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Is Oregon's land use planning program conserving forest and farm land? A review of the evidence

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ABSTRACT

Planners have long been interested in understanding ways in which land use planning approaches play out on the ground and planning scholars have approached the task of evaluating such effects using a variety of methods. Oregon, in particular, has been the focus of numerous studies owing to its early-adopted and widely recognized statewide approach to farm and forest land protection and recent experiment with relaxation of that approach in 2004 with the passage of ballot Measure 37. In this paper we review research-based evidence regarding the forest and farm land conservation effects of Oregon land use planning. We document the evolution of methods used in evaluating state land use planning program performance, including trend analysis, indicator analysis, empirical models, and analysis of indirect effects on the economic viability of forestry and farming. We also draw on data documenting Measure 37 claims to consider the degree to which Measure 37 might have altered land use and development trends had its impacts not been tempered by a subsequent ballot measure – Measure 49. Finally, we provide a synthesis of the current state of knowledge and suggest opportunities for future research. Common to nearly all of the studies we reviewed was an acknowledgement of the difficulty in establishing causal relationships between land use planning and land use change given the many exogenous and endogenous factors involved. Despite these difficulties, we conclude that sufficient evidence does exist to suggest that Oregon's land use planning program is contributing a measurable degree of protection to forest and farm land in the state.

Introduction

A variety of public policies and programs are advocated in the U.S. to protect forest and farm lands from development. These include zoning, use value assessment, purchasing or transferring development rights, and purchasing conservation easements or land in fee, to name a few. Among these, Oregon's land use planning program often is cited in both professional and popular media as exemplary (e.g., Nelson, 1992; Egan, 1996). A central goal of the program is to protect productive farm and forest land sufficient to safeguard the industries those lands support, and, secondarily, because they are a widely recognized contributor to Oregon's overall quality of life. The extent to which Oregon's land use planning program is effectively accomplishing its forest and farm land conservation goals, however, is a subject of debate among both citizens and scholars. Given that most of the debates have been about "*how* to plan, not *whether* to plan" (Abbot et al., 2003, p. 390), there have been numerous attempts to assess the effectiveness of Oregon'sparticular approach.

Oregon's land use planning program was launched in 1973. Between 1973 and 2001, privately owned "wildland" forest declined from 10.7 to 10.5 million acres, while intensive agriculture declined from 5.8 to 5.7 million acres (Lettman, 2002, 2004). Today, forest lands and intensive agriculture make up 37% and 20% of the nonfederal land base in Oregon, respectively. Additional acreage exists as mixed forest and agriculture as well as range. Would there have been greater loss and fragmentation of these resource lands over the past 35 years under a more lax or different land conservation program? In this paper we report on a review of research addressing the effects of Oregon's land use planning program on rates and patterns of forest and farm land development and fragmentation (or parcelization). We document

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the evolution of methods used in evaluating state land use planning program performance, including trend analysis, indicator analysis, and empirical models. We also consider the degree to which recent attempts to change Oregon's land use planning program via ballot Measure 37 might have altered land use and development trends had the impacts not been tempered by a subsequent ballot measure – Measure 49. Finally, we provide a synthesis of key findings and outline our thoughts about how research might best be applied to advance knowledge and application of statewide planning to forest and farm land conservation.

Relatively few studies have examined the performance and effects of land use planning and fewer still have provided confident conclusions. One of the biggest challenges confronting this type of research is separating the effects of land use planning on land cover change from other influential factors. These factors can include population and economic growth; new industries; regional comparative advantages of land in different uses; changes in household sizes, personal income, and tastes and preferences regarding housing; the availability of land for re-development; and physical land features, such as slope, that constrain certain uses, among others (Kline, 2000). In Oregon, evaluative research is further complicated by the evolving nature of the State's program, which has experienced periodic changes in laws and policies to correct perceived problems. These structural changes add complexity to obtaining and analyzing longitudinal data as policy changes and sampling periods rarely align. Given these challenges, our review does not seek to quantify the success of Oregon land use planning or provide a definitive answer as to its overall effectiveness. Rather, it summarizes the research evidence, identifies knowledge gaps, and draws tentative conclusions based on the evidence at hand. Our hope is that this critical analysis of methods used to date and the limitations of conclusions drawn will help planners and policymakers consider and evaluate land use planning approaches to forest and farm land conservation and their effects in other states.

