EVALUATING THE ECONOMIC IMPACT OF COMMUNITY OPEN SPACE AND URBAN FORESTS: A LITERATURE REVIEW

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1. Introduction

A host of ecological, public health, and economic growth benefits of preserving open space were cited by former Governor Barnes and the Georgia legislature in enacting the Georgia Community Greenspace Program in 2000¹. Tax assessors in several Georgia communities have subsequently raised concerns regarding the effect the protection of open space has on local governments' revenue generation. The issue is important since ad valorem property tax is the primary source of revenue for Georgia's counties, cities, and school districts. This paper explores the fiscal impact of open space protection by examining the relationship of open spaces to surrounding parcels. Specifically, this paper reviews the latest research on the influence of open space on neighboring property values using the hedonic pricing approach.

2. AD VALOREM REVENUE GENERATION IN GEORGIA

Each community's Board of Tax Assessors establishes their city or county's tax digest, the total assessed value of all real and private property. In Georgia, taxable property is assessed at 40 percent of its fair market value². The amount of revenue that is generated in each taxing jurisdiction is equal to the value of the digest times the millage rate. The millage rate is determined for each taxing jurisdiction by the city council or the county commission, who are often loath to raise the rate for fear of voter backlash. Therefore a potential change to the value of the tax digest is an important issue for Georgia counties. Tax assessors believe the protection of open space will significantly lower this value because the protected property may be removed from the tax digest when it is transferred into public ownership or its taxable value is reduced when the landowner reduces its development potential through a conservation easement³.

Concern with the fiscal impact of preserving open space may be due in part to the "hit" that local counties took on the value of their tax digest after the adoption of the Conservation Use Valuation Assessment (CUVA) program in 1991. This program is designed to keep farmers farming instead of selling out to developers by providing them with a property tax break. Working farms are assessed on their current use versus the land's highest and best use (e.g., fair market value) which often means development. Current use assessment is often a fraction of the property's fair market value. The amount of potential tax loss is dependent on the level of development pressure in the taxing jurisdiction. Therefore, counties experiencing strong residential and commercial development may face the greatest fiscal impact. In 2002, the amount of assessed value

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¹ The Georgia Greenspace program, which provided state funds for local greenspace protection was initiated under Governor Barnes and has been discontinued as a result of budget constraints. Current Governor Sonny Perdue is pursuing his own open space protection initiative entitled the Georgia Land Conservation Partnership Plan.

² Exceptions to this assessment protocol include tangible real property that is devoted to agricultural purposes or conservation uses, qualifies as rehabilitated historic property, or is located in a transitional developing area.

³ Property that is held by a public entity is not subject to ad valorem taxes. The fair market value of property protected by a conservation easement is often reduced due to the severance of the development rights.

removed from Georgia digests as a result of parcels enrolled in CUVA was \$3.56 billion dollars, which is equivalent to \$90.1 million dollars in direct revenue loss (Georgia Department of Revenue, 2004). Some tax assessors fear the state's support for open space protection will result in another substantial reduction in the tax base.

Numerous studies have shown, however, that protection of open space does not simply result in a revenue write-off for counties. In fact, in most cases, the protection of open space results in an increase in value of residential properties in close proximity. This added value increases the value of the county digest, partially offsetting the loss in property tax revenue from the actual land that is protected.

The issue of potential negative economic impacts is not limited to the protection of open space. Georgia's Planning Act requires local governments to produce a Comprehensive Land Use Plan that involves, among other things, producing current and future land use maps. Counties are encouraged in this process to account for their natural resources including management, protection, and future demand. To help meet their natural resource goals, local governments may encourage voluntary efforts such as donation of a conservation easement and/or enact regulations to, for example, protect tree canopy, riparian buffers, and groundwater recharge areas. In some cases, businesses and citizens have claimed these standards impose an undue economic hardship.

Local government officials, ranging from commission and council members, planners, tax assessors, managers, greenspace coordinators, to parks and recreation administrators are continually weighing the tradeoffs between development and preservation. This group has little information on the cost and benefits of open space preservation programs and ordinances that protect the county's natural resources. Therefore, the goal of this literature review is to provide a synthesis of the most recent research on the economic valuation of open spaces and community forests in a format that is easily accessible to decision makers.

