

LINKING HOUSEHOLD PERCEPTIONS AND ECOSYSTEM IMPACT AMONG FOREST DERIVED ENERGY RESOURCES: THE MIOMBO WOODLANDS OF SOUTHERN PROVINCE, ZAMBIA

ABSTRACT:

More than three-quarters of households in Sub Saharan Africa rely on fuelwood, either firewood or charcoal, as their primary source of energy. Charcoal production is biomass intensive, typically takes place in rural wooded areas and is marketed offsite in cities; firewood is consumed close to its extraction location and is more likely to be used by the rural poor. Over the next several decades regional climatic shifts are slated to decrease overall precipitation and increase seasonal variability of rainfall. With no feasible energy alternatives in sight, the region is slated to see per capita and net increases in consumption of forest derived energy resources as the massive shift toward urbanization continues. Together, these climatic and demographic effects may contribute to a positive-feedback loop in which the stability of local savanna ecosystems and household resource availability are threatened.

Funds will go toward an integrated approach in measuring trends of savanna quality and extent as they relate to household energy resource needs in the miombo woodlands of southern Zambia. In part, the project will make use of a weekly 'text-message' survey to gather information on the seasonal and spatial characteristics of household fuelwood harvesting. Spatial measurements of forest quality and household use characteristics will highlight how household perceptions and practices differ from observed ecosystem quality. The work will provide insight for potential practical and policy approaches toward improving the relationship between the multifaced resource needs of households and ecosystem health in African savannas.

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1. INTRODUCTION AND PROBLEM STATEMENT

Scarcity of one resource often relies upon the utilization of another resource to fill livelihood gaps. In areas where marginal changes in resource availability have considerable affects on livelihoods, the roles of different resources become highly interrelated. Fuelwood, either firewood or charcoal, is the primary source of energy for 90% of households in areas of Sub-Saharan Africa (Twine et al., 2003). Fuelwood is obtained through extraction of woody material from forests and savannas, which are highly interspersed with agricultural fields (Brink & Eva, 2009). As agricultural land use increases and precipitation becomes more variable (Stern & Cooper, 2011), **it is likely that diminished forest and savanna ecosystems will not be able to accommodate local needs for energy resources.**

Record high CO₂ levels in the atmosphere and forest capacity to mitigate CO₂ have received considerable attention (van der Werf et al., 2011). Forestry, deforestation and forest degradation have been major components of multinational climate agreements (Sexton, 2015). Such policies have implications on the future quality of the world's forests and the livelihoods of those who rely on forest resources (Meyfroidt et al., 2010). **Sub Saharan Africa is subject to some of the greatest risks associated with climate change, particularly in regards to energy availability (Lobell et al., 2008).** These risks, coupled with the increasing market and ecological value of forests, attributed by 'payment for ecosystem services' policies, make understanding the long-term trends of these ecosystems an important multinational issue.

This research will investigate the dynamics between livelihoods associated with forest derived energy resources and the environments that provide them. **A household-to-landscape scale empirical analysis will be used to identify forest related energy dynamics in the context of climate variability.** The primary research questions are:

- What are the household-level spatial-temporal trends of forest derived energy resource use among smallholders in Southern Province, Zambia?
- How are these trends impacting the spatial pattern and composition of savanna ecosystems?
- How can these trends be understood in a framework of resource compromise in which climate variability plays a critical role?

Studies of the interrelated food-energy- water resource nexus have established the influence that a given resource can have on the broader resource system (Howells et al., 2013). **However, most prior research has been conducted at the regional level** (Bazilian et al., 2011). This leaves a fundamental disconnect between the actions, drivers, perceptions and motivations that direct different patterns of interrelated resource use (DeFries et al., 2004). Small-scale studies of these resource relationships are needed to understand **how individuals and households adapt to resource scarcity when governance and institutional drivers don't favor their influence.**

2. SUSTAINABILITY OF FOREST RESOURCES IN SUB-SAHARAN AFRICA

The miombo are the largest dry-tropical woodlands in Sub-Saharan Africa (2.7 million km²), they constitute 52% of the land area of Zambia (White, 1983 and Chidumayo, 1996). The **fuelwood energy dependency in Sub-Saharan Africa is expected to increase in the coming decades**, as state-level energy infrastructure continues to decline and Africans continue to migrate to energy intensive urban areas (Ahrends et al., 2010). To meet household energy needs the region is therefore posited to face increased reliance on extraction of fuelwood from forests and wooded savannah ecosystems. At the same time precipitation, a limiting element in savanna regrowth, has seen increased variability and lower annual totals in the region (Cooper et al., 2007).

Zambia in particular faces a potential looming energy crisis due to the failing infrastructure of the Kariba Dam, the country's most important source for electricity. With no feasible energy alternatives, the possibility that forests will face increased harvest will have implications on the regions carbon sequestration. As precipitation variability stresses savanna regrowth, potential resource scarcity becomes impossible to ignore.

3. METHODS

This project employs multiple methods to investigate drivers and outcomes of household and community biomass use dynamics: 1) household surveys documenting fuelwood use patterns and 2) satellite remote sensing analysis of forest condition. **Integration of this data will highlight spatial differences between perceptions of resource use and environmental impact.**

3.1 HOUSEHOLD SURVEYS AND SMS – BIOMASS HARVESTING PRACTICES

The primary survey data are high-frequency SMS responses from 650 smallholders examining the patterns of forest resource use during 2015-2016 agricultural cycle. Survey answers provide weekly individual time investment in resource collection. The collection and analysis framework for SMS data has been established as part of a larger NSF-funded project and has been extensively piloted. *The non-traditional qualities of the data make this project the first of its kind, but also impose high demand for big-data analysis skills.*

I will hire local enumerators through partners at Zambia Agricultural Research Institute (ZARI) to conduct surveys in 25 households of 6 communities across the region (150 HH total). The participating households will answer long-form surveys in which they are asked to summarize their use patterns over the study period. In this way, we will identify differences between real-time perceptions of use and backward-looking perceptions of total use. A community level survey will be conducted with village elders to document land tenure arrangements and demographics, and to identify institutional factors affecting access to land and permitted uses (ie. charcoal production and fuelwood harvesting regulations).

3.2 ECOLOGICAL IMPACT – REMOTE SENSING AND SAVANNA CONDITION

Satellite image analysis is effective for mapping global forests, though there are discrepancies in global scale measurement (Sexton et al, 2015). Savannas constitute one major area of discrepancy because of their low canopy cover, high disturbance frequency and rapid regrowth rates (Yang and Prince, 2000). **Image analysis for this project will determine percent of woody cover as an indicator of available carbon in above-ground biomass.** We will use publicly available Landsat ETM+ data to develop a time series of images of the study area over the last 10 years. Daily precipitation data is available from Mochipapa Research Station, east of Choma, and will be integrated into the selection and disturbance regrowth analysis. Using in-situ measurements as ground truthing for the satellite data, we will develop accurate methods for determining savanna cover and disturbance identification at a high-resolution, allowing ongoing assessment of savanna composition.

In-situ measurements will examine areas identified as high-use locations for fuelwood harvesting; leaf-area-index, above-ground biomass and species present will be recorded. Spatial patterns of harvesting will determine how households decide where to travel to harvest fuelwood – due to resource constraints this analysis will be carried out for 60 of the 150 survey households.

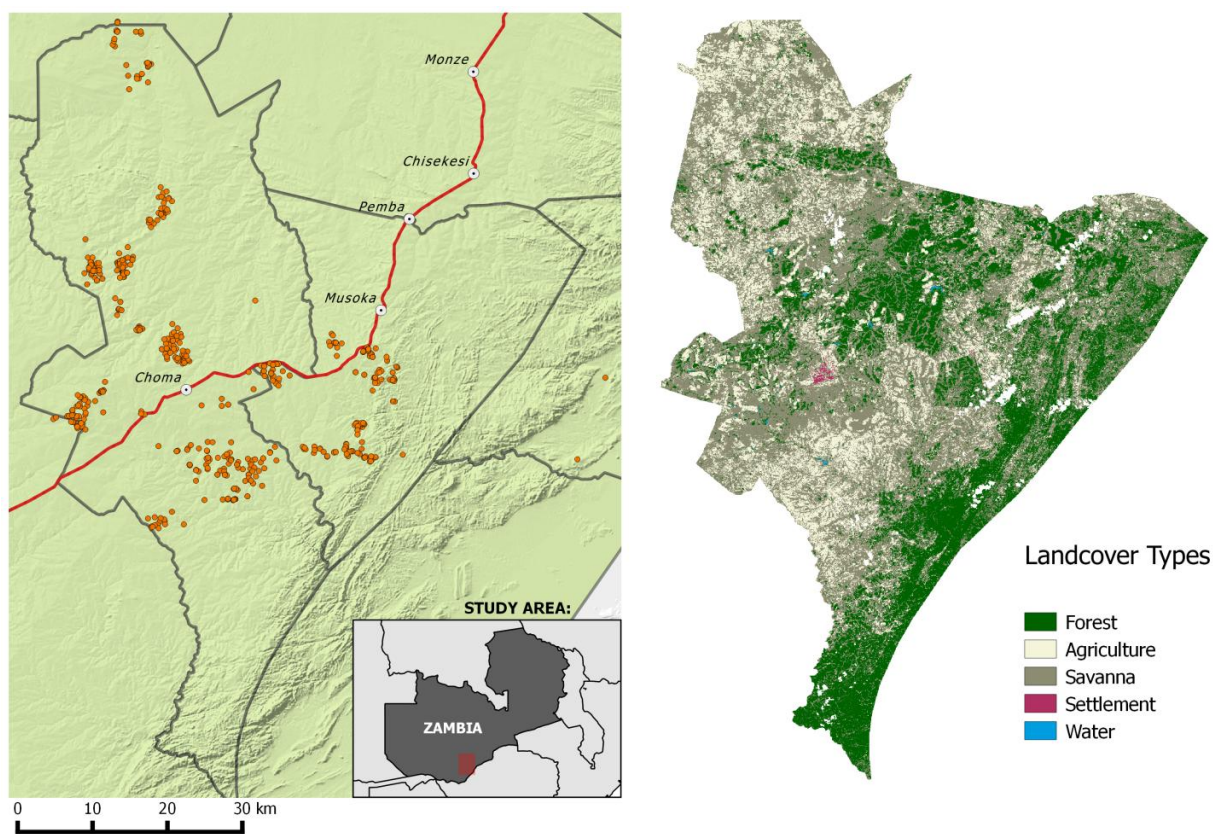


Figure 1 - Left: Study area within Zambia, orange dots represent households participating in SMS surveys (n=650), Choma and other settlements are also indicated along a primary road; **Right:** Landcover map of the study area showing the extent of savanna and forest

4. EXPECTED RESULTS, FEASIBILITY AND TIMELINE

The PI has experience with spatial data analysis and statistical software packages *making the application of high-frequency, high-resolution survey data possible*. Supporting faculty Tom Evans has experience in the study area, where our researchers have a working relationship with scientists at ZARI and the Climate Change Secretariat under the Zambian Office of Vice President. These government connections are instrumental to brokering access to communities and developing relationships with local government officials to gain permission for carrying out research.

