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**Economics at the Fringe:
Non-Market Valuation Studies and their Role in Land Use Plans in the United States**

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Abstract:

Over the past fifty years, economists have developed methods for estimating the public benefits of green spaces, allowing such information to be incorporated into land-use planning. But the extent to which it is ever used is unclear. This paper reviews the literature on public values for lands on urban outskirts, not just to survey their methods or empirical findings, but to evaluate the role they have played—or have the potential to play—in actual US land use plans.

Based on interviews with authors and representatives of land trusts and governments, it appears that academic work has had a mixed reception in the policy world. Reasons include a lack of interest in making academic work accessible to policy makers, emphasizing revealed preference methods which ignore important non-use values, and emphasizing average values over distributions of values. Nevertheless, some success stories that illustrate how such information can play a role in the design of conservation policies.

Keywords: conservation; sprawl; open space; non-market valuation; land-use planning.

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Economics at the Fringe: Non-Market Valuation Studies and their Role in Land Use Plans in the United States

H. Spencer Banzhaf

1. Introduction

Private markets are an efficient way to allocate many resources, but they can fail to take account of public benefits flowing outside market transactions. Many of the public benefits of undeveloped lands, whether natural or agricultural, share this characteristic. Remote wilderness may support biological diversity; city parks may support recreation for thousands of people. In between these two extremes, open space on the urban fringe is of particularly intense policy interest, because it provides important ecosystem services yet is under threat from sprawling cities. While rarely supporting rich biological diversity, such land can still provide habitat for endangered native flora and fauna. It can purify surface and groundwater, improve air quality, and keep the region cooler in the summer. It can provide a place for recreation. And it can provide an aesthetic view and a sense of serenity lost in city developments. In short, it can provide a wide range of important ecosystem services.¹

Accordingly, accounting for the ecosystem services of lands at the urban fringe must play a crucial role in urban planning. Over the past half century, the economics profession has developed methods for estimating these non-market benefits empirically, providing an opportunity to incorporate such information into land-use planning. However, as pointed out by Duke and Johnston (2009) and Johnston and Swallow (2006), economists and other academics are often content to disseminate their work through academic journals, which generally are inaccessible to policy makers. Accordingly, the extent to which estimated benefits ever actually are incorporated into

¹ On the concept of ecosystem services, see recent discussions in Boyd and Banzhaf (2007), Fisher et al. (2009), Turner and Daily (2008), and Wallace (2007).

local land use plans is not clear. For this reason, a recent review of the outstanding questions of greatest importance for international conservation policy highlighted the question of how such non-market values motivate policy makers (Sutherland et al., 2009).

This paper addresses just that question. It reviews the literature on the value of land on the urban fringe in the US, not just to survey their methods or empirical findings, but with a unique goal in mind: to evaluate the role they have played—or have the potential to play—in actual land use plans. Toward that end, we have contacted many of the authors, together with funding agencies and local land trusts, to discuss the studies’ goals and how they have actually been used. In this respect, this article differs from other, more extensive, reviews of values for “open space” by Bergstrom and Ready (2009), Fausold and Lillieholm (1999), McConnell and Walls (2005), and Signorello et al. (2005). Those reviews cover open space in rural areas and within the urban center, as well as on urban outskirts, but do not address the role research has played in the policy process. While those reviews will be more useful for those seeking a comprehensive discussion of non-market values for open space, this review will be of interest to economists and policy analysts interested in how their work might be used in policy-making, to land use planners interested in understanding how they might make use of economic research, and to agricultural extension workers and others bridging the gap between the two.

For tractability, the paper limits its review to the United States. This ensures that the studies are all operating within similar legal, political, and institutional contexts. The United States provides a good place to begin such an endeavor for several reasons. First, the US federal government has the longest history of incorporating formal benefit-cost analysis into public policy, a practice that dates to the 1936 Flood Control Act, which required benefit-cost analysis of water projects like dams. Concomitantly, US economists have the longest history of wrestling with

non-market valuation, dating to at least the 1940s, as they attempted to incorporate recreation and other ecosystem services into the benefits and costs of water projects. Moreover, both practices received an important boost in the 1980s, for two reasons. First, President Reagan issued an executive order requiring benefit-cost analyses of all major regulations. Second, new rules required that compensation for public damages from oil spills and other toxic releases (“Natural Resource Damage Assessments”) be consistent with economic concepts of value.

The extent to which such studies have actually influenced policy is an open question even at the federal level, and all the more so at the local level explored here.² Nevertheless, the United States is a good place to begin a study of applications to local land use planning as well. Not only does it inherit some of the benefit-cost tradition of other planning contexts, local land use plans in the US involve a mix of private and public actors, policy options, and institutions that can benefit from valuation studies. In particular, private land trusts purchase their own land and development rights, support referenda creating conservation funds, or directly lobby local governments for conservation. Local governments in turn can purchase land outright, providing public access for recreation; purchase development rights, securing other ecosystem services; or pass ordinances restricting development. The mix of services supplied by each approach typically differ, so analysis of people's priorities is useful (Johnston and Duke, 2007; Johnston et al., 2006; Nickerson and Hellerstein, 2006). In addition, this mix of actors provides a political environment in which estimates of benefits can play an important role in persuasion.

Nevertheless, it goes without saying that the question is equally relevant to other nations.

² For assessments of the role of benefit-cost analysis at the US Environmental Protection Agency, see Morgenstern (1997). Probably the most tangible effects of non-market valuation studies can be found in the realm of Natural Resource Damage Assessments, where estimated values are sometimes used in settlements. See MacNair and Desvousges (2007) and Breffle et al. (2006) for two recent examples. Both studies were the basis for a settlement over contamination of Wisconsin's Fox River.

Numerous studies of the value of landscape amenities have been conducted throughout the world. Of particular relevance is Fleischer and Tsur's (2009) recent study of the amenity values of agricultural landscapes in Israel and their role in allocating land to urban or rural uses. Other examples include Bowker and Didychuk's (1994) study of agricultural land in Eastern Canada, Mallawaarachchi et al.'s (2001) study of woodlands and wetlands in northern Australia's cane farming region, Morey et al.'s (2008) study of Sicily, and Tyrväinen's (2001) study of urban forests in Finland. As with the US studies reviewed below, these studies had mixed success in being incorporated into policy processes.³ Signorello et al. (2005) and Tuan and Lindhjem (2008) provide bibliographies for additional studies from around the world.

The United Kingdom is probably the second-most active nation in incorporating benefit-cost analysis into public policy. For example, Entec (2004) recently studied the trade-offs between ecosystem services and urban housing. More generally, Hanley (2001) documents several examples in which benefit-cost analyses were conducted as part of policy planning, but does not assess their impact. Russel and Jordan (2007) provide a particularly gloomy evaluation. Interviewing key players in UK policy circles, they find that there has been substantial ambivalence if not resistance toward benefit-cost analysis and other environmental policy appraisals within government agencies. In some sense, the following research is a complement to their review. Not only does it review the experience in the US instead of the UK, it focuses on academic research-

³ The work in Israel by Fleischer and Tsur (2009) (and Fleischer and Tsur, 2000) was presented to the Agricultural Ministry, all the ministries' general directors, and the Water Commissionaire office. Along with other non-market valuation studies, it is cited in government reports and used as one rationale for subsidizing agriculture. The work in Australia by Mallawaarachchi et al. (2001) was sponsored by Australia's Cooperative Research Centre for Sustainable Sugar Production. They gave several presentations to and wrote reports for government officials and sugar stakeholders. The work by Tyrväinen (2001) was widely discussed in Finland at the time, but does not seem to have any impact on land-use plans in the areas studied. Finally, the work by Morey et al. (2008) in Sicily and Bowker and Didychuk in Canada does not seem to have been communicated to policy makers. (This is based on personal communication

ers and their outreach, rather than the research within bureaucracies.

This paper begins by considering the reasons people may value undeveloped lands on the urban fringe and discusses which of these benefits households emphasize over other types and which are likely to be provided by various types of undeveloped land. It then surveys the various approaches to measuring those services. In Section 4, it reviews specific studies and the way they have been used in the policy process. Section 5 concludes.

