

PROJECT SLUCE: Spatial Land Use Change and Ecological Effects at the Rural-Urban Interface: Agent-Based Modeling and Evaluation of Alternative Policies and Interventions

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Project Summary

The complex interaction among current landscape conditions, cultural values and norms, policy prescriptions, and markets dramatically limits the usefulness of linear models of the interaction between the human systems that lead to land use/cover change and their effects on landscape ecological systems. For this reason, positing policy and other solutions to minimize negative ecological effects and introduce possible positive ecological effects of land use change requires tools for anticipating and evaluating the complex interactions between humans and ecological systems. To have some predictive power these tools should characterize the nature of land use decision making on an individual household, firm and local government unit basis and permit evaluation of the ecological effects of various decisions. Such tools should recognize both economic, political, and psychological motivations for land use and management decisions on the urban fringe (demand), as well as utilities for sale of undeveloped land (supply).

This project focuses a multidisciplinary team on developing, evaluating and applying agent based models of land use and cover change processes and assessing the interactions with ecosystem structure and function. Models and tools resulting from this proposed work will have direct implications for understanding both social and landscape dynamics within an urban system as well as projecting patterns of ecological change at the urban-rural fringe. They will also have a direct impact on the graduate and undergraduate education through their incorporation in a broad range of courses at the University of Michigan and their dissemination to the broader research and education communities. Our project seeks to understand the individual decision-making that drives land use decisions and to formulate and test alternative policies and interventions that could reduce environmental costs and enhance environmental benefits. Further, we will focus deliberately on the model development and application process and develop innovative approaches to integrating agent based models of the land use change process with empirical observations of land purchaser, seller, developer, and agency attitudes and land use, cover, and ecosystem change.

The two-fold educational objectives of the project will be implemented immediately and will continue to develop through the course of the project. The first component of the educational initiative involves formal incorporation of the models into a multitude of both "content" classes, which will look at the environmental economics, sociology, and policy implications of the project results and models, and the "methods" classes (e.g., complex systems modeling, GIS, spatial analysis, remote sensing), which will use the model system represented through this project as an example for presentation, discussion, and projects around analytical and modeling methodologies. The second educational component involves the dissemination of various versions of the models and data we create to communities outside the University of Michigan, through the internet and various user communities (e.g., Swarm and GIS). Our models will be well suited to wide dissemination and will be packaged with data collected through this project.