Oregon's land use planning program

Oregon's land use planning program has been cited as a pioneer in U.S. land use policy for its statewide scope (Gustafson et al., 1982), has won national acclaim by the American Planning Association (Department of Land Conservation and Development [DLCD] 1997), and has served as a model for statewide planning in other states (Abbott et al., 1994). The program was a response to rapid population growth in western Oregon during the 1950s and 1960s, which raised concerns in the state about the loss of forests and farm land to development. Legislation had already authorized local governments to manage urban growth, however, residential development of forests and farm lands outside of incorporated cities often remained unplanned and unregulated (Gustafson et al., 1982). In response, Oregon's legislature enacted the Land Conservation and Development Act in 1973 requiring all cities and counties to prepare comprehensive land use plans consistent with several statewide goals and establishing the Land Conservation and Development Commission to oversee the program (Knapp and Nelson, 1992; Abbott et al., 1994).

Among several goals of the program are the orderly and efficient transition of rural lands to urban uses, the protection of forests and agricultural lands, and the protection and conservation of natural resources, scenic and historic areas, and open spaces (DLCD, 2004c, p. 1). To pursue these goals, cities and counties are required to focus new development within urban growth boundaries, and restrict development outside of urban growth boundaries by zoning those lands for exclusive farm use, forest use, or as exception areas (Pease, 1994). Exception areas are unincorporated rural areas where low-density residential, commercial, and industrial uses prevail, and where development is allowed, pending approval by local authorities (Einsweiler and Howe, 1994). Exceptions are granted when strict adherence to a particular goal is not possible or not in the public interest, or when adherence to one goal may conflict with another.

Land use planning does not prevent development, but rather restricts the rates, locations, and densities at which development can take place. Some development within forest and farm use zones can be approved by local authorities and must be reported to the Land Conservation and Development Commission (Land Conservation and Development Commission [LCDC] 1996a,b). Criteria defining such development vary across counties, but generally include minimum parcel sizes and limits on the number of new dwelling permits issued. Construction of personal residences by commercial farmers and forest owners is allowed, subject to an income test designed to discourage recreational/hobby uses of farm and forest land. Though the land use planning system was initiated in 1973, it was not until 1986 that comprehensive plans for all 36 counties and 241 cities in the state were acknowledged by the Land Conservation and Development Commission (Knapp, 1994). This lag time complicates efforts to assess the performance of the system going back to 1973.

Although Oregon's planning program has enjoyed general legislative and citizen support, since its inception it has created tension between its advocates who see land use planning as necessary to the long-term conservation of forest and farm lands, and its detractors who argue that land use regulations unduly burden private landowners (Oppenheimer, 2004a,b). Among the biggest complaints are that it is too prescriptive and inflexible, that it unfairly impinges on private property rights, and it does not reflect a changed economic and social environment since its adoption 35 years ago (Abbot et al., 2003; Howe et al., 2004). Moreover, Howe (1994) suggests that the Oregon program, while innovative, does not have a mechanism for critically engaging new ideas. As a result, people become frustrated with what seems to be overwhelming program inertia (p. 281).

Two fairly recent ballot measures seeking to provide private landowners compensation for property value losses resulting from the program exemplify the persistent tension surrounding the program. Measure 7 was approved by voters in 2000 and eventually was overturned by the Oregon Supreme Court on a technicality (DLCD, 2004a). Measure 37 was approved in 2004 also seeking compensation, and would have allowed planning jurisdictions to remove, modify, or not apply the regulation in lieu of compensation (DLCD, 2004b). The potential implications of Measure 37 were of sufficient concern to state policymakers that the governor and state legislature appointed the bipartisan "Big Look" task force to examine the land use planning program and consider possible changes. Measure 37 also inspired yet another ballot measure – Measure 49 passed by voters in 2007 – which sought to both define and restrict compensation eligibility requirements mandated under Measure 37. These issues continue to evolve today. Also persistent is interest among land use planners and policymakers (in Oregon and elsewhere) in evaluating the effectiveness of planning for maintaining resource lands.