2. Why do Households Value Undeveloped Lands on Urban Outskirts?

It is evident that urban and suburban households increasingly value the conservation of nearby undeveloped lands. According to data collected by the Land Trust Alliance and the Trust for Public Land, from 1999 to 2008 1210 US ballot measures won passage, some 75% of those up for vote, approving a total of \$37.8 billion for conservation.⁴

There are many good reasons households might desire conservation. Environmental economists generally divide these motivations into two categories: use values and non-use values (Freeman, 2003, Ch. 5). Loosely, use values for a resource include any reasons for valuing it that involve combining it with market activities. If open space is valued for recreation, for example, it would be combined with trips to the location. If open space is valued insofar as it provides clean air and a cooler local climate, it would only be valuable when combined with nearby residency. In these ways, use values leave behavior trails (e.g. observed trips or housing purchases). In contrast, nonuse values do not leave such trails. Nonuse values include the simple pleasure of knowing a resource exists (known as “existence values”) or altruistic values for others’ enjoyment. Many ecosystem services related to biodiversity are nonuse values. As we shall see, there is evi-

with Aliza Fleischer, Thilik Mallawaarachchi, Liisa Tyrväinen, Michael Bowker, and Giovanni Signorello).

dence that these values are the most important to people.

To investigate people's actual motives for preserving open space⁵, Kline and Wichelns (1996) presented nine potential motives to a sample of Rhode Island residents. The nine reasons, in the order that households ranked them by importance, were:

1. Protecting groundwater,
2. Protecting wildlife habitat,
3. Preserving natural places,
4. Providing local food,
5. Keeping farming as a way of life,
6. Preserving rural character,
7. Preserving scenic quality,
8. Slowing development, and
9. Providing public access.

The nine reasons might be clustered into four more general ones: environmental (1-3), agrarian (4-5), aesthetic (6-7), anti-growth (8), and recreational (9). Of these reasons, respondents clearly prioritize the environmental ones, putting all three at the top. Surprisingly, the more private reasons of aesthetics and recreation are ranked at the bottom. Interestingly, Krieger (2004) found a similar pattern for the small town of Petoskey, Michigan. There, residents ranked "environmental objectives" as the most important, with "growth management" second, agrarian third, aesthetic fourth, and, again, recreational last.

Rosenberger (1998) presented a related list to residents and tourists in Routt County, CO, home of Steamboat Springs and an important resort area experiencing pressures for development. Rosenberger's list is somewhat different, ranking not "reasons" but "assets." Again, envi-

⁴ Data are available at http://www.tpl.org/tier2_kad.cfm?folder_id=2386. Banzhaf et al. (2008), Kotchen and Powers (2006), and Nelson et al. (2007) have discussed and analyzed these referenda.

ronmental assets rise to the top over cultural and other assets. Moreover, natural assets like wild-life or forests rank higher than purely recreational asset like trails and agrarian assets like ranch-lands.

Finally, Krieger (1999) offers a fourth and very useful qualitative assessment of reasons for conserving lands. He studied the loss of farmland and open space in the Chicago metropolitan area. He offered a list of reasons for protecting farmland and, separately, more generic “open space” from development. Krieger finds that for farmland, “agrarian” reasons score much higher than either aesthetic or environmental reasons. However, for other open space, protecting wild-life habitat scores at the top, while aesthetic amenities generally score in the middle. In both cases, “public access,” a recreational amenity, again scores at or near the bottom.

Triangulating on these studies allows us to gain important insights into people's reasons for protecting lands from development. First, as shown in Krieger (1999), people correctly understand that farmland does not provide the same level of ecosystem services as other types of land cover. In the case of non-agricultural lands, ecological and environmental values do rise to the top. Moreover, Rosenberger (1998) finds that people would rank such lands above agricultural lands and urban “open spaces.” Finally, Kline and Wichelns (1996) and Krieger (2004) confirm the implication that ecological and environmental values are at the top of the list of reasons for protecting lands from development.

These results are a crucial part of the background framing the valuation studies discussed below. If they are to be believed, the results suggest that often the most useful information for policy makers will focus on ecologically valuable lands and non-use values.

⁵ Recent research has suggested that this term itself is ambiguous and has a variety of meanings to different people (Kaplan et al. 2004).

3. Empirical Methods for Measuring Non-market Values

This section briefly reviews the main methods that economists have used to estimate the values of ecosystem services and other benefits of open space. Although based on an appreciation of nature, these values are all anthropocentric, rooted in *people's* values. Book-length treatments include Champ et al. (2003), Freeman (2003), and Mäler and Vincent (2005).

3.1 Stated Preference Methods

The stated preference (SP) method uses surveys to elicit willingness to pay (WTP) from households by constructing a hypothetical scenario and "market" (see Alberini and Kahn, 2006; Bateman and Willis, 2002; Champ et al., 2003). SP surveys generally have four main steps. First, a broad policy context is set and people are asked to think about their priorities. Second, a specific policy context is set (e.g. urban sprawl) and a plan is put forth to achieve a specific objective. This plan should involve some concrete and realistic "payment vehicle" through which funds would be raised. Third, households are asked to indicate how much they are willing to pay for a program, cast a hypothetical vote in favor of or against a program, or make a choice among alternative programs. The final step is to ask various demographic and attitudinal questions of the respondents and to probe on their understanding of the information conveyed.

SP methods can be divided into two types, contingent valuation and conjoint valuation. Contingent valuation surveys describe a single scenario and program and elicit information on the support for that program. As gauges of support, open-ended questions and "payment cards," in which respondents offer their maximum WTP, have generally given way to "dichotomous choice" questions, in which respondents given a yes/no vote on a hypothetical referendum. The latter provides weaker information, but invites less room for respondents to game the price.

Conjoint valuation methods, or choice experiments, instead describe a series of programs

with differing attributes. For example, respondents might see a series of paired conservation programs, each differing with respect to the quantity of land protected, the type of land, public access, and costs. The respondents would be asked to select their preference from the pair. Repeating this exercise over many pairs, and over many respondents, public preferences for the various attributes can be inferred. Using this kind of information about attributes, analysts can repackage the attributes to evaluate many potential policies. In this way, conjoint analysis can provide richer information than contingent valuation.

Indeed, in general SP methods can provide more complete information for the policy process, relative to other valuation methods. First and foremost, they provide information on people's total values—use and non-use—because any of these types of values would be gained if the hypothetical program were to pass. Second, because they are hypothetical in nature, they can confront respondents with scenarios and tradeoffs not found in the real world, providing more variation in the data. Third, through other survey questions, they can provide a range of qualitative information about households' attitudes.

Although a source of some of its strengths, the hypothetical nature of SP methods might also be a disadvantage if there is reason to believe that words are different from deeds. To address this concern, well-designed SP surveys must be “incentive compatible.” That is, they must create a scenario in which respondents believe their responses have consequences and their incentive is to reveal their true values (see Carson and Groves, 2007). Dichotomous choice (yes/no) votes are generally viewed as more reliable than open-ended queries about values.

3.2 Hedonic and Residential Choice Methods

Nevertheless, some economists prefer so-called revealed preference methods because they infer people's values from their actual behavior in linked markets and activities. The hedon-

ic pricing method is one such revealed preference method. It is based on the premise that market prices for a property are related to its attributes (see Freeman, 2003 Ch. 11, and Palmquist, 2005). For instance, of two *otherwise identical* houses in otherwise identical neighborhoods, we would expect the one with more pleasant surrounding land uses to have a higher value. Land-use-related attributes may include proximity to a park, forest, or farmland; unblocked views of greenery; temperature and quality of the air, etc. When all these and other housing attributes vary simultaneously, the importance of each can be inferred using a multiple regression of property values on the various attributes.

Any reason for valuing undeveloped lands that can be enjoyed by living near them can be captured by the hedonic method. For example, a beautiful view or convenient access to nature trails are fundamentally spatial: they can be obtained only by purchasing houses that have them. Demand is higher for houses with a good view, which bids up the price. Moreover, the value of the view can be compared to the values of other attributes, allowing for a relative comparison of land types. In this respect, the hedonic method is similar to conjoint methods which also are based on attributes.

Unfortunately, nonuse values cannot be measured with hedonic regressions. For example, people may value the preservation of an endangered species like the spotted owl for purposes of genetic diversity, but not for bird watching. But the existence of the genetic diversity—unlike a good view—is the same wherever one lives. Thus, there is no reason to buy land near the spotted owl, and no mechanism to bid up prices.

The hedonic method also raises several statistical issues. First, the regression of prices on attributes indicates only households' marginal WTP for a small increase in an attribute. Unlike SP methods, it does not indicate their total WTP for large changes. In principle, a second stage

can be used to infer these total values from data across multiple markets, but the statistical challenges in this additional step are steep. In our review, we focus only on the first-stage marginal values for undeveloped lands for nearby property values. Second, recent work (e.g. Irwin, 2002; Irwin and Bockstael, 2001) has emphasized the spatial correlation between prices even after accounting for observed attributes. It also accounts for the fact that land may be undeveloped because its unobserved quality is poor. If ignored, this correlation would bias estimates of open space downward. The most reliable studies take account of these issues.

