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Different Types of Open Spaces and Their Importance to Exurban Homeowners

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Exurban residential settings are relevant for understanding how societal desires for open space impact landscapes and their ecosystem services. In a 2005 image-based web survey of 468 exurban homeowners in southeast Michigan, we investigated how exurban home-buying choices may be related to having open space nearby, and we measured homeowners' relative preferences for seven different types of open spaces characterized by different ecosystem services. Our study confirms that nearby open space is important to exurban homeowners, but it suggests that homeowners are somewhat heterogeneous in their preferences for different types of open spaces. They generally prefer forests, lakes, and streams, but their preferences for wetlands, prairies, playgrounds, and golf courses vary somewhat with education, age, or having children. In addition, homeowners for whom open space was less important when they bought their home had somewhat different preferences. We discuss the implications for protecting ecosystem services in planning, design, and development.

Keywords conservation, ecosystem services, land use planning, landscape perception, policy, residential development, web survey

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Challenges for Open Space Conservation in Exurbia

People may choose to live in exurbia at least partly because they prefer to live near open space (Daniels 1999; Gude et al. 2006), but the expansion of exurbia may diminish the very open space characteristics that exurban homeowners seek. In this study, we focus on exurban homeowners' preferences for specific types of open spaces, each with different characteristic ecosystem services. Preferences in the context of exurban sprawl have been received little attention in past empirical studies. Unlike preference for wild or scenic landscapes, preferences for the landscape near one's home is complicated by differently combined aesthetic, economic, and societal issues (Gobster et al. 2007). Understanding the extent to which open space types with different ecosystem services are attractive to exurban residents may help decision makers limit environmentally destructive impacts of exurban development by encouraging protection of "win-win" open space types that are both highly preferred and environmentally beneficial. Protecting open space types that are most preferred also may help to ensure that ecosystem services are sustained for the broader community over time (Nassauer 1997).

Exurban residential development, which we operationalized as large lot development with private wells and septic systems (Nassauer et al. 2009), extends beyond urban and suburban development in many regions (Hansen and Brown 2005; Heilmlich and Anderson 2001; White et al. 2009; Zhang et al. 2008). However, increases in exurban residential development are associated with open space losses (Burchell and Mukherji 2003; Hansen et al. 2005). The open space concept is often imprecisely defined and varies with its use (Appler 2004); one often-used definition includes all unbuilt landscapes, whether privately or publically owned (Ahern 2007; Benedict and McMahon 2002; Hollis and Fulton 2002). In this study, we adopted this definition, including open space types such as forests, lakes, wetlands, playing fields, and golf courses.

Land use planning and management must balance the natural and cultural ecosystem services offered by different open space types. Cultural acceptance is essential to maintaining ecosystem services (Daily 1993; Nassauer 1992). If beneficial open space ecosystems are not also visually attractive, exurban residents may not value and protect them over time (Nassauer 1997). In addition, the attractiveness of open space is in itself a cultural ecosystem service that contributes to human welfare (Boyd and Banzhaf 2006), public health (Giles-Corti et al. 2005; Sugiyama and Ward 2008), and psychological satisfaction (Kearney 2006). Knowing which open space types exurban residents prefer may help managers develop stronger planning approaches for protecting beneficial ecosystem types. This may be done by protecting "win-win" open space types that are both environmentally beneficial and highly preferred, or by carefully designing "unscenic" open space types so that these open spaces have immediately attractive spatial characteristics (Nassauer 1995b; Saito 1998).

Different open space types provide different levels and types of ecosystem services (Alberti 1999; Daily 1997), but their overall ecosystem services may be unrelated to their attractiveness. For example, wetlands can recharge aquifers and filter pollutants, and serve as habitat for many species considered endangered or threatened (Hogan and Walbridge 2007; Mitsch and Gosselink 1993), but may be perceived as unattractive (Nassauer 2004). Forests can regulate hydrological flows, prevent soil erosion, produce oxygen, sequester carbon, and serve as habitat (Gamborg and Rune 2004). In comparison, playing fields and golf courses provide

lower levels of ecosystem services but are generally understood to be attractive when located within residential subdivisions (Andersson et al. 2007; Sorace and Visentin 2007).