The focus of this project was to review research completed within the last five years. Articles were collected from peer-reviewed journals as well as non-peer reviewed (grey) literature. Studies were limited to those that used the hedonic pricing approach to estimate the value of protecting open space and community forests. In conducting this review, studies were sought that specifically quantified the economic benefits of trees. However, studies on the effect of open space on property values were far more numerous. These later studies serve as a good proxy for the value of community forests because the protection of open space, in almost all cases, protects trees. This report is structured as follows. Section 3 presents a discussion of the various approaches to the valuation of nonmarket goods and services. Section 4 describes the literature that was reviewed for this study and Section 5 summarizes the findings of these various studies and their relevance to policy decisions.

3. THE ECONOMIC APPROACH TO VALUATION

The challenge in seeking information on the cost and benefits of open space protection is that the services provided by open space are not traded in markets. Economists have developed several valuation techniques to quantify the value that society assigns to these services. The three broad methodological approaches that are used are revealed willingness-to-pay, expressed willingness-to-pay, and derived willingness-to-pay.

Revealed willingness-to-pay studies rely on the actual price paid for marketed goods that have quantifiable levels of an associated environmental attribute. The hedonic pricing approach is an example of a revealed willingness-to-pay study. A dataset consisting of home sales price, characteristics of each house, lot, and neighborhood plus information on the environmental attribute being valued, such as open space, is used. For example, controlling for differences in the house, the lot, and its location, the differences in sale price can be ascribed to differences in the size or type of open space or proximity to it.

Hedonic pricing studies capture the value of the environmental attribute that is capitalized in the price of the house and lot. These studies are able to estimate the "private" benefits of open space. Benefits from preserving open spaces that provide services more akin to "public goods" such as flood control, improved water and air quality, and wildlife habitat, are typically not captured by this method. Therefore the true social value of open space will often be greater than the value estimated by this method.

The advantage of this method over others is its use of actual market transactions versus hypothetical questionnaires or indirect assessments. Contingent valuation studies ask individuals, in carefully crafted questionnaires involving hypothetical scenarios, what they would be willing to pay for open space. These types of studies capture social preferences; however, they are controversial in that the survey participants are not spending their own, actual money and may, therefore overstate their willingness to pay. Derived willingness-to-pay studies essentially estimate the benefit of prevention. The method begins with assuming what might occur if a particular service was no longer available and then estimates the cost of the event occurring. For example, this estimate places a lower bound on the service's value. It is a highly speculative estimate and only capable of capturing services that can be substituted by engineered solutions.

4. THE EFFECTS OF COMMUNITY OPEN SPACE & FORESTS ON PROPERTY VALUES

Since the first application of the hedonic pricing approach to the valuation of environmental goods and services, there has been a proliferation of studies on the effects of open space on property values. Over this 30-year period researchers have refined the technique, improving the robustness of the results. The development of GIS techniques has also contributed greatly to this effort by allowing researchers to tackle the effects of geospatially-distributed attributes in the housing market. This review of the last five years' worth of hedonic studies shows the ubiquitous application of GIS in this field. The review is broken down into the following categories: studies that primarily addressed the impact of varying type and size of open space, proximity, development potential, the

pattern and/or type of land cover, and economic status of the area being studied. Studies were assigned to a specific section based on the stated objective(s) of the authors. Some studies fit into more than one category.

Type and size of publicly-owned open space

One study addresses the issue of the amenity effects of open space that provide specific uses. Using sales transactions from the metropolitan area of Portland, Oregon, Lutzenhiser & Netusil (2001) look at the impact of several different types of open space, namely parks, golf courses and cemeteries, on property values. The authors divide the generic term "park" into three categories, urban park, natural area park, and specialty park/facility, as defined in table 1. Natural area parks are found to have the largest statistically significant influence. On average, homes within 1,500 feet of a natural area park are estimated to sell for \$10,648 more than homes outside the 1,500-foot buffer. Also statistically significant in influencing sale prices upwards are golf courses (\$8,849), specialty parks/facilities (\$5,657), and urban parks (\$1,214). Proximity to cemeteries does not show a statistically significant effect on a home's sale price.

Table 1. Definition of Open Space Categories (Lutzenhiser & Netusil, 2001)

Open Space Type	Definition		
Urban park	More than 50 percent of the park is manicured or landscaped		
	and developed for nonnatural resource dependent recreation		
	(e.g., swimming pools, ball fields, and sports courts.		
Natural area park	More than 50 percent of the park is preserved in native and/or		
	natural vegetation. Park use is balanced between preservation		
	of natural habitat and natural resource-based recreation (e.g.,		
	hiking wildlife viewing, boating, camping). This definition		
	includes parcels managed for habitat protection only, with no		
	public access or improvements.		
Specialty park/facility	Primarily one use at the park and everything in the park is		
	related to the specialty category (e.g. boat ramp facilities).		

