Residential developers' perceptions of ecological alternatives for exurban and suburban development

by

Susan Elizabeth Westbrook

A thesis submitted
in partial fulfillment of the requirements
for the degree of
Master of Landscape Architecture
(Natural Resources and Environment)
at the University of Michigan
2010

Faculty advisors:
Professor Joan Iverson Nassuer, Chair
Professor Daniel G. Brown

Table of Contents

Acknowledgements

I would first like to express my deep appreciation to my advisor and mentor, Joan Iverson Nassauer, for her invaluable support, patience, as well as her honest and thorough feedback. It has been a privileged to work with such a talented teacher, designer, scientist and visionary. I would like to gratefully recognize the support of my committee member Dan Brown, the faculty and staff at the University of Michigan School of Natural Resource and Environment, and the faculty and staff of the Real Estate Development Certificate in the College of Architecture and Urban Planning, all of whom have challenged and supported me throughout my graduate school experience. I gratefully acknowledge support in the form of a grant for Project SLUCE from the National Science Foundation Coupled Natural and Human Systems Program (GEO-0814542) and the National Science Foundation Biocomplexity in the Environment Program (BCS-0119804). I would also like to thank my friends and family for their essential and continual support throughout the entirety of my thesis.

List of Figures

Figure

List of Tables

Abstract

Residential real estate development on the urban fringe affects patterns of forest and agricultural land, terrestrial and aquatic habitats, water quality, and biogeochemical cycling. Because ecological design can support ecosystem services, we investigated whether real estate developers accurately anticipate the market for homes in ecologically designed subdivisions and whether they are likely to employ ecological design in their own firms. We conducted twenty (20) one-on-one ethnographic interviews with leading single-family residential developers in southeast Michigan and compared their responses with preferences of 494 homebuyers who participated in a 2005 image-based web survey (Nassauer et al., 2009). We measured how developers perceive homebuyers' preferences and how their perceptions compare with homebuyers' actual preferences. To understand what affects developers' adoption of ecological design, we also investigated what visible neighborhood landscape characteristics influence developers' perceptions of profitability and their stated likelihood to develop a project, as well as interactions among these variables and perceived homebuyer preferences. Results suggest that developers understand homebuyers' relative preferences for different types of subdivision designs, including their preferences for different forms of ecological design over conventional designs. However, developers' perceptions of the profitability of ecological designs, and their expressed likelihood to adopt ecological design in their own firms is not strongly related to their perceptions of homebuyer preferences, especially for developers in the middle-to-lower priced market segments.

1 Introduction

Residential real estate development on the urban fringe affects patterns of forest and agricultural land, terrestrial and aquatic habitats, water quality, and biogeochemical cycling, and ecological design approaches may result in development that protects and enhances ecosystem services. Real estate developers' perceptions of homebuyer demand, local regulations, and associated financial risks may be barriers to implementing ecological design in residential development (Bowman and Thompson, 2009; Carter, 2009; Mohamed, 2006; Ryan, 2006; Vigmostad, 2003). Radeloff et al. (2005) found Michigan has had higher rates of growth at the urban fringe than other Midwestern States. This study is part of a larger set of projects that have investigated implications of exurban residential development in southeastern Michigan for ecosystem services (Brown et al., 2008; Fernandez et al., 2005; Nassauer et al., 2009; Wang, 2008).

To understand whether real estate developers' application of ecological design is consistent with residential homebuyers' preferences, we investigated how developers' perceptions of alternative subdivision designs might affect their choices to employ ecological design concepts in residential development. This study examines: (1) how developers perceive homebuyers' preferences for ecological design in their market segment, (2) how these developers' perceptions compare with homebuyers' actual preferences, (3) what visible neighborhood landscape characteristics influence developers' perceptions of profitability, and (4) how neighborhood landscape characteristics of ecological designs influence developers' likelihood to develop such a project. We conducted twenty one-on-one interviews with developers in southeast

Michigan in 2009. Then, we compared data from those interviews with data from 494 southeast Michigan homeowners, surveyed in 2005 (Nassauer et al., 2009).

This study builds on the results of past work in southeast Michigan as well as other important studies that compare developers with homeowners. It differs from past studies by focusing on both developer and homebuyer responses to visual representations of subdivision design alternatives as presented in digital imaging simulations, which may enhance respondents' comprehension of landscape characteristics that are included in each design alternative. Importantly, this project also employs design as a research technique, moving beyond verbal descriptions of existing approaches (i.e. conservation subdivision design and low-impact development) to suggest a wider variety of alternatives to conventional subdivision designs (termed "ecological conservation" and "ecological innovation" in this study). It also employs in-depth ethnographic interviews with developers to elicit a more thorough understanding of developers' perceptions and rationales for their responses to design alternatives.

Definition of terms

Developers in this study include both large residential land developers and large developer-homebuilders working in southeast Michigan. Large developers lead companies constructing more than two subdivisions per year during typical market conditions, defined for this study as 2000 to 2002. One developer described his company's success during the 2000 to 2002 market as, "Sweet, I made a lot of money then (D18)." This study does not address the more recent market decline in residential development, beginning around 2005 in southeast Michigan (Shaver, 2007).

The large developers we interviewed tend to work in both exurban (defined for this study as, “homes with lot sizes at least 0.5 acre [0.2 hectare] and not served by municipal water and sanitary sewage systems” [Nassauer et al., 2009]) and suburban (served by municipal water and sewer) settings, and this study addresses both settings.

Homebuyer is used to define the developers’ market consumer of single-family residential properties. In this study we use this term to describe respondents to a 2005 image-based web survey of homeowners, all of whom lived in zip codes in southeast Michigan that were dominantly exurban (Nassauer, et. al. 2009).

Neighborhood is defined as a single subdivision or a contiguous area of single lots (not developed as a subdivision) in this study. The average number of homes per subdivision in images shown to the participants of this study ranged from 17 homes for the higher-priced home neighborhoods to 51 homes for the medium and lower-priced home neighborhoods. Lot sizes in the images ranged from approximately 1-10 acres in the higher-priced subdivisions to approximately 0.5-1 acre(s) in the medium to lower-price neighborhoods.

Neighborhood Characteristics are visible landscape characteristics that may influence homebuyers’ or developers’ preferences for or perceptions of the neighborhood. Commonly occurring characteristics that were noted by developers as they viewed the images of the neighborhoods include: cul-de-sacs, curvilinear roads, size and type of yard, types of open space, natural vegetation, mature trees, topographic features, manicured lawns, homes backing up to open space/vegetation versus other homes, lot

size, density of development, septic v. city utilities, double-loaded roads, sidewalks, neighborhood privacy, similarity of adjacent lots, and neighborhood entrances.

2 Literature Review

Significance of exurban and suburban residential land-use

This study focuses on residential development located at the metropolitan fringe, defined by Sullivan (1994) as "lands that were recently farmland, rangeland, or forest…adjacent to or near older cities." A study (Radeloff, et al.2005) of land cover change mapped at the "partial block groups" scale (mean PBG size 3.4 km^2) in the Midwest concluded that suburban and exurban development patterns destroy habitat and fragment forests, reducing biodiversity. Conversely, other studies have shown that depending upon residential landscape construction, design, and management approaches, exurban residential land uses may actually enhance downstream hydrologic regimes and enhance nutrient cycling in comparison with drained agricultural land or impervious urban land cover (Brown et al., 2008; Milesi et al., 2005; Nassauer et al., 2004).

Ecological design alternatives at the urban-rural interface

This project follows Nassauer et al. (2009), defining ecological design as a means of achieving ecosystem services (Daily, 1997; Ehrlich & Ehrlich, 1974) by intentional landscape change (Nassauer and Opdam, 2008). Ecological design approaches employed in the subdivision design alternatives in this project include well-known techniques such as: detaining or infiltrating stormwater in the surface landscape (which is often described in the professional literature by the term "low impact development" [e.g. Hager, 2003]),

native plant gardens within urban land uses, increasing habitat patch size, and connecting habitat patches, (which is sometimes associated with conservation subdivision design, in which houses and other impervious surfaces are clustered in order to protect ecological or cultural features [Arendt, 1996]).

Developers as agents of land-use change

Developers have been identified as the, "decision agents who make the initial speculative commitment to a [development] location (Leung, 1987)," but very few studies of exurban and suburban residential development have investigated the developer's perspective (e.g. Bowman and Thompson, 2009; Mohamed, 2006; Ryan, 2006; Vigmostad, 2003). Baerwald (1981) identified five different stakeholders in the suburban residential development process "a rural producer [e.g. farmers], a speculator [e.g. land broker], a subdivider [e.g. land developer], a builder, and a household [e.g. the homebuyer]." Because developers are forecasters and suppliers of the housing market they largely determine the housing and neighborhood options available to homebuyers (Leung, 1987).

Although developers are seen as forecasters of housing demand, Ryan's (2006) survey of local residents (n=227), planners (n=45), and homebuilders (n=38) concluded that planners and homebuilders underestimate the importance to residents of rural landscapes and views of nature. Other recent studies suggest that developers' unfamiliarity with ecological design is a significant barrier to implementation (Bowman and Thompson, 2009; Carter, 2009). Developers' lack of knowledge may feed their

aversion to taking on risk associated with using unproven practices (Bowman and Thompson, 2009; Carter, 2009; Mohamed, 2006).

Similarly, Bowman and Thompson (2009) found that developers believe that homebuyer demand is low for conservation features of low impact development and conservation subdivisions, and that this may lead developers to perceive conservation design as financially risky. Their study is particularly relevant to our investigation because they compared developers' perceptions with homebuyers' values and behaviors related to open space, one key feature of ecological design. From a mail survey of Iowa developers (n=54) and residents of conventional and conservation subdivisions in Cedar Rapids, Iowa, (n=296), they found that developers tended to significantly underestimate residents' use and stated willingness to pay for open space in their neighborhoods. They conclude that this gap may exist because 83% of developers in the study relied solely upon their past experience rather than other forms of market research (e.g. focus groups, market studies, community surveys) to determine the design of a residential subdivision.

Related to other ecological design features, especially those related to low impact development management of stormwater, they found that Iowa developers were unfamiliar with these features and generally skeptical of their value. In their mail survey and in prior interviews with a smaller group of developers, Bowman and Thompson provided written descriptions of certain features of low-impact and conservation subdivisions, but they found that developers' responses frequently seemed inconsistent with the verbal information they were given. Bowman and Thompson infer that the developers may not have fully understood the survey instrument's verbal descriptions of low-impact design development features.

Local land use laws may also contribute to developers' perceptions of risk, and ultimately, their likelihood to develop a particular project (Mohamed, 2006). Zoning and approval processes limit the neighborhood design options available to developers. Although some ecological designs remain an option for developers under some local codes, the approval processes for such designs may be seen as more complicated, entailing longer approval times and thereby increasing uncertainty, risk, and cost. Furthermore, developers may see many ecological design features as what Mohamed (2006) characterized as "secondary investments," that do "not contribute to reaching profit targets but are profit opportunities that exist after the target has been met." For example, if local government does not require that trees are planted as part of the subdivision and the developers do not perceive homebuyers as being willing to pay for trees, then trees in a subdivision design are seen as financially risky. Mohamed (2006) and Carter (2009) note that this leads to satisficing by developers, who choose suboptimal design options in order to avoid risk. Consequently, developers are reluctant to employ ecological designs unless they are required by code to do so or market demand is clear.