3.3 The Travel Cost Method

The travel cost method provides a way to measure values for outdoor recreation (Freeman, 2003, Ch. 13). One of the earliest forms of non-market valuation, the method infers values for recreational lands based on how far people are willing to travel to use them: higher-quality resources attract more people and from greater distances. The trade-off people make between travel costs and the quality of the lands and waters can provide an estimate of value. The travel cost method has been used in many policy contexts, but only rarely for managing lands on the rural-urban fringe.

3.4 The Benefit Transfer Method

The so-called "benefit transfer method" is not actually an independent way to estimate values, but rather an organized way to use information gathered from other methods in one context for policy questions in a different context (Desvousges et al., 1998; Navrud and Ready, 2007; Rosenberger and Loomis, 2003). "Aggregate transfers" involve the transferring of an estimate of benefits: i.e., estimated public benefits for plat A are used to infer the benefits for a similar plat B. Disaggregate transfers, or "integrated assessments", involve transferring a series of scientific and economic relationships, linked together. The Urban Ecological Analyses popular-

ized by the US Forest Service are an example of the latter. In this case, to estimate a value of a particular forest, information established from other studies about the relationship between tree cover and air pollution and water run-off is used to estimate those relationships for the forest of interest. Information on the values of the associated reductions in pollution, again estimated in different contexts, is then linked in. The product of the two is the transferred value.

Both aggregate and disaggregate transfers involve two key judgments on the part of analysts. First, they must choose which original studies, or combinations of studies, to transfer. A single study, simple average of studies, or meta-analysis of studies may be used. On one hand, basing a transfer on more studies makes use of more information; on the other, selecting one or a few studies which best fit the new context may keep the information more relevant. Second, the analysis must decide whether to transfer the original estimate without any adjustment, to make judgmental adjustments based on qualitative differences, or to transfer functional relationships that take account of observable differences in the two contexts statistically. These analytical decisions make transfers an art and science in their own right, just like original research.

4. Review of Studies of Public Values for Undeveloped Lands on Urban Outskirts.

Having introduced these methods, we now turn to a review of specific studies that have estimated values for undeveloped lands. The review proceeded by searching bibliographic data bases for non-market valuation studies of open space in the US since 1990, then by searching the bibliographies of those studies. Studies are only included in the review if they examine lands at the rural-urban fringe. The review is organized by the studies' methodological approaches.

4.1 Stated Preference Studies

As part of the qualitative work of Rosenberger (1998) described above, Rosenberger and Walsh (1997) studied residents' values for preserving ranchland in the Yampa River Valley in

Routt County, Colorado. The area lost approximately 20% of its valley ranchland between 1990 and 1995. These lands are used primarily for grazing, but provide important habitat for elk and migratory birds, and serve as a riparian buffer for the Yampa River. In response to this development, the County Board of Commissioners, the Governor, and other groups such as The Nature Conservancy have attempted to preserve land through zoning, regulation, and purchases. Tourist industries, such as the ski resorts, also supported the conservation as a way to improve their amenities and to restrict competition.

Rosenberger and Walsh elicited WTP, in the form of higher taxes, for a county protection program. Respondents were asked to specify their preferred level of protection (25% to 100% of the County's ranchland) and then were asked their WTP for that level. Their estimated WTP values, extrapolated to all the households in Routt County, imply a total value of about \$50 per acre—not enough to justify large purchases on benefit-cost grounds.

In a companion study of tourists, Rosenberger and Loomis (1999) used the travel cost method to estimate how much tourists were willing to pay for trips to the area, supplemented with “contingent behavior” data from surveys on how their travel patterns would change if all the ranch open space were developed, including tourist-related development. The vast majority of tourists stated that the aesthetic contribution of the ranchlands was an important part of their trip. According to the published study, replacing ranchland with tourist infrastructure would not lead to a decrease in trips; however, an unpublished analysis of a larger sample found that trips would decline if ranchland were lost.⁶

Interestingly, it is a colleague of these authors, C.J. Mucklow, who stands in a particularly unique position to bring this research into the policy process. Not only is he the director of

⁶ Personal communication with Randall Rosenberger. See also Routt County Extension Office (undated).

agricultural extension in the county, he also has helped advise the county's conservation programs and serves on the board of directors of the Colorado Cattleman's Agricultural Land Trust. With Mucklow's help, these studies were introduced into the policy process in a number of ways, including a special extension bulletin circulated among stakeholders, a public workshop, numerous meetings with land trusts and other stakeholders, and participation in the county's annual economic summit. Despite the fact that values were generally small relative to land prices, insofar as residents were willing to pay something and insofar as tourism was likely to be negatively impacted, the work was viewed as supporting conservation. In 1995, the work was referenced in new land-use planning rules (the "Open Lands Plan"). This plan declared that a farming or ranching operation could not be deemed a nuisance (or tort), and established Land Preservation Subdivision Regulations that encouraged clustering of new homes and preservation of remaining parcels with agricultural and/or ecological values. In 1997, citizens further approved a Purchase of Development Rights tax that averages \$20 per property per year.⁷ The program continues to be funded, and follow-up studies have confirmed the continuing benefits of the program (Magnan et al., 2005; Ellingson et al., 2006). The follow-up study of residents reported that 90% of residents would vote for conservation, in addition to estimating a mean willingness to pay of \$220 per resident to preserve ranchlands.

In a study undertaken not far away, in the town of Loveland in Larimer County, Colorado, Loomis et al. (1999) elicited household WTP, through sales taxes, for a program that would protect open space through land purchases. They estimated that households were willing to spend an average of \$108 for recreation lands or \$116 for nature lands, per year for ten years. The most

⁷ Personal communications with Randall Rosenberger and C.J. Mucklow. See also Colorado State University (2002). The county's conservation policies and the role of economic analysis in shaping them have also been discussed in Shutkin (2001, Ch. 6) and Living on Earth (1998).

natural interpretation of this study is that households were willing to contribute up to \$116, on average, to conservation, given the cost of land in the area. The study was presented to a local land commission, who designed a 2003 conservation ballot initiative.⁸ Unfortunately, the initiative did not seem to follow the research findings closely enough, for it asked for \$6m in funds, or \$162 for every adult in Loveland. This expenditure is clearly higher than the estimated average preferred contribution, and probably higher still than the median, the level which would garner a 50% approval. Not surprisingly, then, the initiative lost, receiving only 43% of the vote.⁹

Kerri Rollins, one of the authors of this study, now works for Larimer County. According to her, based in part on this experience the county now uses more qualitative survey methods. In particular, they have tried to gauge approval for various levels of open space protection (from modest to ambitious), preferences for conservation easements (which would protect wildlife habitat) versus fee-simple purchases (which would also allow public access for recreation), and interest in wilderness and recreation. For example, a 2001 survey found that households particularly prioritize lands with public access and would support 55% of land being protected with fee simple purchases, despite the added cost (Larimer County 2001). This work has been used to create a master plan for Larimer County, Colorado, that would follow a 50/50 balance between conservation easements and purchases and prioritizes recreation possibilities.¹⁰

As part of his own qualitative work described above, Krieger (1999) studied the WTP of Chicago-area residents to stem the loss of farmland and other undeveloped lands. From 1982 to 1992, 15% and 8% of land in Kane and McHenry counties, respectively, was converted from ag-

⁸ Personal communication with Kerri Rollins.

⁹ An alternative interpretation of the study's results is that households were will to pay \$116 on average for a fixed level of acreage. Under this interpretation, if the ballot initiative failed because conservation costs were higher than WTP, it would be a perfectly satisfactory outcome from a planning perspective.

riculture to other uses, while 61% and 64% remained agricultural. Krieger found that about 76% of respondents were willing to support an open space program at a cost of \$5 per year, for five years, to protect 20,000 acres of farmland in their county. Fifty-seven percent supported it at a cost of \$100 per year, and 45 percent supported it at a cost of \$170 per year.