This project will produce two first-author publications in peer-reviewed journals (remote sensing analysis and forest resource use drivers) and will be presented at the 2017 Meeting of the American Association of Geographers. Remote-sensing data and anonymized social data will be uploaded to IU Scholar Works to promote wider use of project data. Forest change maps will be included in reports given to communities involved in the project. Lastly, results will be presented in a colloquium series at the Ostrom Workshop (affiliated research center of the PI) and a summary report will be completed for IU Office of Sustainability.

Table 1: Research timeline

| Research Activity | 2016 | | | 2017 |
|--|--------|--------|------|--------|
| | Spring | Summer | Fall | Spring |
| Remote sensing analysis | X | | X | |
| American Association Geographers Meeting | X | | | X |
| Poster - Sustainability Symposium | X | | | |
| Fieldwork | | X | | |
| Thesis Writing | | | X | X |
| Manuscript Writing | | | X | X |
| Summary report - IU Office of Sustainability | | | | X |
| Thesis Defense | | | | X |

5. BUDGET

Expenses include travel costs and materials needed for survey enumerators and collection of ground-based fuelwood use data. The budget includes payment for a local vegetation expert from the Southern Province Department of Forestry, for proper tree-species identification and guidance on traditional firewood and charcoaling practices.

Lodging in country will be covered by a grant held by the faculty supervisor (NSF number: WSC 1360463).

Table 2: Budget Estimate

| | |
|---|-----------------------|
| Travel | |
| Airfare (round trip IND → Lusaka) | \$1,800 |
| Ground transportation, IND airport (\$20 x 2) | \$40 |
| Ground transportation, rental vehicle, Zambia (\$100/day x 30 days) | \$3,000 |
| Per Diem(\$15/day x 30days) | \$450 |
| Lodging (no expense, house rented for faculty project) | \$0 |
| Field Data Collection | |
| Spherical densitometer - tree cover | \$104 |
| Clinometer - tree height | \$147 |
| Zambian vegetation guide book | \$42 |
| Trunk diameter measuring tape (2) | \$95 |
| Misc. Materials (field notebooks, maps, pens) | \$75 |
| Payment for local guide, (30 days x \$20/ day) | \$600 |
| Talktime for SMS users (60 HH x 25 cents x 24 surveys) | \$360 |
| Total | |
| | <u>\$6,713</u> |

Faculty sponsor's departmental research account number: 4842704

WORD COUNT: 1,499

REFERENCES:

- Ahrends, A., N. D. Burgess, S. A. H. Milledge, M. T. Bulling, B. Fisher, J. C. R. Smart, G. P. Clarke, B. E. Mhoro, and S. L. Lewis. 2010. "Predictable Waves of Sequential Forest Degradation and Biodiversity Loss Spreading from an African City." *Proceedings of the National Academy of Sciences* 107 (33): 14556–61. doi:10.1073/pnas.0914471107.
- Bazilian, Morgan, Holger Rogner, Mark Howells, Sebastian Hermann, Douglas Arent, Dolf Gielen, Pasquale Steduto, et al. 2011. "Considering the Energy, Water and Food Nexus: Towards an Integrated Modelling Approach." *Energy Policy* 39 (12): 7896–7906. doi:10.1016/j.enpol.2011.09.039.
- Brink, Andreas Bernhard, and Hugh Douglas Eva. 2009. "Monitoring 25 Years of Land Cover Change Dynamics in Africa: A Sample Based Remote Sensing Approach." *Applied Geography* 29 (4): 501–12. doi:10.1016/j.apgeog.2008.10.004.
- Chidumayo, Emmanuel, James Gambiza, and Isla Grundy. 1996. "Chapter 7: Managing Miombo Woodland." In *The Miombo in Transition: Woodlands and Welfare*. CIFOR.
- Cooper, P.J.M., J. Dimes, K.P.C. Rao, B. Shapiro, B. Shiferaw, and S. Twomlow. 2008. "Coping Better with Current Climatic Variability in the Rain-Fed Farming Systems of Sub-Saharan Africa: An Essential First Step in Adapting to Future Climate Change?" *Agriculture, Ecosystems & Environment* 126 (1-2): 24–35. doi:10.1016/j.agee.2008.01.007.
- DeFries, Ruth S., Jonathan A. Foley, and Gregory P. Asner. 2004. "Land-Use Choices: Balancing Human Needs and Ecosystem Function." *Frontiers in Ecology and the Environment* 2 (5): 249–57. doi:10.1890/1540-9295(2004)002[0249:LCBHNA]2.0.CO;2.
- Howells, Mark, Sebastian Hermann, Manuel Welsch, Morgan Bazilian, Rebecka Segerström, Thomas Alfstad, Dolf Gielen, et al. 2013. "Integrated Analysis of Climate Change, Land-Use, Energy and Water Strategies." *Nature Climate Change* 3 (7): 621–26. doi:10.1038/nclimate1789.
- Meyfroidt, P., T. K. Rudel, and E. F. Lambin. 2010. "Forest Transitions, Trade, and the Global Displacement of Land Use." *Proceedings of the National Academy of Sciences* 107 (49): 20917–22. doi:10.1073/pnas.1014773107.
- Sexton, Joseph O., Praveen Noojipady, Xiao-Peng Song, Min Feng, Dan-Xia Song, Do-Hyung Kim, Anupam Anand, et al. 2015. "Conservation Policy and the Measurement of Forests." *Nature Climate Change*, October. doi:10.1038/nclimate2816.
- Stern, R. D., and P. J. M. Cooper. 2011. "Assessing climate risk and climate change using rainfall data – A case study from Zambia." *Experimental Agriculture* 47 (02): 241–66. doi:10.1017/S0014479711000081.
- Twine, Wayne, D. Moshe, T. Netshiluvhi, and V. Siphugu. 2003. "Consumption and direct-use values of savanna bio-resources used by rural households in Mametja, a semi-arid area of Limpopo province, South Africa." *South African Journal of Science* 99: 467-473.
- van der Werf, G. R., D. C. Morton, R. S. DeFries, J. G. J. Olivier, P. S. Kasibhatla, R. B. Jackson, G. J. Collatz, and J. T. Randerson. 2009. "CO₂ Emissions from Forest Loss." *Nature Geoscience* 2 (11): 737–38. doi:10.1038/ngeo671.
- White, Frank. n.d. *The Vegetation of Africa*. UNESCO, Paris: Natural Resources Research.
- Yang, J., & Prince, S. D. (2000). "Remote sensing of savanna vegetation changes in Eastern Zambia" 1972-1989. *International Journal of Remote Sensing*, 21(2), 301-322.

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EDUCATION:

2015 — present M.S. Indiana University, Geography Advisor: Dr. Tom P. Evans
2010 — 2013 B.S. University of Maryland, College Park, Geography

RESEARCH AREAS:

- Global natural resource use; agriculture, forests, water and energy
- Remote sensing, forest ecology and land use modeling
- Human elements of environmental change

EXPERIENCE:

Graduate Research Assistant 2015 — present

Indiana University Department of Geography, Bloomington, IN

- developed data collection and analysis workflow for SMS response data from Zambian smallholder farmers
- remote sensing analysis of miombo woodlands degradation

Research Assistant 2013 — 2014

University of Maryland Department of Geographical Sciences, College Park, MD

- performed in-situ measurements of above-ground forest biomass as control data for NASA Carbon Monitoring System project
- collected data using sonic and laser-based measurement techniques; species classifications
- recorded, organized and managed data for programming input; recorded data in-field using mobile software developed by UMD Geography

Research Volunteer 2013

University of Maryland Department of Geographical Sciences, College Park, MD

- Parsed data from the US EPA Toxic Release Inventory for compatibility with US Census block-level demographics and consumption data

AWARDS, HONORS AND MEMBERSHIPS:

2015 — present Indiana University Graduate Student Research Assistantship
2015 — present American Association of Geographers, membership
2010 — 2013 University of Maryland College of Behavioral and Social Sciences Dean's List

PRESENTATIONS:

Schlachter, T., Evans, T. 2016. *Degradation and Deforestation in the Miombo Woodlands of Southern Province, Zambia: Remote Sensing Profiles of Unique Forest Change Drivers*. Annual meeting of the Association of American Geographers (AAG), San Francisco, CA.

SOFTWARE AND PROGRAMMING:

Javascript, Python, R, LaTeX, MATLAB, Erdas, ENVI, ArcGIS, QGIS, GRASS

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EDUCATION:

1998 Ph.D. University of North Carolina at Chapel Hill (Geography)
1994–1998 Pre-Doctoral Trainee, Carolina Population Center, UNC-Chapel Hill
1989 B.A. Virginia Polytechnic Institute (Geography)

EMPLOYMENT/POSITIONS:

2013–present Professor, Department of Geography, Indiana University
2012–2014 Co-Director, The Vincent and Elinor Ostrom Workshop in Political Theory and Policy Analysis, Indiana University
2009–2014 Director, Center for the Study of Institutions, Population, and Environmental Change (CIPEC), Indiana University
2005–2013 Associate Professor, Department of Geography, Indiana University
1999–2005 Assistant Professor, Department of Geography, Indiana University
1998–1999 Post-Doctoral Fellow in GIS, Center for the Study of Institutions, Population, and Environmental Change (CIPEC), Indiana University

RESEARCH AREAS:

- Human-environment interactions; Human Dimensions of Global Change
- Environmental Decision-Making, Institutions, Governance and natural resource management
- Geographic Information Systems, Spatial Modeling, Agent-based Modeling

EXTERNAL FUNDING:

2015-2019 **Understanding Cross-Scale Interactions of Trade and Food Policy to Improve Resilience to Drought Risk.** Institutional Principal Investigator (IU) with PI Justin Sheffield (Princeton University), Co-PI Kelly Caylor (Princeton U.), Co-PI Lyndon Estes (Princeton U.) and Institutional PI Megan Konar (U. Illinois). National Science Foundation. \$2,520,000 (BCS-1534544).