Although developers may satisfice when they make development design choices (Mohamed, 2006) and may not accurately understand their homebuyers' preferences (Bowman and Thompson, 2009; Ryan, 2006), Vigmostad (2003) states that, "developers do not want to do what is unpopular and have shown that they will respond to changes in public views." Notably, Ryan (2006) also found that the homebuilders he surveyed considered themselves to have "environmental values," and he concluded that the homebuilders were motivated by the desire for positive public perception.

However, an emergent theme from Vigmostad's ethnographic interviews of fifteen Michigan residential developers is that developers do not perceive strong public demand for ecological design. For example, she concludes that in development "wildlife is invisible unless protected by law or public interest." This is reinforced in the vocabulary used by land brokers, developers, and farmers to discuss sites available for development, using phrases like, "vacant land for sale," or "empty lots." Ultimately, Vigmostad concludes that cautious financial institutions, local land planning laws, and American societal perception of land as property all undermine the potential for ecological design of the residential development.

Landscape preferences of exurban and suburban homebuyers

Exurban and suburban homebuyers' landscape preferences have been well documented in numerous studies. Many of these studies find that exurban and suburban homebuyers' seek proximity to the natural environment (Fernandez et al., 2005; Kaplan and Austin, 2004). Ryan (2006) found homebuyers rated proximity to nature and nature-related activities as most important elements in "positive qualities of rural life." Alternatively, Kaplan and Austin (2004) found that the size of house and the privacy from neighbors were less important to the homebuyers interviewed in their southeast Michigan study. Fernandez et al. (2005) found that household characteristics (e.g. presence of children, marital status, type of career, income, and age) were significantly related to some functional aspects of homebuyers' subdivision preferences (e.g. nearness to work, proximity to school, nearness to friends and family), although the importance of neighborhood openness and naturalness preference was not affected by these characteristics.

3 Current study

Study questions

This study examines the following questions:

(1) How do developers perceive homebuyers' preferences for ecological design?

(2) How do developers' perceptions compare with homebuyers' actual preferences for ecological design in their market segment?

(3) What visible neighborhood landscape characteristics influence developers' perception of profitability?

(4) How do neighborhood landscape characteristics of ecological design influence developers' likelihood to develop a project?

Ecological design at the neighborhood scale

Neighborhood type. This project is part of a larger study that examined ecological design approaches in exurban settings at the scale of regions, neighborhoods, streets, and individual properties. This study focused on developer and homebuyer responses to ecological design alternatives and conventional subdivision designs at the neighborhood scale. Building on the subdivision design typology of Brown et al. (2008), we identified four different types of neighborhoods existing in exurban southeast Michigan and varying in home price and subdivision style (Table 1). Then we located and photographed actual southeast Michigan exurban and suburban subdivisions, two replicates for each neighborhood type, as the base images for our study. Finally, we developed and applied different ecological design styles described below to each base conventional subdivision

design (rows 1 and 2 in Table 1) (Wang 2008, Nassauer et al. 2009). The digital-image simulations that illustrate each ecological design and conventional base were the response stimuli for both the 2009 developer interviews and the 2005 image-based web survey of homebuyers (Figure 2 and 3).

Table 1: Neighborhood types

Neighborhood Type	***Developer Type***	***Home Price***	***Lot Size***
1. Medium-to-lower-priced Conventional Subdivision	Single Developer	< $399,999	< 1 acre
2. Higher-priced Conventional Subdivision	Single Developer	$400,000 +	> 1 acre
3. Higher-priced Ecological Remnant subdivision	Single Developer	$400,000 +	> 1 acre
4. Single Lot	Farmer/multiple builders	Varies	1 – 15 acres

Ecological design approaches. Beginning with existing conventional development patterns as the base, we designed two types of ecological design alternatives for each conventional subdivision: 1) The *ecological conservation* design alternatives (e.g. higher-priced home subdivisions: *Eco-Conservation H1* and *H2,* and the medium to lower-priced home subdivisions: *Eco-Conservation ML1* and *ML2*) emphasized forested public open space within the subdivision as a means of increasing habitat patch size, connecting habitat patches, and retaining or infiltrating stormwater in the surface landscape. It also provides recognizable amenities for individual properties that bordered the open space and recreational opportunities for the entire neighborhood. To provide for contiguous forest patches, ecological conservation design alternatives have a higher proportion occupied by open space and lower housing density compared with other alternatives. Specifically, the housing density in the *higher-priced ecological conservation 2* design alternative and the *medium-to-lower* priced *ecological conservation 1* and *2* design alternatives have been reduced by: 1/17 home, 10/65 homes,

9/42 homes, respectively[1]. 2) The four *ecological innovation* design alternatives (e.g. higher-priced home subdivisions: *Eco-Innovation H1* and *H2,* and the medium to lower-priced home subdivisions: *Eco-Innovation ML1* and *ML2*) emphasized native herbaceous plants that replace turf in about half the lawn areas of residential properties and as part of the mix of ecosystems in public open space as well. Patches of native herbaceous plants are designed to increase habitat patch size and connectivity, and detain or infiltrate stormwater in the surface landscape. Both configuration of native plant patches and their composition emphasizing vividly flowering plants are designed to provide recognizable amenities for the neighborhood and individual properties. As we designed the ecological innovation alternative, native herbaceous plants constitute connected habitat in contiguous patches that extend across residential properties, and consequently, housing density is equal to that of conventional designs for each subdivision.

In addition to developing the two ecological design alternatives to the four different conventional subdivisions, we selected an existing subdivision type as the third ecological design alternative for this study: the *ecological remnant subdivision.* An *ecological remnant subdivision* has lots larger than 1 acre, and the developer has retained contiguous forest or wetland in an area of at least 10 acres as a dominant cover within the subdivision.

Study Area

We sampled 494 exurban homeowners and interviewed 20 large developers in southeast Michigan, an area of 5,814 square miles (15,060 km2) encompassing ten

[1] Calculation of homes based on the number of visible driveways in the image of subdivision.

counties (Genesee, Lapeer, Lenawee, Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne) including the Detroit – Ann Arbor – Flint Combined Statistical Area (CSA) with an estimated population of 5.4 million in 2008 (US Census, 2009). This 10-county study area has been the subject of a suite of related studies of exurban residential development (Brown et al., 2008; Fernandez et al., 2005; Nassauer et al., 2009; Wang, 2008), and this study builds on that work. This study area is notable for its high rate of residential construction as well as having a high concentration of residential developers. Southeast Michigan Council of Governments' (SEMCOG) Regional Summary, 2000-2008 (2008) reviewing a 7-county area (Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne) documented that although the population increased 0.8% (from 4.83 million to 4.87 million), the number of homes built increased 4.1% (from 1.95 million to 2.08 million), with most notable growth (over 10% increase in number of housing units) documented in Livingston (23.8%), Monroe (13.0%), Washtenaw (12.8%), and Macomb (10.7%) counties (Figure 1). The developers we interviewed had offices located in Macomb, Oakland, Washtenaw, and Wayne counties (Figure 1) with 15 located within Oakland County, historically one of the wealthiest counties in Michigan (Lubienski, 2005). Their subdivision developments were located across southeast Michigan, including Genesee, Lapeer, Livingston, Macomb, Monroe, Oakland, Washtenaw, and Wayne counties.

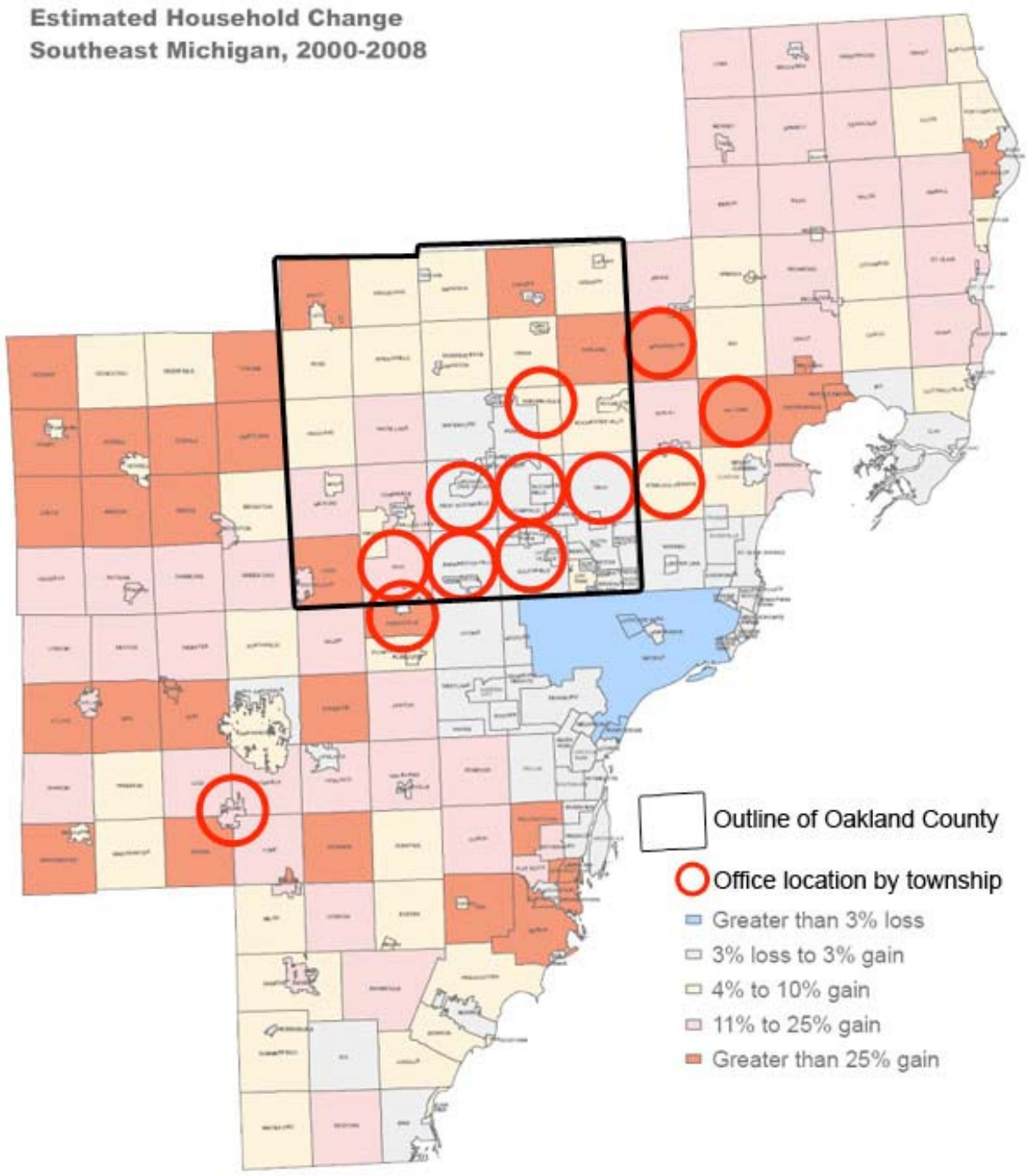

Figure 1: Participating developers' office locations overlaid on household change map (modification of: SEMCOG, 2008). The seven counties included: Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne.