Literature review method

In our review we focused on published research evaluating the forest and farm land conservation effects of Oregon's land use planning program. Although the program has several goals, we limited our review to research addressing either or both of the goals related to the conservation of farm and forest land – Goals 3 and 4, respec-

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tively. We refrained from including research that has examined planning-related secondary effects, such as the potential impacts of planning on property values. Although such secondary effects have garnered significant interest over the years among planners, policymakers, and landowners, they are not central to the primary goals defined at the program's outset – specifically, the conservation of productive forest and farm lands.

Potential research literature was identified using keyword searches of various databases and evaluated for its relevance to addressing the question of whether and how Oregon's land use planning program has effected farm and forest land conservation in the state. We limited our review to studies published between 1973 and 2008; including peer-reviewed journal articles and reports by state and federal agencies. After meeting initial criteria pertaining to relevance; studies were subsequently evaluated for their robustness. Robustness depended on whether the analysis was structured in such a way as to enable assessing the degree to which land use planning effected forest and farm land conservation apart from other contributing factors influencing the loss of forest and farm land to development. For example, could an analysis distinguish changes in rates and patterns of forest and farm land development resulting from land use planning from changes resulting from other factors such as population and income growth; topography; and broader market forces affecting forestry and farming?

Results

Our review identified three broad classes of studies that represent an evolution in methods used to evaluate forest and farm land conservation effects of land use planning in Oregon. Initial pioneering efforts focused on examining general trends in land use – usually agricultural land – using readily available data sources such as the US Census of Agriculture. The majority of the studies we cite fall into this category. A subsequent group of studies attempted to develop indicators regarding the effect of land use planning on forest and farm land development. Common to both types of research, we suggest, is an inability to effectively control for other factors besides planning that influence land use change and development. A third class of more recent studies built upon these earlier efforts by using more intensively sampled data describing land use to construct empirical models of land use change. These studies more explicitly attempted to control for at least some of the other factors that influence land use change and development.

Analyses of land use trends

Several studies have examined historical trends in various land use categories or in specific development metrics, to assess farm and forest land loss (conversion to development), as well as fragmentation (parcelization). While the growing number of small farm and forest properties – at the expense of larger operations – may not signify an immediate net loss of resource land there has been concern that parcelization in the longer term lead to greater costs for farm and foresy operations and thus the decline of farming and forestry. This concern arises in part from studies suggesting that parcelization of lands adjacent to working farms and forests, often for hobby uses, will eventually lead to what some have called "shadow conversion," where the growing financial (and psychological) costs of doing business in such a non-production-oriented atmosphere outweigh any economic benefits (e.g., Sorensen et al., 1997; Kline and Alig, 2005). Related to this is the concern that the growing "rent gap" – the difference between what landowners can earn from forestry or farming versus what they could earn by selling land for development – eventually induces some farm and forest landowners to sell out.

The earliest studies of Oregon land use planning effectiveness examined trends in farm land loss and fragmentation using data from the Census of Agriculture. Furuseth (1981) examined trends in agricultural land use reported through 1978 by the Census of Agriculture, concluding that a slowing in the rate of agricultural land loss – plus agricultural land expansion in some areas – provided empirical evidence of the early effects of Oregon's land use planning program. However, given that actual development and implementation of county plans largely occurred after 1978 (after the period analyzed), these conclusions must be considered suspect. Moreover, drawing such conclusions by observing trends alone can be a difficult task confounded by other factors that also effect land use trends. In this case, for example, it would have been difficult to isolate the potential effects of Oregon land use planning on agricultural land use trends from other factors, such as the expansion of U.S. agriculture generally that occurred during the early 1970s. Later comparative analysis by Daniels and Nelson (1986) using the 1982 Census of Agriculture concluded that Oregon was retaining farm land better than national averages, having lost only 1.7% of its farm land between 1978 and 1982 versus 3% for the nation. The authors also found that Oregon had lost less farm land (1978–1982) than did Washington, a comparable state without statewide land use planning at that time.

