CONFRONTING LAND FRAGMENTATION: OPPORTUNITIES FOR FEDERAL RESEARCH AND OUTREACH PROGRAMMING PARTNERSHIPS

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Introduction

The most recent U.S. Census indicates that the intermountain, great basin region of the U.S. West has many of the states with the fastest growing populations. Half of the fastest growing counties are also in this region. Counties in Wyoming, for example, are experiencing rapid rural (unincorporated) growth both from intrastate urban-rural, and interstate (extra-regional), migration (Taylor and Lieske, 2002). This growth, as it has elsewhere in the United States, has contributed to subdivision and land fragmentation.

Land fragmentation may be defined as dividing a given (usually agricultural or private forest land) tract into smaller parcels. This changes the size, the characteristics and typically the use of that original tract. Examining land fragmentation may consist of simply measuring the extent of the conversion of agricultural land into other uses. The attendant consequences may also be of import. These may include the loss of productive as well as environmental amenity values that are attributed to a given parcel. Such losses in aggregate may result in a diminution of the flows of public benefits (e.g. resource quality, recreation opportunities and aesthetic values) that stem from the maintenance of goods and services associated with environmental amenities in a region.

The heterogeneity of the land resource by state and region is relevant to an examination of the causes and impacts of land fragmentation. Understanding the changes in demand, as well as supply, for rural lands and the potential land use changes is also relevant to land fragmentation research. Governance and policy responses to land fragmentation are also important to consider. These issues in turn suggest considering how private property rights and the asset value of land resources are affected by land use controls or changes in adjacent land uses and management. Ultimately productive viability and niche marketing as well as farm estate planning may be relevant to the preservation of agricultural lands. It is within this general framework that the task of sorting out research opportunities and outreach programming on a national scale takes place. My goals in considering the issues related to land fragmentation consist of the following:

- Determine what economic research was occurring relevant to land fragmentation;
- Discover the outreach programs that addressed land fragmentation; and
- Indicate shortfalls and subsequent opportunities for the above particularly for the benefit of, and future partnering by, the Cooperative State Research, Education and Extension Service (CSREES) that funded my work in Washington, D.C.

Background

Land fragmentation appears to be a relatively new topic for economic and agricultural economic researchers. The Economic Research Service (ERS) provided some useful national analysis concerning public preferences for agricultural preservation programs, including a valuable synthesis of existing work (Hellerstein et al, 2002). Nearly all of the state-run programs as well as the location in which research has been conducted fall east of the Mississippi River or on the Pacific coast. Other useful sources for understanding the value of unfragmented agricultural lands include a general survey

of private and societal values by Bergstrom (2002); and a related work by Fausold and Lilieholm (2001) that offers direction for a wide range of economic analysis.

Hedonic price modeling (HPM) has been employed to determine valued parcel attributes spatially, using Geographic Information Systems (GIS) data (e.g. Geoghegan et al., 1997; Bastian et al., 2002; Sengupta and Osgood, 2003). Other work examines the effects of adjacent development and target parcel status for various determinants of land use change (e.g. Irwin and Bockstael, 2001; Plantinga, 1996). Policy referenda concerning land use and planning preferences in Wyoming and Colorado have been conducted by McLeod et al (1999) and in Rhode Island by Kline and Wichelns (1995) across a variety of resident and nonresident respondents. Contingent valuation methods (CVM) for open space valuation summarized nicely by Randall (2002) and a summary of willingness-to-pay (WTP) estimates by Bergstrom and Ready (2004) offer important analysis from which welfare measures may be obtained. These broad categories of published work constitute the major areas of analysis.

Land Fragmentation Research and Outreach Program Opportunities

Research Focus and Funding:
One difficulty with understanding how researchers have dealt with land fragmentation is that of scale. Impacts due to land use change may be considered alternatively based on a particular species (habitat approach); on an assemblage of species (ecosystem approach); or on some socio-economic criteria such as land use conflicts (recreation use or access to public lands) or taxation issues (cost of community services). Further complications emerge given a mosaic of land ownership, land management responsibilities and the multitude of jurisdictions that may be acting at cross purposes in any one county. The differences in type and extent of scale manifest themselves in diverging research questions, methods and interpretation of outcomes. Discipline-specific approaches appear to be insufficient in addressing the complexity of land fragmentation. Development of a hybrid approach, or at least an explicit comparison of the research from the above perspectives, is needed.