In this study, we operationalized attractiveness as stated preference, following a long tradition of measuring preference as a global affective response to the appearance and associated perceived characteristics of landscapes (Hansen and DeFries 2007; Kaplan and Kaplan 1989; Zube et al. 1975). Stated preference can be considered a psychological precursor to behaviors that reveal economic values (Adamowicz et al. 1994; Schaeffer 2008), and revealed preference studies have concluded that certain open space types in certain development contexts are associated with higher prices for nearby homes. Stated preference provides a complementary, more complete measure.

To assist managers and policymakers in considering how to sustain different types of open spaces within exurban development patterns, we examined three research questions:

1. To what extent is open space important to exurban homeowners when they choose their neighborhood and home?
2. Which types of open space are more preferred by exurban homeowners?
3. Are exurban homeowners heterogeneous in their preferences for different types of open space?

Open Space in Home-Buying Choices

Exurbia is a persistent and growing feature of the American landscape (White et al. 2009). A series of national surveys has consistently shown that the American population tends to prefer living in single-family detached dwellings in locations with low densities and easy automobile use (Myers and Gearin 2001; NRC 2009; Talen 2001). In 1997, 30% preferred to live in a city, 50% preferred suburbia, and the other 20% preferred rural areas or small towns away from a city (Brown et al. 1997). In 2007, only 7% preferred to live in a city, 30% preferred suburbia, and more than 60% preferred exurban or rural areas (NAHB 2007).

Nearby open space and the experience of nature may help to explain these pervasive preferences for low-density living (Kaplan and Austin 2004; Song and Knaap 2004). A 2001 survey of the Detroit metropolitan area found open space to be one of the most important factors in home-buying choice (Fernandez et al. 2005; Vogt and Marans 2004). The National Association of Realtors (NAR) found that 57% of Americans, if they were in the market to buy a new home, were more likely to select a neighborhood that is close to open spaces over another one without open spaces nearby (NAR 2001).

However, open space is not the most important factor affecting home-buying choices. Vogt and Marans (2004) concluded that neighborhood design, schools, and convenience to school and work were as important as open space in choosing a home in the Detroit metropolitan area. Hedonic pricing studies suggest that in urban-rural fringe landscapes, residents put a high value on open space but an even higher value on large-size lots (Kopits et al. 2007; Peiser and Schwann 1993). In varying metropolitan contexts, hedonic models consistently suggest that lot size, number of bedrooms, garage size, and school districts affect home price as well (Garrod and Willis 1992; Geoghegan 2002).

Preferences for Different Open Space Types

We distinguished different open space types by their landcover and land use. Traditional landscape preference studies generally conclude that landscapes characterized by water features (lakes, streams, etc.) are highly preferred (Kaplan 2001; Ulrich 1986). Forests and trees also generally enhance preference in metropolitan landscapes (Kaplan and Austin 2004; Sullivan 1994). Preferences for wetlands are mixed (Nassauer 2004; Zube et al. 1975). Playing fields generally negatively affect preferences (Kaplan and Kaplan 1989).

Homeowners' Background Characteristics

Different background characteristics have sometimes been shown to be related to landscape preference (though not specifically *open space* preference), but conclusions have not been consistent. Preference sometimes varies with respondent age, gender, or education, but most studies have found no significant difference in landscape preferences related to these characteristics (Lyons 1983; Matsuoka and Kaplan 2008; Nassauer 1995a).

Methods

Data

The data used in this study were drawn from an April 2005 image-based web survey of 494 southeast Michigan exurban homeowners who lived within 207 ZIP codes where local governments use large lot zoning and do not provide sewer and water services. This was a targeted convenience sample. All respondents were volunteers who had agreed to receive invitations to participate in web surveys (SurveySpot: <http://www.surveyspot.com>). E-mail invitations to participate in the survey were targeted to volunteers who were self-identified homeowners or had a high income (>US\$200,000/year), because high-income persons are likely to be homeowners but are less likely to respond to requests to participate in web surveys.

The survey instrument was approved by the University of Michigan Institutional Review Board, and the invitation identified the University of Michigan as conducting the survey. In addition, the image-based web questionnaire was designed to emulate the experience of "shopping" for a home and yard. It included many images of houses, yards, and neighborhoods that were highly salient to exurban homeowners.

