Conserving Farm and Forest in a Changing Rural Landscape:

Current and Potential Contributions of Economics

Conference Summary Proceedings

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Prepared by Dr. Robert J. Johnston

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CONSERVING FARM AND FOREST IN A CHANGING RURAL LANDSCAPE:
CURRENT AND POTENTIAL CONTRIBUTIONS OF ECONOMICS

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Preface

The question of how we use land – as a society – is of growing concern to citizens across the nation and, especially, the Northeast US. Recent publications based on data from the 2000 Census and other sources show that the amount of time workers spent commuting between home and place of work increased in the 1990s in many areas. Growing traffic congestion is, in turn, widely believed to be related to land use patterns commonly referred to as "sprawl."

Private and public decision makers need more and better information about the causes and consequences of alternative land uses. This document summarizes leading-edge contributions of one group of social scientists – economists – to the land use debate, and also highlights potential future contributions of this group.

The Northeast Regional Center for Rural Development continues to invest most of its resources on the topic of land use, which was identified by our stakeholders as the single most important priority in the Northeast US. We are pleased to publish these summary proceedings from a recent workshop sponsored by The Northeast Center; this is the second of two conference summary proceedings commissioned. The earlier report, along with other publications related to land use, is available at http://www.cas.nercrd.psu.edu/Publications/rdppapers.htm.

Stephan J. Goetz, Director
The Northeast Regional Center for Rural Development

August 2002
Executive Summary

Matching the growing societal interest in land use issues is an explosion of research into the forces driving land use conversion, the impacts of land use change, and the design of land use policy. Research and extension activities conducted by universities, public agencies, private non-profit groups, and others can help address many questions associated with land use policy. However, the mere existence of research activity does not guarantee a positive impact on land use decisions. The multi-level challenge facing researchers is to identify principal questions; seek appropriate research methods; and—not least—communicate results to appropriate audiences in an accessible and useful manner.

This volume summarizes the proceedings of the 2002 Northeastern Agricultural and Resource Economics Association Land Use Policy Workshop, held from June 11-12 in Camp Hill, PA. The primary theme of the workshop was the relevance of research for policy decisions. Simply put, how can economists and other social scientists make a positive difference in the policy process? Workshop attendees represented government agencies, academia, and private institutions from across the United States.

Invited presentations emphasized ongoing changes in land use policy and means through which economists could increase the relevance of their work. Selected presentations illustrated a wide scope of ongoing research methods, centered on three land use policy questions:

1. Why and when does land conversion occur?
2. What are the implications of land conversion and conservation for property values and tax revenues, and vice versa?
3. What are the practical relationships among rural amenities and the policies designed to protect them?

Discussions among participants revealed strengths of ongoing research, challenges facing economists who seek to inform the land use policy process, and unresolved research questions.

Strengths of ongoing research included:

1. Social scientists are increasingly incorporating models and methods from other disciplines to improve analysis of complex land use issues.
2. Applied research is beginning to extend beyond simple concepts of economic efficiency to incorporate elements such as equity, financing issues, and political feasibility.
3. Much of the presented research was driven by needs and questions of policy makers; economists are addressing complex policy questions that often defy simple solutions.
4. Economists and other social scientists are placing increased emphasis on whether land use policies have had the desired or expected impacts over time, and changes that might improve policy performance.
5. Researchers are increasingly recognizing incentives and institutional structures that influence the actions of program managers and administrators, and assessing whether these actions are in the best interest of the public.
Challenges included:

1. Despite advances in analysis of land use issues, much of this information is found in journals or texts read primarily by other researchers.
2. Economists are often willing to ground models in questionable assumptions. While resulting models may provide insight, they may also provide misleading policy guidance.
3. Geographic regions differ with regard to a range of factors associated with land use and policy. These regional differences may obscure general research findings.
4. Despite the significant benefits of multidisciplinary research, this work is often hindered by data limitations and fundamental differences in disciplinary perspectives.
5. Policy makers rarely use results developed in the literature, in part because these results may fail to account for policy makers’ institutional and personal objectives.

Participants also identified land use topics in which significant uncertainty remains, and in which research could offer much to the policy process:

1. Dynamics of Land Development, Value, and Market Price – While this is a complex area in which many research questions remain, researchers face the added challenge of making results accessible and practical to the broader policy audience.
2. Fiscal Impacts of Easements and Conservation Activities – The impact of conservation activities on communities' fiscal bottom-line is typically unknown. The critical role of parcel cost and tax implications in many communities points to the importance of high-quality research in this area.
3. Relationships Between Public Preferences and the Policy Process – There is a need to better integrate research into public preferences for rural amenities with research regarding the policy process required to sustain those amenities.
4. The Public's Perception of and Preferences for Rural Amenities – Despite significant prior work, there remains considerable uncertainty regarding that which the public values in farm, forest, and open space land uses. While agencies often emphasize conservation of prime soils and active agricultural land, survey research suggests that the rural public places greater value on amenities that may not require active agriculture.
5. Structural Shifts in Land Conversion and the Changing Role of Land Use Policy – Past models of land use change may be inadequate to characterize contemporary patterns. Approaches to land use issues must change to reflect current issues and dynamics.

In addition to this Summary of presented and invited presentations, manuscripts presented at the workshop will be available in a special issue of the Agricultural and Resource Economics Review, to be published in April, 2003. This volume was prepared and distributed by The Northeast Regional Center for Rural Development, the principal workshop sponsor.
I. Introduction

Matching the growing societal interest in land use issues is an explosion of research into the forces driving land use conversion, the impacts of land use change on communities and natural resources, and the design of land use policy. This research is particularly timely, as external forces increase the demand for land conversion, members of rural and urban-fringe communities are increasingly willing to support policies that encourage maintenance of productive forest and agricultural lands. Simultaneously, federal and state policy analysts are evaluating their alternative roles in land use and conservation policy.