2015-2017 **Transitions and Tradeoffs between Food, Energy, and Water Security in African Dryland Agro-ecosystems.** Principal Investigator (IU) with PI Kelly Caylor (Princeton University), Co-PI Justin Sheffield, Co-PI Shahzeen Attari (IU-SPEA) and Co-PI Beth Plale (IU Informatics). \$300,000 (Supplemental award to SES-1360463).

2014-2019 **Impacts of Agricultural Decision Making and Adaptive Management on Food Security.** Principal Investigator (IU) with PI Kelly Caylor (Princeton University), Co-PI Justin Sheffield, Co-PI Shahzeen Attari (IU-SPEA) and Co-PI Beth Plale (IU Informatics). National Science Foundation. \$3,600,000 (SES-1360463).

2012-2015 **Nutrient Cycle Impacts on Forest Ecosystem Carbon Cycling: Improved Prediction of Climate Feedbacks from Coupled C–Nutrient Dynamics from Ecosystem to Regional Scales.** Co-Principal Investigator with Principal Investigator Josh Fisher (Jet Propulsion Labs/UCLA), and Co-PIs Rich Phillips (IU-Biology) and Danilo Dragoni (IU-Geography). Department of Energy. \$1,045,000.

2012–2015 **A Belowground Framework for Predicting How Plant-Microbe Interactions Couple Carbon and Nutrient Economies of Forests.** Co-Principal Investigator with PI Richard Phillips (IU-Biology) and Co-PI Joshua Fisher (Jet Propulsion Labs/UCLA). (NSF: DEB-1153401) \$398,045.

- 2011–2016 **CNH: Institutional Dynamics in Robust Social-Ecological Systems: Adaption to Climate Change in Snowmelt-Dependent Agricultural Systems.** Principal Investigator with and Co-PIs Elinor Ostrom, Krister Andersson (Political Science, Univ. of Colorado), Kelly Caylor (Civil and Env. Engineering, Princeton University), and Daniel Cole (IUB School of Law/SPEA) (NSF: BCS-1115009) \$1,200,000.
- 2010–2015 **Spatial Resilience of Agriculturalists to Coupled Ecological and Hydrological Variability in Rural Zambia.** Principal Investigator with Co-PIs Kelly Caylor (Civil and Environmental Engineering, Princeton University) and Scott Robeson (Geography, IU) (NSF: BCS1026776) \$700,000.
- 2010–2012 **EAGER: In-Situ Archiving of Digital Scientific Data.** Co-Principal Investigator with PI Beth Plale (School of Informatics and Computing, IU) and Co-PI Elinor Ostrom (Political Science, IU) (NSF: OCI1058452) \$200,000.
- 2010–2011 **New Media Approaches for Cross-Disciplinary Education and Community Awareness of Remote Sensing and Land Use Dynamics.** Principal Investigator with Co-PI Rich Phillips (Biology, IU). NASA/Indiana Space Grant Consortium. \$14,719.
- 2007–2010 **Dynamics of Reforestation in Coupled Social-Ecological Systems: Modeling Land-Use Decision Making and Policy Impacts.** Principal Investigator with Co-PIs Emilio Moran (Anthropology, IU), Burney Fischer (SPEA, IU), Catherine Tucker (Anthropology, IU), and Kelly Caylor (Civil and Env. Engineering, Princeton University) (NSF: BCS0624178) \$749,150
- 2007–2010 **Decentralization, Local Institutions, and Environmental Change: A Cross-Sectional Time-Series Study of Forest Governance in Latin America.** Co-Principal Investigator with PI Krister Andersson (Political Science, University of Colorado) and Co-PI Clark Gibson (Political Science, University of California at San Diego) (NSF: SES0648447) \$272,895
- 2002–2008 **Development of a Spatial-Experimental Laboratory for Research and Policy Analysis Related to Complex Systems.** Co-Principal Investigator with PI Elinor Ostrom (Political Science, IU) and Co-PIs Jerome Busemeyer (Psychology, IU), Robert Huckfeldt (Political Science, IU), and James Walker (Economics, IU) (BCS0215738) \$847,874
- 2001–2006 **Biocomplexity in Linked Bioecological-Human Systems: Agent-Based Models of Land-Use Decisions and Emergent Land-Use Patterns in Forested Regions of the American Midwest and the Brazilian Amazon.** Co-Principal Investigator with PI Elinor Ostrom (Political Science, IU) and Co-PIs Jerome Busemeyer (Psychology, IU), Vicky Meretsky (School of Public and Environmental Affairs, IU), and James Walker (Economics, IU) (SES0083511) \$2,751,732
- 2001–2003 **Incorporating Human Drivers and Responses in Land Use Change Models for the Northeastern and North Central Research Areas.** Co-Principal Investigator with Morgan Grove (USDA-FS) and Charles Schweik (Political Science, University of Massachusetts at Amherst) USDA. \$75,000
- 2001–2002 **Social Assessment of the Shawnee National Forest.** Principal Investigator USDA – Forest Service. \$25,000
- 2000–2001 **A Social Assessment of the Hoosier National Forest.** Co-Principal Investigator with PI Elinor Ostrom (Political Science, IU) USDA – Forest Service. \$25,000

AWARDS/HONORS/VISITING FELLOWSHIPS:

Named Senior Research Fellow, Ostrom Workshop, Indiana University (March 2015)

Visiting Fellowship, Research Institute for Humanity and Nature (RIHN), Kyoto, Japan, January–June 2010.

Sustainability Science Award, Ecological Society of America, 2009 (co-recipient with authors of manuscripts in *Proceedings of the National Academy of Sciences USA* special feature on "Land Change Science")

Visiting Fellowship, Research Institute for Humanity and Nature (RIHN), Kyoto, Japan, May–August 2008.

Visiting Fellowship, East-West Center, Honolulu, Hawaii, February–April 2007.

2000 ASPRS/ERDAS Award for Best Scientific Paper in Remote Sensing. Walsh SJ, Evans TP, Welsh WF, Entwisle B, and Rindfuss RR. 1999. Scale dependent relationships between population and environment in northeastern Thailand. *Photogrammetric Engineering and Remote Sensing* 65(1):97–105.

First Place, Association of American Geographers (AAG), Geographic Information Systems Specialty Group, Student Paper Competition, 1997 AAG meeting. Paper Title: *Integration of Community Level Population and Environmental Data: Region Growing and Fuzzy Boundaries for the Delineation of Village Territories in Northeast Thailand*.

PUBLICATIONS:

Manuscripts under review

Drew B. Gower, Jampel Dell'Angelo, Paul F. McCord, **Tom P. Evans**, Kelly K. Caylor. In review. Ecohydrological dynamics of smallholder strategies for food production in dryland agricultural systems. *Environmental Research Letters*.

McCord, P.F., J. Dell'Angelo, E. Baldwin, and **T.P. Evans**. In review. Polycentric transformation in Kenyan water governance: A dynamic analysis of institutional and social-ecological change. Submitted to *The Policy Studies Journal*. (revise and resubmit, Feb 2016)

Refereed Journal Articles

Fisher, J., Sweeney, S., Brzostek, E., **Evans, T. P.**, Johnson, D., Bourg, N., Myers, J., Wolf, A., Howe, R. and Phillips, R. In press. Tree–mycorrhizal associations detected remotely from canopy spectral properties. *Global Change Biology*.

Estes, L., McRitchie, D., Choi, J., Debats, S., **Evans, T.P.**, Guthe, W., Luo, D., Ragazzo, G., Zempleni, R., and Caylor, K. In press. A platform for crowdsourcing the creation of representative, accurate landcover maps. *Environmental Modeling and Software*.

Dell' Angelo, J., McCord, P., Gower, D., Carpenter, S., Caylor, K., **Evans, TP**. In press. Revisiting Institutional Design Principles for Community-Based Water Management: the case of Mount Kenya. *Mountain Research and Development*.

Baldwin, E., Washington-Ottombre, W., Dell' Angelo, J., Cole, D. and **Evans, TP**. In press. Polycentric Water Governance in Response to Failures of Centralized Irrigation Policy in Kenya. *Governance*.

Magliocca, N., van Vliet, J., Brown, C., **Evans, TP**, Houet, T., Messerli, P., Messina, J., Nicholas, K., Ornetsmüller, C., Sagebiel, J., Schwiezer, V., Verburg, P. and Yu, Q. 2015. From meta-studies to modeling: Using synthesis knowledge to build process-based land change models. *Environmental Modelling and Software*. 72: 10-20.

McCord PF, Cox, M., Schmitt-Harsh, M., **Evans, TP**. 2015. Crop diversification as a smallholder livelihood strategy within semi-arid agricultural systems near Mount Kenya. *Land Use Policy*. 42: 738-750.

O'Sullivan, D., **Evans, TP**, and Manson, S. 2015. Strategic Directions for Agent-based Modeling - Avoiding the YAAWN Syndrome. *Journal of Land Use Science*. 1-11.

Ruseva, T., **Evans, TP**, Fischer, B. 2015. Can incentives make a difference? Assessing the effects of policy tools for encouraging tree-planting on private lands. *Journal of Environmental Management*. 155, 162-170.

Sweeney, S., Ruseva, T., Estes, L., and **Evans, T. P.** 2015. Mapping cropland in smallholder-dominated savannas: integrating remote sensing techniques and probabilistic modeling. *Remote Sensing*. 7(11): 15295-15317.

Troy, T., Pavao-Zuckerman, M. and Evans, TP. 2015. Sociohydrologic modeling: Tradeoffs, hypothesis testing, and validation. *Water Resources Research*. 51: 4806-4814.

Wright, G., Andersson, K., **Evans, TP** and Gibson, C. 2015. What Incentivizes Local Forest Conservation Efforts? Evidence from Bolivia. *International Journal of the Commons*. 9(1): 322-346.