Data were collected from 512 respondents, all of whom self-identified as homeowners. We reviewed all completed questionnaires to identify "race-through respondents" (18 of 512 respondents), those who completed the questionnaire in a very short time and also answered our validity check items inconsistently. We then removed these invalid cases from our data.

Despite our efforts to target our sample, design a salient and engaging instrument, and remove invalid cases, our study does not provide solutions for other sample bias and coverage errors that can happen in web surveys (Cook et al. 2000; Lee 2006). Web samples raise different problems than traditional survey sampling techniques. Most obviously, they exclude people who do not use the web. However, generalizability is of less concern if web use is widespread among the population of interest (Sills and Song 2002). According to the U.S. Census Bureau, 61.7% of U.S. households used the Internet by 2007, and exurban households were more likely

than central city or nonmetropolitan households to have Internet access. In 2000, 88% of adults living in households with annual incomes US\$75,000 had a computer and 79% used the Internet (Newburger 2001). The exurban counties of southeast Michigan have the highest median household incomes in the state, ranging from about US\$52,000/yr to about US\$73,000/yr. Each of these characteristics led us to conclude that a web-based survey could produce valuable data for understanding exurban homeowners in southeast Michigan.

Respondents to our web survey were largely representative of that population as described by 2000 U.S. Census data for our study area (Nassauer et al. 2009). The survey oversampled women, but analyzing our data, we found no overarching significant differences between the women and men in our sample. Of all 494 respondents, 468 completed all items related to the questions examined in this article.

For this investigation, we used questionnaire items about:

- The importance of different factors in homeowners' choice to move to their current home (home-buying choice).
- Preferences for different types of open spaces near their homes.
- Background characteristics including gender, age, household income, number of children at home, education and employment status.

Home-Buying Choices

To address our first research question, we used items addressing the importance of different factors in respondents' decisions to move to their current home. These 13 items (Table 2) using a 4-point importance scale (1: "not at all important" to 4: "very important") replicated items in the 2001 Detroit Area Survey (DAS) (Fernandez et al. 2005; Marans 2003; Vogt and Marans 2004).

Preference for Different Open Space Types

To address our second question, we used image-based items that presented respondents with seven types of exurban open spaces in southeast Michigan: both natural-appearing open space types (forests, streams, lakes, wetlands, and prairie) and more obviously manipulated landscapes, such as golf courses and playing fields (Figure 1). These images included 14 photographs of exurban open spaces in southeast Michigan, one photograph of each of two different open spaces (replicates) of each of the seven open space types. Photographs were controlled on season (midsummer images only), time of day (midday images only), and ephemeral elements (excluding people and animals). All photographs were taken to eliminate foreground "framing" elements and to emphasize middle ground landscapes. Respondents were randomly assigned to view one of the two different replicates of each type of open space, and were asked to rate their preference for the open space shown in each image assuming it was within three miles of their new home but not next to their property. We used three miles as a measure to elicit preferences that could extend to regional open spaces and their related ecosystem services. Respondents indicated their preference on a 7-point Likert rating scale (1: "strongly do not prefer" to 7: "strongly prefer"). *t* Tests comparing responses of the groups that viewed different replicate images showed no significant difference between groups, and we assumed that image sequence and variations in images of each open space type did not bias response.



Figure 1. Preferences for different types of open spaces (two images for each type).

Heterogeneous Respondent Groups

For our third research question, whether exurban homeowners are heterogeneous in their preferences for different types of open spaces, we operationalized heterogeneity in two ways: demographic background characteristics (Table 1) and the importance that homeowners had placed on open space when they bought their home, as indicated by responses related to our first research question (Table 2).