Despite widespread interest in topics related to land use conversion and management, the specific consequences of land use policies are often unclear. This lack of information may in some cases hinder otherwise beneficial policy changes, or may contribute to misdirected or ineffectual conservation programs.

Research and extension activities conducted by universities, public agencies, private non-profit groups, and others can help address many critical questions associated with land use. However, the mere existence of funded research activity does not guarantee a positive impact on land use decisions. The multi-level challenge facing researchers is to identify principal questions; seek appropriate research methods; and-not least-communicate results to appropriate audiences in an accessible and useful manner. Prior workshops (NERCRD 2002; Abdalla 2001) have sought to develop a comprehensive research agenda targeting many of the critical issues surrounding land use conflicts, conversions, regulations, and non-regulatory policies. Results of these and other prior efforts have provided the foundation for the workshop summarized here.

This volume summarizes the proceedings of the 2002 Northeastern Agricultural and Resource Economics Association (NAREA) Land Use Policy Workshop, held from June 11-12 in Camp Hill, PA. The workshop was organized by a committee comprised of Stephen Swallow and Robert Johnston (University of Rhode Island), James Shortle and Elizabeth Marshall (Pennsylvania State University), Joshua Duke (University of Delaware), and Lori Lynch (University of Maryland). Workshop attendees represented government agencies, academia, and private institutions from across the United States.

The primary theme of the workshop was the relevance of research for on-the-ground policy decisions. Simply put, how can economists and other social scientists make a positive difference in the policy process? Presentations covered a wide range of land use topics in which economics and other social sciences may help to inform policy. Accompanying discussions emphasized a search for practical ways in which researchers could make their work more accessible and useful to the policy process.

Sixteen presentations were made at the workshop. In addition to the Summary of these works presented here, manuscripts presented at the workshop will be available in a special issue of the Agricultural and Resource Economics Review, to be published in April, 2003. This volume was prepared and distributed by the Northeast Regional Center for Rural Development, the principal workshop sponsor.
II. Workshop Presentations

Invited presentations were provided by Sandra Batie, Daniel Bromley, and Emery Castle. These presentations emphasized ongoing changes in land use policy and means through which economists and other social scientists could increase the practical relevance of their work to the policy process. Despite differing perspectives and backgrounds, the invited presentations shared the common theme that work of social scientists should be driven by current and pressing problems in land use, and should reflect a pragmatic view of the policy process and the role of research within that process.

As stated by Emery Castle, "more than one valid analytic approach may be applied to land;" the primary driving force behind a research agenda should not be an unswerving dedication to a single methodological approach, but rather the practical circumstances and social dynamics surrounding contemporary land use issues. Following this theme, selected workshop presentations illustrated a wide scope of ongoing research methods. However, despite the range of research methods applied, most speakers focused on three general questions, each with clear relevance to land use policy:

1. Why and when does land conversion occur?
2. What are the implications of land conversion and conservation for property values and tax revenues, and vice versa?
3. What are the practical relationships among rural amenities and the policies designed to protect them?

A. Invited Presentations: The Role of Economics in Land Use Policy

The Multifunctional Attributes of Northeastern Agriculture, Sandra S. Batie

Batie's invited presentation emphasized the many attributes of agricultural land and the role of research in recognizing the myriad functions of the agricultural landscape. In Europe, these attributes are referred to as multifunctional attributes. Agricultural land can produce commodities or differentiated products, and can produce environmental services such as water quality, wildlife habitat, or amenity values such as viewscapes. Such land can provide hunting, agro-entertainment or agro-tourism opportunities. As incomes rise, these non-commodity attributes tend to be valued more highly than the production of commodities.

Although the Northeast United States contains a significant number of traditional agricultural enterprises, studies suggest that the rural-urban fringe is undergoing change. In many locations, it is being transformed from a locus of production into one of leisure pursuits. An example would be the loss of a row crop commercial farm to a small horse farm. These changes can preserve rural landscapes in terms of open spaces with a presence of farmsteads. As traditional agriculture runs into competitive difficulties, various types of high valued market niches are also being exploited within the region. These include everything from mushrooms, organic greens, and wines to specialty cheeses, bedding plants, turf farms, farm vacations and even animal boarding. However, the viability of these enterprises can be threatened by the conversion of farmland to...
alternative uses as well as by the parceled checkerboard patterns of development. Furthermore, whether there are positive linkages to the emerging agricultural pattern of development will depend on complimentary investments in sustainability.

As illustrated by Batie, consumer preferences for multifunctional attributes are typically not well reflected in market transactions or policy. Indeed many market and policy influences encourage the neglect of such attributes, such as ignoring the ecological connections with agricultural land uses. Fragmented information sets and missing markets pose considerable challenges for the conservation of multifunctional agriculture. This represents an important challenge for economists and other social sciences addressing the conversion and preservation of multifunctional agricultural land.

*Land, Economic Change, and Agricultural Economics*, Emery N. Castle

As elucidated by Castle, the applied economist does not have the luxury of using a single conceptual lens to view reality. For example, land provides a different bundle of goods and services in the rural areas of the Great Plains than it does in the urbanized Northeast. Further, the motivation of researchers who seek to understand issues related to land varies among, as well as within, geographic situations. When speaking or writing about land, economists will not communicate well even within their own discipline, unless the economic characteristics of land, as well as the motivation of analysts, are recognized explicitly. Castle outlines three distinct contexts in which applied economists have contributed to the analysis of land use issues, with an emphasis on links between agricultural land use issues at various points in US history and the dominant form of economic inquiry. The first is concerned with the agricultural firm and agricultural industry, with an emphasis on the production of marketed products. The second arises if agricultural use of
land has effects on the remainder of the economy that are not reflected in the outcomes of unregulated markets. The third context involves the use of land as a policy instrument to influence the nature, direction, or impact of economic activity. Castle's view is that land plays different roles in economic affairs, and that more than one valid analytic approach may be applied to land. In some cases, economists must be willing to modify textbook theory to develop approaches that "work better" for the problems at hand.