Daniels and Nelson (1986) were also among the first to examine the parcelization phenomenon on resource lands in Oregon and found that between 1978 and 1982 the state ranked fifth in the nation in the percentage increase in small farms (<50 acres), adding 600 more small farms than did Washington which did not have statewide land use planning at the time. They also noted a growing imbalance among farm types, with the ratio of commercial farms ($10,000 or more in annual sales) to small farms decreasing by 21%, for example. The authors speculated that the growth in hobby farming in Oregon could be connected to elements of Oregon's land use planning program, such as the large minimum lot sizes, which, while intended to keep land in commercial farming, can steer farm landowners towards subdividing and marketing "hobby-sized" properties to prospective landowners interested in rural lifestyles. The authors also suggested that generally lenient eligibility requirements for reduced property taxes for agricultural producers in the 1980s were creating economic incentives for hobbyists to purchase resource land. However, given that their analysis, like Furuseth's, was conducted before many county plans were completed and approved by the Land Conservation and Development Commission, we suggest that their findings cannot be directly tied to early program effectiveness.

In another early study dealing with farm land fragmentation, Daniels (1986) found that average farm size in the Willamette Valley had declined from 144 to 117 acres (18%) between 1978 and 1982. Given a simultaneous rise in total farm numbers, hobby farming was viewed as a contributing factor to the fragmentation of Oregon farm land. Supporting this view was the fact that average annual sales from farms grossing less than $10,000 dollars also fell during this time period, which Daniels attributed to newer hobby farmers using their land less productively than the former small farm owners. He also found that between 1978 and 1982, farm land values increased by 53%, with greater increases found near urban areas. Daniels attributed this growing rent gap to hobby farming, and declared that hobby farming was the primary threat to commercial agriculture in Oregon.

Responding to Daniels and Nelson (1986) and Bernhardt (1988) used Standard Industrial Classifications and the Census of Agriculture to better describe the dynamics of farm land consolidation and parcelization in the Willamette Valley between 1978 and 1982.

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While Daniels and Nelson (1986) primarily were concerned about the decline in midsize farm numbers and the rise in small farms, Bernhard showed that farms over 320 acres had gained more acreage than farms with less than 20 acres, suggesting that more consolidation had occurred during this period than parcelization. Bernhardt (1988) also placed farms within SIC groups to identify which types of farms experienced the greatest changes and found that the least efficient farms in terms of adjusted gross income were the most susceptible to parcelization, while those with the highest incomes increased in acres farmed. These findings, Bernhardt argued, provided evidence of a strong agricultural sector supported by competitive markets.

Nelson (1992) conducted still further comparative analysis of land use trends in different states and found that between 1982 and 1987 Oregon had gained more farms over 500 acres (proportionately) than did Washington or the U.S., while losing fewer mid-size farms of 50–499 acres. He attributed these results to the effectiveness of Oregon's land use planning program, which, by the mid-1980s, was fully operational with all comprehensive plans completed. Like the previous studies, however, Nelson (1992) was unable to account for the relative importance of exogenous factors – aside from land use planning – affecting land use and development. It is this shortcoming that makes such trend analysis somewhat anecdotal with regard to evaluating land use planning effectiveness.

More recent trend analysis has included a focus on forest land retention. Using a unique land use inventory technique based on visual interpretation of historical aerial photographs, Lettman examined annual trends in "wildland forest," "intensive agriculture," and other land use categories in Oregon. He observed that reductions in wildland forest and intensive agriculture land were about 0.1 and 0.6% from 1973 to 1982, respectively – again prior to full implementation of statewide planning – but had declined to 0.0 and 0.2% for the period 1994–2000 (Lettman, 2002). Similar reductions were found in eastern Oregon (Lettman, 2004). Although not necessarily conclusive regarding the effectiveness of Oregon's land use planning, these analyses resulted in the development of fine-scaled spatially explicit land use data that eventually enabled more intensive empirical analysis of land use planning effectiveness that continues today.

Analyses using indicators

Another set of studies examined general indicators of development rates and patterns and farm and forest land retention, but again without formally attempting to control for the other factors potentially influencing those changes. For example, Moore and Nelson (1994) and Nelson and Moore (1996) examined how land use laws had been implemented by local governments, as part of a larger effort to assess how effectively urban growth boundaries have been implemented in four Oregon regions. One measure used to evaluate effectiveness was the number of dwellings built on resource lands outside the urban growth boundaries. For example, during the study period examined (1985–1989) 27% of the residential development in Jackson County occurred outside urban growth boundaries, and 41% of those 529 residential units were built in resource zones (Moore and Nelson, 1994). However, it is difficult to conclude from the analysis what influence the implementation of land use zoning had on effecting these changes.