Villamayor-Tomas, S., Grundmann, P., Epstein, G., **Evans, TP** and Kimmich, C. 2015. The water-energy-food security nexus through the lenses of the IAD framework and value chain analysis. *Water Alternatives*, 8(1) 735-755.

Evans, TP, and Cole, D. 2014. Contextualizing the influence of social norms, collective action on social-ecological

- systems. *Journal of Natural Resources Policy Research*. 6(4): 259-264. DOI: 10.1080/19390459.2014.956422
- Ruseva TB, **Evans TP**, Fischer BC. 2014. Variations in the social networks of forest owners: the effect of management activity, resource professionals, and ownership size. *Small-scale Forestry*. 13(3): 377-395. DOI 10.1007/s11842-014-9260-z
- Paulson-Priebe, M., **Evans TP**, Andersson K, Castellenos E. 2014. Decentralization, forest management, and forest conditions in Guatemala. 1-17. *Journal of Land Use Science*. DOI: 10.1080/1747423X.2014.915350
- Mincey SK, Hutten M, Fischer BC, **Evans TP**, Stewart SI, and Vogt JM. 2013. Structuring institutional analysis for urban ecosystems: a key to sustainable urban forest management. *Urban Ecosystems* 16(3):553–571. DOI: 10.1007/s11252-013-0286-3.
- Schmitt-Harsh M, Mincey SK, Patterson M, Fischer BC, **Evans TP**. 2013. Private residential urban forest structure and carbon storage in a moderate-sized urban area in the Midwest, United States. *Urban Forestry & Urban Greening* 12(4):454–463. <http://www.sciencedirect.com/science/article/pii/S1618866713000848>.
- Schmitt-Harsh M, Sweeney SP, and **Evans TP**. 2013. Classification of coffee-forest landscapes using Landsat TM imagery and spectral mixture analysis. *Photogrammetric Engineering & Remote Sensing* 79(5):457–468.
- Schmitt-Harsh M, **Evans TP**, Castellanos E, and Randolph JC. 2012. Carbon stocks in coffee agroforests and mixed dry tropical forests in the western highlands of Guatemala. *Agroforestry Systems* 86(2):141–157. DOI:10.1007/s10457-012-9549-x.
- Sweeney SP and **Evans TP**. 2012. An edge-oriented approach to thematic map error assessment. *Geocarto International* 27(1):31–56. DOI:10.1080/10106049.2011.622052.
- Evans TP**, Phanvilay K., Fox J, and Vogler J. 2011. An agent-based model of agricultural innovation, land-cover change and household inequality: the transition from swidden cultivation to rubber plantations in Laos PDR. *Journal of Land Use Science* 6(2-3):151–173.
- Kelley H and **Evans TP**. 2011. The relative influences of land-owner and landscape heterogeneity in an agent-based model of land-use. *Ecological Economics* 70(6):1075–1087.
- Andersson K, **Evans TP**, and Richards KR. 2009. National forest carbon inventories: Policy needs and assessment capacity. *Climatic Change* 93:69–101.
- Ekbja HR and **Evans TP**. 2009. Regimes of Information: Land Use Management and Policy. *The Information Society* 25(5):328–343.
- Donnelly S and **Evans TP**. 2008. Characterizing spatial patterns of land ownership at the parcel level in south-central Indiana, 1928–1997. *Landscape and Urban Planning* 84(3):230–240.
- Evans TP** and Kelley H. 2008. Assessing the transition from deforestation to forest regrowth with an agent-based model of land cover change for south-central Indiana (USA). *Geoforum* 39(2):819–832.
- Messina JP, **Evans TP**, Manson SM, Shortridge AM, Deadman PJ, and Verburg PH. 2008. Complex systems models and the management of error and uncertainty. *Journal of Land Use Science* 3(1):11–25.
- Parker DC, Entwisle B, Rindfuss RR, VanWey LK, Manson SM, Moran E, An L, Deadman P, **Evans TP**, Linderman M, Mussavi SM, and Malanson G. 2008. Case studies, cross-site comparisons, and the challenge of generalization: Comparing agent-based models of land-use change in frontier regions. *Journal of Land Use Science* 3(1):41–72.
- Rindfuss RR, Entwisle B, Walsh SJ, An L, Badenoch N, Brown DG, Deadman P, **Evans TP**, Fox J, Geoghegan J, Gutmann M, Kelly M, Linderman M, Liu J, Malanson GP, Mena CF, Messina JP, Moran EF, Parker DC, Parton W, Prasartkul P, Robinson DT, Sawangdee Y, VanWey LK, and Verburg PH. 2008. Land use change: Complexity and comparisons. *Journal of Land Use Science* 3(1):1–10.
- Tucker CM, Randolph JC, **Evans TP**, Andersson KP, Persha L, and Green GM. 2008. An approach to assess relative degradation in dissimilar forests: Toward a comparative assessment of institutional outcomes. *Ecology and Society* 13(1):4 [online]. URL: <http://www.ecologyandsociety.org/vol13/iss1/art4>.
- Evans TP** and Manson SM. 2007. Guest editorial: Space, complexity and agent-based modeling. *Environment and Planning B* 34(2):196–199. URL: <http://www.envplan.com/epb/editorials/b3402ed.pdf>.

- Manson SM and **Evans TP**. 2007. Agent-based modeling of deforestation in southern Yucatán, Mexico, and reforestation in the Midwest United States. *Proceedings of the National Academy of Sciences of the United States of America* 104(52):20678–20683.
- Evans TP**, Sun W, and Kelley H. 2006. Spatially explicit experiments for the exploration of land-use decision-making dynamics. *International Journal of Geographical Information Science* 20(9):1013–1037.
- Musacchio L, Ozdenerol E, Bryant M, and **Evans TP**. 2005. Changing landscapes, changing disciplines: Seeking to understand interdisciplinarity in landscape ecological change research. *Landscape and Urban Planning* 73(4):326–338.
- Schweik C, **Evans TP**, and Grove JM. 2005. Open source and open content: A framework for global collaboration in social-ecological research. *Ecology and Society* 10(1):33 [online]. URL: <http://www.ecologyandsociety.org/vol10/iss1/art33/>.
- Evans TP** and Kelley H. 2004. Multi-scale analysis of a household level agent-based model of landcover change. *Journal of Environmental Management* 72(1-2):57–72.
- Evans TP**, Ostrom E, and Gibson C. 2002. Scaling issues with social data in integrated assessment modeling. *Integrated Assessment* 3(2-3):135–150.
- Evans TP**, Manire A, de Castro F, Brondízio E, and McCracken S. 2001. A dynamic model of household decision-making and parcel level landcover change in the eastern Amazon. *Ecological Modelling* 143(1-2):95–113.
- Evans TP**, and Winterhalder B. 2000. Modified solar insolation as an agronomic factor in terraced environments. *Land Degradation and Development* 11(3):273–287.
- Walsh SJ, **Evans TP**, Welsh WF, Entwisle B, and Rindfuss RR. 1999. Scale-dependent relationships between population and environment in northeastern Thailand. *Photogrammetric Engineering and Remote Sensing* 65(1):97–105.
- Entwisle B, Rindfuss RR, Walsh SJ, **Evans TP**, and Curran SR. 1997. Geographic information systems, spatial network analysis, and contraceptive choice. *Demography* 34(2):171–187.

Peer-Reviewed Chapters in Edited Volumes

- Dell'Angelo, J., McCord, P., Baldwin, E., Cox, M., Gower, D., Caylor, K., **Evans, TP**. 2014. 'Multi-Level Governance of Irrigation Systems and Adaptation to Climate Change in Kenya'. In *"The Global Water System in the Anthropocene"*. Ed. Bogardi, J., Bhaduri, A., Leentvaar, J., Marx, S. Springer.
- Farinaci J, Ruseva T, Tucker C, **Evans TP**, Batistella M. 2014. Humans as agents of change in forest landscapes. In *Forest Landscapes and Global Change: Challenges for Research and Management*, ed. Azevedo J, Perera A, Pinto A. Newark, NJ: Springer.
- Andersson, K. **Evans, TP**, Gibson, and C.C., Wright, G. 2014. Decentralization and Deforestation: Comparing Local Forest Governance Regimes in Latin America. In *State and Environment: The Comparative Study of Environmental Governance*, ed. Duit A, 239-264. Cambridge, MA: MIT Press.
- Evans TP**, Robinson DT, and Schmitt-Harsh M. 2013. Limitations, challenges, and solutions to integrating carbon dynamics with land-use models. In *Land Use and the Carbon Cycle: Advances in Integrated Science, Management, and Policy*, ed. Brown DG, Robinson DT, French NHF, and Reed BC, 178–208. Cambridge, UK: Cambridge University Press.
- United Nations Environment Programme. 2012. "Land" chapter in *Global Environment Outlook 5: Environment for the Future We Want*, 65–96. Nairobi, Kenya: United Nations Environment Programme. URL: http://www.unep.org/geo/pdfs/geo5/GEO5_report_C3.pdf. [Evans Coordinating Lead Author with one other CLA and ~20 contributing authors]
- Schmitt-Harsh M, Sweeney SP, and **Evans TP**. 2011. Historic land use and social policy affecting large-scale changes in forest cover in the Midwest United States. In *Engineering Earth: The Impacts of Megaengineering Projects*, ed. Brunn S, 1369–1382. Dordrecht, the Netherlands: Springer.