The authors use a quadratic form for the acreage variable allowing them to calculate the area of open space that would maximize the amenity effect on a home within 1,500 feet of the open space. Natural area parks are estimated to maximize sale price at 258 acres, golf courses at 169 acres, urban parks at 148 acres, and specialty parks/facilities at 112 acres (see table 2). Interestingly, the size of specialty parks, urban parks, and natural areas within the study area are well below the acreage that could maximize the enhancement value. For instance, the average size of specialty parks is 7.21 acres as opposed to the estimated optimal 112 acres. The average size of golf courses in the study area, 169 acres, is equivalent to the acreage that would maximize enhancement value.

Table 2. Type of open space and the enhancement value for properties within 1,500 feet

	Dollar value	Mean open space	Acreage that
Open Space Type	estimate (1990)	acreage	max value
Urban park	\$1,214	19.89	148
Natural area park	\$10,648	78.21	258
Specialty park	\$5,657	7.21	112
Golf course	\$8,849	168.81	169
Cemetery	ns	110.93	ns

Note: ns – not significant at the 0.10 level

Condition of Open Space

The appearance of open space can determine the level of amenity effects derived from it. This is true for private lots as well as publicly owned parks. The amenity effects associated with open space as a function of appearance is addressed in two studies in this section.

Thompson, et al. (1999) estimate the effect of forest health on property value in an urbanizing area of Lake Tahoe Basin. The health of privately owned forests in this area is in decline due to fire exclusion and the outbreak of disease and insects. Because property values are primarily driven by views in the basin, the preponderance of unhealthy and therefore unattractive forests is negatively affecting property values. The authors find that a thinning prescription of 40 percent adds one to three percent to property values. If thinning reduces the number of infested trees, then values can be enhanced an additional five to as much as 30 percent. The authors note that it is reasonable to attribute part of the enhancement value to a reduction in fire risk.

Choosing small and medium-sized neighborhood parks in Greenville, South Carolina, Espey and Owusu-Edusei (2001) find that the appearance of the park influences the effect on neighboring residential property values. The authors group the parks into four categories based on size and appearance: small and attractive, small and basic, medium and attractive, and medium and basic. The small, basic parks are characterized as having some playground equipment in a sandy area along with a small grassy area that is not well kept. The authors note that even though the parks appear to be regularly maintained, they are not particularly attractive. The small, attractive parks are generally appealing and had some playground equipment. The attractive, medium sized parks provide walking trails and natural areas and vary in the types of amenities available (baseball fields, tennis courts and playgrounds), whereas the basic, medium parks have fewer amenities and no natural areas. The small, attractive parks have a positive and statistically significant influence on neighboring property values and the medium, attractive parks exhibit a positive but not statistically significant effect on residential property values. Both the small and medium basic parks are found to have a negative and statistically significant impact on neighboring property values.

Proximity to open space

In general, open space is an amenity and, as such, has a positive influence on property values. But how far does this effect reach? Do homes within a short distance (one block) experience negative externalities such as noise and congestion that override the amenity value of the open space? The three studies presented in this section examine these questions.

In Athens, Georgia, Nelson et al. (2002) investigate the effect of a 690-acre wildlife sanctuary and riverine trail system on the value of neighboring parcels. The authors find a positive and statistically significant effect on sales price due to the presence of the park. Properties adjacent to the open space are estimated to sell for approximately \$7,400 more than homes more than 3,000 feet away. The statistically significant and positive influence on sale price reaches as far as 1,500 feet from the open space compared to homes more than 3,000 feet from the park (see table 3a).

Aggregating public and private parks, golf courses, and cemeteries into one open space variable, Bolitzer & Netusil (2000) find a positive but not statistically significant effect on the sale price of homes adjacent to (within 100 feet of) open space in Portland, Oregon. At distances greater than 100 feet and up to 1,500 feet from open space, homes are found to sell for a statistically significant greater price than homes more than 1,500 feet from an open space (see table 3b).