As argued by Castle, it is unlikely that a single, grand economic model will ever permit analysis of all land related economic events. Debates about the relative merits of various conceptual approaches often fail to reflect the fact that these concepts were advanced to illuminate different aspects of land use "reality" in the first place. A pluralistic approach permits economists to take advantage of information and insights that would be excluded by any single approach.

*Land Use Policy and Volitional Pragmatism*, Daniel W. Bromley

Bromley discussed two distinct conceptual frameworks brought to bear by applied economists interested in land use matters. The first framework concerns the idea and practice of property rights in the United States. The second framework concerns the economic doctrine regarding how decisions ought to be made in a democratic market economy. Bromley focused his presentation on the first of these frameworks: the idea of property rights. Specifically, he discussed the dominant presumptions in the idea and practice of property rights. These common – but as argued by Bromley, often misdirected – presumptions are (1) that property rights are clear, stable, and unchanging; (2) that the owner of a piece of American real estate is the final authority concerning which activities may or may not occur on that land; and (3) if currently permissible activities are attenuated by government regulations then compensation must be forthcoming. Bromley stresses that there is often a disconnect between the theories and advice of applied economists – often based on the concept of welfarism – and the way decisions are made in the real world. In the arena of property rights, this implies the abandonment of axiomatic interpretations in favor of a more abductive approach which views such rights as a creation of the legal process used to resolve land disputes, and hence subject to change. Bromley suggests that economists and other social scientists recognize the need of the nation to adjust to new priorities, tastes, and preferences through a changing concept of the meaning of property rights to land. Simply put, economists’ approaches to land use issues should reflect the “common sense” of the policy process and the general public.

B. Selected Presentations

1. Why and When Does Land Conversion Occur?

These six presentations describe empirical and theoretical work seeking to better understand the land conversion process. The challenge faced by individuals conducting these often technical analyses is ensuring that the results are nonetheless accessible to land use managers, many of whom may lack extensive Geographic Information System facilities or training in land use modeling.
Modeling and Managing Urban Growth at the Rural-Urban Fringe: Evidence from a Model of Residential Land Use Change, Elena G. Irwin and Kathleen Bell

As many local and state governments in the U.S. grapple with increasing growth pressures, the need to understand the economic and institutional factors that underlie these pressures has taken on added urgency. From an economic perspective, individual land use decisions play a central role in the manifestation of growth pressures, as changes in land use pattern are the cumulative result of numerous individual decisions regarding the use of lands. Irwin and Bell address the issue of growth management by developing a spatially disaggregated, micro-economic model of land conversion decisions suitable for describing residential land use change at the rural-urban fringe.

Their model employs parcel-level data on land use in Calvert County, Maryland, a rapidly growing rural-urban fringe county. Combining these data with a spatially-explicit microeconomic modeling framework provides for a better understanding of the human behavior underlying residential land use change and for assessing the effects of myriad growth management policies on land use decisions. Irwin and Bell estimate a model of residential land use change using a duration model and employ the parameter estimates to simulate possible future growth scenarios under alternative growth management scenarios. Their results suggest that “smart growth” objectives are best met when policies aimed at concentrating growth in target areas are implemented in tandem with policies designed to preserve rural or open space lands.
Integrating Land Use Change into Landscape-level Ecological Assessments, Jeffrey D. Kline

Economists increasingly face opportunities to collaborate with ecologists and other scientists in multidisciplinary research involving landscape-level analysis of socio-economic and ecological processes. For economists who specialize in land use issues, such collaboration often calls for the development of empirical models with which to examine factors involved in land use change and to project potential future land use change scenarios for integration with other models describing socio-economic and ecological processes under study. Providing ecologists with the specific types of land use information they desire can present challenges regarding the availability of appropriate land use and other data, the need to modify existing land use modeling methods, and unresolved econometric issues associated with spatial autocorrelation. Kline provides an overview of the relatively recent adaptation of land use modeling methods toward greater spatial specificity desired in integrated research between economists and ecologists. The particular challenges presented by data, modeling, and econometric issues are highlighted. Kline follows with a discussion of a spatially explicit land use model developed as part of a multidisciplinary landscape-level analysis of socioeconomic and ecological processes in Oregon's Coast Range Mountains. The model improves upon previous land use modeling efforts using discrete land use data, by characterizing the spatial dynamic distribution of building densities throughout the forest landscape of western Oregon (USA). Model projections serve as input into other models describing socio-economic and ecological processes.

Projected Building Density Categories in Western Oregon

Does a Critical Mass Exist? Determining Whether Farmland Conversion Is Affected by the Number of Agricultural Acres, Lori Lynch and Janet Carpenter

Rapid population growth near farming areas has created problems as well as opportunities for farmers. For example, the proximity of non-farm neighbors has resulted
in conflicts about traditional farming practices. In addition, as farmland acres decrease, there are fewer farmers to purchase farm inputs and to sell farm outputs to processors. This could change the cost structure of the agricultural industry’s support sector. If a critical mass of farmland acres is needed to sustain a viable agricultural sector, profits in the sector may decline once a region has dropped below this threshold, causing the rate of farmland loss to accelerate. Agricultural census and population and housing census data were assembled as a panel by county and five-year time periods for the 50-year period (1949-1997) for six Mid-Atlantic States. Lynch and Carpenter present the results of three random effects models.