In other work, Nelson (1999) developed a set of indicators for Georgia, Florida and Oregon to evaluate the effectiveness of growth management efforts in each state in retaining farm land, containing urban sprawl, and meeting other planning goals. Using data from the Census of Population and Census of Agriculture, he noted that Oregon had lost only 0.33 acres per new resident between 1982 and 1992, whereas Georgia, a state without statewide land use planning, had lost 2.1 acres per new resident. The author also examined the containment of urban sprawl, showing that population densities within Census-defined urbanized areas had decreased in Oregon by only 0.5% between 1980 and 1990 versus almost 16% in Georgia. He argued that these results were evidence of the farm land retention and urban sprawl containment benefits of Oregon's land use planning system.

In a response to Nelson (1999) and Kline (2000) examined alternative land use data reported by the Natural Resources Inventory. Kline argued that an actual inventory of land provided a better portrayal of land use than did the Census of Agriculture, which is based on a survey of farm operations, or the Census of Population, which is based on a survey of people. Using this alternative data, he showed that Oregon had lost 0.71 acres of farm land per new resident between 1982 and 1992, compared to only 0.63 acres per new person for Georgia, suggesting that Georgia was actually performing better in terms of farm land retention. Regarding the containment of urban sprawl, Kline showed that the population per acre of developed land had decreased by 4% in Oregon between 1982 and 1992, and 9% in Georgia. Kline also computed an additional urban sprawl indicator showing that Oregon gained 0.5 acres of developed land per new resident between 1982 and 1992 compared to one acre per new resident in Georgia. Rather than using such figures to make a case for Oregon land use planning effectiveness, Kline cautioned that such statewide indicators actually may be of little usefulness for demonstrating growth management effects. To illustrate, he computed his own indicators for 49 states (excluding Alaska) and showed that, according to the indicators, Oregon ranked just 21st at farm land retention and 11th at containing urban sprawl. Kline concluded that there are likely *several* factors at work influencing rates and patterns of land use change, none of which can be accounted for using coarse statewide indicators such as the ones he or Nelson (1999) had computed.

Econometric model-based analyses

Two studies of particular note used econometric models describing development both before and after planning implementation in an attempt to control for the confounding effects of socioeconomic and topographic factors when evaluating land use planning effects (Kline and Alig, 1999; Kline, 2005a). Kline and Alig (1999) used USDA Forest Service data describing general land use classes on private land from 1961 through 1994 to construct a probit regression model of forest and farm land development as a function of socioeconomic and topographic variables and general land use zoning over the data period. No statistically significant correlation was found between zoning and the likelihood that forest and farm lands were developed, suggesting that land use zoning had not influenced forest land development rates and patterns since their inception. Kline and Alig noted, however, the possibility that the relatively coarse spatial resolution and small sample size of plots on which development had been observed may have made it difficult to observe and measure land use planning effects with the data at hand.

In a second study, Kline (2005a) used an approach similar to Kline and Alig (1999) but with a much larger and more spatially detailed dataset developed by the aforementioned Lettman (2002). Data consisted of building (or structure) counts within 80-acre circles gathered from aerial photos taken between 1974 and 1994. The data were used to estimate a negative binomial regression model describing increases in building counts as a function of socioeconomic, topographic, and zoning variables, as well as the proximity of land to cities of varying sizes. The empirical model was then used

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to estimate the amount of forest and farm lands falling within specific building "density" ranges with and without zoning in place. Estimates suggested that by 1994, an additional 1.4% of forestland, 14.4% of agricultural land, and 5.3% of mixed forest/agricultural land that existed in 1974 would have fallen in the low-density or higher developed class had zoning not been implemented (Kline, 2005a).