Also using sales data from the Portland metropolitan area, Lutzenhiser & Netusil (2001) consider the effect of specific open space types as a function of distance. They find a positive and statistically significant influence for all the open space types considered except cemeteries. Their model includes urban parks, natural area parks, specialty parks, golf courses, cemeteries, and seven distance categories. Natural area parks are found, uniquely, to provide a positive and statistically significant effect on homes up to 1,500 feet from these areas. The other open space types, while also exerting a positive influence on sale price, do not exhibit the same extent and magnitude of influence as natural area parks (see table 3c).

Neither of the two Portland studies shows a statistically significant negative impact on property values as a result of properties being adjacent to open space. The estimated coefficient on the distance variable that represented homes that are very close (one-half block) to open space in Bolitzer & Netusil's (2000) study is positive but statistically insignificant. The authors reason that it might be a result of both amenity effects and negative externalities being present for these homes. Lutzenhiser and Netusil (2001) find a statistically significant increase in sale price for homes within a block (200 feet or less) showing that, in this case, there is not a significant negative externality from noise or congestion due to proximity. While properties adjacent to open space in the Athens, Georgia study experience statistically significant amenity effects, the open space is quite large and accessed from only two points. Therefore, neighboring properties that are not close to the entrance locations do not experience noise or congestion from visitors to the park.

Table 3a. Distance to open space (wildlife sanctuary) and the estimated effect on property values (Nelson, et al., 2002)

	Dollar value estimate	
Distance (feet)	(2001)	
Adjacent	\$7,402	
Less than 500 ¹	ns	
501 to 1,000	\$5,332	
1,001 to 1,500	\$8,573	
1,501 to 3,000	ns	

Table 3b. Distance to open space (generic) and the estimated effect on property values (Bolitzer & Netusil, 2000)

Distance (feet)	Dollar value estimate (1990)	Percent change estimate	
0 to 100	ns	ns	
101 to 400	\$2,755	4.09	
401 to 700	\$1,983	2.96	
701 to 1,000	\$1,522	2.28	
1,001 to 1,300	\$1,455	2.18	
1,301 to 1,500	\$1,004	1.51	

Note: ns = not significant at the 0.10 level

Table 3c. Distance to open space type and the estimated effect on property values (Lutzenhiser & Netusil, 2001)

	Dollar value estimate (1990)			
Distance (feet)	Urban Park	Natural Area Park	Golf Course	Specialty Park
<200	\$1,926	\$11,210	\$13,916	\$7,396
201 to 400	\$2,061	\$10,216	\$7,851	\$5,744
401 to 600	\$1,193	\$12,621	ns	\$10,283
601 to 800	ns	\$11,269	\$8,842	\$5,661
801 to 1,000	ns	\$8,981	\$8,898	\$4,972
1,001 to 1,200	\$1,691	\$8,126	\$4,391	\$4,561
1,201 to 1,500	ns	\$9,980	\$4,366	\$3,839

Note: ns=not significant at the 0.10 level

Note: ns = not significant at the 0.10 level ¹ Less than 500 feet from the park but not adjacent.

Development potential: "Developable" vs. Preserved

It is reasonable to assume that the amenity values that are associated with open space may vary depending on the development potential of the open space. In other words, buyers of property in close proximity to open space may consider permanently protected open space as more valuable than open space that can be developed sometime in the future. The four studies reviewed in this section test this hypothesis.

Focusing on a rapidly developing suburban county of Washington DC and Baltimore, Maryland, Geoghagen (2002) considers the amenity effects of developable versus permanent open space. Using sales transactions from 1993 to 1996, the study shows that permanently preserved open space increases nearby residential property values over three times more than open space that could be developed at some point in the future.

Also focusing on suburban and exurban communities in Maryland, Irwin (2002) distinguishes open space by land ownership (private versus publicly held), and land use type (cropland, pasture and forest that are developable) as well as development potential. Irwin finds that the conversion of one acre of developable pastureland to privately owned conservation land within a parcel's neighborhood⁴ increases the parcel's estimated value by \$3,307 or 1.87 percent (see table 4). Likewise, conversion of pastureland to publicly owned open space increases the neighboring parcel's value by \$994 or 0.57 percent⁵. Conversion to cropland from pastureland is not statistically significant whereas conversion of pastureland to forest is found to decrease the neighboring parcel's value by \$1,424 or 0.82 percent. The later effect may be due to timber harvest practices and the potential for negative externalitites such as noise and logging truck traffic. The overall results suggest that proximity to permanently protected open space is more highly valued than developable open space.