The general model indicates that having less than 189,240 total harvested cropland acres accelerates a county’s rate of farmland loss. As acres increase by 10% (5,400 acres), the loss declines from the predicted 7.9% to 7.67%. As sales and percent change in income increase, the rate of farmland loss also decreases. The rate falls with the introduction of a preferential taxation program. As expenses, population density, percent change in total housing units, and percent unemployment increase, the rate of farmland loss accelerates. The rate accelerates if the county is metropolitan.

Yet when the data are divided into an early (pre-1978) and late (post-1978) period and two additional models are estimated, the threshold effect disappears in the later period, suggesting a potential structural change. The earlier model’s results are similar but in the later period, increases in population density and sales, increase the rate of loss. Conversely and counter-intuitively, as expenses increase, the rate of loss decreases. Apparently, even if a threshold existed, the results suggest that it may dissipate over time.

Bid Values and their Role in Land Development Over Time and Under Uncertainty, Amitrajecst A. Batabyal

In pondering when to develop land, it is reasonable to suppose that a landowner would have a reservation level of revenue from development in mind. Batabyal asks what happens when a landowner uses the following decision rule: Develop land as long as the dollar value of a bid exceeds a stochastic reservation level of revenue. While deterministic reservation levels have been used to analyze problems in contract theory and resource economics, the impact of a stochastic reservation revenue level on the land development decision has not been analyzed previously. Batabyal's analysis indicates that even though the probability of land development is always positive, the expected wait until the land in question is developed is infinite. Consequently, in an expected waiting time sense, the landowner will never develop his or her land. Specifically, this result tells us that even when a landowner's focus is not on maximizing the probability of accepting the best bid of development, the use of the decision rule delineated in Batabyal's analysis can still lead, in an expected waiting time sense, to a preservation tendency in the decision to develop land. Because this tendency towards preservation does not exist when the reservation level of revenue is deterministic, Batabyal concludes that the existence of a preservation or a development tendency in the land development decision is a function of, among other things, the properties of the underlying decision rule.
Hite, Sohngen and Templeton investigate timing of residential, commercial and industrial development in Delaware County, Ohio, a rapidly growing area of the Midwest. They explore how different types of zoning and tax structures may contribute to leapfrog development, a pattern occurring when growth pressure in urban areas causes expansion of subcenters beyond the suburban-rural fringe. In leapfrog development, it is hypothesized that agricultural landowners at the edge of a growing city hold land speculatively, causing new development to locate beyond the suburbs. In addition, tax and zoning policies can affect development patterns, and may also contribute to sprawl. Hite, Sohngen and Templeton use a competing risks survival model to investigate leapfrog development, which explicitly incorporates the irreversibility inherent in land markets. They examine whether changes from agricultural to industrial land use contribute differently to sprawl than do changes from agricultural to residential or commercial zoning. In addition, they simulate land conversion under different property tax and capital intensity scenarios to investigate how different policies affect land use change. The empirical findings support the hypothesis that leapfrog development exists in the study area.

The authors find that residential conversion is concentrated near preexisting industrial development, and that industrial development locates in areas away from existing development of other types. Land within a mile of municipal boundaries was developed more slowly than other land, substantiating the notion that landowners near cities hold land speculatively. Residential land conversion also concentrates
near commercial sites, so that commercial development outside municipal boundaries will encourage sprawl. Locating industrial sites within a tax district decreases overall residential conversion time, even though residential conversion occurs less rapidly near such sites. Thus, locating industrial sites in agricultural areas will contribute to sprawl. Through simple policy simulations, Hite, Sohngen and Templeton find that increasing taxes and reducing capital intensity would reduce speed of development.

The Impact of Urban Influence on Land Use Decisions and Sustainability: The Case of the Conservation Reserve Program, Ramkumar Bendapudi, Gerard D'Souza and Alan R. Collins

Bendapudi, D'Souza and Collins model the choice to enroll or not enroll in the conservation programs such as the Conservation Reserve Program (CRP). Hence, their study addresses not land conversion per se but policies that may affect land cover on existing agricultural land. Their study area is the mid-Atlantic region. Counties in this region are grouped based on their distances to major urban centers. An “urban influence potential” is computed and incorporated into a grouped logit model. Results show that urban influence is a significant, negative determinant of the CRP enrollment decision. In addition, land values also have a significant and negative influence. However, contrary to expectations, variables such as agricultural returns and CRP payments are not significant.

2. What are the implications of land conversion and conservation for property values and tax revenues, and vice versa?

Land conversion and conservation occur in a dynamic environment, in which the combination of land use, ongoing land conversions, and land use policies can have profound impacts on property values. Improved understanding of these relationships may help managers forecast the effects of their decisions on local tax revenues, and may influence the extent to which public agencies can afford land preservation initiatives. Researchers in this area face a challenge of estimating results from limited data, in the face of the complex spatial and behavioral interactions that determine land values. However, to be useful to the policy process, implications of these often intricate models must be communicated in a straightforward, accessible manner.

Capitalization of Open Spaces into Housing Values: Can Agricultural Easement Programs Pay for Themselves? Jacqueline Geoghegan, Lori Lynch, Shawn Bucholtz

As agricultural and forestland have been converted to residential and commercial uses, concerns about the preservation of open space have grown. Open space has many potential public goods aspects: aesthetic, recreational, and biodiversity values and ecosystem services such as flood control and water purification. As these public goods are lost, governmental and nonprofit entities have responded with a variety of mechanisms: cluster, low density, and strict agricultural zoning; purchase of and transfer of development rights programs; and direct purchases of open spaces financed by donations, land taxes and bonds.

