast Prairie</td>
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<td>Gulf Coastal Plains and Ozarks</td>
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<td>Peninsular Florida</td>
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<td>Plains and Prairie Potholes</td>
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<td>Southern Rockies</td>
<td>1.64</td>
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<tr>
<td>Upper Midwest and Great Lakes</td>
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Trends of land cover change, 1973-2000

Landscape-level variability of LULCC, 2000-2006

USGS
Investigating a long-term & current record of land change
- Example from the South Central Plains, 1973 to 2010

- We are extending the analysis to ‘present’

- Analyzing the causes, trends, and implications of recent land change occurring across the diversity of US ecoregions
- Systematically-collected
- Comparable across the U.S.

Net change for 6 time intervals, 1973-2010

Extent of change in Level IV ecoregions, 2000-2006
The National Landscape

- **Variable rates of change**
  - In some cases, highest rates are due to one-type of land use (e.g. pine plantation)
  - Areas of low rates may have diverse changes or intensive land use practices, e.g. fertilization, irrigation, etc

- **Finer-level changes** relate to the land use potential determined by biophysical setting and socioeconomic drivers

- **Connection between assessment and consequence**
Emerging Direction

- Consequences of land change
  - Support DOI research needs within the LCC and CSC networks through regional consequences assessments that examine land use effects on earth systems and processes.
    - Communicating land use effects on land conservation and management
      - Land use effects conservation lands
      - Land use impacts on hydrology and climate
      - Land use impacts on habitat and species
      - Effects of energy development
Conclusions

- An understanding of land management options for landscape conservation is anchored by an understanding of the regional variability of human-environmental interactions across the United States.

- These interactions include but are not limited to the rates, types of land conversion, driving forces, and consequences of land change.

- We address the issues of landscape change by:
  - A systematic analysis of change across multiple scales
  - Integration of land use information with land cover
  - Identification of patterns and drivers of landscape change
  - Targeted analyses of consequences to the national landscape
Summaries of Land Change in LCCs

- Publication in progress
- Summaries of LULC change results for each of the 16 CONUS LCCs

THANK YOU!

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