Table 4. Development potential and the effect on property values

				Dollar	Percent
	Development		Land	value	change
Authors	potential	Ownership	Use	estimate	estimate
Irwin	Protected	Private	Ag easements &	\$3,307	1.87
(2002)			conservation areas		
		Public	Open space	\$994	0.57
			Military	ns	ns
	Developable	Private	Forest	-\$1,424	-0.82
			Crop	ns	ns
			Pasture	(1)	(1)

Note: ns = not significant at the 0.10 level; (1) land use variables are estimated as change from pasture.

⁴ The parcel's neighborhood is defined as a 400-meter radius buffer around the parcel's center.

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Irwin makes a distinction between military and non-military land that is publicly owned because of the presence of large areas of military land including the largest contiguous area of open space (Fort Meade). The reference to publicly owned open space in this study refers to the non-military open space areas.

Smith et al. (2002) also compare the effects of open space that is permanently protected such as parks, greenways, private land with conservation easements and golf courses versus open space that may be developed sometime in the future such as privately owned vacant land and agricultural and forested land. Unique to this study is the inclusion of property designated for future development as an interstate loop highway in Northern Wake County, North Carolina, a suburban area just north of Raleigh and close to the Research Triangle area. The planning for the right-of-way corridor began in 1972 and was formalized in 1978 (Smith et al., 2002). The loop road is being completed in sections with the first section being opened in 1997. The study area consists of a 29-mile segment of the interstate loop that is 3 miles wide. The estimation of amenity effects is conducted for properties that sold between 1995 and 1998.

They find that private vacant land acts as an open space amenity, homes that are adjacent to this land command a statistically significant higher price than homes further away. Proximity to privately owned agricultural and forested land, on the other hand, has a negative impact on property value. The authors believe this result reflects buyers' suspicion regarding future changes to land use that would make living nearby less desirable. The authors argue the difference between the two results is a function of parcel size. Agricultural and forested lands tend to be larger and, thus, in comparison to smaller parcels of vacant land, their conversion would lead to more dramatic changes in a given area.

Contrary to expectation, Smith et al. find a negative relationship between permanently protected open space and property values. The authors research the possibility of the existence of land uses that would result in negative externalities, such as landfills or airports that would override the amenity benefits typically associated with open space. Their investigation finds no evidence to support this hypothesis. To shed some light on their unexpected results, the authors reference a study in Seoul, South Korea where density of urban areas is thought to affect the amenity value of a greenbelt area (Lee and Linneman, 1998). Lee and Linneman suggest that when urban expansion is held up by the greenbelt, the associated congestion effects result in a downward shift in the amenity effects of the open space.

The results of Smith, et al. suggest the linear distance to open space as an explanatory variable in hedonic pricing studies is insufficient when the study area consists of a complex and dense mosaic of land uses. The authors acknowledge the need for hedonic pricing studies to "consider the full pattern of land uses as determinants of site values." The importance of estimating open space amenity effects as a function of land use pattern is addressed in the next section.

Pattern of Land Use

The issue of scale and pattern in land use is quickly becoming an important area of study in hedonic analysis for several reasons. For instance, the cost of providing basic public services such as water, sewer, police and fire protection, and busing school children is inherently dependent on their spatial distribution. The provision of ecological services such as water purification, flood control, groundwater recharge, and wildlife habitat is

also dependent on the pattern of land use. The distribution and size of relatively undisturbed land dictates the ability of that land to provide these ecological services. Our quality of life, argue Geoghegan, et al. (1997) is even tied to land use pattern. The five studies presented in this section address this issue.

Geoghegan, Wainger, and Bockstael (1997) are among the first to examine the amenity effects of landscape features on residential property values. They consider the amount of agricultural and forested lands surrounding residential properties in an exurban setting in central Maryland just outside Washington DC. Differing open space effects are found, depending on the size of the neighborhood considered. The percent of open space within a tenth of a kilometer radius positively impacts land values, but within a one-kilometer radius it negatively influences land prices. The authors interpret this result as suggesting that individuals value open space as a view from their house, but at the larger scale, individuals prefer more diverse land uses.