Policy makers would benefit from additional information on the benefits and costs of open space preservation. Geoghegan, Lynch, and Bucholtz focus on just one
type of benefit – that which is obtained by adjacent landowners of preserved agricultural open space. If agricultural preservation programs increase nearby residential land values, does this capitalization effect generate enough to use a value recapture tax to finance or partially finance the programs? While previous research could not demonstrate that the easements’ restrictions were capitalized into farmland price, related research suggested that these agricultural open spaces can increase residential values.

Using a unique spatially-explicit database, Geoghegan, Lynch, and Bucholtz examine this proposition for three counties in Maryland with active agricultural preservation programs. Using a hedonic model, they test whether parcels near permanent open space receive higher prices than those with developable open space or no open space. After correcting for endogeneity and spatial autocorrelation, they use estimated coefficients to predict the change in housing values for a simulated change in current neighborhood open space for residential parcels near the current agricultural preserved land. Then, using the current residential property tax for each parcel, they compute the associated increase in county tax revenue and compared this revenue to the cost of preserving the lands in question. They find that in Calvert County, about one-third of the cost of providing 1% more space can be generated from the increase in property tax revenue, while in Howard County about one-half of the cost could be covered.


England and Mohr discuss the relationship between property taxation and patterns of land use. In particular, they model a landowner’s decision to develop a parcel that is enrolled in a current use assessment program. The analytical results highlight different factors that influence the effectiveness of a current use assessment program in delaying development. For example, if a landowner enjoys a non-pecuniary benefit from the occupancy of undeveloped land, then she will put off development, even though land conversion is implied by the “highest and best use” criterion. While current use programs postpone development, even without non-pecuniary benefits, development decisions are most responsive to changes in non-pecuniary benefits. A current use assessment program delays development the most when it features a withdrawal penalty that declines over time. Many state programs, however, feature penalties that rise. Finally, their comparative static results show that current use assessment programs are particularly effective when tax rates are high or when discount rates are low.

The present value of a stream of payments from land is described by:

$$\int_{t=0}^{t=D} \left[ c(t) + n(t) - tA(t) \right] e^{-rt} dt - P(D)e^{-rD} + \int_{t=D}^{\infty} [u(t) - \tau A(t)] e^{-rt} dt$$

Loomis, Rameker and Seidl develop and apply a public hedonic model that statistically disaggregates the price per acre of open space paid by public agencies into implicit prices for seven attributes of open space (size, wetlands, wildlife corridor, groundwater, working farm, protection of air quality, access to water) as well as payments for easements versus outright purchase. The regression model is implemented using data on over 100 public agency purchases of open space as well as easements in the Front Range of Colorado. The model explains over half the variation in price per acre, with the presence of water bodies on the property or access to water bodies increasing this price. Population of the area increased the purchase price as well, while presence of a wildlife corridor, protection of groundwater, and air quality had no statistically significant effect on the price per acre, perhaps due to measurement of the variable as only presence or absence (due to data limitations).

The public hedonic model may provide a viable alternative to traditional real estate appraisal techniques when agencies must determine fair market values of open space lands. Specifically, by setting the values of the independent variables to match the particular sale of interest, the equation can provide a rough estimate (based on the transaction data) of what agencies paid for an open space parcel with that particular mix of characteristics even though that particular mix might not have been observed in any individual sale. The current equation is for Colorado, but similar equations could be developed in other states. Thus the public hedonic approach can interpolate comparable sales valuation and provide an estimate of the reduction in purchase price with easements as compared to fee title purchase.

Preserved Farmland, Property Values, and Development Patterns: The Experience of Peninsula Township, Michigan, Douglas Krieger

In 1994, Peninsula Township in Grand Traverse County implemented Michigan's first local program to preserve farmland through the purchase of development rights (PDR). The success of the program, however, may have unintended consequences. The implication for Peninsula Township is that preserving farmland may contribute to the desirability of the peninsula as a place to live, increase development pressure, and lead to the conversion of more farmland and open space. If the PDR program attracts residential development to parcels near protected farmland, the resulting development pattern may be inconsistent with desired development patterns. For example, if land adjacent to protected farmland becomes more desirable as home sites, conflicts between farmers and non-agricultural neighbors over farming practices will likely increase and farming will become more difficult.

Krieger uses qualitative and quantitative methods to evaluate the impacts of Peninsula Township's PDR program on land values and development patterns. The quantitative component of the research uses an hedonic property value approach with a spatial component to estimate the relationship between land values and proximity to different land uses, including protected farmland. The qualitative component consists of interviews with a sample of individuals who had recently moved to the township. Results suggest that proximity to preserved farmland had no significant
The presence of a farmland preservation program affected individuals' decision to locate in Peninsula Township rather than in other nearby areas with similar features. ...parcels with severed development rights sold for substantially less than parcels with development rights intact.

Douglas Krieger

The presence of a farmland preservation program affected individuals' decision to locate in Peninsula Township rather than in other nearby areas with similar features. Another finding from the hedonic analysis is that parcels with severed development rights sold for substantially less than parcels with development rights intact. This suggests that – at least in Peninsula Township – the sale of development rights does tend to keep land more affordable for farming.

3. What are the practical relationships between rural amenities and the policies designed to protect them?

A wide array of policy tools and institutions may be brought to bear on land use issues, and the choice of management tools often has significant implications for conservation of rural amenities. Moreover, the policy process itself – as applied in different regions – may offer important insights regarding rural amenities and their values to society. Three presentations emphasized links between rural amenities and the policy process. Critical questions addressed here include (1) what can the policy process itself reveal concerning the values of rural amenities?; (2) are preferences for land use outcomes correlated with matching support for the underlying policy process?; (3) can the cost-effectiveness of amenity conservation be improved?