Table 1. Background characteristics of respondents

Background characteristics	Categories	<i>n</i>	%
Children under 18 years	Having children	217	53.6
	Not having children	251	46.4
Age (years)	<40	140	30.1
	40–60	276	59.5
	>60	48	10.3
Employment	Full-time	233	50.3
	Part-time	62	13.4
	Not employed	168	36.3
Marriage	Single, never married	33	7.1
	Married	352	76.0
	Separated/divorced/widowed	57	12.3
	Domestic partnership	21	4.5
Household income	<\$20,000	27	6.2
	\$20,000–\$29,999	34	7.8
	\$30,000–\$39,999	37	8.5
	\$40,000–\$49,999	56	12.9
	\$50,000–\$59,999	47	10.8
	\$60,000–\$74,999	62	14.3
	\$75,000–\$99,999	62	14.3
	\$100,000–\$149,999	88	20.3
Education	\$150,000+	21	4.8
	High school graduate	79	17.1
	College degree	308	66.7
	Post-college graduate	75	16.2
Gender	Male	100	21.6
	Female	364	78.4

Analysis Techniques

To address our first research question, we replicated the technique Fernandez et al. (2005) used in analyzing data for the Detroit area. We employed a principal component factor analysis (PCA) with varimax rotation (factors with eigenvalues greater than 1.00 and alpha coefficients greater than 0.70) to generate meaningful themes among the 13 variables. Statistical analyses were executed in SPSS13.0 for Windows. Using descriptive statistics, we also compared the 13 variables' relative importance in home-buying choice. For our second research question, we used pairwise comparisons of the observed set of stated preferences using *t* tests. For our third research question, we first used background characteristics to define respondent groups, and then compared their preferences for different open space types by *t* test and analysis of variance between groups (ANOVA) (*F* test). We used a post hoc Tukey's test to identify significant differences among specific groups. Finally, we generated each respondent's comparative ranking of the different open space types and used Kendall's tau C to test for differences in the ranking of each type across groups. In a second analysis for this question, we used *K*-means cluster analysis of the open space factor scores (from our first research question) to cluster respondents into

Table 2. Principal Components Analysis (PCA) and descriptive statistics of homeowners' stated importance on different items in their home-buying choice

Home-buying factors (eigenvalue) and items (indented)	Mean	SD	Factor loadings ^b
Close to natural areas (woods, ponds, streams, etc.)	3.24	0.80	0.88
Openness and spaciousness of area	3.39	0.72	0.84
Housing costs and good value	3.54	0.65	0.57
Attractive appearance of neighborhood	3.37	0.67	0.77
Appearance and layout of the dwelling	3.44	0.69	0.90
People similar to me	2.66	0.87	0.73
Familiar with area	2.72	0.92	0.83
Close to family and friends	2.68	1.00	0.77
Good schools	3.17	1.08	0.74
Lots of recreational opportunities	2.72	0.87	0.68
Close to work ^a	2.61	0.96	
Convenient to places such as shopping and schools ^a	2.85	0.81	
Community size ^a	2.99	0.83	

Note. Total variance explained is: open space (24.23%), neighborhood design and cost (14.93%), social factors (9.86%), school and activities (8.51%).

^aItems had low loading coefficients and/or loaded almost equally on two factors.

^bMost items load cleanly on a single factor (factor loading higher than 0.5 after Varimax rotation with Kaiser normalization) except those listed under others. Cronbach's alpha for all items is .72.

groups that placed different levels of importance on open space in their home-buying choice. Then we used the same statistical tests as above to compare these groups' preferences for different types of open spaces.

Results

Importance of Open Space in Home-Buying Choices

We found that having open space nearby was important to home-buying choices in exurban southeast Michigan. We described factors derived from our PCA analysis as open space, neighborhood design and cost, social concern, and school and recreational opportunities (Table 2). Variables loading on the factor *neighborhood design and cost* were most important in homeowner decisions, followed by variables loading on the factor *open space*. Quality of schools also was relatively important. Other variables were rated far less important than neighborhood design/cost, open space, and good schools.

Preferences for Different Open Space Types

Forests were most preferred by exurban homeowners in our sample, almost the same as preference for lakes and streams (slightly lower than forests but not significantly different). Golf courses and playing fields were least preferred. Respondents also had relatively high agreement in their preference for forests compared with other land

Table 3. Paired sample *t* test of open space preferences of all respondents ($n = 468$)