Commissioned by American Farmland Trust's Center for Agriculture in the Environment, this work was communicated, via a large press conference, to media reaching millions of people. For example, the results were reported in the *Chicago Tribune*, the city's major newspaper (e.g. Starks, 1999). American Farmland Trust had created stakeholder committees which have used the report to lobby local county boards. These, in turn, have had some success in advocating conservation, with both counties passing conservation measures.¹¹ The information about how much people were willing to pay, but also the qualitative information which showed people ranked open space as a top issue, were especially persuasive in these outcomes.¹²

Krieger (2004) also studied WTP values in his work in Petoskey, MI, a city of about 14,000 people on Lake Michigan. Although small, Petoskey's population had grown nearly 20 percent from 1990 to 2000 and its housing units grew by 24 percent, while it lost agricultural and forest lands. The City of Petoskey and two neighboring townships created a Land Conservancy Task Force, which included the mayor as well as local citizens, to write an ordinance for purchasing development rights, which would qualify the area for state matching grants for conservation.

¹⁰ See Larimer County (2001). Additional (and more recent) plans for specific portions of the county are available at <http://www.co.larimer.co.us/planning/planning/>.

¹¹ In 2005, Kane County voters approved \$75m in conservation funds. In 2006, McHenry County's board created its Farmland Protection Commission with the power to purchase conservation easements. Moreover, one of the goals of McHenry County's draft "2030 Comprehensive Plan," is to recognize the cultural, social, recreational, conservation, economic, environmental and aesthetic benefits provided by agricultural use (McHenry County 2009).

¹² Personal communication with Ann Sorenson, Assistant Vice President for Research, American Farmland Trust.

They commissioned the work of Krieger (2004) in support of this process.

The task force's interest was not in average benefits per se, that is, not in the usual information required for a benefit-cost analysis. Rather, it was interested in information on whether there was support for a property tax millage to fund the purchase of development rights. But when the payment vehicle of the SP survey is a property tax, that is precisely the information that a traditional contingent valuation study provides. About 65% of households supported the millage if it cost their household \$4 per year, with support dropping steadily to a 50% if it cost \$105 per year. These results were presented to the task force and presented at a “reasonably well attended” public meeting. Despite the initial interest and the supporting data however, a lack of leadership seems to have stalled the program.¹³

In another SP study, Breffle et al. (1998) elicited responses from residents of a Boulder neighborhood about their WTP to preserve the Cunningham property, a 5.5 acre parcel slated for development. Bordering other protected lands abutting the foothills of the Rocky Mountains, the property provided some wildlife habitat. It also provided views of mountains and “unofficial access” to a path and additional open space. Breffle et al. surveyed residents within one mile of the property. The average one-time WTP for preservation of the land was \$294, giving a neighborhood-wide value of about \$750 000. Like Krieger (1999, 2004), Breffle et al. also report the distribution of benefits. They found that median WTP was 20% lower than mean WTP, and that 15% of the sample had no values for the open space. They also reported that values were much higher closer to the property.

The report was sent to the city council and was received by the Mayor of Boulder, and information was given to the Cunningham Coalition, a neighborhood group. Because of this study

¹³ Personal communication with Douglas Krieger.

and other factors, the City of Boulder decided that annexing the property was not in the best interest of the community, ending all plans for a housing development. Meanwhile, the coalition's attempt to purchase the property in cooperation with another buyer who would erect one modest home was delayed due to difficulties with the financing. Ironically, the developer sold the property to another buyer who intended to build one home—but a home with a pool, tennis court, artificial ponds, golf greens, expansive lawns, and a tall iron fence. While development was limited to one house, these modifications obviously were not consistent with the coalition's original vision of preservation.¹⁴ This story is a cautionary one: even when the information is there to persuade the public and public decision-makers, other resources have to be available to follow through with conservation.

A final SP study was conducted by Johnston and Duke (2007). Unlike the applications reviewed above, Johnston and Duke did not study a specific community, but rather surveyed households in a number of Connecticut and Delaware communities facing development pressures. They exploited the ability of conjoint techniques to estimate the values residents have for different kinds of land (cropland, forest land) with different levels of recreational access. Moreover, they extended this idea to estimating people's values for the *method of preserving* land (outright purchase or conservation easements, each by private land trusts or governments, or zoning laws). They found that households were indeed willing to pay to conserve open space, and that they especially valued recreation access, but did not seem to care about the type of land. Interestingly, Johnston and Duke also found that people had strong preferences over the method of preservation. In particular, they seemed to have more faith in governments than land trusts. They also expressed strong preferences for conservation easements over outright purchases, and

¹⁴ Personal communication with Edward Morey.

either over zoning rules. As the authors note, these preferences may suggest tastes for limited government per se, with easements being the least heavy-handed and zoning connotating the taking of property rights. Alternatively, they may reflect inferences about the true level of protection, with respondents reacting to the fact that zoning rules are reversible.

Johnston and Duke have taken the time to communicate this work into the policy process in a number of ways. They have issued reports written to be accessible to the public (e.g. Duke et al., 2007) and met with conservation organizations (e.g. Working Lands Alliance, American Farmland Trust), quasi-governmental conservation agencies, legislators, and general-interest groups (e.g. the League of Women Voters). Joshua Duke himself has served on the Newcastle County Farmland Advisory Committee, and in this position was able to steer conservation priorities to the types of land their research suggested was most valuable.¹⁵

Other recent SP studies of the value of undeveloped lands on urban outskirts have not been well incorporated into the policy process, including such work as Kaoru (1993) on wetlands on Martha's Vineyard, Ready et al. (1997) on Kentucky horse farms, and Roe et al. (2004).¹⁶ Roe et al. provide an especially promising study in Columbus, Ohio. Like Johnston and Duke (2007), they estimate a conjoint model over a neighborhood's characteristics, including the extent to which its surrounding lands were in agriculture and permanently preserved agriculture. They find that households do value agricultural land, especially when it is permanently protected. They also find that values for additional protection increase when agricultural lands become scarcer, and that other open spaces, such as parks, may substitute for the services provided by farmland.

Although such SP research has the advantage of capturing nonuse values, evidence of

¹⁵ Personal communication with Joshua Duke and Robert Johnston. The authors discuss their views on the importance of outreach in Duke and Johnston (2009).

“real” wealth and income, as incorporated into land values and tourism incomes, can be persuasive as well, as shown in the experience of Rosenberger and Loomis (1999). The next sections turn to additional studies of such effects.

4.2 Hedonic Pricing Studies

Hedonic studies are second to SP studies in popularity for open space valuation, but they are far less likely to be communicated into the policy process. To our knowledge, the only hedonic study accompanied by a substantial outreach effort is Ready and Abdalla (2005). They study lands at the rural-urban fringe in Berks County, Pennsylvania. Berks County has been losing population in its largest city, Reading, but has experienced sprawl in rural and suburban areas, partly driven by nearby Philadelphia. At the same time, it has a very active conservation program, leading the nation in acres of farmland conserved and ranking third in the nation for overall open space conserved. After Ready and Abdalla had begun their work, a local advocacy group, Citizens for Pennsylvania’s Future, funded additional research into the effect of disamenities like landfills and concentrated animal feeding operations.

This study gives great care to issues of spatial correlation in the statistical analysis, as well as to the fact that unobserved factors that affect land prices also affect the probability that land remains undeveloped (tricky problems statistically). They conclude that forested open space is the most valuable type of land to have nearby a residential home. However, they found that it is only marginally preferable to other low-density residential properties. Commercial and industrial areas are clearly less preferred. Ready and Abdalla also found that nearby landfills and animal production facilities are important disamenities, decreasing property values by 12% and 6% respectively at a distance of one-half kilometer.

¹⁶ Personal communication with Glenn Blomquist, Yoshiaki Kaoru, Richard Ready, and Elena Irwin. The Ready et al. study was presented to some local audiences, including the Chamber of Commerce.

Ready and Abdalla, with help from others, did a number of things to introduce their findings into policy making. They created a webpage (landuse.aers.psu.edu) and wrote a non-technical report posted there. They also presented their work to planning staff, county commissioners, and the general public. They spoke with reporters. Finally, both their college and Citizens for Pennsylvania's Future distributed press releases, and an article in the local paper (Lockhart 2003) was picked up by other regional papers. The media particularly emphasized the effects of disamenities like landfills and animal farms. Although the work received a lot of attention, there is no clear way to trace its impact on actual policy developments.¹⁷

Bowman et al. (2009) compared residential subdivisions in Cedar Rapids, Iowa, with and without embedded conservation features like protected meadows, forests, and streams. Interestingly, they use both hedonic and contingent valuation methods. They found that 66% of SP respondents were willing to pay some amount to get their preferred level of open space and that 46% were willing to pay the suggested sum of \$2000. In their hedonic analysis, they found that a one acre increase in the subdivision's open space would increase property values by \$241 on average. They also found substantial differences in the types of conservation features, with protected streams having very large values (increasing property values by 9.6%) and forests having negative values.