Participants

We conducted one-on-one ethnographic interviews with 20 large residential subdivision developers each working in a different development firm in southeast Michigan. They were large single-family residential land developers and developer-homebuilders, firms constructing more than two subdivisions per year during 2000 to 2002. Interview participants were selected from a list of developers acquired through numerous online searches (e.g. southeast+ Michigan + residential + land + developer), a Michigan business directory website, the Building Industry Association of southeast Michigan website, the client list of a local residential marketing firm (located on their website), local news-sources, and a snowball sample from developers initially selected. Based on our inquiries with developers we interviewed and their prominence nationally as well as regionally, we think that this study's participants included nearly all of the large, single-family residential developers in the study area.

The first form of contact with the developers was a postcard mailing to the initial list of 43 potential participants, all development companies with current contact information. The mailings were followed up with a phone call to exclude developers who did not do single-family residential development, only built homes (were not involved in the land development), did less than two single-family residential developments a year, or were only development consultants. From the list of 43 contacts, 34 developers met the requirements of the study[2], and we invited the person in charge of residential land

[2] Study requirements for interviews: (1) The participant must be a large single-family land developers or developer-homebuilders, (2) developing more than two subdivisions per year

development for the firm to participate in our study. Of the 34 eligible developers, 11 did not respond (i.e. multiple voicemails not returned), 3 declined (i.e. no time, not interested), and 20 completed interviews: a 59% response rate. Information describing the participating developers is summarized in Table 2.

Table 2: Summary of developer information (all respondents were Caucasian males, [n=20])

Type of developer information	**Responses**		
Home-price	*< $399,999*	*$400,000 +*	*Both price ranges*
	8	4	8
Current number of single-family homes developments listed on firm website (2009)	*None*	*1 – 4 subdivisions*	*5+ subdivisions*
	5	9	6
Average number of lots per subdivision (n= 82)*	*8-20 lots*	*21-99 lots*	*100+ lots*
	6	44	32
Family business**	*No*	*Yes*	*Yes, multigenerational*
	11	9	8
Business title	*Vice-president*	*Land Dev. Manager*	*Principal/Founder/ Owner/Partner*
	4	1	15
Range of developments	*Regional only*	*Regional & National*	*Publicly-traded*
	15	5	3
Companies acquired/closed at time of interview	*No*	*Yes*	
	16	4	

* Does not include developers with no subdivisions listed on their company website
**Family company defined as operated by two or more family members; multigenerational defined as two or more generations.

In addition to data from developer interviews, we analyzed homebuyer data drawn from an image-based web survey of 494 southeast Michigan homeowners living in exurban locations conducted in April 2005 (Nassauer et al., 2009; Wang, 2008). The homeowners (referred to as homebuyers throughout the remainder of this study) were selected because they lived in the ten-county study area of southeast Michigan within zip codes characterized by local zoning allowing individual well and septic systems and

during typical market conditions (2000 to 2002), and (3) the majority of developments were located in southeast Michigan.

requiring lots to be larger than 0.5 acre (Nassauer et al., 2009). 84.8% were between ages 30 to 60 years old, 38% did not have children living at home, 41.9% completed some college, and 58.6% moved to their homes after 1995.

To match developers with their homebuyer market, developers were asked to estimate the 2000-2002 price of homes they had built, and homebuyers were asked to estimate the price of the home that they currently owned (Table 3); 40% of developers built in more than one of the home price ranges, and their responses were counted in each of those price ranges.

Table 3: Market segment home prices: for developer and homebuyer samples (Developer, n=20; Homebuyer n=494).

	Higher-priced homes	**Medium-priced homes**	**Lower-priced homes**
Home price range	$400,000 - 600,000+	$250,000 - 399,999	<$250,000
No. of developers	12	13	10
No. of Homebuyers	54	135	299

NOTE: Developers building in more than one home-price range were compared with homebuyers in every price range in which the developers had worked.

4 Methods

Developer Interview Instrument

The interview instrument had two parts; (1) a computer-assisted forced-answer questionnaire including images of neighborhood types that were also seen by exurban homeowners in the 2005 web-survey (Nassauer et al., 2009; Wang, 2008); (2) open-ended interview questions to further probe the reasons why developers responded to the forced-answer questions as they did (See Appendix 1 and 2 for complete instrument).

For developer interviews, the computer-assisted questionnaire was shown as a power-point presentation on a laptop brought to the developer's private office or conference room. The questionnaire included 16 alternative design images (Figures 2 and 3), and each was shown to the developers three times: first to measure their perceptions of homebuyer preference on a 7-point Likert scale: (7 = strongly prefer, 1= strongly do not prefer), then to measure their perceptions of the profitability of the development (7= highly profitable, 1= not profitable), and finally to measure their stated likelihood to "do" the development shown (7 = highly likely to develop, 1 = highly unlikely to develop). During the interviews, developers were asked to assume that they were operating under normal market conditions in the years 2000 to 2002, and that all subdivision designs were equal in terms of proximity to good schools, transportation, and local governmental attitudes towards development.

In addition to forced answer responses, this study utilized ethnographic interviewing methods to probe the reasons for developers' perceptions. This approach is similar to that used by Westphal et al. (2008) and Vigmostad (2003), including elite-interview methods and unstructured interview questions in a "dialogic approach". In a dialogic approach (Vigmostad, 2003), questions are structured to elicit narratives in which both respondent and interviewer participate. The responses to the unstructured questions are not limited by time and go in the direction of the respondent's choosing. This approach elicited a great deal of information from developers about their past projects and experiences. The elite-interview method addresses the developers as business elites, which are traditionally difficult to access by social scientists and focuses on making the interview time and location most convenient for them (Hertz and Imber, 1995). The open-ended questions

were designed to directly relate to the computer-assisted questionnaire as well as additional questions that further explore developers' perceptions of ecological development.

Data Analysis

Data generated by the forced answer items were analyzed using Microsoft Excel and SPSS/PASW version 17 (Windows). All developers' ratings of their perception of homebuyer preference, perception of the profitability of the design, and the likelihood that they would "do" a similar development are summarized in Table 4.

We compared developers' perceptions with those of homebuyers, matching the groups by market segment: homebuyers were classified into three groups based on their estimate of the value of their current home, and the developers were matched with these groups if they built homes for that market segment (Table 3). We compared developers' and homebuyers' ratings of subdivision design alternatives using a *t-test* ($p < 0.05$), and we compared the two groups' rankings using *Kendall's tau* ($p < 0.05$) (Research Question #1 and #2). We compared developers' perceptions of homebuyers' preferences for each subdivision design with developers' perceptions of the profitability of each design, and with their stated likelihood to use each design in their own development activities (Research Question #3 and #4). Ratings on each variable were compared using a *t-test* ($p<0.05$) and rankings were compared using *Kendall's tau* ($p < 0.05$).

To determine what visible landscape characteristics might be influencing developer responses, we conducted a cluster analysis of their ratings of: (1) their perception of homebuyer preference; (2) their perception of profitability of the design; and (3) their

own likelihood to develop this design. This analysis grouped the 16-design alternatives into a 6 clusters (3 clusters for the higher-priced design alternatives and 3 clusters for the medium-to-lower-priced design alternatives). These clusters acted as the framework for interpreting qualitative data about subdivision design landscape characteristics that could influence developers' likelihood to develop a similar project (Research Question #4).

5 Results

Results suggest that, while developers generally have a good sense of homebuyers' relative preferences for different subdivision designs, developers in different market segments differ in the accuracy of their perceptions of absolute market preferences and in the likelihood that they themselves would do an ecological subdivision design. Specifically, we found ranking of subdivision designs by developers' perceptions of homebuyer preference and ranking of the designs by actual homebuyer preference were significantly correlated ($p < 0.05$, *Kendall's tau*) for all market segments (Table 5, 6, and 7), and that both developers and homebuyers favor certain combinations of ecological design characteristics with other landscape characteristics of subdivisions. However, for middle-priced and lower-priced homes, developers tended to overestimate homebuyers' absolute preferences for all subdivision designs. In addition, lower-priced home developers' perceptions of the profitability of a development are strongly related to their perceived likelihood to "do" a similar development ($p=0.039$, *Kendall's tau*), while medium-priced and higher-priced home developers perceptions of profitability are not significantly correlated with their stated likelihood to "do" a similar development ($p=0.188$, $p=0.138$, *Kendall's tau*).

Furthermore, open-ended interview responses suggest that the reduction of housing density in the *Higher-priced Ecological Conservation 1 (Eco-Conservation H1)* design and the *Medium-to-lower-priced Ecological Conservation 3* and *4 (Eco-conservation ML3* and *Eco-Conservation ML4)* designs (1/17 home, 10/65 homes, 9/42 homes, respectively) significantly influenced developers' perception of neighborhood profits for the *Eco-Conservation ML3* and *Eco-Conservation ML4* designs, though not for the *Eco-Conservation H1*. This may be because the higher price of homes, the smaller proportion of homes "lost" to forest, and/or the perception of the location of conserved forest patch in the *Eco-Conservation H1* design.

Table 4: Overview of all developers' (n=20) ratings of all subdivision designs

Neighborhood Type	Subdivision Design Alternative	Perceived Homebuyer Preference		Perceived Profit		Likelihood to Develop	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Higher-priced Subdivision 1: $400,000 + (*H1*)	Ecological Conservation	5.14	1.111	5.43	0.907	4.65	1.671
	Ecological Innovation	5.38	1.798	5.00	1.755	4.88	1.834
	Conventional	4.48	1.409	4.38	1.180	4.50	1.496
Higher-priced Subdivision 2: $400,000 + (*H2*)	Ecological Conservation	5.73	1.106	4.25	1.943	3.55	2.058
	Ecological Innovation	5.30	1.390	4.23	1.810	3.40	2.010
	Conventional	3.90	1.382	4.50	1.646	3.60	1.759
Medium-to-lower-priced Subdivision 3: < $399,999 (*ML3*)	Ecological Conservation	5.23	1.362	4.25	1.094	4.59	1.588
	Ecological Innovation	4.88	1.213	6.00	1.414	4.59	1.588
	Conventional	4.53	1.371	5.75	0.698	6.01	0.793
Medium-to-lower-priced Subdivision 4: < $399,999 (*ML4*)	Ecological Conservation	5.20	1.568	3.47	1.160	4.00	1.756
	Ecological Innovation	4.93	1.092	5.70	1.185	5.32	1.445
	Conventional	4.20	1.093	5.39	0.718	5.42	1.109
Higher-priced Ecological Remnant Subdivision 5: $400,000 + (*H5*)	Ecological Remnant	5.70	0.979	5.11	1.487	3.70	2.221
Higher-priced Ecological Remnant Subdivision 6: $400,000 + (*H6*)	Ecological Remnant	6.00	0.725	5.58	1.084	4.50	1.965
Single Lot 7: Price Varies	Not in a subdivision	2.93	1.340	3.61	1.380	1.79	1.134
Single Lot 8: Price Varies	Not in a subdivision	3.85	1.385	4.03	1.438	2.24	1.806

Because of these differences among market segments, the analysis below is divided into the following market segment classes: higher-priced home developers and homebuyers ($400,000 +), medium-priced home developers and homebuyers ($250,000 - $399,999), and lower-priced home developers and homebuyers (<$250,000). To further interpret the quantitative results, quotes from the open-ended developer interviews are included. Since developers of all price ranges were shown the same computer-assisted questionnaire, qualitative results from developers in all home price ranges are labeled by price range and included in the neighborhood descriptions.