Second, they find that different amenity effects are a result of urban, suburban, and rural settings. For instance, landscapes that are more diverse and fragmented (e.g., lots of different land uses spread across a small area) are preferred in highly developed, almost urban, Washington DC suburbs because they translate into walkable distances to work, transit centers, shops, and schools. Remote suburbs, on the other hand, prefer less diversity and fragmentation because homeowners in these areas prefer privacy and space. In rural areas where distance to shopping centers and schools increase, diversity and fragmentation once again become valued.

Following a similar strategy as Geoghegan, et al., Acharya and Bennett (2001) estimate the effect of land use pattern on property values in the New Haven watershed in New Haven County, Connecticut. The watershed encompasses a range of development levels – rural, suburban, and urban. The authors find that spatial distribution as well as the types of land use present has statistically significant effects on property value. For instance, percent open space within a 1/4-mile and 1-mile radius has a positive and statistically significant impact on property value. The study also finds that people prefer to live in places with a lower diversity of land use in the immediate vicinity of their homes. This effect appears to be only slightly offset by the level of development in the area. In other words, regardless of location in the watershed, a more homogenous landscape is preferred in the immediate neighborhood. This finding does not necessarily contradict Geoghegan, et al. because Washington DC suburbs are highly developed compared to the development levels in the New Haven watershed.

In Berks County, Pennsylvania, Ready and Abdalla (2003) conclude that surrounding land uses have the potential to affect residential property values. Within 400 meters of a parcel, open space is the most desirable land use. Forested open space, either publicly or privately owned, had the largest amenity value, followed by grass, pasture, and crops, although the difference was not statistically significant. Permanently protected, privately owned open space covered in grass, pasture or crops has a lesser effect on property values than developable, similarly planted, open space. The authors suggest that this may be a function of the type of open space that this type of permanently protected land is

associated with (actively-farmed or productive farmland) that makes it a less desirable neighbor, rather than the fact that it is encumbered by a conservation easement. Privately owned, vacant land is estimated to have a negative effect although it is not statistically different than an industrial land use.

Nelson, et al. (2004) find that the pattern as well as composition of forest cover influence house prices in Fulton County, Georgia. The authors evaluated landscape pattern at three scales using 0.1, 0.25, and 1.0-mile buffers that represent the homeowner's yard, block, and neighborhood, respectively. Homeowners in this area prefer hardwoods to pines in their yard with the trees dispersed rather than aggregated in one area. Within their block, homeowners like a mixture of hardwoods and pines in small patches as opposed to a few large patches. In the neighborhood, they prefer both hardwood and mixed forests in a dispersed pattern rather than a few, large assemblages. The presence of a sizeable pine forest or pasture within the block or neighborhood also acts as an amenity, influencing property values upwards.

Economic status of neighborhood

It is assumed that lower income neighborhoods experience negative externalities such as noise, congestion, higher crime rates, and poorly performing schools that would counteract the amenity effects of open space. Three studies presented in this section explore the relationship between neighborhood economic status and the amenity effects of open space.

Estimating the effect of a tree protection ordinance on sales price in Fulton County, Georgia, Nelson, et al. (2002) are interested in evaluating this effect across a range of home values in the county. The study compares neighborhoods where developers protected existing tree canopy versus neighborhoods where trees were cleared and replanted. The authors find that homes in neighborhoods that protected mature trees sell for eight percent more than homes built in neighborhoods where trees were replanted. In this study, the amenity effect due to the presence of mature trees is only realized for neighborhoods with high-end homes because in searching for neighborhoods that protected existing tree canopy, only neighborhoods with high value homes could be found. Developers of high-end neighborhoods know they can recoup their costs for protecting the trees whereas developers of low to mid-range homes choose to replant trees to keep the home prices within their target market.

Netusil, et al. (2000) find that the effect of proximity to open space is dependent on the assessed home values within a neighborhood. Using sales data from the Portland metropolitan area, the researchers show no statistically significant amenity effects if the open space is in a neighborhood with low to medium value homes⁶. However, a home located in a high value neighborhood and within 1,500 feet of an open space is estimated to sell for \$9,900 more than a similarly located home in a low value neighborhood.

⁶ A low value neighborhood is defined as having mostly low value homes, within the lowest 30 percent of assessed home values in the study area. A high value neighborhood consisted mostly of homes in the highest 30 percent of assessed home values.

Netusil, et al. (2000) hypothesize that the negative externalities of living in low and mid value neighborhoods in Portland may mask the amenity effects of open space.