This study illustrates the strengths of the various methods, including the ability to project stated public support at various cost levels, the verified tangible values in home prices, and the analysis of specific conservation attributes. Its authors worked with city officials from the outset and provided common-language reports to reach out to those officials and to the public.¹⁸ Unfortunately, they did not use best practices in all respects, making use of open-ended SP data and

¹⁷ Personal correspondence with Richard Ready.

ignoring some of the statistical issues in hedonics discussed above.

Other prominent hedonic studies in the literature do not seem to have been communicated into the policy process in any substantial way.¹⁹ This is surprising, because hedonic studies provide important real-world market tests of the hypothesis that households value open space. Moreover, they do so by linking open space amenities to real estate prices, which are an important driver in local politics and a common indicator of local economic health. Indeed, increasing land values through a decrease in the supply of land may be one motivation for conservation (Fischel, 2001). Whether through supply restrictions or amenity effects, the fiscal effect of this price appreciation on the property tax base is also important (Geoghegan et al., 2006). Hedonic studies would be helpful from all of these perspectives.

In addition, like conjoint studies, hedonic studies can yield important insights into people's preferences over kinds of open space and the best ways to protect it. For example, consider the carefully conducted work by Irwin (2002) on the effects of open space on residential property values in Maryland. She found that significant additional benefits are derived from moving from developable open spaces to permanently conserved open spaces. This suggests that households value undeveloped lands, not just for their current use, but also for the expected use of the open space over the long term. This finding has been observed in other work as well, including the Roe et al. (2004) conjoint study noted above. It has also been found for forest lands in Grand Rapids, Michigan (Thorsnes, 2002) and in open spaces in Maryland (Geoghegan, 2002 and Ge-

¹⁸ Personal communication with Jan Thompson.

¹⁹ Personal communication with Jacqueline Geoghegan, Elena Irwin, Kerry Smith, Paul Thorsnes, and Randall Walsh. Thorsnes (2002), discussed below, is perhaps an exception. This is not to say hedonics and property value studies have not been incorporated into other policy contexts. See for example Wilde (2009) on their use in toxic tortes cases.

oghegan et al. 2006).²⁰ However, not all studies have supported this hypothesis. Ready and Abdalla (2005) found in their study in Pennsylvania that permanently protected open space was no more valuable than other open space. Smith et al. (2002) found that being closer to public open spaces appeared detrimental to property values in their study of Raleigh, NC.

Hedonic studies generally can capture local aesthetic amenities, but remain more attractive to academic economists and have not been widely disseminated into policy debates. This may be because they cannot capture nonuse values like biological diversity. Nevertheless, given their other advantages, they are an underutilized resource for policy-makers.

4.3 Benefits Transfer Studies

Stated preference and hedonic studies are by far the most common ways to estimate benefits for open spaces. However, sometimes analysts have used benefit transfer methods to apply such estimates to new policy contexts. In an example of such an application, Kiker and Hodges (2002) estimate the economic benefits of natural lands in Northeast Florida, including Jacksonville. Twenty-three percent of this area is developed, with the remainder consisting of roughly equal parts agricultural lands, wetlands, and natural forest. The authors combine together the value added from agriculture and forestry, an estimate of expenditures on recreation and consumer surplus from recreation. Furthermore, Kiker and Hodges transfer benefits from a study by Ready et al. (1997) of Kentucky horse farms as a way to estimate aesthetic amenities provided by the lands.²¹ The estimated total value is \$2.6 billion per year. Since the market expenditures represent costs or are already captured in land values, the aesthetic and recreation surplus values

²⁰ The work by Thorsnes (2002) is perhaps the next-best candidate for a hedonic study communicated into the policy process. He produces a common-language report and spoke to two community groups (personal communication with Paul Thorsnes).

²¹ One might question the applicability of values for horse farms, which occupy relatively little land but form an important part of Kentucky's character, to all agricultural land in northeastern Florida. However, they do adjust the Ready et al. estimate to only 10 percent of their per-acre value.

totaling \$1.8 billion might be considered a better value for some purposes.

Kroeger (2005) extends Kiker and Hodges's study to a broader range of ecosystem services. He inventories the region's ecosystems, categorizing them into 15 types, from freshwater marshes to forest to brushland. Values for each of 11 services, including water regulation, water supply, habitat, and so forth, for each of these lands, are then transferred from Costanza et al. (1997) and the US Forest Service (2000). In this way, Kroeger estimates that the total economic value of the ecosystem services in the four-county area amounts to approximately \$3.2 billion annually.

The transferred Costanza et al. study is controversial and has been criticized by some economists for not sufficiently accounting for income constraints, with total WTP exceeding world income (Bockstael et al. 2000). Although not all economists would accept the validity of its estimates, the study provides an excellent example of the way such research can guide policy. Defenders of Wildlife repackaged the results of the Kiker and Hodges study in a shorter report called *Investing in Nature*, intended to bring the issue of the economic contribution of natural areas to the public. These materials in turn helped shape major amendments to Florida's Growth Management Act, which the Florida legislature made in 2005. The new provisions encourage local governments to adopt urban service boundaries, steer development to infill, and require a full cost accounting analysis for development projects for any new development outside the urban services boundary. As Defenders interprets it, this would require accounting for ecosystem services. Thus, such analyses would ensure that conservation and natural lands benefits are evaluated when rezoning and changing land use designations. Furthermore, Defenders of Wildlife obtained a commitment from the bill's sponsor to make the economic value of conservation lands

a subject for study.²²

A second example of a transfer study is an approach known as Urban Ecological Analysis (UEA), developed by the US Forest Service to quantify the value of urban trees. Trees provide ecosystem services like groundwater recharge, floodwater management, and filtration of pollutants. To estimate these service flows, the Forest Service has developed the Urban Forest Effects model. From inputs about a city's trees in a base period, the model estimates the composition of tree sizes and species over time. The model then estimates the effect of the trees on reducing air pollution, pollen, and energy use over time. Finally, it uses cost-avoidance techniques to calculate the value of these effects. The basic architecture of UEA is in the form of an integrated assessment benefits transfer, and would be fully consistent with best benefit-cost practices if it used WTP instead of cost-avoidance as its measure of benefits. Adapting the approach in this way would provide better estimates of actual benefits.²³

As an example, McPhearson et al. (1997) studied tree cover in Chicago. They found the region's trees remove an estimated 5575 metric tons of air pollution annually at a value of \$9.2 million, and sequester an estimated 315 800 metric tons of carbon. Increasing tree cover 10% would result in savings of \$50 to \$90 per household in annual heating and cooling costs. The estimated present value of a tree's services is \$621, nearly three times costs.

To make their research more accessible to the general public, USDA researchers have created a website overviewing the method, providing case studies, and giving tips for how communities can utilize it (www.ufore.org). In addition, the conservation organization American

²² Personal communication with Laurie McDonald of Defenders of Wildlife. For more on the changes to the Growth Management Act, known as SB 360, see Rhodes (2005).

²³ For example, just because the cost of removing dust (were trees not available to remove it) is estimated at such-and-such an amount, does not indicate that people actually benefit from its removal by that amount.

Forests is building a user-friendly desktop model for planners across the country (see www.americanforests.org). The Trust for Public Lands has used this model to value urban parks (Harnik and Welle, 2009) and some cities have used UEAs to help manage their undeveloped lands. For example, Roanoke, Virginia, conducted a UEA in 1998 in partnership with American Forests. As a result of the analysis, more effort is being put into protecting urban trees and green cover. American Forests has also updated its model to allow Roanoke's forestry division to conduct similar analysis on smaller tracts of land.²⁴

Before using UEA in land use planning, it must be emphasized that it captures only the direct services of tree cover to people in the form of values for air quality, water quality, and cooling. It does not capture ecosystem services related to biodiversity, recreation, or aesthetics. Moreover, because it values only tree cover, in some cases it could lead to perverse findings if not interpreted with care. Much of the undeveloped land around urban areas is agriculture or pastureland. As a result, development may well increase the canopy if trees are planted in backyards and along streets. In this case, if other values of undeveloped, but unforested, lands were not accounted for, development would appear to increase ecosystem services. This cautionary note is not meant as a criticism of UEA, but to note that, as with all analyses, its findings must be interpreted appropriately.