Comparison of developer and homebuyer preference results

Developers and homebuyers in each market segment ranked subdivision designs similarly: the two groups' rankings were strongly correlated with $p \sim$ or <0.05 (higher-price, $p=0.048$; medium-price, $p=0.056$; lower-priced, $p=0.039$, *Kendall's tau*). However, comparing the developer ratings with actual homebuyer ratings of the same subdivision designs, there were significant differences ($p<0.05$, *t test*) for three of the six (50%) subdivision designs for lower-priced home respondents, four of the six (67%) subdivision design alternatives for medium-priced home respondents, and only one of the eight (13%) subdivision design alternatives for the higher-price home respondents (Table 5).

Figure 2: Higher-priced home subdivision design alternative images ($400,000 +)

Ecological Conservation Subdivision Design 1 (*Eco-Conservation H1*)

Ecological Innovation Subdivision Design 1 (*Eco-Innovation H1*)

Conventional Subdivision Design 1 (*Conventional H1*)

Ecological Conservation Subdivision Design 2 (*Eco-Conservation H2*)

Ecological Innovation Subdivision Design 2 (*Eco-Innovation H2*)

Conventional Subdivision Design 2 (*Conventional H2*)

Ecological Remnant Subdivision Design 5 (*Eco-Remnant H5*)

Ecological Remnant Subdivision Design 6 (*Eco-Remnant H6*)

Table 5: Rating and ranking comparisons of developer and homebuyer perceptions of alternative subdivision designs for higher-priced homes ($400,000 +)

	Developer (n=12)			Homebuyer (n=54)		
Subdivision design type	**Rank**	**Mean**	**S.D.**	**Rank**	**Mean**	**S.D.**
Eco-Conservation H1	6	5.13	1.069	3	5.43	1.508
Eco-Innovation H1	4	5.75	1.712	4	5.09	1.092
Conventional H1	7	4.46	1.196	7	4.78	1.150
Eco-Conservation H2	1	6.08*	0.925	5	5.06*	1.446
Eco-Innovation H2	5	5.38	1.299	6	4.98	1.341
Conventional H2	8	4.25	1.306	8	3.72	1.040
Eco-Remnant H5	3	5.88	0.908	2	5.87	1.447
Eco-Remnant H6	2	6.00	0.739	1	5.89	1.497

Kendall's tau test for bivariate correlation of ranks: $p=0.048$
*denotes significant difference with t-test of means ($p<0.05$)

Comparing higher-priced home developer and homebuyers' responses, one revealing difference was the *Ecological Conservation Subdivision 2 (Eco-Conservation H2)*, which was ranked 1st by higher-priced developers (with a low S.D.=0.925) but 5th by homebuyers. Like all the ecological conservation designs, many lots in *Eco-Conservation H2* border forested open space. However, several homes in *Eco-Conservation H2* border on a relatively small open space (about 1 acre) in the center of a block, and homeowners may have been paying attention to the size and edge dimensions of that space compared with apparently more extensive, connected forest in the other higher-priced subdivision's (*H1*) ecological designs. In interviews, developers stated that homebuyers would strongly prefer the centrally located forested open space in *Eco-Conservation H2* compared with other designs for subdivision 2. Developers stated that for homebuyers, "backing up to

open space is the highest priority, the most important feature (D14)," and that "[homebuyers] like trees, and trees bring some extra money [in the sale of the house] (D8)." Even among all developers (including those who do not develop in the higher-priced market segment), *Eco-Conservation H2* was ranked 3rd overall (Table 4) in perceived homebuyer preference, but high-priced homebuyers did not rank it as high as other designs.

Ecological innovation designs and conventional designs for *Higher-priced Subdivision 1* (*H1*) ranked over the same designs for *Higher-priced Subdivision 2* (*H2*) among developers and homebuyers in the higher-priced market segment. The cul-de-sac present in all of *Higher-priced Subdivision 1* design alternatives could be the reason. Most developers mentioned the presence of cul-de-sacs being "very desirable (D12)" to homebuyers, receiving premium prices, and being a "more efficient use of the space (D17)."

Although the mean rating by developers of high-priced homes for the *Ecological Innovation Subdivision 1* (*Eco-Innovation H1*) was somewhat higher than the mean rating for *Eco-Conservation H1*, the standard deviations for *Eco-Innovation H1* was very high (Table 5), and many developers noted potential problems with what they termed the "natural plantings" present in that design. One commented, "natural [plantings] should not be in front…and they make the backyard less functional (D15)." Another pointed out variation in market-type, "the natural plantings would be preferred by empty nesters, but families want the more usable yard like in [*Conventional H1*] (D4)," and, "[The] natural plantings make the backyard less functional (D15)." Other developers stated, "this is

what they want [*Eco-Innovation H1*] (D9)," and, "[*Eco-Innovation H1*] is good because of the mixed plantings…wooded and cleared (D10)."

The highly ranked, higher-priced *Ecological Remnant Subdivisions 5* and *6* seemed to strike a common chord between higher-priced homebuyers and developers; they were ranked 1st and 2nd by homebuyers and a close 2nd and 3rd by developers (Table 5). Developers described *Eco-Remnant H6* as, "beautiful (D23)." One developer even declared, "with the trees and rolling terrain, I would want to live [in *Eco-Remnant H5*] (D22)." The privacy that the trees, lot size, and topography provide were also noted by developers as preferred in both designs. They stated, "[homebuyers will pay a] premium for quiet places…[*Eco-Remnant H5*] provides privacy for older buyers (D8)," "[*Eco-Remnant H5*] is more desirable because of vegetation…. gets a premiums for trees (D11)," and another noting the "[*Eco-Remnant H5* has] diversity in 3D… curving road, vertical interest, [and] walkout basements (D12)."

Conventional Subdivisions 1 and *2 (Conventional H1 and Conventional H2)* were ranked as least preferred by both higher-priced home developers and homebuyers (Table 5). One developer stated that the reason why *Conventional H2* was so undesirable was that there were, "No natural features…[no] reason to live out there (D7)" and, "more vegetation is better [when comparing to the other development alternatives] (D9)." One developer notably stated that, "[*Conventional H2*] is the cheapest [to build] and got the lowest profit [rating] because of the [homebuyers'] perceived value (D13)."

Figure 3: Medium and lower-priced subdivision design alternative images (home price <$399,999)

Ecological Conservation Design Subdivision 3 (*Eco-Conservation ML3*)

Ecological Innovation Design Subdivision 3 (*Eco-Innovation ML3*)

Conventional Subdivision 3 (*Conventional ML3*)

Ecological Conservation Design Subdivision 4 (*Eco-Conservation ML4*)

Ecological Innovation Design Subdivision 4 (*Eco-Innovation ML4*)

Conventional Subdivision 4 (*Conventional ML4*)

Table 6: Rating and ranking comparisons of developer and homebuyer perceptions of alternative subdivision designs for medium-priced homes ($250,000 – 399,999)

	Developer (n=13)			**Homebuyer (n=135)**		
Subdivision design type	**Rank**	**Mean**	**S.D.**	**Rank**	**Mean**	**S.D.**
Eco-Conservation ML3	1	5.31*	1.377	3	4.01*	1.766
Eco-Innovation ML3	2	5.00	1.354	2	4.17	1.899
Conventional ML3	5	4.65*	1.281	5	3.63*	1.554
Eco-Conservation ML4	2	5.00	1.814	1	4.75	1.799
Eco-Innovation ML4	4	4.96*	1.216	4	3.77*	1.684
Conventional ML4	6	4.35*	0.801	6	3.35*	1.556

Kendall's tau test for bivariate correlation of ranks: $p=0.056$

*denotes significant difference with t-test of means ($p<0.05$)

Ranking of alternative designs for subdivisions of medium-priced homes was similar for developers and homebuyers ($p<0.05$, *Kendall's tau*) (Table 6). However, developers of medium-priced homes consistently overestimated the homebuyers' preferences for all types of subdivision designs, with significant differences ($p<0.05$, *t-test*) for four of the six designs (67%). More than developers may realize, medium-priced homebuyers may compromise what they prefer for what they can afford to pay.

Similar to the higher-priced market, medium-priced developers and homebuyers ranked the four ecological design types (conservation and innovation) higher than the conventional designs. Ranked highest by the homebuyers was the *Medium-to-lower-priced Ecological Conservation Subdivision 4* (*Eco-Conservation ML4*). This may be attributable to its lower housing density and increased forested open space in the center of the development compared with the other designs for *Subdivision ML4*. One developer specifically stated, "[homebuyers] prefer lower density [in *Eco-Conservation ML4*] (D23)." Developers consistently noted backing up to open space as desirable in the conservation alternatives "privacy is [an] important feature…backing up to each other is not as preferable (D1)," "[*Eco-Conservation ML4*] eliminates backing up to other houses (D21)," "[*Eco-Conservation ML4*] creates more backyard privacy (D2)," and one noted that, "[*Eco-Conservation ML4* has] less density…[which] changes the feel of the neighborhood (D18)." A higher-priced home developer also noted that, "Trees definitely improve the value of the neighborhood…[in *Eco-Conservation ML4*] the groves [of existing trees] definitely add a lot [of value]...creates interest for the lots (D15)."

Although not ranked as highly by homebuyers (3rd), the *Medium-to-lower-priced Ecological Conservation Subdivision 3* (*Eco-Conservation ML3*) was ranked 1st by

developers. Like homebuyers viewing conservation designs for the higher-priced neighborhoods, medium-priced homebuyers did not prefer "double-loaded" small patch disconnected open spaces to the same degree as developers thought. Instead, homebuyers appear to prefer open spaces that are loaded on only one side and are larger and less fragmented. Developers' comments about *Eco-Conservation ML3* suggest that they might not fully understand what homebuyers were noticing about this alternative. Developers said that: "[*Eco-Conservation ML3* creates] visual privacy (D7)," "[*Eco-Conservation ML3*] is most desirable because it provides a park for use by the [homebuyers] (D10)," "[*Eco-Conservation ML3* has] lower density and more trees in backyard (D22),"

The *Ecological Innovation Subdivision 3* (*Eco-Innovation ML3*) was ranked 2nd by both homebuyers and developers. Interestingly, *Eco-Innovation ML3* has more cul-de-sacs than any other design, and developers focused on this feature immediately. The majority of developers mentioned the high number of cul-de-sacs numerous times, noting that homebuyers prefer cul-de-sacs. One went as far as to describe the "sanctity of the cul-de-sac (D22)." In addition, many developers discussed cul-de-sacs as a design tactic to enhance profit.