Protecting Rural Amenities through Farmland Preservation Programs, Cynthia J. Nickerson and Daniel Hellerstein

Concerns over the loss of rural amenities often accompany concerns about conversion of farmland to developed uses. Following public choice studies that suggest public preferences influence government program design, Nickerson and Hellerstein investigate what farmland preservation programs reveal about preferences for amenities. They begin with a conceptual model demonstrating a market failure motivating government intervention in providing rural amenities. Next, they model decisions of stylized farmland preservation agencies, demonstrating how public preferences and the presence of other rural land protection programs influence the decision process and program objectives. This model provides the framework for the three-pronged analysis.

Nickerson and Hellerstein first conduct a content analysis of enabling legislation for farmland preservation programs in the lower 48 States, to discern what program objectives reveal about underlying preferences. Next, using information on parcel rankings in 13 Purchase of Development Rights (PDR) programs in 5 northeastern States, they analyze variation in program objectives and what that variation signals about preferences for particular amenities. Finally, they examine how differences in the arrays of other rural land protection programs and socioeconomic characteristics influence the design of farmland protection programs.
According to Nickerson and Hellerstein, state governments purport to use farmland preservation programs to protect a large number of rural amenities and program objectives are non-uniform across the country. Also, the PDR programs studied place high priority on maintaining active agricultural operations, rather than passive open space uses; the analyses imply that excess demand for rural amenities associated with farmland is likely to differ across jurisdictions; and the presence of other protected rural land and the economic importance of farming may influence the design of State farmland preservation programs.

Correspondence Among Preferences for Land Use Attributes and Support for the Policy Process: Implications for Management and Conservation of Rural Landscapes, Robert J. Johnston, Stephen K. Swallow, and Dana Marie Bauer

Economists frequently assess preferences for land management and conservation outcomes either in isolation of information regarding the specific mechanisms of policy implementation, or as a function of a single, often vaguely specified management process. However, there is no guarantee that respondents will support policies that are consistent with their stated preferences for land use outcomes. Respondents may reveal strong preferences for management outcomes while being unwilling to accept the management processes required to generate those outcomes. Johnston, Swallow and Bauer examine relationships among the rural public's support for the policy process with their preferences and goals for land management and conservation outcomes. They examine preferences within the context of alternative
proposals to manage residential growth and conserve rural landscape attributes in Southern New England. Results are based on (1) stated preferences estimated from a multi-attribute contingent choice survey of rural residents, and (2) a Likert-scale assessment of strength-of-support for twenty-one growth management and conservation tools.

Results indicate general but not universal correspondence among support for management tools and preferences for associated management outcomes, and that support for land use management tools is in some cases correlated with greater marginal utility for the attributes provided by those tools. However, in many instances a lack of statistically significant correlations is of potential note. These results might be taken as partial evidence that the marginal utility for management outcomes is often independent of the means used to achieve management goals. Moreover, some unexpected results suggest a high degree of complexity in preferences, with potentially surprising policy implications. Findings confirm the suspicion that policy support and land use preference may not always coincide. As a result, analysis that suppresses the details of the policy process may lead to unexpected results if used to inform on-the-ground policy.

Conservation Contracting in Heterogeneous Landscapes: An Application to Watershed Protection with Threshold Constraints, Paul J. Ferraro

A key issue in the design of land use policy is how to integrate information about spatially variable biophysical and economic conditions into a cost-effective conservation plan. Ferraro demonstrates a way in which conservation agencies can integrate spatially variable biophysical and economic data in the absence of sophisticated biophysical modeling. Using common biophysical scoring methods, in combination with economic data and simple optimization methods, he illustrates how one can identify a set of priority land parcels for conservation investment. He applies these methods using Geographic Information System data from a conservation easement acquisition initiative for water quality protection in upstate New York.

The results of the empirical analysis support previous empirical work suggesting that the failure to incorporate cost data in conservation investment decisions can lead to large efficiency losses (i.e., an inability to secure maximum benefits per dollar expended). Furthermore, there is increasing scientific information that suggests biophysical thresholds are important when designing conservation initiatives (e.g., a riparian buffer has little effect on water quality unless it achieves a minimum size). Few economic analyses, however, have incorporated such thresholds. Ferraro demonstrates how simple linking constraints in the optimization problem can be used to model the effect of biophysical thresholds on decisions. In the empirical analysis, he compares the conservation contract portfolios selected
with and without threshold constraints and finds that failure to incorporate thresholds can have dramatic effects on conservation investment efficiency.

**Contracted Easement Portfolio, Ratio-Scale Scoring Equation ($2.5 million)**
III. The Practical Role of Economics in the Policy Process

The stated objective of the land use workshop was to collect results and lessons from research to assist in land use planning and decision making. The workshop combined invited and selected paper presentations that displayed advances in economic research and thinking addressing contemporary land use issues. Workshop presentations and discussions, however, converged to a more fundamental issue: improving the role of economic and social science research in the policy process. Simply put, how can economists and social scientists increase the relevance of their work for land use policy?

The workshop was not designed to generate a list of formal recommendations for research and outreach, and likely raised more questions than it ultimately answered. However, discussions among participants revealed both key challenges facing economists who seek to inform the land use policy process, and unresolved questions representing significant research opportunities. Discussions also revealed strengths of ongoing research, as presented and discussed at the workshop, with regard to practical implications for policy.