- Evans TP**, Donnelly S, and Sweeney S. 2010. Threats to the forest transition in the Midwest United States. In *Reforesting Landscapes: Linking Pattern and Process*, ed. Nagendra H and Southworth J, 175–203. Dordrecht, the Netherlands: Springer.
- Kelley H, **Evans TP**. 2010. Measuring the impact of behavioral traders in the market for closed-end country funds from 2002 to 2009. In *Handbook of Behavioral Finance*, ed. B Bruce, 325–345. Cheltenham, UK: Edward Elgar.
- Evans TP**, York AM, and Ostrom E. 2008. Institutional dynamics, spatial organization and landscape change. In *Political Economies of Landscape Change: Places of Integrative Power*, ed. Wescoat JL Jr and Johnston DM, 111–129. The GeoJournal Library, Vol. 89. Dordrecht, the Netherlands: Springer.
- Evans TP**, Munroe DK, and Parker DC. 2005. Modeling land-use/land-cover change: Exploring the dynamics of human-environment relationships. In *Seeing the Forest and the Trees: Human-Environment Interactions in Forest Ecosystems*, ed. Moran EF and Ostrom E, 187–213. Cambridge, MA: MIT Press.
- Evans TP**, VanWey LK, and Moran EF. 2005. Human-environment research, spatially explicit data analysis, and geographic information systems. In *Seeing the Forest and the Trees: Human-Environment Interactions in Forest Ecosystems*, ed. Moran EF and Ostrom E, 161–185. Cambridge, MA: MIT Press.
- Walsh SJ, **Evans TP**, and Turner BL II. 2004. Population-environment interactions with an emphasis on land-use/land-cover dynamics and the role of technology. In *Geography and Technology*, ed. Brunn SD, Cutter SL, Harrington JW Jr, 491–519. Dordrecht, the Netherlands: Kluwer.
- Evans TP**, Ostrom E, and Gibson C. 2003. Scaling issues in the social sciences. In *Scaling in Integrated Assessment*, ed. Rotmans J and Rothman D, 75–106. Integrated Assessment Studies series, ed. Martens P and Rotmans J. Lisse, the Netherlands: Swets & Zeitlinger.
- Evans TP** and Moran EF. 2002. Spatial integration of social and biophysical factors related to landcover change. In *Population and Environment: Methods of Analysis*, ed. Lutz W, Prskawetz A, and Sanderson WC. Supplement to *Population and Development Review* 28:165–186. New York: Population Council.
- Grove JM, Schweik C, **Evans TP**, and Green G. 2002. Modeling human-environmental systems. In *Geographic Information Systems and Environmental Modeling*, ed. Clarke KC, Parks BO, and Crane MP, 160–188. Upper Saddle River, NJ: Prentice Hall.
- Hoffmann M, Kelley H, and **Evans TP**. 2002. Simulating land cover change in Indiana: An agent-based model of de/reforestation. In *Complexity and Ecosystem Management: The Theory and Practice of Multi-Agent Approaches*, ed. Janssen M, 218–247. Northampton, MA: Edward Elgar.
- Evans TP**, Green G, and Carlson L. 2001. Multi-scale analysis of landcover composition and landscape management of public and private lands in Indiana. In *GIS and Remote Sensing Applications in Biogeography and Ecology*, ed. Millington A, Walsh S, and Osborne P, 271–287. Boston: Kluwer.

Edited Journal Issues

- Evans TP and Manson SM, eds. 2007. *Space, Complexity and Agent-Based Modeling*. Special issue of *Environment and Planning B* 34(2). URL: <http://www.envplan.com/contents.cgi?journal=B&volume=34&issue=2>.

Working Papers, Technical Reports, Conference Proceedings, Encyclopedic Entries

- Defries RS, Balstad R, Colwell R, Evans TP, Lam N S-N, Michaelsen J, Seto K, and Wilson ML. 2007. *Contributions of Land Remote Sensing for Decisions about Food Security and Human Health: Workshop Report*. Washington, DC: National Academies Press. URL: http://books.nap.edu/openbook.php?record_id=11759&page=R1.
- Evans TP**. 2006. Center for the Study of Institutions, Population, and Environmental Change. In *Our Earth's Changing Land: An Encyclopedia of Land-Use and Land-Cover Change*, vol. 1, ed. Geist H, 104. Westport, CT: Greenwood Press.
- Evans TP**. 2006. Decision-making. In *Our Earth's Changing Land: An Encyclopedia of Land-Use and Land-Cover Change*, vol. 1, ed. Geist H, 155–159. Westport, CT: Greenwood Press.
- Evans TP**. 2006. Pixel. In *Our Earth's Changing Land: An Encyclopedia of Land-Use and Land-Cover Change*, vol. 2, ed. Geist H, 472. Westport, CT: Greenwood Press.

- Evans TP.** 2006. Secondary vegetation. In *Our Earth's Changing Land: An Encyclopedia of Land-Use and Land-Cover Change*, vol. 2, ed. Geist H, 532–533. Westport, CT: Greenwood Press.
- Schweik CM, Grove JM, and **Evans TP.** 2004. The open source paradigm and the production of scientific information: A future vision and implications for developing countries. In *Open Access and the Public Domain in Digital Data and Information for Science*, ed. Esanu JM and Uhler PF, 103–109. Washington, DC: National Academies Press. URL: <http://www.nap.edu/books/0309091454/html/103.html>.
- Schweik CM, **Evans TP**, and Grove JM. 2003. *Initiating an Open Source\Content Landcover Change Modeling Effort*. Report from a workshop held August 2003, Department of Natural Resources Conservation, University of Massachusetts, Amherst.
- Welch D and **Evans TP.** 2003. *A Social Assessment of Shawnee National Forest History, Demographics, and Stakeholder Views of Southern Illinois*. CIPEC Summary Report No. 5. Bloomington: Center for the Study of Institutions, Population, and Environmental Change (CIPEC), Indiana University.
- Agarwal C, Green GM, Grove JM, **Evans TP**, and Schweik CM. 2002. *A Review and Assessment of Land-Use Change Models: Dynamics of Space, Time, and Human Choice*. CIPEC Collaborative Report No. 1. USFS Publication GTR-NE-297. Joint publication by the Center for the Study of Institutions, Population, and Environmental Change (CIPEC) at Indiana University–Bloomington and the USDA Forest Service. Burlington, Vt.: USDA Forest Service Northeastern Forest Research Station. URL: http://nrs.fs.fed.us/pubs/gtr/gtr_ne297.pdf.
- Welch D, Croissant C, **Evans TP**, and Ostrom E. 2001. *A Social Assessment of Hoosier National Forest*. CIPEC Summary Report No. 4. Bloomington: Center for the Study of Institutions, Population, and Environmental Change (CIPEC), Indiana University.
- Walsh SJ, **Evans TP**, Welsh WF, Rindfuss RR, and Entwisle B. 1998. Population and environmental characteristics associated with village boundaries and landuse/landcover patterns in Nang Rong District, Thailand. In *Proceedings, Pecora 13 Symposium on Human Interactions with the Environment: Perspectives from Space*, 395–404. Bethesda, MD: American Society for Photogrammetry and Remote Sensing. CD-ROM.
- Evans TP**, Walsh S, Entwisle B, and Rindfuss R. 1995. Testing model parameters of transportation network analyses in rural Thailand. In *GIS/LIS '95 Annual Conference and Exposition Proceedings: November 14–16, 1995, Nashville Convention Center, Nashville, Tennessee*, vol. 1, pp. 302–311. Gaithersburg, MD: American Congress on Surveying and Mapping
- Winterhalder B and **Evans TP.** 1991. Preliminary GIS analysis of the agricultural landscape of Cuyo Cuyo, Department of Puno, Peru. In *Applications of Space-Age Technology in Anthropology: Proceedings of a Conference Held at the NASA Science and Technology Laboratory, Stennis Space Center, November 28, 1990*, ed. Behrens CA and Sever TL, 195–225. Bay St. Louis, MS: National Aeronautics and Space Administration. URL: <http://naca.larc.nasa.gov/search.jsp?R=19940004468&q=N%3D4294730567%2B4294956368%2B4294724598>.

PRESENTATIONS:

Invited Presentations

- Evans TP. 2014. Moving Beyond Case Studies in Social Ecological Systems Research. Research Institute for Humanity and Nature. Kyoto, Japan, November 18.
- Evans TP. 2014. Phones, Farmers and Agricultural Decision-Making. Princeton Global Collaborative Network - Workshop on Hydrological and Food Security Forecasting. Mpala Research Centre, August 26-28.
- Evans TP. 2014. Governance, Learning and Complexity in Water Systems. International Symposium on Integrated Water Resources Management - International Association of Hydrological Sciences Meeting. Bologna, Italy, June 4-6.
- Evans TP. 2014. Learning from the Vincent and Elinor Ostrom Workshop at Indiana University. Workshop in Institutional Analysis of Social-Ecological Systems (WINS) Inception Workshop, Humboldt University, Berlin, Germany, July 14-16.
- Evans TP. 2014. Water Governance and Adaptation to Disturbances in Irrigated Semi-Arid Agricultural Systems. Albrecht Daniel Thaer Kolloquium - Institutional Economics & Climate Adaptation, Humboldt University, Berlin, Germany, March 18, 2014.

- Evans TP. 2014. *Adaptation, Innovation and Institutional Dynamics in Social-Ecological/Socio-Technical Systems*. Delft University of Technology, March 24, 2014.
- Evans TP. 2013. *Water Governance, Water Security and Community-Level Resilience to Climate Change*. Humboldt University, Berlin, Germany, May 16.
- Evans TP. 2012. *Climate, Food Security, and Community-Level Institutions in Rural Kenya*. Department of Geography as part of Water in Our World program, University of North Carolina Chapel Hill, October 12.
- Evans TP and Caylor KK. 2011. *Integrated Analysis for Spatial and Temporal Resilience to Food Insecurity*. Annual Institute for Joint Outcomes Related to Sustainability. University of Michigan. Ann Arbor, MI, September 29-30.
- Evans TP and Caylor KK. 2011. *Integrated Analysis for Spatial and Temporal Resilience to Food Insecurity*. "Building Social-Ecological Resilience in a Changing World," International Symposium hosted by the Research Institute for Humanity and Nature, Kyoto, Japan, June 18–20.
- Evans TP. 2011. *Agent-Based Modeling of Smallholder Decision-Making and Food Security in Rural Zambia*. Policy Analysis and Public Finance Faculty Group Speaker Series, School of Public and Environmental Affairs, Indiana University, Bloomington, April 1.
- Evans TP. 2011. *Spatial Analysis and Modeling of Climate Variability, Food Security, and Social-Ecological Resilience in Rural Zambia*. Geography Colloquium Series, Michigan State University, East Lansing, February 25.
- Evans TP. 2010. *Food Security, Climate Variability and Land Use in Zambia: Methods for Spatial Analysis and Modeling Vulnerability and Resilience of Smallholder Systems*. Research Institute for Humanity and Nature, Kyoto, Japan, June 17.
- Evans TP. 2009. *Actor Heterogeneity and Spatial Interactions in Land Use Systems: Agent-Based Perspectives on Natural Resource Management*. Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, November 2.
- Evans TP. 2009. *Agricultural Innovation, Land-Cover Change and Household Inequality: The Transition from Swidden Cultivation to Rubber Plantations in Laos PDR*. Research Institute for Humanity and Nature, Kyoto, Japan, August 3.
- Evans TP. 2009. *A Spatial Structure for the Institutional Analysis of Common Pool Resource Systems*. Research Institute for Humanity and Nature, Kyoto, Japan, August 3.
- Evans TP. 2009. *The Balance between Urban Deforestation and Rural Reforestation in the Midwest United States*. International Human Dimensions Programme Open Meeting, Bonn, Germany, April 26–30.
- Evans TP. 2009. *Integration of Social and Environmental Data using Geographic Information Systems and Remote Sensing Techniques*. Ctr for Data and Search Informatics, Indiana University, Bloomington, Apr. 1.
- Evans, TP. 2008. *A History of Deforestation & Reforestation in South-Central Indiana*. Bloomington Science Café, City of Bloomington Commission on Sustainability, Bloomington, IN, December 4.
- Evans TP. 2008. *Human-Environment Dynamics with Agent-Based Models of Land Cover Change*. Institute of Industrial Science, University of Tokyo, Japan, July 25.
- Evans TP. 2008. *Modeling Human-Environment Dynamics with Agent-Based Models in Laos PDR, United States and Zambia*. Forestry and Forest Products Research Institute, Tsukuba, Japan, July 24.
- Evans TP. 2008. *Modeling Household-Level Deforestation and Reforestation with Agent-Based Approaches: Case Studies from Laos PDR, United States and Zambia*. Research Institute for Humanity and Nature, Kyoto, Japan, July 17.
- Evans TP. 2008. *Framework for an Agent-Based Model of Resilience*. Research Institute for Humanity and Nature, Kyoto, Japan, June 28.
- Evans TP. 2008. *History and Trends of Agent-Based Models and Their Application to Resource Management*. Research Institute for Humanity and Nature, Kyoto, Japan, May 12.
- Evans TP. 2008. *Diverse Land-Use Decisions in Reforesting and Deforesting Land Change Systems*. Institute for Population and Social Research, Mahidol University, Bangkok, Thailand, January 21.