Several developers noted undesirable spatial relationships among homes in the conventional alternatives. Conventional designs were ranked last (5th and 6th) by both medium-priced home developers and homebuyers. Numerous developers noted that, "A buffer between homes is preferable, shared backyards are not preferable [in *Conventional ML3*] (D3)," "Backing up to each other is not as preferable [*Conventional ML3* and *Conventional ML4*] (D1)," "Backyards facing other backyards [in *Conventional ML4*] is

not good (D22)," and, "Back to back is bad [in *Conventional ML4*], we always try to stagger when designing a neighborhood (D21).

Table 7: Rating and ranking comparisons of developer and homebuyer perceptions of alternative subdivision designs for lower-priced homes (<$250,000)

	Developer (n=10)			**Homebuyer (n=299)**		
Subdivision design type	**Rank**	**Mean**	**S.D.**	**Rank**	**Mean**	**S.D.**
Eco-Conservation ML3	2	5.70*	1.160	3	4.16*	1.722
Eco-Innovation ML3	4	5.00*	0.816	2	4.25*	1.879
Conventional ML3	5	4.35	1.733	5	3.69	1.541
Eco-Conservation ML4	1	6.05	1.212	1	5.19	1.658
Eco-Innovation ML4	3	5.20*	0.753	4	3.91*	1.568
Conventional ML4	6	4.05	1.383	6	3.52	1.482

Kendall's tau test of bivariate correlation of rank: p=0.039
*denotes significant difference with t-test of means ($p<0.05$)

Developers of lower-priced homes (<$250,000) rank homebuyer preferences differently than do developers of medium-priced homes ($250,000 – 399,999). Like developers of medium-priced homes, they tend to overestimate their market homebuyers' preferences for every subdivision design type, but they even more closely approximate homebuyers' relative preferences for the designs (Table 7), appearing to know their market even better than the developers of medium-priced homes know theirs. Though, the lower-priced homebuyers preference ratings for all of the development alternatives are neutral, except for *Eco-Conservation ML4* (x=5.19).

Like developers and homebuyers in the medium and high-priced markets, developers and homebuyers in the lower-priced market rank *Conventional Subdivision*

Designs 3 and *4 (Conventional ML3* and *Conventional ML4)* last. Like developers in the medium-priced markets, developers and homebuyers in the lower-priced market rank the *Eco-Innovation ML3,* which had many cul-de-sacs, very high, while they ranked the second *Eco-Innovation ML4*, which had only one cul-de-sac, somewhat lower. Similar to medium-priced home developers and homebuyers, lower-priced developers and homebuyers most prefer the ecological conservation design that features single-loaded, connected forested open space (*Eco-Conservation ML4*). Lower-priced developers mirror their market in ranking the ecological conservation designs that feature double-loaded, more fragmented forested open space (*Eco-Conservation ML3*) lower.

Figure 4: Single lot neighborhoods 7 and 8

Single lot 7

Single lot 8

Table 8: Comparison of homebuyer and developers' preferences for Single lot neighborhoods 7 and 8

	Higher-priced homes			
	Developer (n=12)		Homebuyer (n=54)	
	Mean	S.D.	Mean	S.D.
Single lot 7	3.08	1.379	2.89	1.449
Single lot 8	4.04	1.177	3.98	1.353

	Medium-priced homes			
	Developer (n=13)		Homebuyer (n=299)	
	Mean	S.D.	Mean	S.D.
Single lot 7	2.69*	1.109	5.02*	1.518
Single lot 8	3.58*	1.382	5.59*	1.340

	Lower-priced homes			
	Developer (n=10)		Homebuyer (n=135)	
	Mean	S.D.	Mean	S.D.
Single lot 7	2.85*	1.248	5.33*	1.303
Single lot 8	4.20*	1.160	5.74*	1.170

*denotes significant difference between developers and homebuyers ($p<0.05$)

The only type of exurban neighborhood that was rated by all homebuyers and all developers in our investigation was single lots: individual residential lots that are not part of a subdivision but are split from agricultural land and have direct access to a public road rather than an internal road system. Because the *Single lot neighborhoods* include homes in a wide range of prices, they were shown to homebuyers in all price ranges. Ratings of these alternatives, then, act as a control in our study, allowing comparisons across market segments (Table 8). Medium and lower-priced homebuyers ranked *Single lots* as the 1st and 2nd most preferred neighborhood type, but developers in all three price ranges as well as the higher-priced homebuyers ranked *Single lots* as the least preferred neighborhood types. This difference between medium and lower-priced homebuyers and all others tends to support our interpretation of the reason why these homebuyers rated most alternative subdivision designs significantly lower than did developers: medium and lower-priced homebuyers compromise their preferences for what they can afford to pay, and developers may not understand the degree to which homebuyers' preferences are compromised by market choices. Compared with middle-to lower-priced

subdivisions, *single lots* are characterized by greater variety in lot size and house type, and may present a wider spectrum of choice for middle-to-lower- priced homebuyers.

Importantly, the two lowest ratings for developers' perception of homebuyer preference, perception of profits, and development likelihood are *Single lot 7* and *Single lot 8*. *Single lots 7* and *8* were considered outliers since many of the developers indicated they did not typically build this development type (mean ratings for likelihood to develop: x=1.79 and x=2.24, respectively). The *Single lots* were described as lot-by-lot development, which requires a process of approvals and financing viewed as inefficient compared to larger production-style[3] subdivision developments. One developer stated that they are "simple splits[4]…not [done by] a real developer."

Developers in all markets perceived *Single lots* as not preferred by their homebuyers because, "there is no architectural control (D2)," "no sense of community (D11)," "haphazard from a planning perspective…setbacks all over the place, [homebuyers] prefer a consistent street edge (D18)," "it is sparse with no neighborhood consistency (D23)," and, "[*Single lot 7*] is not marketable or well designed…[*Single lot 8*] is not much better (D18)." Developers also said that there was a lack of market for this type of development, saying: "it does not appeal to a broad market (D15)," and "it is less

[3] Production homes are typically homes built by developers who are building numerous homes in a single neighborhood. They use common construction techniques and layouts in order to streamline the construction process. Some developers building production homes may call them custom because of the homebuyers' option to select unique finishes and floor plans.

[4] Simple land division in the State of Michigan allow the landowners minimum number of splits based on the number of acres on the site. These splits create larger lots (typically close to 5 acres/lot), are not supported by municipal services (water and sewer), and are not created for traditional subdivision or condominium (Fisher, et al. 2008).

preferred by 75% of the buyers (D9).” Actual homebuyers’ responses contradict the developers’ impressions; both the medium-priced (n=299) and lower-priced homebuyers (n=135) rated the *Single lots 7* and *8* as most preferable.

Although both single-lot neighborhoods were perceived as least preferable overall by developers, the *Single lot 8* neighborhood was accurately recognized by most developers as being more preferred by homebuyers because, “[*Single lot 8*] has enough trees for privacy, not like a farm field…not as bad as [*Single lot 7*] (D22),” and “[*Single lot 8*] has more character because of more vegetation and windy drives (D8).”

Developers’ perception of neighborhood profitability and likelihood to develop

Higher-priced home developers differed from medium-to-lower-priced home developers in their perceptions of profitability and their likelihood to develop the subdivision design. While there was a weak correlation between rankings of perceived profitability and development likelihood for higher-priced home developers and medium-priced developers (p=0.138, p=0.188, *Kendall’s tau*), there was a significant correlation between perceived profitability and development likelihood (p=0.039, *Kendall’s tau*) among lower-priced developers.

Table 9: Comparison of higher-priced home developers' (n=12) perception of profits and their likelihood to develop a similar project

	Perception of profits			**Likelihood to develop**			**Preference ranks**	
Neighborhood Type	**Rank**	**Mean**	**S.D.**	**Rank**	**Mean**	**S.D.**	Deve-loper	Home-buyer
Eco-Conservation H1	2	5.46	1.033	3	4.58	1.730	6	3
Eco-Innovation H1	8	4.46	1.305	4	4.33	1.723	4	4
Conventional H1	4	5.00	1.665	2	4.67	1.723	7	7
Eco-Conservation H2	6	4.67	1.775	8	3.88	2.068	1	5
Eco-Innovation H2	7	4.50	1.638	6	4.08	1.832	5	6
Conventional H2	5	4.79	1.616	7	4.00	2.132	8	8
Eco-Remnant H5	3	5.18	1.250	5	4.11	2.257	3	2
Eco-Remnant H6	1	5.73	1.212	1	4.86	1.790	2	1

Kendall's tau bivariate correlation	Perceived profitability and likelihood to develop	Perceived profitability and perception of homebuyer preference	Developers' and homebuyer's preference
Significance	0.138	0.216	0.048*

*denotes significant correlation with Kendall's tau bivariate correlation results ($p<0.05$)

Developers' comments help to explain the relationship between perceived profitability and likelihood to develop a similar design. Although the *Higher-priced Ecological Remnant Subdivisions 5* and *6* (*Eco-Remnant H5* and *H6*) received high ratings for profitability (x=5.18 and x=5.73), development likelihood is much lower (x=4.11 and x=4.86). Some developers noted why they would not choose to develop *Eco-Remnant H5* and *H6*, "[*Eco-Remnant H6* needs to have] more density…less isolated to

make a profit (D10)" and, "some developer went to a lot of trouble to save the trees [in *Eco-Remnant H5*]…more expensive to the developer (D15)." Similar to the *Single lots*, some of the developers noted that *Eco-Remnant H5* seemed to contain custom homes and inferred that multiple builders had developed individual properties.

Other comments made about the profitability of the higher-priced neighborhood types pointed out the inefficiency in the *Higher-priced Subdivision 2'*s single-loaded road layout. Paving the road is a very expensive portion of the development costs, the developers commented that, "Street frontage is king (D12)," and, "You cannot afford single-loaded street [*Eco-Conservation H2*] (D10)." The *Eco-Conservation H2* received mixed responses on the change in density (less 1 home), although it was still ranked 2nd highest in profits (x= 5.46). There were differences among developers in their perception of profits. Some said, "one home won't matter in the profits (D23)," "site premiums make up for lost home [in *Eco-Conservation H2*] (D10)," and another said, "the one with the most number of units will have the most profits (D15)."

The medium and lower-priced home developers also commented on the inefficiency of single-loaded roads. One stated that he, "wouldn't single-load a road for another park [in *Eco-Conservation H2*] (D4)," and, "[*Subdivision H2*] is not good because it has too much road and not enough homes (D1)." One developer also commented on the cost of planting in *Eco-Innovation H2* that, "The price of wildflower seed is expensive (D21)."