Kline (2005a) arguably provides the strongest evidence that land use planning in Oregon has had a measurable effect in reducing development on lands located within forest and agricultural zones relative to lands located within urban growth boundaries and other development zones. The study also suggests that these conservation effects have been greater on farm lands than on forest lands largely owing to the greater proximity of farm lands to existing cities where development is most likely. Although far from perfect in its evaluation of planning effectiveness, as the author readily admits, the analysis provided some control for the combined effects of regional population growth, the spatial location of land relative to existing cities, and topography. Following passage of Measure 37, Kline (2005b) used his earlier (2005a) regression model to project the potential effects of land use planning in Oregon forward to 2024. Results suggested that significant conservation would result from continuation of the planning program.

Lastly, Wu and Cho (2007) examined land use change in five western states (including Oregon) between 1982 and 1997 to evaluate relationships between land use regulations and the supply of developable land. Estimates of land conversion were derived from USDA Natural Resources Inventory data with development probabilities acquired from a land use model based on socioeconomic factors and urbanization pressure. Results suggest that Oregon's land use planning program prevented 13% of the developable supply of land from being developed between 1982 and 1997. The study found that the most effective land use policies – incentive-based policies, such as tax deferrals – have reduced the supply of developable land in Oregon by 8%. Similarly, Washington's land use regulations prevented 13% of the state's developable land supply from being developed, with 9% of that reduction attributable to incentive-based policies. Results suggested that "development guidelines," including county comprehensive plans, zoning, and urban growth boundaries, accounted for only a 3% reduction in developable land supply in Oregon, and, likewise, 3% in Washington.

The case of Measure 37

Given the significant controversy in Oregon caused by the aforementioned ballot Measures 37 and 49, a few words about particularly Measure 37 are warranted. Measure 37 would have required planning jurisdictions to provide private landowners compensation for property value losses resulting from the land use planning or to remove, modify, or not apply the regulation in lieu of compensation (DLCD, 2004b). Following passage of Measure 37 and up until compensation eligibility requirements were significantly restricted by Measure 49,planning jurisdictions expended significant effort documenting and examining the influx of Measure 37 "claims" for compensation. These efforts are best exemplified by reporting and analysis by the Institute of Portland Metropolitan Studies (2006), which recorded and tracked Measure 37 claims using a geographic information system. In western Oregon, these claims ultimately comprised 518,058 acres or about 5% of private land (Institute of Portland Metropolitan Studies, 2006, p. 4). These data have inspired recent thinking about the degree to which land use planning has influenced (and prevented) forest and farm land conversion in the state.

Most notably, many observers have presumed that Measure 37 claims were indicative of a pent-up supply of land for development that was adjusting to the post-Measure 37 relaxing of land use regulations. That is, lands for which claims were submitted likely would have been developed at some time in the recent past had Oregon land use planning not been enacted. We feel, however, that the reasonableness of this presumption is debatable. Although some landowners who submitted claims likely would have developed their land sometime in the previous 30 years had land use planning not been enacted in 1973, whether all landowners who submitted claims would have done so is uncertain. Also uncertain is whether any pent up supply of land for development would have been met with sufficient demand for developable land to result in economically feasible development projects. These uncertainties owe to our inability to observe what would have happened had Oregon not implemented statewide planning. Still, observers have often noted the total area of land covered by Measure 37 claims and wondered how it might compare to the area of development avoided through planning.

Drawing on previous analysis of the forest and farm land conservation effects of the program, we examined, in a coarse way, the validity of presumptions that equate Measure 37 claims with likely development under a more lax land use planning system. Specifically, we used the econometric model projections described by Kline (2005a) to estimate the amount of forest and farmland development falling into three building density classes under two scenarios: (1) one assuming that statewide planning was enacted in 1973 and implemented; and (2) one assuming statewide planning had not been enacted and implemented. The building density categories included 0–16 buildings per square mile, 17–64 buildings per square mile, and greater than 64 buildings per square mile. The differences in the amount of development among these density categories provide some measure of the amount of development prevented on forest and farmland.