A. Strengths of Current Research – What are we Doing Right?

Workshop participants included both those whose work extends both the frontier of research associated with land and land use policy, and those who communicate results to local, state, and federal policy makers. Although those seeking to inform land use policy face complex problems and research challenges, workshop presentations illustrated numerous strengths and benefits of ongoing work. These include:

- Economists and social scientists are increasingly incorporating models and methods from other disciplines to improve analysis of complex land use issues.
- Applied research is beginning to extend beyond simple concepts of economic efficiency to incorporate elements such as equity, financing issues, and political feasibility.
- Much of the presented research was driven by needs and questions of policy makers; researchers are addressing complex policy questions that often defy simple solutions.
- Economists and other social scientists are playing an increasing role in questioning whether land use policies have had the desired or expected impacts over time, and identifying changes that may improve policy performance.
- Researchers are increasingly recognizing incentives and institutional structures that influence the actions of program managers and administrators, and assessing whether these actions are in the best interest of the public.

Although economic research has sometimes been accused of detachment from “real world” issues and complexities, workshop presentations repeatedly illustrated a search for solutions to practical, unresolved, and often complex questions facing
policy makers. Research is increasingly focused on practical problems and questions emerging from the policy process.

The trend towards increasing involvement with those in management roles and with practical on-the-ground problems represents an important strength of ongoing land use research. As this trend continues, applied economists and social scientists have increasingly discovered the benefits of non-traditional research methods and cooperative work with those from outside their own discipline. This willingness to find methods that “work,” both inside and outside of traditional economics, was in evidence in many workshop presentations.

B. Challenges – Can Economics Play a Greater Role?

Economics can play a greater positive role in land use management. However, discussions identified a number of challenges or obstacles to the increased use of economic and social science insights in the land use education and policy process. Although few have simple solutions, explicit recognition of these challenges may help economists provide more effective policy support. Future workshops may address potential solutions to these challenges, presented below as a list of stylized facts:

- Policymakers Do Not Read Journal Articles
- Regional Differences May Obscure General Results
- Realistic Assumptions Are Critical
- Disciplines Offer Divergent Solutions
- Managers' and Researchers' Goals May Differ

Policymakers Do Not Read Journal Articles

Applied economists are increasingly working with policy makers to address land use and policy issues of immediate practical concern. Research has provided clear advances improving our ability to address pressing land use issues, and extension activities have communicated these results to appropriate policy audiences. However, at the same time, a significant proportion of economic research is found solely in journals or texts read primarily by other researchers. Those responsible for land use policy, particularly at the community level, rarely read this material. This pattern is exacerbated by an incentive system that provides greater reward for highly technical or methodological work—typically published in academic journals—which may be less accessible to those on the front lines of management. Although many researchers have provided significant outreach and extension to government and stakeholder groups, there remains a divergence between research findings that are most useful to policy makers, and the type of research typically encouraged by academic institutions and professional journals.

Regional Differences May Obscure General Results

Geographic regions differ with regard to a range of factors associated with land use and policy. Patterns of land use conversion and amenity preferences in the largely urbanized Northeast may not mirror those found elsewhere, such as in the sparsely populated states of the Great Plains. Even within the Northeast, patterns of
Land provides a different bundle of goods and services in the rural areas of the Great Plains than it does in the urbanized Northeast. Further, the motivation of researchers who seek to understand land varies among, as well as within, geographic situations...

Emery Castle

change in, for example, Rhode Island, may diverge greatly from those in rural Pennsylvania. While researchers often seek general results or patterns applicable to a wide range of policy contexts, in many cases the most relevant research is conducted on a much smaller geographic scale. Community officials may discount research findings generated outside their immediate region as irrelevant or not applicable. Similarly, the transfer of research results may be viewed with skepticism.

Realistic Assumptions Are Important

Assumptions are an integral part of economic models. In order to make models tractable, economists have sometimes grounded models in questionable assumptions. While the resulting models may provide important insights, the policy implications derived from these efforts are often highly dependent on the specific assumptions applied. A challenge facing all economists is that such works may risk increasing the skepticism with which managers and stakeholders treat research results, unless accompanying explanations clearly indicate the sensitivity of outcomes to the assumptions used.

Disciplines Offer Divergent Solutions

Economists' perspectives on land use issues often differ from those held by other disciplines, including ecologists, foresters and planners. As a result, policy guidance may differ, leading policy makers or program administrators to discount findings from one or more groups. In addition, where economic models have traditionally relied on the concept of a stable equilibrium, other disciplines tend to emphasize movement between states and the lack of stable equilibria – a fundamental difference in approach. Workshop presentations illustrated many of the challenges faced when working in multidisciplinary settings, but also illustrated the potential benefits of such work. Despite the significant benefits of joint research with ecologists and others, this work is often hindered by data limitations, as well as fundamental differences in disciplinary perspectives and core models. The ability to conduct effective cross-disciplinary policy analysis may have an important influence on the continuing role of economics in the policy process.

Managers' and Researchers' Goals May Differ

As highlighted by the presentation of Ferraro, as well as that of Nickerson and Hellerstein (both discussed above), the goals of land use program administrators may well differ from those of scientists. Policy makers face institutional constraints and incentive systems which may encourage 'meeting the agency's requirements' above the search for more optimal land use policy – a variant of the classical principal-agent problem. Hence, even when research identifies clear areas in which policy...
may be improved, recommendations may not be incorporated into the policy process. A related issue is the common use of results solely as justification for predetermined policies, rather than as a means to explore new and potentially beneficial actions. In some cases, agencies may discount results that do not correspond with predetermined policy actions, while emphasizing results that support them.