- Evans TP and Bauer J. 2007. *Social and Biophysical Dynamics of Reforesting Systems: Tensions between Macro-Scale Theories and Local-Scale Findings*. Seminar presentation at the Research Institute for Humanity and Nature, Kyoto, Japan, May 23.
- Evans TP. 2006. *Contributions of Land Remote Sensing for Decisions about Food Security and Human Health*. National Academy of Sciences, Washington, DC, October 23. Representing the Committee on Earth System Science for Decisions about Human Welfare: Contributions of Remote Sensing.
- Evans TP, Deadman P, and Kelley H. 2006. *Diverse Land-Use Decisions in Reforesting and Deforesting Land Change Systems*. Annual Meeting of the American Association for the Advancement of Science, St. Louis, MO, February 20.
- Evans TP. 2005. *Integrating Empirical Analysis and Models of Land Cover Change: Challenges of Model Calibration, Validation and Application*. Symposium on spatial modeling at the Carolina Population Center, University of North Carolina, Chapel Hill, October 26.
- Evans TP, York AM, and Ostrom E. 2004. *Institutional Dynamics, Spatial Organization and Landscape Change at "Places of Power: Economic and Political Driving Forces of Landscape Change in the 21st Century,"* University of Chicago, September 9–11.
- Deadman PJ, Moran E, Evans TP, and Kelly H. 2004. *Agent-Based Models of Land Use Change in Southern Indiana and Altamira, Brazil* at "Decision Making under Uncertainty," Colorado State University, Fort Collins, CO, July 21–23.
- Schweik CM, Evans TP, and Grove JM. 2004. *Open Source Programming as a Framework for Scientific Collaboration: An Example in the Context of Land-Use Change Modeling* at "Scholarly Communication as an Information Commons," Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, March 31–April 2.
- Deadman P, Evans T, Kelley H, and Ostrom E. 2004. *Emergent Land-Use Patterns of Social-Biophysical Interactions in Complex Systems*. 2004 meeting of the American Association for the Advancement of Science, Seattle, WA, February 12–16.
- Evans TP, Schweik CM, and Grove JM. 2003. *Connecting Landcover Change Models to Policy Needs by Spatial Scale*. European-American Workshop on Long Term Socio-Environmental Research, Motz, France, July 1–5.
- Grove JM, Schweik CM, and Evans TP. 2003. *An Open Source Framework for Landuse Modeling: Kernels and Constituents*. European-American Workshop on Long Term Socio-Environmental Research, Motz, France, July 1–5.
- Evans TP and Welch D. 2003. *Social Assessments of the Shawnee and Hoosier National Forests*. Workshop on Changing Social Landscapes (sponsored by USDA Forest Service), Milwaukee, WI, March 26–28.
- Schweik CM, Grove JM, and Evans TP. 2003. *The Open Source Paradigm and the Production of Scientific Research*. International Symposium on Open Access and Public Domain in Digital Data and Information for Science, United Nations Educational, Scientific and Cultural Organization, Paris, France, March 11.
- Kelley H and Evans TP. 2002. *Simulating Land-Cover Change in South-Central Indiana: An Agent-Based Model of Deforestation and Afforestation*. Workshop in Political Theory and Policy Analysis Colloquium Series, Indiana University, Bloomington, February 11.
- Evans TP. 2001. *Linking Agent Decisions to Landscape Outcomes in a Socio-Ecological Agent-Based Model*. Workshop on Integration of Spatial Ecological and Environmental Social Science Methods for Study of Biodiversity and Biocomplexity, Indiana University, Bloomington, September 27–28.
- Evans TP. 2001. *An Agent-Based Model of Landcover Change in South-Central Indiana: Bridging Social and Environmental Science Research Methods*. School of Natural Resources Colloquium, Ohio State University, Columbus, May 11.
- Evans TP. 2000. *Landcover Change on Public and Private Lands in Indiana*. Workshop on Changing Landscapes of Rural America, Mammoth Hot Springs, WY, September 23–24.

Evans TP, Ostrom E, and Gibson C. 2000. *Scaling Issues in the Social Sciences*. European Forum of Integrated Environmental Assessment (EFIEA) Matrix workshop "Scaling Issues in Integrated Assessment," Mechelen, the Netherlands, July 12–19.

Evans TP, Ostrom E, and Moran E. 1999. *Spatial Integration of Social, Political and Biophysical Factors Contributing to Landcover Change*. Workshop on Population-Environment Modeling, Max Planck Institute for Demography, Rostock, Germany, August 12–13.

Conference Presentations

Evans TP. 2015. New Approaches to Capture High Frequency Agricultural Dynamics in Africa through Mobile Phones. American Geophysical Union Fall Meeting, San Francisco, CA.

Evans TP. 2015. Modeling Local vs. Global Dimensions of Food Security in Sub-Saharan Africa. American Geophysical Union Fall Meeting, San Francisco, CA.

Evans, TP. 2015. Infrastructure, Institutions and the Water-Food Nexus in Kenya. Global Conference on Complex Systems. Arizona State U, October 1.

Evans TP. 2015. Mid-Season Farmer Adaptation to Climate Variability in Africa. ICARUS IV: Vulnerabilities and Livelihoods of the Poor. University of Illinois, 7-9 May.

Evans TP. 2015. Coupling Land Systems Science and Sociohydrology: Theoretical, Methodological and Policy Challenges and Opportunities. Association of American Geographers Annual Meeting.

Evans TP. 2014. Water Governance in Dryland Irrigation Systems: The Role of Data and Information in Institutional Dynamics. Global Land Project Meeting, Berlin, Germany, March 19-21.

Evans TP. 2014. The Interplay between Environmental Data, Information and Water Governance. Workshop on the Workshop, Bloomington, IN, June 18-21.

Evans T, Cox M, McCord P, Caylor K, Washington-Ottombre C, Soderberg K, Sadri S. 2013. *Water Governance, Agricultural Development and Community-Level Resilience to Climate Change*. 14th Global Conference of the International Association for the Study of the Commons, Mt. Fuji, Japan, June 3–7.

Evans TP, Caylor K, McCord P. 2013. *Water Governance, Agricultural Development and Community-Level Resilience to Climate Change*. Global Water System Project conference "Water in the Anthropocene," Bonn, Germany, May 23.

Evans TP, Caylor, K, McCord P, Cox M, Washington-Ottombre C, Soderberg K. 2013. *Water Governance and Community-Level Resilience to Climate Change in Rural Kenya*. Association of American Geographers Annual Meeting, Los Angeles, CA, April 11.

Evans TP, Cox M, McCord P, Caylor KK, Washington-Ottombre C, Soderberg K, Sadri S. 2012. *Water Governance, Agricultural Development and Community-Level Resilience to Climate Change*. American Geophysical Union Fall Meeting, San Francisco, CA, December 3–7.

Evans TP, Cox M, McCord P, Caylor K, Washington-Ottombre C, Soderberg K, Sadri S. 2012. *Water Governance, Agricultural Development and Community-Level Resilience to Climate Change*. International Association for the Study of the Commons biennial meeting, Université Catholique de Louvaine, Louvaine-la-Neuve, Belgium, September 12–14.

Andersson KP, Evans TP, Gibson CC, Wright GD. 2011. *Decentralization and Deforestation: Examining the Ecological Footprint of Local Governments in Three Latin American Countries*. American Political Science Association annual meeting, Seattle, WA, September 1–4.

Evans TP, Lekprichakul T, Umetsu C, and Caylor KK. 2011. *An Agent-Based Model of Land Use, Climate Variability and Food Security in Rural Zambia*. Association of American Geographers annual meeting, Seattle, WA, April 12–16.

Evans TP, Lekprichakul T, Umetsu C, and Caylor KK. 2011. *An Agent-Based Model of Land Use and Smallholder Resilience in Rural Zambia*. Second International Science and Policy Conference of the Resilience Alliance, Tempe, AZ, March 11–16.