Investigating the effect of mature trees on residential housing values in Quebec City, Theriault, et al. (2002) consider the socio-economic status of the neighborhood, family structure (with or without children), and if homeowners in the study area self-declare an appreciation of the benefits provided by trees (see table 5). In households with children, the effect of trees on sale price changes with the economic status of the neighborhood. Trees are estimated to have a negative impact on sale price in poorer neighborhoods (from negative five to nine percent) while in high-income neighborhoods, trees are estimated to influence sale price upwards of 10 to 15 percent. In households without children, the estimated effect of trees on sale price is positive and consistent (4 percent) regardless of neighborhood economic status. The study also shows that an unsolicited stated appreciation of trees by a homeowner results in higher sale prices for homes with mature trees.

Table 5. Effect of mature trees on sale price considering household, neighborhood economic status, and perceived benefits of trees

Neighborhood	Households without children		Households	with children
status	Benefits not	Benefits	Benefits not	Benefits
	appreciated	appreciated	appreciated	appreciated
High	0%	4%	10%	15%
Above	0%	4%	4%	8%
Middle	0%	4%	-3%	1%
Low	0%	4%	-9%	-5%

5. CONCLUSION

The studies reviewed in this paper show overwhelmingly that open space and urban forests have a statistically significant and positive impact on the sales price of neighboring properties. Quantifying the value that society assigns to these land uses, this study informs the discussion surrounding future land use decisions, in general, and open space protection, in particular. First and foremost, the information presented in this study should help alleviate concerns expressed by tax assessors and others on the fiscal impacts of open space protection efforts.

Notable results for Georgia's commissioners, council members, planners, greenspace coordinators, and developers are the range of open space types that produce amenity effects. The Portland, Oregon study by Lutzenhiser and Netusil (2001) shows that parks designed for natural habitat preservation and light recreation (e.g. hiking and wildlife viewing) contribute significant amenity effects and outperformed golf courses with respect to neighboring property value enhancement. Counties and cities looking to protect their natural resources such as forests, rivers, lakes, and groundwater recharge

areas could promote development that embraces while preserving these areas. Neighborhoods could be developed around natural areas, similar to golf course communities, and command a premium for properties in close proximity helping to offset revenue loss as a result of preservation. Unlike golf courses, these parks don't require the level of maintenance or reliance on chemical fertilizers and pesticides, keeping down costs and protecting the environment. However, local governments will need to enact specific development-related ordinances to make certain the ensuing development does not compromise the natural resource being protected.

Developable open space such as farmland and forested land (and sometimes vacant lots) provide amenity effects although at lower levels than permanently protected open space. Analyzing the economic impacts of open space protection efforts, this result is fiscally beneficial for three reasons. First, because these land uses are privately owned, they are still on the tax rolls. Second, by increasing neighboring property values, these land uses improve the value of a community's tax digest, which translates into more revenue for the local government. Secondly, these land uses do not require the level of publicly provided services that residential, commercial, or industrial land uses require. Thus, these land uses do not exert the same financial drain on the local government coffers. From a revenue and expenditure perspective, open space is a win-win situation for local government officials looking to be fiscally responsible.

The one exception to open space not resulting in amenity effects as evidenced by increasing property values of neighboring parcels is in the Smith, et al. (2002) study near Raleigh, North Carolina. The authors suggest that it might be a result of congestion effects due to population density and failure to account for the area's overall land use pattern. However, it would be unfair to say, based on this result, that open space in a highly populated area does not produce amenity effects. Perhaps a better explanation lies in the explanatory variables used in the study as suggested by the authors themselves and as revealed in the results of the land use pattern studies. These studies show that the pattern of the surrounding landscape and the scale at which it is evaluated are critical components to understanding the amenity effects of open space and urban forests. More importantly, the preferred pattern of land use is a function of the density of land uses. The take home point for Georgia's local government officials is that plans for open space protection should take into account development level and the associated preferences for landscape pattern if they want to maximize amenity effects.

Finally, this literature review shows that the economic status of a neighborhood is a factor in the analysis of the fiscal impacts of open space protection. Open space in lower income neighborhoods tends not to result in amenity effects; however, this may be a function of other externalities masking the benefits of the open space. In no way should this finding be interpreted as a reason for not providing this segment of our population with open space amenities. In fact, it should be interpreted as a compelling reason to increase the efforts of protecting open space and community forests in these neighborhoods to counteract stagnation and decay and save neighborhoods from these debilitating effects.

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