Open space types			<i>t</i> Statistics					
	Mean	<i>SD</i>	Forests	Lakes	Streams	Prairie	Wetlands	Golf courses
Forests	6.32	0.99						
Lakes	6.27	1.09	0.84					
Streams	6.22	1.10	1.75	1.02				
Prairie	5.61	1.31	13.38 ^a	9.30 ^a	9.30 ^a			
Wetlands	5.28	1.43	15.33 ^a	15.44 ^a	15.85 ^a	4.65		
Golf courses	4.14	1.50	23.52 ^a	23.97 ^a	22.26 ^a	14.59 ^a	10.92 ^a	
Playground	4.12	1.77	26.30 ^a	26.33 ^a	24.93 ^a	16.35 ^a	12.14 ^a	0.23

^aIndicates significant differences with $p < .05$.

covers. Multiple *t* tests comparing ratings of different types of open spaces demonstrated that exurban homeowners' most preferred open space types were forests, lakes, and streams, somewhat preferred open space types were prairie and wetlands, and golf courses and playing fields were least preferred overall (Table 3).

Differences Among Respondent Groups

Some background characteristics including gender, income levels, employment, and marriage did not relate to preference. However, having children living at home, education level, and age were associated with open space preferences across open space types (Table 4). Compared with those who had no children at home, exurban homeowners with children under 18 years had significantly lower preferences for living near forests, lakes, and wetlands but higher preferences for living near playing fields. Ranking all open space types, those with children ranked wetlands significantly lower and playing fields significantly higher than homeowners without children. Those under age 40 years also ranked playing fields significantly higher than older homeowners. Compared with younger homeowners, those over 60 years old had higher preferences for living near golf courses. Compared with older homeowners, those under 40 years old had significantly lower preferences for living near streams. High school graduates had significantly lower preferences for living near golf courses, and those with graduate degrees had significantly lower preferences for living near prairies.

It is important to note that when respondents' rankings of the different open space types are compared across groups, open space rankings generally are not significantly different among groups (Kendall's tau C statistic; see Table 4). For example, though forests, lakes, streams, and wetlands are rated differently by different age groups, they are not ranked significantly differently. Considering both rating (*F* statistic) and ranking (Kendall's tau C statistic) comparisons, open space types that are most consistently heterogeneous across background groups are playing fields (heterogeneous based on age and having children) and golf courses (heterogeneous based on age and education).

To investigate whether exurban homeowners who placed more importance on living near open space in home-buying choice prefer different types of open spaces,

Table 4. Background characteristics significantly related to preferences for open spaces

Background characteristics (n)	Preference mean rating for different types of open spaces						
	Forests	Lakes	Streams	Wetlands	Prairie	Playground	Golf courses
<i>Education</i>							
High school graduates (79)	6.34	6.27	6.38	5.42	5.82 ^a	3.89	3.62 ^a
College degree (308)	6.35	6.29	6.21	5.25	5.63 ^b	4.17	4.17 ^b
Post-college graduates (75)	6.15	6.27	6.16	5.33	5.25 ^c	4.31	4.43 ^b
<i>F</i> statistics	1.29	0.02	0.96	0.45	3.84 ¹	1.65	4.40 ¹
Kendall's tau C	0.01	0.07	0.01	0.05	0.12 ¹	0.01	0.11 ¹
<i>Age (years)</i>							
<40 (140)	5.96 ^a	6.14 ^a	5.91 ^a	4.94 ^a	5.46	4.37	4.02 ^a
40–60 (276)	6.45 ^b	6.42 ^b	6.39 ^b	5.48 ^b	5.75	4.04	4.04 ^a
>60 (48)	6.27 ^c	5.94 ^c	6.29 ^b	5.21 ^c	5.19	4.02	4.94 ^b
<i>F</i> statistics	12.10 ¹	4.04 ¹	11.35 ¹	5.19 ¹	2.52	1.73	4.17 ¹
Kendall's tau C	0.04	0.05	0.04	0.06	0.07	0.16 ¹	0.13 ¹
<i>Having children under 18 years of age</i>							
No (251)	6.41	6.37	6.32	6.37	5.61	3.95	4.09
Yes (217)	6.21	6.06	6.22	6.06	5.60	4.36	4.16
<i>t</i> Statistics	4.83 ¹	9.99 ¹	1.03	9.29 ¹	0.00	8.88 ¹	0.18
Kendall's tau C	0.06	0.07	0.05	0.14 ¹	0.05	0.19 ¹	0.01

Note. *F* statistics compare mean ratings and Kendall's tau C statistics compare relative ranking of open space types for each characteristic; superscript 1 indicates significant differences with $p < .05$. Values with different letter superscripts (a, b, c) within a column are statistically different (alpha = .05; Tukey's post hoc comparisons).