There appears to be a developing interest in the topic area. Nearly 100 CSREES supported land use analysis projects have been initiated since 1997. The diversity of approaches was compelling and challenging to interpret. Many were newly initiated or in progress with few outcomes to report. The intermountain/great basin west was under-represented, indicating a shortfall of grant awards or funding in a rapid growth, high amenity region. It may also reflect hesitation by faculty to risk pursuing economic analyses of land fragmentation: a decidedly complicated and contentious topic in a rapidly changing region.

Multidisciplinary funding opportunities for researching the causes, consequences, alternatives and remedies of land fragmentation are becoming available from the National Science Foundation (NSF) and the Environmental Protection Agency (EPA). Explicit economic research opportunities pertaining to land fragmentation via the National Research Initiative (NRI) are still scant. They currently consist of parts of the rural development and managed ecosystems announcements. An economic research component might address issues, for example, pertaining to individual incentives, market shifts, and institutional arrangements as well as responses to regulation and compensation existing in resource management efforts.

An internet search of Cooperative Extension Service (CES) programs in the fall of 2003 indicated that every state had a natural resource management program, a community planning program or both. The capacity appears to exist in CES to address land use issues locally. The state of Indiana, for example, formalizes the importance of this capacity to address land fragmentation by requiring county CES educators to serve on local land use and planning boards. University of Wyoming offers the *Wyoming Open Space Initiative* which joins the expertise of several departments to address land and water planning research needs (http://www.uwyo.edu/openspaces/5K.html). The supporting research to

assess the individual or joint impact of land fragmentation policies is required to assist the local planning efforts.

Efforts in providing policy relevant land use outreach and programming tend to be parochial. The author acknowledges that in his state as in other places policy makers often insist that theirs' is a "unique situation." Unfortunately often times the wheel is being re-invented. Work done elsewhere may offer opportunities to increase project efficiency while allowing an advance of understanding in delivery and analysis. One can conclude similarly for land fragmentation research, especially across regions of the U.S. efforts to summarize and disseminate outcomes are needed. Resources should be dedicated to this end.

Private Sector Opportunities:
A search, current as of the summer of 2003, was conducted to determine potential Non-Governmental Organizations (NGO) partners who may offer research, funding, and/or outreach efforts addressing land fragmentation. Some twenty-five possibilities were identified. These operate in multiple regions or nationally and may offer potential future partnerships with land grant institutions and/or federal agencies. Contacts need to be established and trust forged to pursue synergies between public and private efforts.

Land trusts have been in operation throughout the United States to provide public education and help broker conservation easements with landowners. The growing existence of land trusts appears to be a private sector response to a set of issues that the public sector has been slower to address. NGOs, communities and groups of landowners are not waiting for thorough research or outreach programming in many cases. A sense of urgency is being conveyed in this fashion concerning community and landscape changes. The American Farmland Trust, the Nature Conservancy, the Trust for Public Lands and the Land Trust Alliance are all currently active in facilitating education, outreach and land preservation efforts.

Table 1 provides a broad-brush view of the density of land trusts on a population basis in comparison to population density. There is considerable NGO activity and presence that varies across stateliness. This too reveals the existing private sector capacity for partnerships with various levels of government.

Table 1. Population Densities and Number of Land Trusts per 100,000 of Population for Selected States (2003)

Selected State	*Population Density per Square Mile*	*Land Trust per 100,000 Population*
Maine	42.3	3.97
Rhode Island	1,029.8	2.32
New York	406.4	0.40
South Carolina	137.7	0.51
Florida	315.6	0.13
Ohio	279.3	0.33
Minnesota	63.5	0.10
Missouri	82.8	0.21
Texas	84.5	0.08
Montana	6.3	0.88
Idaho	16.5	0.96
Colorado	43.9	0.81
California	227.5	0.34

Source: US Census Quick Facts; Land Trust Alliance

Several general outcomes appear from Table 1 as follows: low population density states (below 50/square mile) such as Colorado, Idaho, Montana and Maine tend to have a high number of land trusts per 100,000 of overall population. High population density states tend to have the opposite (Rhode Island being a notable exception), though there is no accounting here for economies of scale in land trust effort or activities. Intermountain states such as Idaho, Colorado and Montana which can be characterized as having high in-migration rates as well as much public lands and recreation occurring tend to have a high density of land trusts. These also are states that still have wide open spaces that are threatened by encroaching development.