4.4 Other Studies

Several other studies and reports, which do not fit neatly into the above categories, have played a prominent role in the wider literature on land conservation and in the public square. One such study is the Sonoran Institute's report on "Prosperity in the 21st Century West" (Rasker et al., 2004a,b). The report estimates the relationship between local income growth and local de-

²⁴ Personal communication with Forestry Division, Roanoke, VA.

mographics, geography, accessibility, and land uses. It finds that some Western communities are benefiting from their public lands, but that not all benefit equally. Those with the most accessible amenities (e.g., near an airport) and with more educated workforces benefit the most. In contrast, communities dependent upon resource extraction industries have the slowest long-term growth rates. This report is not a true measure of economic *benefits*, but rather economic impacts on income. The distinction is important because some of the revenues measured in such impact studies do not represent new wealth, but rather transfers of wealth from other locations. Nevertheless, such impacts may better reflect the interests of local governments.

According to Dr Rasker, the study's primary author, the report has caught the attention of policy makers, public land managers and advocacy groups. It has circulated widely, with a 30-page popular version disseminated to over 3000 groups and individuals. In co-operation with the US Bureau of Land Management, The Sonoran Institute has also developed the Economic Profile System (EPS) an automated system to create custom socio-economic profiles for communities in the West. The EPS is available on the institute's website, and the institute conducts training workshops to allow communities to conduct their own economic analysis (see eps.sonoran.org). The Institute has also incorporated the *Prosperity* report in all of the field-level trainings conducted for the Bureau of Land Management.

Not unlike hedonic studies, which identify effects of conservation on land values, this report, by emphasizing economic development, has the potential to appeal to greens and green eyeshaders alike. However, the authors of this report have shown more interest and savvy in incorporating it into the policy process. One particularly important step is the creation of literature for a policy-making audience.

Such literature need not be restricted to a single study. Even a well-crafted overview of

previous findings can influence policy. One prominent example is the ECONorthwest report on “Economic Benefits of Protecting Natural Resources in the Sonoran Desert” (2002).²⁵ The document was commissioned by the Coalition for Sonoran Desert Preservation, an umbrella organization for neighborhood and environmental groups in Pima County, Arizona. The report lists the various benefits of natural resources and provides illustrative economic values based on primary studies. It reviews SP studies for intrinsic values in the Southwest, studies of recreational tourism revenues to proxy for recreational values, and hedonic studies. The report has the flavor of a benefits transfer, but as the authors acknowledge stops short of tailoring these values to the Sonoran Desert. The authors conclude that conservation of the Sonoran Desert would yield substantial economic benefits, which should receive full consideration in policy-making, but that continued research is warranted.

This report has been influential in a public campaign to conserve natural habitat in the Tucson area. While ECONorthwest did not publicize their research, the Coalition issued a press release, and its members met with the editorial boards of local papers, wrote guest editorials, and appeared on local television and radio programs. This launch was followed by a presentation of the paper to the Pima County Board of Supervisors, the steering committee for the Conservation Plan, as well as a large open community forum.²⁶ “We felt it was important to explain that people had heard a lot about the costs of protecting undeveloped areas around Tucson, but not enough about the benefits,” says Susan Shobe, assistant director of the Coalition. “The paper was credible and helpful because it came from an independent research organization that had sup-

²⁵ Another is Fausold and Lillieholm (1996). Issued by the Lincoln Institute of Land Policy, the report was commissioned by the Boston Foundation. It reviews the services provided by open space, and has circulated widely among city officials, planners, and academics (personal correspondence with Robert Lillieholm).

²⁶ Personal communications with Kristin Lee, research analyst at ECONorthwest, and Susan Shobe, assistant director of the Coalition for Sonoran Desert Protection, to Stan Wellborn (RFF).

ported its findings with solid data.” It also made clear that preserving land would enhance tourism values and other benefits.

Pima County held a referendum for a land conservation program in May 2004. The referendum was successful, passing with approximately 67 percent of the vote. It designated \$112 million specifically for a “Habitat Protection Priorities” program, for purchase of lands identified as ecologically sensitive by the Sonoran Desert Conservation Project, plus \$63 million for “community open space.” The county has already spent over \$31 million to acquire about 20 000 acres of land, and has obtained the grazing leases for another 75 000 acres of State Trust Lands. The ECONorthwest paper clearly was a prime factor in the overall process, not only in passing the referendum but in steering protection efforts toward ecologically sensitive lands.

5. Conclusions

There are many reasons for protecting undeveloped lands on urban outskirts, including the ecological, aesthetic, and recreational. Information about these values can help stakeholders persuade decision makers to protect lands. It can also play a vital role in prioritize lands to target and in shaping strategies to protect them. Nevertheless, this review suggests four ways that research on values for open space at the urban fringe fails to connect cleanly with the activities of stakeholders and policymakers.

First, there is some tension between the priority households place on ecological conservation, such as protecting habitat and water quality, and the typical emphasis of land trusts on agricultural lands. Under the right circumstances, preserving agricultural lands can yield ecosystem services related to water quality and air quality, but usually not related to habitat (with the possible exception of rangelands). Even with respect to water quality, agriculture can be a source of soil erosion and organic pollution. Accordingly, land trusts might consider revising their practic-

es in response to such input. For example, research by ECONorthwest (2002), which emphasized the ecosystem services of the Sonoran Desert near Tucson, has helped shape conservation initiatives in the direction of those services.

At the same time, the public's ecological motives are also inconsistent with the research strategies of economists and others, much of which employs property value methods that cannot recover such non-use values. The emphasis on hedonic studies may follow from the fact that the observed outcomes in housing markets seem more “real” to many economists than the hypothetical questions associated with SP. Without doubt, there are certainly cases where property value studies are appropriate, but analysts should be sure before proceeding with them that their benefits estimates will not miss half the point of conservation.

Third, when policy analysts do use property value studies, they generally provide information only on marginal values for various types of open space. Yet policy makers interested in maximizing land values (and their tax base) may be more interested in the total capitalization effect of conservation. This information is usually computable from a hedonic model, but is rarely reported (Geoghegan et al., 2006, is an exception).

A final way that the economic literature is somewhat disconnected from the needs of stakeholders and policy-makers is its emphasis on average or total WTP. This is the type of information typically used in benefit-cost analysis, the decision-making paradigm that economists are used to. But while benefit-cost decision rules are central in economic theory and in US federal regulations, they are not as important in the mind of local leaders monitoring political support. Often of more interest would be the *distribution* of values in the public. Breffle et al. (1998) identify which demographics groups have the highest WTP for preservation in their application, information which would allow decision-makers and stakeholders to identify constituencies and

coalitions. Breffle et al. and Krieger (1999, 2005) also provide distributional information that would allow policy-makers to gauge the level of political support associated with various conservation programs ranging across the scale from modest to ambitious. The failed conservation referendum in Loveland, CO, illustrates the peril of ignoring such information. That referendum sought more money than a recent study (Loomis et al., 1999) had suggested had support, and lost with only 43% of the vote.

For all these reasons, economic studies of the values of preserving lands on the urban fringe have had a mixed impact on the formation of policy in the US, and the experience of a smaller sample suggests the same is true world-wide. Not surprisingly, academic studies focused on using the latest economic and statistical methods have generally not been communicated into the policy process. Research by academics at US land grant universities (with a tradition of policy outreach), on the other hand, is more likely to be communicated to local stakeholders, often with the assistance of staff in extension offices. Naturally, so are studies directly commissioned by land trusts. Fortunately, a “secondary market” for valuation studies of preserved lands has developed. ECONorthwest (2002) and Fausold and Lillieholm (1996) are some of the most cited and most influential reports on the value of preserving lands, but were not original research. Rather, they summarized the literature and packaged it for a popular audience.

Of course, only the style, not the fundamental content, can be repackaged. With respect to the content of their research, economists are continuing to advance the ball. For example, they are giving more care to spatial connections between land uses at different places and even different points in time (Irwin and Bockstael, 2001; Irwin, 2002; Ready and Abdalla, 2005; Riddel, 2001). Even more recently, they are using equilibrium approaches that model, simultaneously, effects throughout the urban landscape, allowing forecasts of the impacts of land use changes at

one place on other places (Walsh, 2007; Wu and Cho, 2003). However, this review suggests that if these developments are to have a real impact on local land use policy, we must learn, not only how to advance the ball, but how better to pass it forward to policymakers.