Table 10: Comparison of medium-priced home developers' (n=13) perception of profits and their likelihood to develop a similar project

	Perception of profits			**Likelihood to develop**			**Preference ranks**	
Neighborhood Type	**Rank**	**Mean**	**S.D.**	**Rank**	**Mean**	**S.D.**	Deve-loper	Home-buyer
Eco-Conservation ML3	5	4.12	1.227	5	4.67	1.670	1	3
Eco-Innovation ML3	1	5.92	1.702	3	5.75	1.712	2	2
Conventional ML3	2	5.65	0.747	2	6.00	0.853	5	5
Eco-Conservation ML4	6	3.42	1.084	6	3.92	1.881	2	1
Eco-Innovation ML4	3	5.50	1.384	4	5.17	1.697	4	4
Conventional ML4	4	5.25	0.622	1	6.25	1.138	6	6

Kendall's tau bivariate correlation	Perceived profitability and likelihood to develop	Perceived profitability and perception of homebuyer preference	Developers' and homebuyer's preference
Significance	0.188	0.702	0.056*

*denotes significant correlation with Kendall's tau bivariate correlation results ($p<0.05$)

Medium-priced home developer perceptions of profitability by rank were weakly correlated to their likelihood to develop a similar project (p=0.188, *Kendall's tau*). The higher development density and cul-de-sacs in both of the innovative alternatives *Subdivisions ML3* and *ML4*, as opposed to the conservation design alternatives may explain why developers ranked them higher (1^{st}, 2^{nd}, 3^{rd}, and 4^{th}) for profitability and likelihood to build, even given numerous criticisms of native plantings (*Eco-Innovation ML3* and *ML4*). One developer commented that, "[Homebuyers] wouldn't notice the difference [between *Eco-Innovation ML4* and *Conventional ML4*]." Developers' comments on ecological innovation design alternatives' effects on profits include, "[*Eco-*

Innovation ML3 and *Eco-Innovation ML4*] would be too expensive to do all the plantings (D11)" and, "The [homebuyer] prefers the vegetation, but I don't want to deal with the landscape requirement (D6)." Higher-priced home developers had a different perspective on the innovative plantings, "[I] will pay [more to build *Eco-Innovation ML3*], but it looks great (D13)," and another higher-priced home developer stated, "Natural buffers [in *Eco-Innovation ML3* & *Eco-Innovation ML4*] is preferred…but not appropriate for a traditional buyer (D15)," and one developer commenting on their higher-priced homebuyer, "The more mature landscape package is preferred by active adults (D18)."

Developers ranked *Eco-Conservation ML3 and Eco-Conservation ML4* as the least profitable and least likely to build, yet the developers' perceived the same alternatives as most preferred to their market segment homebuyers. The conservation alternatives shown in *Eco-Conservation ML3* and *Eco-Conservation ML4* reduced housing density and the number of cul-de-sacs, and increased the proportion of the subdivision in woodland. The loss of density was noted as significant to profits by most of the developers, and as one clearly stated, "more profit with more density (D18)."

Other developers discussed the trade-offs of the conservation development alternatives versus the conventional alternatives, "[*Eco-Conservation ML3*] losing the premium cul-de-sac sites is not preferable (D5)," and "There is a trade-off between vegetation and density, configuration of the lot can receive a significant premium because large lots pay more…[in *Eco-Conservation ML3*] the lots backing up to open space are premium lots (D22)." Two developers described why the location of open space matters to the homebuyer, commenting that, "The open space in [*Eco-Conservation ML3*] won't get [premiums] because it has to be visible, it has to be accessible…[*Eco-Conservation*

ML4] is more preferable, [the homebuyer] can see the space and there is access to the space (D11)," another stating that, "No one cares [the open space in *Eco-Conservation ML3*], only planners care about it (D23)." One developer said, "the [homebuyer] is less interested in the community design [in *Eco-Conservation ML3*] and more interested in the cost of the home…[homebuyers] won't pay for the [open space] we need a break…very few [homebuyers] are asking about vegetation, they ask 'how much will it cost' and 'who will maintain it'…[the homebuyers] like it as long as they don't pay for it (D18)."

All developers' noted that properties on cul-de-sacs receive a premium price, the amount a homebuyer will pay over the baseline home price. Developers who built higher-price subdivisions estimated receiving higher premiums for cul-de-sac development than did developers of the medium and lower-priced subdivisions. . For example, one higher-priced home developer estimated, "$20,000 – 30,000/lot premium (D9)," while a medium to lower priced-home developer responded that a cul-de-sac would get, "$5,000/lot premium (D7)."

Table 11: Comparison of lower-priced home developers' (n=10) perception of profits and their likelihood to develop a similar project

	Perception of profits			**Likelihood to develop**			**Preference ranks**	
Subdivision Type	**Rank**	**Mean**	**S.D.**	**Rank**	**Mean**	**S.D.**	Deve-loper	Home-buyer
Eco-Conservation ML3	5	4.35	1.203	5	4.90	1.745	2	3
Eco-Innovation ML3	2	6.50	0.527	1	6.30	0.823	4	2
Conventional ML3	1	5.80	0.753	2	6.15	0.944	5	5
Eco-Conservation ML4	6	3.56	1.333	6	4.60	1.823	1	1
Eco-Innovation ML4	4	6.05	0.832	3	5.80	1.229	3	4
Conventional ML4	3	5.50	0.612	4	5.45	1.301	6	6
Results: ***Kendall's tau bivariate correlation***	Perceived profitability and likelihood to develop		Perceived profitability and perception of homebuyer preference			Developers' and homebuyer's preference		
Significance	0.039*		0.039**			0.039*		

*denotes significant correlation with Kendall's tau bivariate correlation results ($p<0.05$)
**denotes significant negative correlation with Kendall's tau bivariate correlation (correlation coefficient: - 0.733)

Lower-priced home developers' perception of profit and their likelihood to develop a similar project are significantly correlated (p=0.039, *Kendall's tau*), while their perception of profits is negatively correlated with their perception of homebuyer preference (p=0.039, correlation coefficient: - 0.733). This is consistent with lower-priced home developers' comments that they perceive homebuyers prefer open space, but they do not believe homebuyers are willing to pay for it. Developers' perception of density, "efficiency," and, the additional costs of the design alternatives were most often noted by developers who built in the lower-priced subdivisions. One developer clearly stated that, "density is good and efficient for profits (D1)." A medium-priced home developer

confirms this by stating, “density is more affordable for the homebuyer,” and later says that, “the more expensive the house the more important the [site] elements are (D4).” This finding is notable because the actual homebuyer respondents rated all of the development alternatives as having neutral preference except for the *Single lot* neighborhoods (Table 8). This is illustrated further by developer survey responses and direct quotes for the *Single lot* neighborhoods (Table 12).

Table 12: Comparison of developers’ perception of profitability and likelihood to develop Single lot 7 and 8

	Higher-priced home developers (n=12)			
	Profitability		Development Likelihood	
	Mean	S.D.	Mean	S.D.
Single Lot 7	4.18*	1.25	1.64*	0.809
Single Lot 8	4.36*	1.12	2.23*	1.862

	Medium-priced home developers (n=13)			
	Profitability		Development Likelihood	
	Mean	S.D.	Mean	S.D.
Single Lot 7	3.33*	1.303	1.50*	0.798
Single Lot 8	3.67*	1.435	1.92*	1.782

	Lower-priced home developers (n=10)			
	Profitability		Development Likelihood	
	Mean	S.D.	Mean	S.D.
Single Lot 7	3.39*	1.219	2.00*	1.333
Single Lot 8	4.17*	1.000	2.70*	2.226

*denotes significant difference with t-test of means ($p<0.05$)

Although all the developers have a low to neutral perception of profits and low likelihood to develop *Single lot* neighborhoods, higher-priced developers perceived greater profitability than others in *Single lot* neighborhoods. When developers discussed

the profitability of *Single lot 7* and *8* one said, "[*Single lot 7*] is crappy but will make money…it may make money but I won't like doing it (D13)." Another confirmed this by saying, "[there is an] opportunity for profit because there are very little improvements[5] (D12)." *Single lots* were seen by some of the developers as, " having a slow sales rate (D15)," and as "[having] too many variables and unknowns [to make a profit] (D22)."

How specific subdivision landscape characteristics influence developers' perception of profits and likelihood to develop

Based on our cluster analysis, we grouped design alternatives by visible landscape characteristics. For example the presence of a cul-de-sac, different vegetation type, and changes in housing density had a large influence on developer responses. The different types of vegetation such as: mature trees, conservation areas, native plantings, and planting buffers between homes, also were frequently noted. This section further discusses the subdivision landscape characteristics that influence developers' perceptions of their market homebuyers' preferences, their own profits, and their likelihood to develop different development alternatives. The differences between clusters (shown in Table 13) of the higher-priced home developers and the medium-to-lower-priced home developers underscore our finding of differences among developers in different market segments. The results in Table 13 show the similarity between the higher-priced home developer clusters and actual homebuyer preference. In contrast, medium-to-lower-priced home developer clusters differ from actual homebuyer preferences.

[5] The term improvements in used here to mean construction items such as utilities and road construction.

Higher-priced home clusters

Table 13: Cluster analysis of higher-priced home developers (n=12, $400,000 +)

	Profit	
Preference	Higher Profits	Neutral Profits
High Preference	*Eco-Remnant H5, Eco-Remnant H4, Eco-Conservation H1, Conventional H1*	*Conventional H2, Eco-Conservation H2*
Neutral Preference		*Single lot 7, Eco-Innovation H1, Eco-Innovation H2*
Low Preference		*Single lot 8*

	Likelihood	
Preference + Profit	Neutral Likelihood	Low Likelihood
High Pref. + Higher Prof.	*Eco-Remnant H5, Eco-Remnant H4, Eco-Conservation H1, Conventional H1*	
High Pref. + Neutral Prof.	*Conventional H2, Eco-Conservation H2*	
Low/Neutral Pref. + Neutral Prof.	*Eco-Innovation H1, Eco-Innovation H2*	*Single lot 7, Single lot 8*

The higher-priced home developers preferred the more densely wooded sites of the *Ecological Remnant 5* and *6* (*Eco-Remnant H5* and *Eco-Remnant H6*) design alternatives as well as preferred the overall cul-de-sac layout of *Higher-priced Subdivision 1* to the arching road layout of *Higher-priced Subdivision 2* layout. The higher-priced homebuyer preference responses correspond closely with the developers' classifications.

Developers who responded as not building in this home-price range reacted differently to the *Eco-Remnant H5* and *Eco-Remnant H6* design alternatives. One developer explained, "I don't do custom homes, because I cannot deal with custom clients (D21)." Another developer stated, "[*Eco-Remnants'*] lots are too big for good

profits (D5)." One also remarked that *Eco-Remnant H6* has, "nice trees, privacy, aesthetics, but is not a neighborhood (D4)."

Many of the developers had inconsistent responses to different ecologically innovative design alternatives (*Eco-Innovation H2* and *Eco-Innovation H1*). One developer rated both the *Eco-Innovation H1* and *Eco-Innovation H2* very highly (7 and 6 respectively) but rated *Eco-Innovation H2* much lower (rating it a 3, while rating *Eco-Innovation H1* a 6) for profits stating, that it creates, "more open space to maintain, higher homeowner fees, and too much grass (D11)." Numerous developers discussed the cost of the natural plantings noting that, "Landscaping is costly (D13)," "Spending money creating natural areas is difficult to make work [in *Eco-Innovation H2*], [*Eco-Conservation H2*] is more likely to be done because the natural areas are existing (D12)," and, "[*Eco-Innovation H2* is the] least attractive because it is forcing nature and the seeds will blow into the yards and the yards will get weeds (D12)."