Again, western Oregon Measure 37 claims comprised 518,058 acres (Institute of Portland Metropolitan Studies, 2006, p. 4). Estimates by Kline (2005a) of 1974–2004 net changes in the areas of forest and farmland falling in the three building density classes suggest that statewide planning prevented the conversion of 66,748 acres of forest land to building densities of greater than 64 buildings per square mile; 166,495 acres for farmland and 52,826 acres for mixed forest/farmland, for a total of 285,826 acres of avoided forest and farmland development (Table 1). Similarly, estimates suggest that planning prevented the conversion of 269,195 acres of forest land to building densities of 17–64 buildings per square mile; 166,495 acres for farmland and 52,826 acres for mixed forest/farmland, for a total of 935,166 acres of avoided forest and farmland development (Table 1).

Although the areas of avoided development as described by these building density categories are not directly comparable to the areas of development intended by Measure 37 claims, the shifts of forest and farm land among building density categories resulting from planning are of a similar magnitude as Measure 37 claims. According to the estimates, planning helped to retain 1,220,992 acres of forest and farmland in the lowest building density class of 0–16 buildings per square mile. Although this is almost two and a half times the 518,058-acre area comprising Measure 37 claims, the 17–64 and greater than 64 building density categories represent fairly low development thresholds. If we think of development as that land primarily occupied by housing and other structures, the actual amount of developed area would be substantially less.

An important factor to consider when pondering the degree to which Measure 37 claims were indicative of the pent-up supply of land for development resulting from planning is that planning was

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Table 1
Estimated net changes in forest and agricultural land areas (acres) among three building density classes with and without land use planning in effect, 1974–2004.[a].

Land use	Buildings per square mile		
	0–16	17–64	>64
With land use planning			
Forest	−99,756	45,477	54,279
Agriculture	−322,403	174,384	148,019
Mixed	−59,571	16,557	43,014
Total	−481,730	236,418	245,312
Without land use planning			
Forest	−435,699	314,672	121,027
Agriculture	−1,094,882	780,368	314,514
Mixed	−172,141	76,544	95,597
Total	−1,702,722	1,171,584	531,138
Difference[b]			
Forest	335,943	−269,195	−66,748
Agriculture	772,479	−605,984	−166,495
Mixed	112,570	−59,987	−52,583
Total	1,220,992	−935,166	−285,826

[a] Estimated using the econometric model described in Kline (2005a,b).
[b] The "with" figure minus the "without" figure.

not intended to stop development nor did it do so. Rather, urban growth boundaries have always been intended to accommodate 20 years worth of new development; and, since their inception, development within those bounds has continued. Some of that development likely would have taken place without planning, largely because of its proximity to existing urban areas. What proportion of those lands addressed by Measure 37 claims might also have been developed in the absence of planning remains unknown.

Discussion and further research needs

Despite the significant interest in Oregon's land use planning program since its inception and the rather large body of research focused on weighing its effectiveness, little empirical analysis exists that has rigorously analyzed the forest and farm land conservation effects of the program. Many studies tend to be descriptive in nature, focusing on land use trends since land use planning was implemented, or comparing general land use indicators across various states or regions, for example. Although these descriptive analyses provide a story of shifting land use trends coinciding with the evolution of Oregon's land use planning program, the failure to control for the numerous socioeconomic and topographic factors that influence land use change and development confound their ability to draw meaningful conclusions about the potential causal relationships between zoning and rates and patterns of forest and farm land loss. Analyses based on econometric models arguably have gone the farthest in attempting to control for at least some of these factors, however imperfectly. The overall impression that emerges from these analyses is that Oregon's land use planning program has resulted in a measurable, if also incremental, degree of protection of forest and farm land since its full implementation in the mid-1980s.

Whether Oregon land use planning has resulted in significant conservation of forest and farm land sufficient to declare the program a success is a question that will elicit different responses from different observers. Some observers will see relatively little forest and farm land protected, while others will be more satisfied with the current situation. Recent data from the Census of Agriculture indicate that farmland acres continue to decline in the state, from 17.7 million acres in 1997 to 16.4 million acres in 2007 (US Bureau of Census, 2009). The extent to which land use planning has translated into sustained or improved farming and forestry viability remains somewhat uncertain as well, since merely protecting farm and forest land does not guarantee the continuation of commercial farming and forestry on those lands. Much has been written, for example, about the ways in which the large minimum lot sizes associated with Oregon's land use planning system may inadvertently encourage the growth of hobby farming, potentially at the expense of commercial farming. This body of literature may warrant a separate review.