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References

- Alberini, A., Kahn, J.R. (eds.), 2006. *Handbook on Contingent Valuation*. Elgar, Cheltenham, UK.
- Banzhaf, H.S., Oates, W.E., Sanchirico, J.N., 2008. The Conservation Movement: Success through the Selection and Design of Local Referenda. Working Paper.
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1247903.
- Bateman, I.J., Willis, K.G. (eds.), 2002. *Valuing Environmental Preferences: Theory and Practice of the Contingent Valuation Method in the US, EU, and Developing Countries*. Oxford University Press, Oxford.
- Bergstrom, J.C., Ready, R.C., 2009. What have we learned from Over 20 Years of Farmland Amenity Valuation Research in North America? *Review of Agricultural Economics* 31, 21-49.
- Bockstael, N.E., Freeman, A.M., Kopp, R.J., Portney, P.R., Smith, V.K., 2000. On Valuing Nature. *Journal of Environmental Science and Technology* 34, 1384-89.
- Bowker, J.M., and D.D. Didychuk. 1994. Estimation of the Nonmarket Benefits of Agricultural Land Retention in Eastern Canada. *Agricultural and Resource Economics Review* 23, 218-25.
- Bowman, T., Thompson, J., Colletti, J., 2009. Valuation of Open Space and Conservation Features in Residential Subdivisions. *Journal of Environmental Management* 90, 321-30.
- Boyd, J., Banzhaf, H.S., 2007. What are Ecosystem Services? The Need for Standardized Environmental Accounting Units. *Ecological Economics* 63, 616-26.
- Breffle, W.S., Morey, E.R., Lodder, T.S., 1998. Using Contingent Valuation to Estimate a Neighborhood's Willingness to Pay to Preserve Undeveloped Land. *Urban Studies* 35, 15-727.
- Breffle, W.S., Morey, E.R., Rowe, R.D., Waldman, D.M., 2006. Combining Stated Choice and Stated Frequency Data with Observed Behavior to Value NRDA Compensable Damages: Green Bay, PCBs, and Fish consumption Advisories, in: Alberini, A., Kahn, J.R. (eds.), *Handbook on Contingent Valuation*, Elgar, Cheltenham, UK.
- Carson, R.T., Groves, T., 2007. Incentive and Informational Properties of Preference Questions. *Environmental and Resource Economics* 37, 181-210.
- Champ, P.A., Boyle, K.J., Brown, T.C. (eds.), 2003. *A Primer on Non-Market Valuation*. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Colorado State University, 2002. Ranching and Conservation in Routt County, Colorado. Mimeo. Routt County Cooperative Extension, Steamboat Springs, CO.
- Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P., van den Belt, M., 1997. The value of the world's ecosystem services and natural capital. *Nature* 387, 253-60.
- Desvousges, W.H., Johnson, F.R., Banzhaf, H.S., 1998. *Environmental Policy Analysis with Limited Information: Principles and Applications of the Transfer Method*. Edward Elgar, Cheltenham, UK.

- Duke, J.M., Johnston, R.J., 2009. Nonmarket Valuation of Multifunctional Farm and Forest Preservation, in: Goetz, S.J., Brouwer, F. (eds.), *New Perspectives on Agri-Environmental Policies: A Multidisciplinary and Transatlantic Approach*. Routledge, London, forthcoming.
- Duke, J.M., Johnston, R.J., Campson, T.W., 2007. Preserving Farms and Forests in Sussex County, Delaware: Public Value. FREC Research Report RR07-02.
- ECONorthwest, 2002. *The Economic Benefits of Protecting Natural Resources in the Sonoran Desert*. Report prepared for the coalition for Sonoran Desert Protection. Eugene, OR.
- Ellingson, L., Seidle, A., Mucklow, C.J., 2006. Tourists' Value of Routt County's Working Landscape, 2005. Colorado State University Extension Economic Development Report 06-07. <http://dare.colostate.edu/pubs/edr06-07.pdf>.
- Entec UK, 2004. *Study into the Environmental Impacts of Increasing the Supply of Housing in the UK*. Report for the Department for Environment, Food, and Rural Affairs. <https://statistics.defra.gov.uk/esg/reports/housing/default.asp>.
- Fausold, C., Lillieholm, R., 1996. *The Economic Value of Open Space: A Review and Synthesis*. Lincoln Institute of Land Policy Research Paper WP96CF1.
- Fausold, C., Lillieholm, R., 1999. The Economic Value of Open Space: A review and Synthesis. *Environmental Management* 23, 307-20.
- Fischel, W.A., 2001. *The Homevoter Hypothesis*. Harvard University Press, Cambridge, MA.
- Fisher, B., Turner, R.K., Morling, P., 2009. Defining and Classifying Ecosystem Services for Decision-Making. *Ecological Economics* 68, 643-53.
- Fleischer, A., Tsur, Y., 2000. Measuring the Recreational Values of Agricultural Landscape. *European Review of Agricultural Economics* 27, 385-98.
- Fleischer, A., Tsur, Y., 2009. The Amenity Value of Agricultural Landscape and Rural-Urban Land Allocation. *Journal of Agricultural Economics* 60, 132-53.
- Freeman, A.M., III, 2003. *The Measurement of Environmental and Resource Values*. Resources for the Future, Washington, DC.
- Geoghegan, J., 2002. The value of open spaces in residential land use. *Land Use Policy* 19, 91-8.
- Geoghegan, J., Lynch, L., Bucholtz, S., 2006. Are Agricultural Land Programs Self-Financing? In: Johnston, F.J., Swallow, S.K. (eds.), *Economics and Contemporary Land Use Policy: Development and Conservation at the Rural-Urban Fringe*. Resources for the Future, Washington, DC, pp. 149-69.
- Hanley, N., 2001. Cost-Benefit Analysis and Environmental Policymaking. *Environment and Planning C* 19, 103-18.
- Harnik, P., Welle, B., 2009. Measuring the Economic Value of a City Park System. http://www.tpl.org/content_documents/ccpe_econvalueparks_rpt.pdf.
- Irwin, E., 2002. The Effects of Open Space on Residential Property Values. *Land Economics* 78, 465-80.

- Irwin, E.G., Bockstael, N.E., 2001. The Problem of Identifying Land Use Spillovers: Measuring the Effects of Open Space on Residential Property Values. *American Journal of Agricultural Economics* 83, 698-704.
- Johnston, R.J., Duke, J.M., 2007. Willingness to Pay for Agricultural Land Preservation and Policy Process Attributes: Does the Method Matter? *American Journal of Agricultural Economics* 89, 1098-1115.
- Johnston, R.J., Swallow, S.K., 2006. Introduction: Economics and Contemporary Land Use Policy, in: R.J. Johnston and S.K. Swallow (eds.), *Economics and Contemporary Land Use Policy: Development and Conservation at the Rural-Urban Fringe*. Resources for the Future, Washington, DC.
- Johnston, R.J., Swallow, S.K., Bauer, D.M., Philo, L.D., 2006. "Support for Conservation Policies and Values for Conservation: Are they Related?," in: Johnston, F.J., Swallow, S.K. (eds.), *Economics and Contemporary Land Use Policy: Development and Conservation at the Rural-Urban Fringe*. Resources for the Future, Washington, DC, pp. 237-66.
- Kaoru, Y., 1993. Differentiating Use and Nonuse Values for Coastal Pond Water Quality Improvements. *Environmental and Resource Economics* 3, 487-94.
- Kaplan, R., Austin, M.E., Kaplan, S., 2004. Open Space Communities: Resident Perceptions, Nature Benefits, and Problems with Terminology. *Journal of the American Planning Association* 70, 300-12.
- Kiker, C.F., Hodges, A.W., 2002. *Economic Benefits of Natural Land Conservation: Case Study of Northeast Florida*. Final Report for Defenders of Wildlife. University of Florida, Institute of Food and Agricultural Sciences, Gainesville, FL.
- Kline, J., Wichelns, D., 1996. Public Preferences Regarding the Goals of Farmland Preservation Programs. *Land Economics* 72, 538-49.
- Krieger, D.J., 1999. *Saving Open Spaces Public Support for Farmland Protection*. Report prepared for Center For Agriculture in the Environment.
- Krieger, D.J., 2004. *Public Preferences for Undeveloped Land in the Petoskey Area*. Report prepared for the Petoskey Area Open Space Task Force.
- Kotchen, M.J., Powers, S.M., 2006. Explaining the Appearance and Success of Voter Referenda for Open Space Conservation. *Journal of Environmental Economics and Management* 52, 373-90.
- Kroeger, T., 2005. *The Economic Value of Ecosystem Services in Four Counties in Northeastern Florida*. Companion report to the Kiker and Hodges (2002). Defenders of Wildlife, Washington, DC.
- Larimer County, 2001. *Larimer County Open Lands Master Plan*.
http://www.co.larimer.co.us/naturalresources/openlands/master_plan.pdf
- Living on Earth, 1998. Western Sprawl Alternative, Feb 6.
<http://www.loe.org/shows/shows.htm?programID=98-P13-00006#feature2>
- Loomis, J, Trainer, K., Brown, T., 1999. Trichotomous Choice: A Possible Solution to Dual Response