Some of the developers saw homes that back up to open space, the preservation of mature trees, and privacy provided by both the existing and planted vegetation in the ecological development alternatives (*Eco-Conservation H2* & *Eco-Innovation H2*) as valuable, while others focused more on the numbers (lot size and ratio of road to number of units).

Interestingly, the two notable comments made about *Conventional H1* were by respondents developing outside of this price-range. Their comments were similar: "[*Conventional H1*] is better than [*Eco-Innovation H1*] because it has a more effective backyard…families want a more useable yard (D5)," and "The natural plantings would

be preferred by empty nesters [*Eco-Innovation H1*] but families want more usable yard [*Conventional H1*] (D4)."

Medium-to-lower-priced home clusters

Table 14: Cluster analysis of medium-priced home developers (n=13, $250,000 – 399,999)

	Profit	
Preference	Higher Profits	Neutral Profits
Higher Preference	*Eco-Innovation ML3, Eco-Innovation ML4, Conventional ML3, Conventional ML4*	*Eco-Conservation ML3, Eco-Conservation ML4*
Lower Preference		*Single lot 7, Single lot 8*

	Likelihood		
Preference + Profit	High Likelihood	Neutral Likelihood	Low Likelihood
Higher Pref. + Higher Prof.	*Eco-Innovation ML3, Eco-Innovation ML4, Conventional ML3, Conventional ML4*		
Higher Pref. + Neutral Prof.		*Eco-Conservation ML3, Eco-Conservation ML4*	
Lower Pref. + Neutral Prof.			*Single lot 7, Single lot 8*

Table 15: Cluster analysis of lower-priced home developers (n=10, >$250,000)

	Profit	
Preference	*Higher Profits*	*Neutral Profits*
High Preference	*Conventional ML3, Conventional ML4*	*Eco-Conservation ML3, Eco-Conservation ML4*
Neutral Preference	*Eco-Innovation ML3, Eco-Innovation ML4,*	*Single lot 8*
Low Preference		*Single lot 7*

	Likelihood		
Preference + Profit	High Likelihood	Neutral Likelihood	Low Likelihood
High Pref. + Higher Prof.	*Conventional ML3, Conventional ML4*		
High Pref. + Neutral Prof.		*Eco-Conservation ML3, Eco-Conservation ML4*	
Neutral Pref. + Higher Prof.	*Eco-Innovation ML3, Eco-Innovation ML4,*		
Low/Neutral Pref. + Neutral Prof.			*Single lot 7, Single lot 8*

The medium and lower-priced home developer responses do not align with homebuyer preferences for these designs. This may be noted in the previous section's discussion of the significant change in density on the *Eco-Conservation ML3* and *ML4*. Table 13 also shows that the higher-priced home have all neutral rating for profits and development likelihood, where the medium and lower-priced design alternatives that maintained density (*Eco-Innovation* and *Conventional ML3* and *ML4*) received high ratings on perception homebuyer preference, profits as well as development likelihood by the medium and lower-priced home developers. Although, the actual homebuyer preference were neutral to low for all design alternatives except *Eco-Conservation ML3* and *ML4*.

Even though the *Eco-Innovation Design ML3* and *ML4* ranked higher than other designs, and the developers' comments reflected that there were several landscape characteristics that developers perceived as preferable (e.g. cul-de-sacs, privacy, double-loaded roads, homes backing up to open space, and mature vegetation), developers did not perceive other characteristics of these designs, such as prairie-type plantings, favorably.

Comments responding to the increased native herbaceous vegetation and reduced turf area include, "[It is] weeds for landscape (D17)," "It looks like weeds on unsold lots (D9)," "Rough areas are too close to the homes (D2)," and, "[In *Eco-Innovation ML3*] the natural areas are reducing the backyard, cutting down on a place to play (D12)." One developer went more in depth saying that, "[The] crap in the front [yard] is restricted in the site condo deed restrictions, [which] allows primarily lawn…If these were traditional [plants] [the homebuyers] would like them in the back [yard] but not the front [yard]… I cannot sell [homes] with the natural vegetation in front, because that is not what [the homebuyer] is used to and it also costs more. So if it is close to what the [homebuyer] is used to and they perceive a value return within 3 to 5 years, [then] yeah they'll do it (D21)."

Landscape characteristics that developers preferred in the *Eco-Innovation ML3* and *Eco-Innovation ML4* development alternatives include, "[Liking] the cul-de-sacs in [*Eco-Innovation ML4*] because the homebuyers are willing to pay a premium [for their perception of] less traffic more privacy (D4)," "backing up to the existing woodland [in *Eco-Innovation ML3*] is valuable…[*Eco-Innovation ML3*] is dense, has lot premiums, and is backing up to substantial landscaping (D18)," "privacy is improved with vegetation in [*Eco-Innovation ML3*] (D22)," "[*Eco-Innovation ML3* has an] effective use of trees (D23)," "[*Eco-Innovation ML4*] the location of the natural plantings add value (D9)," and, "the best sites [in *Eco-Innovation ML4*] have mature open space [for privacy] (D21)." One developer pointed out, "the increase in non-planted trees [in *Eco-Innovation ML4*] is significant (D22)."

The *Conventional (ML3* and *ML4)* design alternatives, referred by one developer as "typical (D18)" were ranked the lowest (5^{th} and 6^{th} respectively) in preference by both the homebuyers and the developers. On the other hand *Conventional ML3* as ranked in the top 3 for profits and likelihood by the medium and lower-priced home developers with one developer stating, "this looks like what we do (D12)." *Conventional ML4* was ranked 4^{th} for profits and likelihood possibly due to the layout and location, one developer commenting that, "I don't like the corner parcels (D6)." Developers offered that these designs were desirable because, "I like the cul-de-sacs in [*Conventional ML3*] because the [homebuyers] are willing to pay a premium (D4)," and, "[*Conventional ML4*] is typical, load [the roads] as much as you can (D18)." Many developers discussed the importance of density stating, "density is good (D1, D5, D7, & D21)," and one saying "profits all depend on density (D9)."

6 Discussion

Overall both homebuyers and developers see value in ecological design alternatives versus the conventional alternatives. However, developers' perceptions of the profitability of ecological designs, and their expressed likelihood to adopt ecological design in their own firms is not strongly related to their perceptions of homebuyer preferences, especially for developers in the lower-priced market segments.

Developer and homebuyer perception of neighborhood types

In this study, we made direct comparisons between developers' perceptions of homebuyer preference and actual homebuyer preference for the same neighborhood views. We found that homebuyer preferences as well as developers' perception of

homebuyer preference indicate that certain ecological design alternatives are favored. For example, subdivision designs that include forested open space are preferred, consistent with Kaplan and Austin's (2004) survey of exurban residents, and Bowman and Thompson's (2009) results indicating that subdivision residents are willing to pay a premium for nearby open space. We found that homebuyers' preferences and developers' perceptions of their preferences extends to ecologically innovative designs that replace turf in about half the lawn areas of residential properties and much of public open space with native herbaceous plants. However, developers' comments expressing concerns for maintenance and the need to retain turf areas for active families are also consistent with past studies (Kaplan and Austin 2004; Nassauer, 2004; Nassauer, 1993).

Unlike Bowman and Thompson's study (2009), we found that developers perceive homebuyers preferring ecological design alternatives, particularly those emphasizing forested open space. Differences could be attributable to differences in the sample populations of developers and subdivision residents in eastern Iowa compared with southeast Michigan. Another reason might be differences in the survey instrument. Participants in our study were presented with images of alternative subdivision designs, while participants in the Bowman and Thompson study were presented with verbal descriptions of specific development characteristics that could enhance sustainability.

Developers also frequently noted that homebuyer preferences differ with age, presence of children and income, and this is consistent with many previous studies (Fernandez et al., 2005; Wang, 2009).

Developers' perceptions of neighborhood profitability and likelihood to develop

Results from the developers' perceptions of profitability and their likelihood to develop are notable. The analysis suggests that higher-home price developers understand that ecological design developments are most preferred by their market segment homebuyers, the same design alternatives are perceived as most profitable, but their willingness to develop a similar subdivision is neutral to low. This raises the question, why are developers not doing the more profitable projects? Mohamed (2006) raised similar questions and speculated that developers satisfice, not making "secondary investments" even when such investments could result in higher profits.

In addition, the results suggest that the medium-to-lower-priced home developers are building what they believe to be most profitable, not necessarily what homebuyers prefer, even when they have a strong understanding to what homebuyers prefer. Bowman and Thompson's (2009) study further concludes that homebuyers are willing to pay for such features.

How specific visible neighborhood characteristics influence on developers' perception of profits and likelihood to develop

It is evident that specific visible neighborhood characteristics have a large influence on a developer perception of homebuyer preference, profitability and development likelihood of a neighborhood. Notably, site characteristics specifically selected for their ecological design benefits received high ratings by developers and homebuyers. For example, existing vegetation, mature trees, and backing up to open space.

Privacy was perceived as important to homebuyers by developers. Neighborhood characteristics such as cul-de-sacs, backing up to open space, larger lots and lower

density were all mentioned as providing the homebuyer with more privacy. Privacy was something that developers believed to be very important to homebuyers, but this contrasts with what Kaplan and Austin (2004) found to be important to residents of exurban subdivisions. Their survey indicated that privacy from neighbors was notably less important to residents than a view to nature from home, and fulfilling a "desire for space".

7 Conclusions

Our results suggest that higher-priced homebuyers prefer ecological designs, and that higher-priced home developers know this, and perceive such development designs as profitable. The results also suggest that the medium-to-lower-priced homebuyers also prefer ecological designs for neighborhoods within their market segment. However, developers in this market segment may underestimate demand for such designs, as well as their potential profitability. Consequently, there may be unrealized markets for ecologically designed medium-to-lower-priced subdivisions at the metropolitan fringe.

Appendices

Appendix 1: Modified survey instrument[6]

[6] The same neighborhood images were shown three different times to the developers during the actual interview (i.e., 1. homebuyer preference, 2. profitability, 3. development likelihood), the images are shown only once in the appendix.

We want to show you new houses in new neighborhoods that are in about the same price range as **your** market segment homebuyer. Please estimate how much their market house price in the 2000-02 market would be:

- ○ **Less than $ 250,000**
- ○ **Between $ 250,000 – 399,999**
- ○ **Between $400,000 – 599,999**
- ○ **More than $600,000**
- ○ **I'm not sure**
- ○ **I don't own a home**

Left-Arrow Back | Right-Arrow Next page

Now you will select the neighborhood your market homebuyer would most likely prefer. Some of the views you will choose from will look very similar - like those you see below. But the trees and other plantings in each neighborhood ARE different. In the following pages, you will see larger images of the neighborhoods shown below, and you will rate your market homeowner's preference. To help you compare, you can use the left-arrow key on the keyboard to review the neighborhood images.

