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

PI - Dan Brown
CO-PI - Joan Nassauer
CO-PI - Scott Page
Senior Pers - David Allan
Senior Pers - Kathleen Bergen
Senior Pers - Bobbi Low
Senior Pers - Robert Marans
Senior Pers - Rick Riolio
Senior Pers - Carl Simon
Senior Pers - Steve Yaffee

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.