- Objectives in Dichotomous Choice Contingent Valuation Questions. *Journal of Agricultural and Resource Economics* 24, 572-83.
- MacNair, D.J., Desvousges, W.H., 2007. The Economics of Fish Consumption Advisories. *Land Economics* 83, 600-16.
- Magnan, N., Seidl, A., Mucklow, C.J., Alpe, D., 2005. The Societal Value of Ranchlands to Routt County Residents, 1995-2005. Colorado State University Extension Economic Development Report 05-01. <http://dare.colostate.edu/pubs/edr05-01.pdf>.
- Mäler, K.-G., Vincent, J.R. (eds.), 2005. *Handbook of Environmental Economics, Vol. II: Valuing Environmental Changes*. Elsevier, Amsterdam.
- Mallawaarachchi, T., Blamey, R.K., Morrison, M.D., Johnson, A.K.L., Bennett, J.W., 2001. Community Values for Environmental Protection in a Cane Farming Catchment in Northern Australia. *Journal of Environmental Management* 62, 301-16.
- McConnell, V., Walls, M., 2005. *The Value of Open Space: Evidence from Studies of Nonmarket Benefits*. Resources for the Future, Washington, DC.
- McHenry County, 2009. *2030 Comprehensive Plan*. <http://www.mchenrycounty2030plan.com/goalsandobjectives/index.htm>
- McPhearson, G., Nowak, D., Heisler, G., Grimmond, S., Souch, C., Grant, R., Rowan, R., 1997. Quantifying Urban Forest Structure, Function, and Value. *Urban Ecosystems* 1, 49-61.
- Morey, E.R., Thiene, M., De Salvo, M., Signorello, G., 2008. Using Attitudinal Data to Identify Latent Classes that vary in their Preference for Landscape Preservation. *Ecological Economics* 63, 536-46.
- Morgenstern, R.D. (ed.), 1997. *Economic Analysis at EPA: Assessing Regulatory Impact*. Resources for the Future, Washington, DC.
- Navrud, S. Ready, R., (eds.), 2007. *Environmental Values Transfer: Issues and Methods*. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Nelson, E., Uwasu, M., and Polasky, S., 2007. Voting on Open Space: What explains the appearance and support of municipal-level open space conservation referenda in the United States. *Ecological Economics*. 62, 580-593.
- Nickerson, C.J., Hellerstein, D.M., 2006. Farmland Preservation Programs and the Importance of Rural Amenities, in: Johnston, F.J., Swallow, S.K. (eds.), *Economics and Contemporary Land Use Policy: Development and Conservation at the Rural-Urban Fringe*. Resources for the Future, Washington, DC, pp. 217-236.
- Palmquist, R.B., 2005. Property Value Models, in: K.-G. Mäler and J.R. Vincent (eds.), *Handbook of Environmental Economics, Vol. II*. North-Holland, Amsterdam.
- Rasker, R., Alexander, B., van den Noort, J., Carter, R., 2004a. *Public Lands Conservation and Economic Well-Being*. Sonoran Institute, Tucson, AZ.

- Rasker, R., Alexander, B., van den Noort, J., Carter, R., 2004b. *Prosperity in the 21st Century West: the Role of Protected Public Lands*. Sonoran Institute, Tucson, AZ.
- Ready, R.C., Abdalla, C.W., 2005. The Amenity and Disamenity Impacts of Agriculture: Estimates from a Hedonic Pricing Model. *American Journal of Agricultural Economics* 87, 314-26.
- Ready, R.C., Berger, M.C., Blomquist, G.C., 1997. Measuring Amenity Benefits from Farmland: Hedonic Pricing vs. Contingent Valuation. *Growth and Change* 28, 438-58.
- Rhodes, R., 2005. The New Growth Management Legislation and what it Means for You. Urban Land Institute. July 29. <http://commerce.uli.org/AM/Template.cfm?Section=Home&CONTENTID=30574&TEMPLATE=/CM/ContentDisplay.cfm>
- Riddel, M., 2001. A Dynamic Approach to Estimating Hedonic Prices for Environmental Goods: An Application to Open Space Purchase. *Land Economics* 77, 494-512.
- Rosenberger, R.S., 1998. Public Preferences Regarding the Goals of Farmland Preservation Programs: Comment. *Land Economics* 74, 557-65.
- Rosenberger, R.S., Loomis, J.B., 1999. The Value of Ranch Open Space to Tourists: Combing Observed and Contingent Behavior Data. *Growth and Change* 30, 366-83.
- Rosenberger, R.S., Loomis, J.B., 2003. Benefit Transfer: in Champ, P.A., Boyle, K.J., Brown T.C. (eds.), *A Primer on Non-Market Valuation*. Kluwer Academic Publishers, Dordrecht, The Netherlands, pp. 445-82.
- Rosenberger, R.S., Walsh, R.G., 1997. Nonmarket Value of Western Valley Ranchland using Contingent Valuation. *Journal of Agricultural and Resource Economics* 22, 296-309.
- Roe, B., Irwin, E.G., Morrow-Jones, H.A., 2004. The Effects of Farmland, Farmland Preservation, and other Neighborhood Amenities on Housing Values and Residential Growth. *Land Economics* 80, 55-75.
- Routt County Extension Office, [Undated]. Recreation Value of Ranch Open Space Survey Summary. Mimeo.
- Russel, D., and A. Jordan. 2007. Gearing-up Governance for Sustainable Development: Patterns of Policy Appraisal in UK Central Government. *Journal of Environmental Planning and Management* 50, 1-21.
- Shutkin, W.A., 2001. *The Land that Could Be: Environmentalism and Democracy in the Twenty-first Century*. MIT Press, Cambridge, MA.
- Signorello G., Missiato, A., De Salvo, M., 2005. The economic valuation of landscape. An annotated bibliography. ENVALAB working paper, Laboratorio di Valutazione Ambientale (ENVALAB), Dipartimento di Scienze Economico-Agrarie ed Estimative, Università degli Studi di Catania.
- Smith, V. K., Poulos, C., Kim, H., 2002. Treating Open Space as an Urban Amenity. *Resource and Energy Economics* 24, 107-29.
- Starks, C., 1999. Buying the Farm: Collar County Residents Say they would Pay to keep Sprawl at Bay. *Chicago Tribune*, July 18th, p. 9K.

- Sutherland, W.J., and 43 others, 2009. One Hundred Questions of Importance to the Conservation of Global Biological Diversity. *Conservation Biology* 23, 557-67.
- Thorsnes, P., 2002. The Value of a Suburban Forest Preserve: Estimates from Sales of Vacant Residential Building Lots. *Land Economics* 78, 426-41.
- Tuan, T.H., Lindhjem, H., 2008. Meta-Analysis of Nature Conservation Values in Asia and Oceania. http://mpra.ub.uni-muenchen.de/11470/1/MPRA_paper_11470.pdf.
- Turner, R.K., Daily, G.C., 2008. The Ecosystem Services Framework and Natural Capital Conservation. *Environmental and Resource Economics* 39, 25-35.
- Tyrväinen, L., 2001. Economic Valuation of Urban Forest Benefits in Finland. *Journal of Environmental Management* 62, 75-92.
- U.S. Forest Service, 2000. *Water and the Forest Service*. FS660. Washington, DC.
- Walsh, R.P., 2007. Analyzing Open Space Policies in a Locational Equilibrium Model with Endogenous Landscape Amenities. *Journal of Urban Economics* 61, 319-44.
- Wallace, K.J., 2007. Classification of Ecosystem Services: Problems and Solutions. *Biology Conservation* 39, 235-46.
- Wilde, L., 2009. Keeping the Gate: Damages Testimony in Cases Alleging Property Value Diminution Due to Contamination. *Toxics Law Reporter*, Feb. 2, pp. 1-16.
- Wu, J., Cho, S.-H., 2003. Estimating Households' Preferences for Environmental Amenities Using Equilibrium Models of Local Jurisdictions. *Scottish Journal of Political Economy* 50, 189-206.