K-means cluster analysis divided respondents into three groups according to their open space factor score in PCA analysis. Homeowners with a mean factor score of 1.03 were classified as putting very high importance on open space in their home-buying choice ("high importance"), those with a mean factor score of 0.02 were classified as putting neutral importance on open space ("neutral importance"), and the remaining homeowners, with mean factor scores below -1.82, were classified as finding open space relatively unimportant ("low importance"). Groups of homeowners who had placed different importance on open space in their home-buying choice had different ratings for nearly all open space types except the more obviously manipulated landscapes, playing fields, and golf courses (Table 5), which had the lowest mean ratings by all groups. In contrast, homeowners grouped by education, age, or having children were heterogeneous in their preferences for playing fields and golf courses. Among importance groups, ranked preference for different open space types was significantly different for lakes and wetlands but not the other open space types.

Table 5. Preference for open space types by respondent groups that placed different importance on living near open space when they bought their home (one-way ANOVA)

Open space types	“High importance” respondents’ mean rating (n = 161)	“Neutral importance” respondents’ mean rating (n = 215)	“Little importance” respondents’ mean rating (n = 92)	Kendall’s tau C	F statistic
Forests	6.68 ^a	6.27 ^b	5.82 ^c	0.07	46.8 ¹
Streams	6.53 ^a	6.28 ^a	5.55 ^b	0.05	17.03 ¹
Lakes	6.52 ^a	6.27 ^a	5.84 ^b	0.09*	12.14 ¹
Prairie	5.99 ^a	5.56 ^b	5.04 ^c	0.07	23.66 ¹
Wetlands	5.75 ^a	5.23 ^b	4.55 ^c	0.09*	19.11 ¹
Golf courses	4.15	4.14	4.04	0.07	0.69
Playground	4.14	4.14	4.14	0.07	1.21

Note. Superscript 1 indicates significant differences with $p < .05$. Values with different letter superscripts (a, b, c) within a column are statistically different ($\alpha = .05$; Tukey’s post hoc comparisons).

Overall, knowing about how the importance of having open space nearby influenced the choice of a home may help to anticipate heterogeneity in preferences for different types of open spaces, especially in anticipating exurban homeowners’ preferences for open space types that provide high levels of ecosystem services. It may be useful to continue to explore open space importance clusters as indicators of heterogeneity in open space preference. Education, age, and having children at home are more helpful for anticipating heterogeneity in preferences for playing fields (more preferred by homeowners with young children) and golf courses (more preferred by older and well-educated homeowners).

Discussion

Our study has many implications for the role of open space in exurban development, particularly planning and management of public open spaces at the neighborhood or regional scale (Grose 2009). Our finding that open space is important in choosing a home is consistent with previous studies and replicates a key conclusion from data drawn from the 2001 Detroit Area Study (Fernandez et al. 2005). However, our conclusion is different from studies that sampled within urban areas (Vogt and Marans 2004; NAR 2001; Nelessen 2002); these concluded that location relative to urban features (nearness to shops, nearness to work, etc.) is more important than open space. Our different results may indicate distinct characteristics of exurban residents, who may place greater importance on nearby open spaces and natural environments than do residents from across an urban area.

While we found relative preferences for most open space types to be consistent across different homeowner groups, we also found evidence of some heterogeneity based on life stages and different levels of education. Compared with others, people

with children at home have higher preferences for living near playing fields but lower preferences for wetlands, perhaps because parents need places for children to play but may perceive wetlands as less safe for children (Field et al. 2005). Our finding that people over 60 or with more education had greater preferences for golf courses nearby might be explained by the fact that these groups play golf more frequently than others (NGF 2004). However, our most relevant finding for land planning that protects ecosystem services may be that all exurban groups prefer forests, lakes, and streams over other open space types.