In weighing the evidence to date, we must remember that Oregon land use planning was not intended to stop development, but rather to facilitate the orderly and efficient development of rural lands while protecting forest and farm lands (Knapp and Nelson, 1992; Abbott et al., 1994). Realizing measurable conservation effects from land use planning is likely a slow process involving incremental changes in land use patterns over long periods of time. Land use planners, policymakers, and the public must gauge the effectiveness of planning programs over decades rather than years, and work towards a shared understanding of what might have happened in planning's absence, and a shared vision of desired future conditions.

Future research can assist in that process if existing data resources and analytical avenues are used effectively. The following are what we see as the most promising and needed next steps:

- Greater spatial tracking and evaluation of forest and farm land lost to development to better differentiate between planned and unplanned loss, both within and outside of urban growth boundaries. Such analyses could take advantage of existing spatial data sets (e.g. Lettman, 2002, 2004) or initiate spatial analyses of lesser-used sources such as the Natural Resources Inventory. Such analyses should focus on isolating land use planning effects from socioeconomic, topographic, and other factors that also influence land use change and development.
- Greater tracking and evaluation of the *quality* of forest and farm land lost to development, based on soils and other topographic information. An important aspect of Goals 3 and 4 is the maintenance of forestry and farming viability. In this respect the quality of land is important; however it has not received much attention in past research literature. Enright et al. (2002) initiated such an effort by tabulating acreage within different soil classes both outside and within urban growth boundaries, but they did not track changes over time.
- Greater use of spatial land use data to examine both the effects of development on forestry and farming viability, and related mitigation effects resulting from land use planning. Existing forestry and farming viability studies are a first step in examining the influence of development on forestry and farming. However, future studies must try to link viability measures more directly to development and land use planning. One recent (unpublished) study by a University of Washington graduate student used a promising new method to test whether the approval and siting of dwellings in Hood River County led to decreased resource land activity on adjacent lands (Veka, 2008). Using aerial photos to locate dwellings on resource lands, Veka classified the surrounding resource uses and documented how resource use had changed between 1994 and 2005. Results showed there were no significant differences in either resource use or land conversions between areas where higher numbers of dwellings were approved on resource lands and areas where fewer numbers of dwellings were approved. In fact, there were instances where dwellings approved for resource use led to more intensive (activities requiring more investment) resource use on surrounding lands. Although this study was not statistically robust according to our review criteria, land use planners are interested in

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the potential for applying this method in other parts of the state.

- Analyses of the ways in which Oregon's land use planning program has influenced quality-of-life factors through its forest and farm land conservation effects. Most research evaluating the effectiveness of Oregon's approach has focused on maintenance of the commercial aspects of forestry and farming. The program, however, likely provides other significant benefits associated with the enhancement of water quality, scenic views, and other environmental amenities, which are also important to Oregonians and could even encourage continued in-migration to the state. The extent to which Oregon land use planning has met these more latent objectives or has led to greater in-migration largely remains unknown.

Conclusion

The existing body of research evaluating the forest and farm land conservation effects of Oregon's land use planning program suggests that the Program has resulted in a measurable degree of forest and farm land protection since its inception in 1973. Land use planning, however, is a complex multifaceted approach to forest and farm land conservation which seeks to influence rates and patterns of land use change and development through zoning and permitting processes. Its effects are largely incremental, occur over long periods of time, and are therefore difficult to measure especially in light of the many confounding factors that also influence land use change and development. For these reasons, planners and policymakers are cautioned to carefully consider both stated and unstated caveats that might or might not accompany any analysis of planning conservation effects. The body of research evaluating the forest and farm land conservation effects of Oregon land use planning represents an evolution of approaches and methods ranging from analysis of land use trends and development indicators to the use of more complex empirical techniques that attempt to account for factors other than planning that also influence land use change and development. Even so, there is significant room for continued evolution and continued refinement. In many respects, existing research regarding the forest and farm land conservation effectiveness of planning has only scratched the surface in terms of data and techniques used, leaving a variety of opportunities available for future scholars interested in examining program effectiveness in Oregon and elsewhere and comparing that effectiveness to other forest and farm land conservation approaches.

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