- Evans TP, Lekprichakul T, Umetsu C, and Caylor KK. 2010. *An Agent-Based Model of Land Use and Smallholder Resilience to Climate Variability in Rural Zambia*. Global Land Project Open Science Meeting, Tempe, Arizona, October 17–19.
- Batistella M, Farinaci JS, Carmo RL, Evans TP, and Moran EF. 2010. *Dynamics of Reforestation in Coupled Social-Ecological Systems: The State of São Paulo, Brazil*. IUFRO Landscape Ecology Working Group International Conference "Forest Landscapes and Global Change – New Frontiers in Management, Conservation and Restoration," Instituto Politécnico de Bragança, Portugal, September 21–27.
- Evans TP, Caylor K, Sweeney S, Batistella M, and Farinaci JS. 2010. *Comparison of Local-Level Drivers of Reforestation in Indiana (USA) and São Paulo (Brazil)*. IUFRO Landscape Ecology Working Group International Conference "Forest Landscapes and Global Change – New Frontiers in Management, Conservation and Restoration." Instituto Politécnico de Bragança, Portugal, September 21–27.
- Evans TP, Caylor K, Sweeney S, Johnson D, Batistella M, and Farinaci J. 2010. *Balancing Social and Ecological Complexity in Models of Reforestation in Indiana (USA) and São Paulo (Brazil)*. IUFRO Landscape Ecology Working Group International Conference "Forest Landscapes and Global Change – New Frontiers in Management, Conservation and Restoration." Instituto Politécnico de Bragança, Portugal, September 21–27.
- Andersson KP, Evans TP, Gibson CC, Wright GD. 2010. *Decentralization and Deforestation: Comparing Local Forest Governance Regimes in Latin America*. Workshop on "Mapping the Politics of Ecology: Comparative Perspectives on Environmental Politics and Policy," Stockholm, Sweden, June 28.
- Evans TP. 2010. *Food Security, Climate Variability and Land Use in Zambia: Methods for Spatial Analysis and Modeling Vulnerability and Resilience of Smallholder Systems*. Research Institute for Humanity and Nature, Kyoto, Japan, June 17.
- Evans TP, Caylor K, Farinaci J, Batistella M, and Moran E. 2010. *Forest Transition Theory and Thresholds of Reforestation in the Midwest United States and State of São Paulo, Brazil*. Japan Geoscience Union annual meeting, Chiba, Japan, May 23–28.
- Evans TP, Caylor K, Sweeney S, Batistella M, Farinaci J, and Moran E. 2010. *Balancing Social and Ecological Complexity in Models of Reforestation in Indiana (USA) and São Paulo (Brazil)*. Association of American Geographers annual meeting, Washington, DC, April 14–18.
- Evans TP and Moran E. 2009. *Dynamics of Reforestation in Coupled Social-Ecological Systems: Preliminary Results for the State of Indiana, USA*. Latin American International Association of Landscape Ecology, Campos do Jordão, Brazil, October 4–7.
- Evans TP and Caylor K. 2009. *Balancing Social and Ecological Complexity in an Agent-Based Model of Reforestation in South-Central Indiana*. International Association of Landscape Ecology annual conference, Snowbird, Utah. April 12–16.
- Evans TP, Phanvilay K, Fox J, and Vogler J. 2009. *Household and Institutional Dynamics in an Agent Based Model of Land Cover Change in Lomue Village, Laos PDR*. Association of American Geographers annual meeting, Las Vegas, NV, March 22–27.
- Evans TP and Sweeney S. 2008. *Applications of Agent-Based Models in Human Dimensions of Global Change: Heterogeneity, Vulnerability, Inequality and Resilience*. West Lakes Meeting of the Association of American Geographers, Bloomington, IN, November 13–15.
- Evans TP, Panvilay K, Fox J, and Vogler J. 2008. *An Agent-Based Model of Agricultural Innovation and Household-Level Inequality: The Transition from Swidden to Rubber in Northern Laos*. Association of American Geographers annual meeting, Boston, MA, April 15–29.
- Kelley H and Evans TP. 2007. *A Complementary Agent-Based Simulation and Human Experiment Approach to Studying Cooperation in Spatial Resource Use Dilemmas*. Society for the Advancement of Economic Theory Conference, Kos, Greece, June 18–24.
- Evans TP. 2006. *Validation Approaches for Agent-Based Models of Land Cover Change*. Annual Meeting of the Association of American Geographers, Chicago, IL, March 7–11.

- Evans TP and Donnelly S. 2005. *Comparing Landowner Heterogeneity and Historical Processes of Deforestation and Reforestation in the Midwest United States and Brazilian Amazon*. Open Meeting of the Human Dimensions of Global Environmental Change Research Community, University of Bonn, Germany, October 9–13.
- Evans TP, Kelley H, and Sun W. 2005. *Spatially Explicit Computer-Based Experiments As a Tool for Exploring Heterogeneous Decision-Making in Agent-Based Models of Landcover Change*. Geocomputation 2005 meeting, Ann Arbor, MI, August 2–5.
- Evans TP, Kelley H, and Sun W. 2005. *Spatial Decision-Making, Heterogeneity, and Agent-Based Models of Landcover Change*. Annual Meeting of the Association of American Geographers, Denver, CO, April 5–9.
- Evans TP, Kelley H, and Sun W. 2004. *Using Spatial Experiments to Explore Agent Behavior in Agent-Based Models and Simulations*. Workshop on "Integrated Assessment of the Land System: The Future of Land Use," Amsterdam, the Netherlands, October 28–30.
- Evans TP, Kelley H, and Deadman P. 2004. *Spatial Aspects of Decision-Making in Land Management Systems: Implications for Agent-Based Modeling*. Annual Meeting of the International Geographical Union, Glasgow, Scotland, August 15–20.
- Evans TP, Kelley H, and Sun W. 2004. *Using Spatial Experiments to Explore Agent Behavior in Agent-Based Models and Simulations*. Annual Meeting of the Association of American Geographers, Philadelphia, PA, March 15–19.
- Schweik CM, Grove JM, and Evans TP. 2003. *An Open Content Framework for the Production of Landcover Change Models*. Open Meeting of Human Dimensions of Global Environmental Change, Montreal, Canada, October 16–18.
- Evans TP, Kelley H, and VanWey L. 2003. *Incorporating Demographics into Agent-Based Models of Landcover Change*. Annual Meeting of the Population Association of America, Minneapolis, MN, May 1–3.
- Evans TP, Schweik CM, and Grove JM. 2003. *Connecting Landcover Change Models to Policy Needs by Spatial Scale*. International conference on Framing Land Use Dynamics: Integrating Knowledge on Spatial Dynamics in Socio-Economic and Environmental Systems for Spatial Planning in Western Urbanized Countries, Utrecht University, the Netherlands, April 16–18.
- Janssen M, Evans TP, and Meretsky V. 2003. *Validation of Land Use Change Models: The Need to Validate the Dynamics behind the Landscape Patterns and Composition*. International conference on Framing Land Use Dynamics: Integrating Knowledge on Spatial Dynamics in Socio-Economic and Environmental Systems for Spatial Planning in Western Urbanized Countries, Utrecht University, the Netherlands, April 16–18.
- Kelley H and Evans TP. 2003. *Decision Strategies and Landcover Change: A Multi-Agent Model of Household Landuse Decisions in a Reforesting Landscape*. International conference on Framing Land Use Dynamics: Integrating Knowledge on Spatial Dynamics in Socio-Economic and Environmental Systems for Spatial Planning in Western Urbanized Countries, Utrecht University, the Netherlands, April 16–18.
- Mussacchio L, Bryant M, Cadenasso M, Evans TP, and Steiner F. 2002. "Cities of Resilience: Integrating Ecology into Urban Planning, Design, Policy, and Management." Panel discussion at the Council of Educators in Landscape Architecture, Syracuse, NY, September.
- Meretsky V, Evans TP, Carlson L, Parker D, and Welch D. 2002. *Painting Trees by Numbers*. 17th Annual Symposium of the International Association for Landscape Ecology, Lincoln, NE, April 23–27.
- Evans TP, Parker D, Meretsky V, and Kelley H. 2002. *An Agent-Based Model of Landcover Change: Monroe County, IN*. Annual Meeting of the Association of American Geographers, Los Angeles, CA, March.
- Meretsky V, Evans T, Brondizio E, Croissant C, and Parker D. 2001. *Characterizing Landscape Composition and Pattern: Cross-Site Comparison of Social and Biophysical Factors*. Annual Meeting of the International Association of Landscape Ecology, Tempe, AZ, April 25–29.
- Evans TP, Hoffmann M, Kelley H, and Parker D. 2001. *An Agent-Based Model of Parcel-Level Landcover Change in Southern Indiana*. Annual Meeting of the Association of American Geographers, New York, NY, February 27–March 3.

- Green G, Agarwal C, Grove M, Schweik C, and Evans T. 2001. *Limits to Land Cover Change Modeling: Barriers Imposed by Disciplinary Divisions and Data Availability*. Annual Meeting of the Association of American Geographers, New York, NY, February 27–March 3.
- Schweik C, Agarwal C, Green G, Grove JM, and Evans TP. 2000. *A Review and Assessment of Land Use Change Models: Dynamics of Space, Time, and Human Choice*. The 4th International Conference on Integrating GIS and Environmental Modeling (GIS/EM4): Problems, Prospects and Research Needs, Banff, Alberta, Canada, September 2–8.
- Hoffmann M, Kelley H, and Evans TP. 2000. *Simulating Land Cover Change in Indiana: An Agent-Based Model of De/Reforestation*. Microbehavior and Macroresults Conference of the International Fisheries Economics and Trade Association, Oregon State University, Corvallis, July 10–14.
- Green G, Carlson L, and Evans T. 2000. *The Spatial Scale of Institutional Anomalies in the Distribution of Forested Land in Indiana*. Biennial Meeting of the International Association for the Study of Common Property, Bloomington, IN, May 31–June 4.
- Evans TP, Ostrom E, and Moran E. 2000. *Spatial Integration of Social, Political and Biophysical Factors Contributing to Landcover Change*. Association of American Geographers, Pittsburgh, PA, April 6–8.
- Evans TP, Manire A, De Castro F, and McCracken S. 2000. *A Dynamic Model of Household Decision Making and Parcel Level Landcover Change in the Eastern Amazon*. Annual Meeting of the Population Association of America, Los Angeles, CA, March 23–25.
- Evans TP, Green G, and Schweik C. 1999. *Forest Fragmentation and Land Cover Change on Private Lands in Southern Indiana*. Annual Meeting of the Association of American Geographers, Honolulu, HI, March 23–27.
- Entwisle B, Rindfuss R, Walsh S, and Evans TP. 1998. *Satellite Data and Social Demographic Research*. Annual Meeting of the Population Association of America, Chicago, IL, April 2–4.
- Evans TP. 1998. *Spatial Modeling of Community Boundaries in Northeast Thailand*. Annual Meeting of the Association of American Geographers, Boston, MA, March.
- Walsh S, Evans TP, Welsh W, Rindfuss R, and Entwisle B. 1997. *Scale Dependence of Landuse/Landcover, Terrain, and Plant Biomass in Northeast Thailand and Their Relationship to Population Characteristics at the Community Level*. Open Meeting of the Human Dimensions of Global Environmental Change Research Committee. Laxenburg, Austria, June 12–14.
- Evans TP. 1997. *Integration of Community Level Population and Environmental Data: Region Growing and Fuzzy Boundaries for Delineation of Village Territories in Northeast Thailand*. Annual Meeting of the Association of American Geographers, Fort Worth, TX, April 1–5.