We also found significant differences in preference ratings among homeowners who placed different importance on open space in their home-buying choice, but we found few statistically significant differences in their rankings of open space types. This result may shed light on a more fundamental interaction among natural and human systems. Considering preference ratings (*F* statistic), people for whom nearness to open space was more influential in a very important life choice, their home, had higher absolute preferences for open space types that do not appear to be highly manipulated, including prairies and wetlands. In contrast, people for whom nearness to open space was less important when choosing a home had lower absolute preferences for forests, streams, lakes, prairies, and wetlands. Only open space types that appear to be highly manipulated (playing fields and golf courses) are rated similarly (low) by all these groups. Considering how each of the open space importance groups ranked the seven open space types (Kendall's tau C statistic), all groups ranked forests, lakes, and streams high, consistent with many previous studies. However, homeowners who placed little importance on open space nearby ranked lakes higher significantly more than did other groups. Forests, lakes, and streams in southeast Michigan have high potential ecosystem services, and our results suggest these ecosystems enhance the value of nearby residential property as well. We conclude that along with the well-known market premium for homes near lakes, exurban homeowners' strong preferences for forests and stream ecosystems nearby also suggest a market premium.

Playing fields and golf courses, more obviously manipulated landscapes, were least preferred by nearly all groups in both analyses. Some past research also has shown that playing fields are less preferred. Nevertheless, playing fields are widely recognized as important for recreation, and having such facilities nearby may promote public health. Our study suggests that the location and total area of playing fields within a community should be strategically determined to meet community needs, especially the needs of families with young children, but also balanced against community preferences for recreation in many types of open spaces, including forests, lakes, streams, and wetlands. Most groups' lower preference for golf courses nearby contradicts the popularity of golf community developments. Many people who live in golf communities are not golfers, but they appreciate golf courses for the aesthetic value of the permanent open space provided by the courses (Mulvihill et al. 2001). Our research suggests that other open space types that provide greater ecosystem services than golf courses might have even greater aesthetic value for many nearby homeowners.

Planning for wetlands and prairie as part of exurban development patterns can be challenging because many homeowners may not find these ecosystem types particularly attractive. This result is consistent with findings from previous studies, which suggest that the effects of wetlands on perception and property values vary, partially depending on wetland types. Prairies and wetlands provide valuable natural

ecosystem services in southeast Michigan. Since not all exurban homeowners prefer to live near wetlands and prairie, future exurban development should rely on careful design to present these ecosystems as attractive in order to protect them. Especially for these open space types, design may dramatically affect preference. In addition, regulations and codes can be used to preserve these ecosystems, and environment education efforts should be strengthened to increase residents' appreciation of beneficial ecosystems as well as their support for protection (Gobster 1995).

Conclusions

Exurban development is the result of a complex mix of landscape characteristics, human desires, market forces, and policy choices. The goal of this study was not to attract more people to exurban locations by giving them the kinds of open spaces they prefer, but rather to anticipate and influence exurban landscape change if the strong trend toward exurban development continues and as existing exurban development is retrofit by future occupants. Exurban development is by definition extensive, and, compared with other forms of settlements, its relative influence on landscapes is disproportionately great. Ironically, the low densities that make exurban landscapes undesirable with respect to travel and service costs also heighten opportunities for design and planning to protect and enhance ecosystem services within the exurban landscape matrix. Looking closely at possible convergence between homeowner preferences and open space types that are characterized by different levels of ecosystem services is one perspective that may build planning arguments for achieving the larger public good, greater ecosystem services, even in the midst of exurban development.

Our study demonstrates that open space plays an important role in preferences for living in exurban locations in southeast Michigan. While different groups' relative preferences for different types of open space are generally similar, their absolute preferences are more heterogeneous, relating to life stage and education, as well their perspective on the importance of open space. In general, natural-appearing open space types (forests, streams, lakes, wetlands, and prairie) are preferred over more obviously manipulated landscapes, such as golf courses and playing fields.

Exurban development creates tension between the desire to have open space nearby and the loss of open space for development. Both the ecological health of metropolitan areas and the long term availability of open space experiences depend on planning exurban development to maintain desirable open space patterns and experiences. Our research suggests that maintaining forests, lakes, and streams as part of the public open space system in exurbia can simultaneously satisfy homeowners' preferences and enhance ecological quality. Careful design of wetlands and prairies is essential to protect these extremely valuable ecosystems that are not always seen as attractive. Golf courses and playing fields should be strategically prioritized and sited.

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