C. Unresolved Questions – Where Can Research Make a Difference?

Aside from the strengths and challenges identified above, workshop discussions identified broad areas of land use and policy in which significant uncertainty remains—areas in which research could offer much to the policy process. While these are not the only issues of importance to land use policy, they are the ones emphasized most heavily in workshop discussions. These issues typically involve complex but highly relevant problems, oftentimes characterized by conflicting results in the published literature. While some of these have been addressed as research needs in prior conferences and workshops (e.g., Abdalla 2001; NERCRD 2002), they remain as principal areas in which research is needed.

Key areas identified as research needs and opportunities included:

- Dynamics of land development, value, and market price
- Fiscal impacts of easements and conservation activities
- Relationships between public preferences and the policy process
- The public's perception of and preferences for rural amenities
- Structural shifts in land conversion and the changing role of land use policy

Dynamics of Land Development, Value, and Market Price

Despite the significant proportion of workshop presentations addressing these topics, considerable uncertainty remains. For example, empirical research often generates conflicting, unexpected, or otherwise uncertain results regarding the impacts of conservation activities (e.g., easements) on nearby property values. Such research is often beset by data limitations and the complexity of spatial effects.

Similarly, forecasting land use conversion is an area of keen interest, particularly in urbanizing areas of the Northeast. The different approaches to this complex question (e.g., hazard, survival time, discrete choice, cellular automaton models) involve different assumptions and may in some cases provide divergent results. As a result, many workshop participants agreed that more effort needs to be applied to dynamic issues of land conversion and value. However, the question was also raised as to whether the findings of such research—while of clear interest to researchers—have been used by policy makers. Hence, while this is an area in which many research questions remain, researchers face the challenge of making results accessible and practical to the broader policy audience.
Fiscal Impacts of Easements and Other Conservation Activities

Geoghegan’s presentation addressed the question, "can conservation easements pay for themselves?" This analysis focused on property value impacts of easements—a complex question in its own right. However, easement and other conservation activities also influence the cost of providing community services. The combined impact of conservation activities on communities’ fiscal bottom-line, and on tax levies, is typically unknown. Common, static approaches such as “cost of community service analysis” leave many questions unanswered, and are typically unsuitable for predicting future impacts. The critical role of parcel cost and tax implications in many communities points to the importance of research addressing the short- and long-term fiscal impacts of conservation activities.

Relationships Between Public Preferences and the Policy Process

The rural public may not only be concerned with the consequences of land management; residents may also have systematic preferences for the policy instruments applied to management goals. Preferences for outcomes do not necessarily imply matching support for the underlying policy process. Nonetheless, economists typically disassociate preferences for management outcomes from detailed analysis of policies that might generate those outcomes. These issues were addressed in part by Johnston, Swallow and Bauer, and by Nickerson and Hellerstein. Subsequent workshop discussions pointed to a clear need to better integrate research into public preferences for rural amenities with research regarding the policy process required to sustain those amenities.

The Public’s Perception of and Preferences for Rural Amenities

Despite a growing body of evidence, there remains significant uncertainty regarding that which the public values in farm, forest, and open space land uses. For example, state and local conservation agencies often emphasize conservation of prime soils and active agricultural land, while survey research suggests that the rural public places greater value on attributes such as scenic views and wildlife habitat—amenities that do not require active agriculture. Similarly, land conservation policy is often based on the intuitively reasonable assumption that the highest marginal values are placed on those farm and forest amenities that are in the shortest supply. However, anecdotal evidence suggests that in some communities, residents may place greater marginal value on land uses in relatively greater supply (e.g., in an agricultural community, residents may favor the preservation of more common farmland over more scarce forested land). These and other related issues have clear implications for the targeting of land conservation activities, particularly given that evidence increasingly suggests that preferences are spatially heterogeneous.
D. Conclusion

Economists are increasingly addressing practical and complex problems associated with land use change and policy. This increasing focus on land use issues comes at an opportune time. The combination of increasing development pressures emanating from urban centers, changes in the viability of different types of farm and forest activities, and growing application of myriad conservation policies has created a dynamic and rapidly changing policy environment. Although many important questions remain, presentations at the 2002 NAREA Land Use Workshop revealed numerous areas in which economic insight and research can inform land use policy. The workshop presented a wide range of research approaches to land use issues, and perspectives on the role of economics in policy. Discussions emphasized a search for practical ways that researchers could make their work more accessible and useful to the policy process.

While the value of research in this area is clear, it is also increasingly evident that the simple existence of ongoing research does not assure progress in land and agricultural policy. It is also clear that there is no single “correct” model through which one may address all land use issues. While individual models may often be improved, any search for a single, unified approach through which researchers may address all land use issues will likely end in failure. Indeed, recognition of the research questions that are germane in different circumstances; the role of common assumptions; the context in which research results are applied; the importance of regional differences; and the institutional incentives facing program administrators is crucial if researchers wish to increase their role in policy development.
IV. References


V. Speakers and Program Participants

Amit Batabyal, Rochester Institute of Technology
Sandra S. Batie, Michigan State University
Kathleen Bell, University of Maine
Ramkumar Bendapudi, West Virginia University
Daniel W. Bromley, University of Wisconsin-Madison
Emery N. Castle, Oregon State University
Joshua Duke, University of Delaware
Paul Ferraro, Georgia State University
Jacqueline Geoghegan, Clark University
Daniel Hellerstein, USDA-ERS
Diane Hite, Mississippi State University
Robert J. Johnston, University of Rhode Island
Jeffrey Kline, Pacific Northwest Research Station, Forestry Sciences Laboratory
Douglas Kreiger, Ovid, MI
John Loomis, Colorado State University
Lori Lynch, University of Maryland
Elizabeth Marshall, The Pennsylvania State University
Robert D. Mohr, University of New Hampshire
Cynthia Nickerson, USDA-ERS
James Shortle, The Pennsylvania State University
Stephen K. Swallow, University of Rhode Island