Backcasting Land Use Change
Using GIS and Neural Networks
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Introduction: Why “backcast”?  

- Landscape analysis limited by availability of historical maps and remotely sensed images  
- Recent recognition of importance of land use legacies  
- Valuable in evaluating reliability of forecasted information
Methodology

• Previously developed Land Transformation Model (LTM) was significantly modified to produce a model to “backcast” land use change—LTM-Legacy

• Sixteen predictor variables created using GIS
  – Distance to roads, rivers, each of 4 land uses, etc.
  – Slope, soil permeability, max pH of soil, USGS ecoregions, etc.
  – Land use density

• Used to train artificial neural networks (ANN) to recognize patterns involved in the conversion of urban, forest, agriculture, and shrub land uses
Methodology

• Backcasts based on two proxy datasets
  – Total housing units data for each time period derived from the *U.S. Census*.
  – The *National Agriculture Statistics Service* (NASS) data for Land in Farms for each county converted from acres to 30-m cells.

• Transitions in forests and shrubland calculated from ratios of known change (1978-1998)
Conclusions

• Represents first step in linking recreations of historical land use scenarios to a Variable Infiltration Capacity model for the Great Lakes Basin
  – Predicts water and energy fluxes within an area of interest

• Through reconstructing time history of water and energy balances over the basin

• Using several climate scenarios, future water cycle variations in response to land use and climate change can be predicted
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