Opportunities Resulting from Federal Agencies Administering Programs:

The 2002 Farm Bill adds an array of conservation efforts to existing programs. These opportunities are largely administered by the Natural Resource Conservation Service (NRCS) and are as follows:

- Conservation of Private Grazing Land (CPGL),
- Environmental Quality Incentives Program (EQIP),
- Farmland and Ranchland Protection Program (FRPP),
- Grassland Reserve Program (GRP),
- Wetlands Reserve Program (WRP) and
- Wildlife Habitat Incentives Program (WHIP).

These opportunities augment US Forest Service (USFS) options. The latter are as follows:

- Forest Legacy Program,
- Forest Stewardship Program and
- Forest Land Enhancement Program.

U.S. Fish and Wildlife (USF&W) provides landowners with Endangered Species Conservation and Partnership for Fish and Wildlife Habitat Conservation. The Farm Service Agency (FSA) manages the Conservation Reserve Program. The ubiquitous activities of NGOs, Land Grant Universities (LGUs) and federal agencies offer opportunities to leverage resources. Public-private partnerships can offer a complementary means to overcome limited resources and knowledge across both program development and administration.

Recommendations for CSREES

CSREES can serve as a broker and conduit of opportunity nation-wide. A potential role for CSREES in addressing land fragmentation and agricultural productive viability may consist of collaborating with the listed entities as follows:

- Working with NGOs involved in resource management issues on private lands as well with community planning professionals;
- Making land fragmentation research and CES land use programming a priority for Regional Rural Development Centers through ear marked resources (for example following the work sponsored by the Northeast Center);
- Encourage multidisciplinary and multi-institutional research requests with an explicit role for economic inquiry to LGU CES and Research units;
- Collaborating with other units in the USDA and federal agencies responsible for resource management and analysis such as the USFS, EPA, USF&W, FSA, NRCS, as well as the National Park Service and Bureau of Land Management in order to incorporate the public and private land management successfully into land fragmentation research and outreach education;

- Working to sort out programs, procedures and outreach opportunities relevant to land fragmentation in CSREES through the vehicle of the internally formed Environment and Natural Resource working group;
- Promotion of workshops such as the Farmland Amenity Workshop (Baltimore 11/03) with varied jurisdictional public and assorted private concerns participating in regions beyond the Northeastern and mid Atlantic states;
- Soliciting input from multi state research projects (MSRP) such as W-1133 "Benefits and Costs associated with the Management of Public and Private Lands" as to researchable issues concerning land fragmentation;
- Reaching out to the *Association of Environmental and Resource Economists* for input on resource related research opportunities related to land fragmentation;
- Soliciting researchable questions concerning land fragmentation issues from the National Association of Counties; geographers; American Planning Association; landscape architects; rural residential developers; ecologists; and many other perspectives;
- Re-invigorating NEC 1001 "Land Use Planning" as a vehicle to develop a joint CES and Research MSRP; and
- Providing a bridge and communication network between these various entities to address issues as they arise through collaboration.

CSREES offers and institutional framework to assist CES programming and university research efforts. The tasks provided above are not without difficulty. The following challenges exist for CSREES:

- Dollars for research and outreach need to be discovered and leveraged between federal agencies, NGOs, states, counties, and foundations;
- The non-coastal US West is vastly under-represented in most phases of the operation, support, and working knowledge of CSREES. This is particularly critical given the quantity of federal lands therein, the overall size of the area, the large and rapid loss of agricultural land, the critical array of recreation, cultural, water, forest, rangeland and energy resources as well as the rapid population growth occurring there; and
- Determine ways to share resources, particularly personnel between CSREES, LGUs, NGOs and other federal agencies, to provide a more holistic approach to collaborative efforts.

The above opportunities and challenges point to potential improvements in the voice that the land grant institutions can have in informing the debate concerning land fragmentation. Continuing liaison with federal and NGO partners can only strengthen the ability to conduct timely and policy-relevant research, outreach and resident instruction. Public resources are available for communities and landowners via federal land conservation and protection programs. A broad portfolio of land stewardship programs exist: analysis concerning their effectiveness and outreach strategies to educate the public should continue to be pursued.

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