Workshops Given/Training

- Spring/Summer 2008. Social Science Research Council, Dissertation Proposal Development Fellowship. Workshop on Human Dimensions of Global Environmental Change, St. Louis, MO (May 29–June 1) and Milwaukee, WI (Sept. 11–14).
- May 2005. Co-Instructor. CIPEC/Biocomplexity Summer Institute on “Agent-Based Modeling and Natural Resource Governance,” May 16–June 1.
- August 2003. Co-organized “Initiating an Open Source/Content Landcover Modeling Effort” workshop, Boston, MA, co-sponsored by National Science Foundation Biocomplexity program and USDA Forest Service.
- Spring 2003. The Application of FRAGSTATS for the Study of Landuse/Landcover Change. Offered at Indiana University, Bloomington, through the University Information Technology Services “InfoShare” campus series.
- Summers 1998–2003. Co-Instructor. A Summer Institute on Environmental Monitoring and Assessment: Applications in the Americas, Center for the Study of Institutions, Population, and Environmental Change, Indiana University, Bloomington, three-week intensive training course.
- Spring 2002. Co-organized “Initiating an Open Source/Content Landcover Modeling Effort” workshop, Madison, WI, co-sponsored by National Science Foundation Biocomplexity program and USDA Forest Service.
- Spring 2000. Introduction to the Use of Spatial Data in Common-Pool Resources Research at the Biennial

Meeting of the International Association for the Study of Common Property, Bloomington, IN.

COURSES TAUGHT:

Physical Systems of the Environment (G107, Geography)
 Cartography and Geographic Information Systems (G237, Geography)
 Introduction to Geographic Information Science (G338/G538, Geography)
 Sustainable Development Systems (G411/G511, Geography)
 Advanced Geographic Information Science (G438/G539, Geography)
 Seminar in Geographic Information Science (G439/G639, Geography)
 Research Problems in Geography (G501, Geography)

GRADUATE STUDENT COMMITTEE:

Chair:

- Paul McCord (PhD. Geography) in progress
- Jordan Blekking (M.A. Geography) in progress
- Tyler Schlachter (M.A. Geography) in progress
- Jacob Schumacher (M.A., Geography), 2012, "Building bicycle friendly communities: a case study of five Midwestern communities"
- Mikaela Schmitt-Harsh (Ph.D., Environmental Science), 2012, "Land-cover change and carbon sequestration under diverse land use systems in Guatemala"
- Monica Paulson Priebe (Ph.D., Environmental Science), 2012, "Forest governance institutions, anthropogenic disturbance and forest cover change in Central American forests"
- Charles Winkle (M.A., Geography), 2010, "An inventory of greenspace in Bloomington, Indiana, 1993-2007"
- Shanon Donnelly (Ph.D., Geography), 2009, "Linking land use, land cover, and land ownership at the parcel scale in the Midwest United States"
- Wenjie Sun (Ph.D., Geography) 2006, "A GIS-based integrated approach to explore land-use/cover change dynamics in south-central Indiana"
- Shanon Donnelly (M.S., Geography), 2003, "Linking landscape pattern to social process: a multi-scale analysis of farm woodlots in Northern Indiana"

Member:

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|-------------------|---------------------------------------|-------------|
| Edgar Espinosa | Ph.D., Geography | in progress |
| Rich Thureau | Ph.D., Environmental Science | 2013 |
| Bassil El-Masri | Ph.D., Geography | 2011 |
| Michael Cox | Ph.D., Public Affairs | 2010 |
| Lauren Persha | Ph.D., Environmental Science | 2008 |
| Ed Brumelia | Ph.D., Political Science | 2006 |
| Martin Jepsen | Ph.D., Geography, Univ. of Copenhagen | 2006 |
| Jon Winburn | Ph.D., Political Science | 2005 |
| Cynthia Croissant | Ph.D., Geography | 2004 |
| Brian Offerle | Ph.D., Geography | 2003 |
| Nian Liu | M.A., Geography | 2005 |
| Ben Crawford | M.S., Geography | 2005 |
| Julie Hanson | M.A., Geography | 2001 |

SERVICE:

University Service Activities

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|--------------|--|
| 2015-2017 | Faculty Co-chair of Campus Sustainability Advisory Board, Indiana University |
| 2013-2014 | Director of Graduate Program, Department of Geography, Indiana University |
| 2012-2014 | Co-Director, The Vincent and Elinor Ostrom Workshop in Political Theory and Policy Analysis, Indiana University |
| Spring 2011 | Coordinated IU Sustainability Course Development Fellowship program and Sustainability Research Development Grant program |
| 2011-2012 | Co-chair of cross-campus committee to create an undergraduate degree program in Environmental Studies and Sustainability |
| 2010-2011 | Co-Chair of Campus Sustainability Academic Initiatives Working Group |
| 2010-present | Member of Campus Sustainability Advisory Board |
| 2009-present | Director of Indiana University PhD Minor in Human Dimensions of Global Change |
| 2009-2010 | Co-Chair of committee to develop an Environmental Studies degree (Indiana University) |
| 2009-present | Director, Center for the Study of Institutions, Population, and Environmental Change (CIPEC), Indiana University |
| 2008-2012 | Internal Advisory Board Member, Center for Research in Energy and the Environment (CREE), Indiana University |
| 2008-present | Internal Advisory Board Member, Center for Research in Environmental Sciences (CRES), Indiana University |
| 2006-2009 | Co-Director, Center for the Study of Institutions, Population, and Environmental Change (CIPEC), Indiana University |
| 2002-present | Lead Delegate to University Consortium for Geographic Information Science |
| 2002-2006 | Associate Director, Center for the Study of Institutions, Population, and Environmental Change (CIPEC), Indiana University |
| 2001-present | Co-organizer of annual GIS Day Open House at Indiana University, Bloomington, co-sponsored by Department of Geography, Indiana Geological Survey, and University Information Technology Services |
| April 2004 | Keynote speaker at Indiana University School of Public and Environmental Affairs graduate student conference "A Diversity of Disciplines in Creating 'Public' Knowledge: Multiple Approaches to the Study of Environmental and Public Affairs" |
| Spring 2002 | Member of committee to develop a Global Environmental Change program within new International Studies curriculum at Indiana University |
| Fall 2001 | Coordinated application for membership in University Consortium for Geographic Information Science |

Other Service Activities

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| 2011 | Coordinating Lead Author of the "Land" chapter in a United Nations Environment Programme report, <i>Global Environment Outlook 5</i> (one of two CLAs) |
| 2011 | Organized the session "Design Principles of Agent-Based Models of Land-Use/Land-Cover Change" for the annual meeting of the Association of American Geographers |
| 2007 | Co-organized sessions on "Complexity in Geography" for the annual meeting of the Association of American Geographers, with Steve Manson (U Minnesota) |
| Jan-Apr 2006 | Member of National Academy of Sciences steering committee on Remote Sensing Applications to Human Welfare |
| 2005 | Co-edited special issue of <i>Environment and Planning B</i> on agent-based modeling and landuse/landcover change, with Steve Manson (U Minnesota) |

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| Spring 2005 | Co-organized sessions on Complexity for the annual meeting of the Association of American Geographers, with Steve Manson (U Minnesota), Paul Torrens (Arizona State U), and Dawn Parker (George Mason U) |
| Spring 2004 | Organized three sessions on agent-based modeling for the annual meeting of the Association of American Geographers |
| Fall 2003 | Organized special session on "Designing Landcover Change Models to Meet Policy Needs" for the International Open Science Meeting of Human Dimensions of Global Change |
| Summer 2003 | Co-organized workshop "Initiating an Open Source\Content Landcover Modeling Effort" in Boston, MA, with Morgan Grove (USDA Forest Service) and Charles Schweik (U Massachusetts) |
| Fall 2001 | Co-organized workshop "Land Use/Land Cover" in Madison, WI, an initiative to develop modeling strategies among Long Term Ecological Research (LTER), Human-Environment Regional Observatory (HERO), and National Science Foundation (NSF) project members, with Morgan Grove (USDA Forest Service) and Charles Schweik (U Massachusetts) |
| Spring 2001 | Co-organized multiple sessions on "Population-Environment Interactions" for the annual meeting of the Association of American Geographers |

Proposal Review Activities (last three years)

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| 2015 | Panel member, National Science Foundation, Geography and Spatial Sciences Program |
| 2014 | Panel member, National Science Foundation, Coupled Natural and Human Systems |
| 2013 | Panel member, National Science Foundation, Coupled Natural and Human Systems |
| 2012 | Panel member, National Science Foundation, Sustainability Research Network |
| 2012–present | Ad hoc reviewer for Regular Research Panel, National Science Foundation, Geography and Spatial Sciences |
| 2012 | Long-Term Ecological Research Advisory Panel, National Science Foundation |
| 2011 | External committee member, Asia Institute of Technology |
| 2011 | Indiana University Sustainability Course Development Fellowships |
| 2011 | Indiana University Sustainability Research Grants |
| 2011 | Center for Research in Environmental Sciences, Indiana University |
| 2011 | National Science Foundation, Geography and Spatial Sciences |
| 2010–present | Associate editor, <i>Journal of Environmental Management</i> |
| 2009–2012 | Panel member, National Science Foundation, Geography and Spatial Science, Doctoral Dissertation Research Improvement Grants |

Manuscript Reviews (last three years)

Annals of the Association of American Geographers, Applied Geography, Ecology and Society, Environmental Modelling and Software, Global Change Biology, Global Environmental Change, International Journal of Geographic Information Systems, Journal of Land Use Science, Proceedings of the National Academy of Sciences of the USA (PNAS), Science, Urban Forestry