Left-Arrow Back | Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer 1 2 3 Neutral 4 5 6 Strongly prefer 7

Left-Arrow Back | Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer 1 2 3 Neutral 4 5 6 Strongly prefer 7

Left-Arrow Back | Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer — Neutral — Strongly prefer

1 2 3 4 5 6 7

Left-Arrow Back | Right-Arrow Next page

Now you will select the neighborhood your market homebuyer would most likely prefer. Some of the views you will choose from will look very similar - like those you see below. But the trees and other plantings in each neighborhood ARE different. In the following pages, you will see larger images of the neighborhoods shown below, and you will rate your market homeowner's preference. To help you compare, you can use the left-arrow key on the keyboard to review the neighborhood images.

Left-Arrow Back | Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer — Neutral — Strongly prefer

1 2 3 4 5 6 7

Left-Arrow Back

Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer — Neutral — Strongly prefer

1 2 3 4 5 6 7

Left-Arrow Back

Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer 1 2 3 Neutral 4 5 6 Strongly prefer 7

Left-Arrow Back | Right-Arrow Next page

Next you will see more images of different neighborhoods. Rate each image to show your market homebuyer's preference for the neighborhood shown.

Strongly do not prefer 1 2 3 Neutral 4 5 6 Strongly prefer 7

Left-Arrow Back | Right-Arrow Next page

Next you will see more images of different neighborhoods. Rate each image to show your market homebuyer's preference for the neighborhood shown.

Strongly do not prefer — Neutral — Strongly prefer

1 2 3 4 5 6 7

Left-Arrow Back | Right-Arrow Next page

Next you will see more images of different neighborhoods. Rate each image to show your market homebuyer's preference for the neighborhood shown.

Strongly do not prefer — Neutral — Strongly prefer

1 2 3 4 5 6 7

Copyright @2004
Joan Nassauer
Updated 2008
Liz Westbrook

Left-Arrow Back | Right-Arrow Next page

Next you will see more images of different neighborhoods. Rate each image to show your market homebuyer's preference for the neighborhood shown.

Strongly do not prefer — Neutral — Strongly prefer

1 2 3 4 5 6 7

Left-Arrow Back | Right-Arrow Next page

Now you will select the neighborhood your market homebuyer would most likely prefer. Some of the views you will choose from will look very similar - like those you see below. But the trees and other plantings in each neighborhood ARE different. In the following pages, you will see larger images of the neighborhoods shown below, and you will rate your market homeowner's preference. To help you compare, you can use the left-arrow key on the keyboard to review the neighborhood images.

Left-Arrow Back | Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer 1 2 3 Neutral 4 5 6 Strongly prefer 7

Left-Arrow Back | Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer 1 2 3 Neutral 4 5 6 Strongly prefer 7

Left-Arrow Back | Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer — Neutral — Strongly prefer

1 2 3 4 5 6 7

Left-Arrow Back | Right-Arrow Next page

Now you will select the neighborhood your market homebuyer would most likely prefer. Some of the views you will choose from will look very similar - like those you see below. But the trees and other plantings in each neighborhood ARE different. In the following pages, you will see larger images of the neighborhoods shown below, and you will rate your market homeowner's preference. To help you compare, you can use the left-arrow key on the keyboard to review the neighborhood images.

Left-Arrow Back | Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer — Neutral — Strongly prefer

1 2 3 4 5 6 7

Left-Arrow Back | Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer — Neutral — Strongly prefer

1 2 3 4 5 6 7

Left-Arrow Back | Right-Arrow Next page

Rate the image to show your market homebuyer's preference for the neighborhood shown. You can go back and forth to compare these three images and revise your ratings.

Street View

Strongly do not prefer — Neutral — Strongly prefer

1 2 3 4 5 6 7

Left-Arrow Back | Right-Arrow Next page

How important do you think each of the following is in your market homebuyer's decision to move to a neighborhood?

	Not at all important	Not very important	Somewhat important	Very important
Close to work	○	○	○	○
Good schools	○	○	○	○
Housing costs/good value	○	○	○	○
Convenient to places such as shopping and schools	○	○	○	○
Lots of recreational opportunities	○	○	○	○
Attractive appearance of neighborhood	○	○	○	○
Community size	○	○	○	○
People similar to you	○	○	○	○
Appearance/layout of dwelling	○	○	○	○
Familiar with area	○	○	○	○
Close to natural areas (woods, ponds, streams, etc.)	○	○	○	○
Openness/spaciousness of the area	○	○	○	○
Close to family/friends	○	○	○	○

Left-Arrow Back | Right-Arrow Next page

Of these reasons, which of those reasons do you think is the most important to your market homebuyer? (MARK ONLY ONE)

	Most important
Close to work	○
Good schools	○
Housing costs/good value	○
Convenient to places such as shopping and schools	○
Lots of recreational opportunities	○
Attractive appearance of neighborhood	○
Community size	○
People similar to you	○
Appearance/layout of dwelling	○
Familiar with area	○
Close to natural areas (woods, ponds, streams, etc.)	○
Openness/spaciousness of the area	○
Close to family/friends	○

Left-Arrow Back | Right-Arrow Next page

During a typical week in the summer, how many hours per week do you think your market homebuyer works in their garden or yard?

During the past year, about how often do you think your market homebuyer participated in the each of the following activities in southeast Michigan?

Activity	Never	1-2 times	3-6 times	More than 6 times
Bird watching				
Camping				
Hiking, biking, walking on a nature trail				
Hunting				
Canoeing, fishing or swimming in rivers or lakes				
Scenic viewing of natural or scenic areas				
Having picnic or barbecue in parks				
Engaging in outdoor sports, e.g. golfing, tennis, football, basketball				

Left-Arrow Back | Right-Arrow Next page

What do you estimate your market homebuyer's household income to be, before taxes and other deductions, during 2001?

- **Less than $34,999**
- **$35,000 through $74,999**
- **$75,000 through $114,999**
- **$115,000 through $154,999**
- **$155,000 through $194,999**
- **$195,000 through $234,999**
- **$235,000 through $274,999**
- **$275,000 through $314,999**
- **$315,000 and greater**
- **Unsure**
- **Decline to answer**

Left-Arrow Back
Right-Arrow Next page

Part Two – Neighborhood Profitability

You'll see the same images of the different neighborhoods and you will give your best judgment about its profitability for you as the developer.

This section will be based on the following assumptions:

- A normal market (between 2000-20002)
- All neighborhoods are equal in terms of proximity to good schools, highway, etc.

Left-Arrow Back
Right-Arrow Next page

Part Three – How likely YOU are to do a development like the one shown

Now, finally, you'll see the same images of the different neighborhoods and you will indicate how likely you yourself would be to do a residential subdivision with the landscape characteristics that you see in the image.

This section will be based on the following assumptions:

- A normal market (between 2000-20002)
- All neighborhoods are equal in terms of proximity to good schools, highway, etc.

Left-Arrow Back

Right-Arrow Next page

Appendix 2: Interview instrument of open-ended questions

1. *Introduction:* Verbally present the contents of the introduction page and the survey assumptions before showing the developer the questionnaire. Give definition of terms:
    a. *Neighborhood* – defined as a single contained subdivision.
    b. *Exurban* – defined as communities located on the urban fringe that has at least a quarter of the residents commuting to jobs in an urbanized areas. Exurban development exhibits low housing density, and has relatively high population growth.
    c. *Market homebuyer* – defined as the homebuyer you were typically sellinghouse to during the 2000–2002 housing market.
    d. *Profitability* – defined as the neighborhood's ability to make a profit under the presented conditions.
    e. *Developable* – defined as your ability as the developer to build the project.

2. *Computer-assisted Questionnaire:* Have the developer's take survey.
    a. *Part One*: Respond from the perspective of a homebuyer in their market segment;
    b. *Part Two*: Respond from a profitability perspective;
    c. *Part Three*: Respond about their likelihood to develop.

3. *Open-ended Questionnaire:* Questions to further gain insight from the developer's decision-making during the survey.
    a. *Part One*: Market Homebuyer
        1. Why do you believe your market homebuyer would prefer/not prefer this certain neighborhood?
        2. What specific elements do you use to estimate your market homebuyer's preferences? Point to the elements on the screen.
        3. How do determine what homebuyers to target and why?
    b. *Part Two*: Neighborhood Profitability
        1. What did you notice about this certain neighborhood that leads you to believe it would be more/less profitable?
        2. How does this neighborhood contribute to or detract from

your profit?

3. How do you differentiate between investing in public goods/services and pricing of the lot/home?
4. Are certain natural elements or neighborhood layouts that are more important in determining profitability of developments? What other natural elements are important in determining profitability?

c. *Part Three*: Likelihood to Develop

1. What makes this neighborhood more likely for you to develop?

ii. What additional information do you look for before developing a site?

d. *Part Four:* Ecological Design

1. Looking at specific designs or sites do you see aspects that are valuable to nature?
2. Do you see elements related to improving stormwater management?
3. Do you see elements related to improving wildlife habitat? Do you see this adding value to the development?
4. If your market homebuyer were told that some of the plantings in the neighborhood are ecologically-friendly and are contributing to stormwater management, wildlife habitat, CO2 absorption, would the buyer be more willing to buy a home in this neighborhood? Would your market homebuyer be willing to pay more because of these elements? If so how much? What factors do you use to determine the amounts?

References

Baerwald, T. 1981. The site selection process of suburban residential builders. *Urban Geography*, 2(4): 339-357.

Brown, D.G., Robinson, D.T., An, L., Nassauer, J.I., Zellner, M ., Rand , W., Riolo, R., Page, S.E., and Low, B. 2008. Exurbia from the bottom-up: Confronting empirical challenges to characterizing complex systems. *GeoForum*, 39(2): 805-818.

Bowman, T. and Thompson, J. 2009. Barriers to implementation of low-impact and conservation subdivision design: Developer perceptions and resident demand. *Landscape and Urban Planning*, 92(2): 96-105.

Daily, G.C.1997. *Ecosystem Services: Benefits Supplied to Human Societies by Natural Ecosystems*. Ecological Society of America.

Ehrlich, P.R., Ehrlich, A.H., 1974. *The End of Affluence: A Blueprint for Your Future*. Ballantine Books, New York, NY..

Carter, T. 2009. Developing conservation subdivisions: Ecological constraints, regulatory barriers, and market incentives. *Landscape and Urban Planning*, 92(2): 117-124.

Fernandez, L., Brown, D.G., Marans, R, and Nassauer, J. I. 2005. Characterizing location preferences in an exurban population: Implications for agent based modeling. *Environment and Planning B*, 32(6): 799-820.

Fisher, G. A., Galvin, J. F., Greene, A.M., Need, G.K., Rosati, C.A. 2008. *Michigan Zoning, Planning, and Land Use*. The Institute of Continuing Legal Education. Ann Arbor, MI.

Hager, M.C. 2003. Low-Impact Development. *Stormwater*, 4(1): 12 –25.

Hertz, R. and Imber, J. 1995. *Studying Elites Using Qualitative Methods*. Sage Publications, Inc. Newbury Park, CA.

An, L., Brown, D.B., Nassauer, J.I., Low, B. In Review. Variations in development of exurban residential landscapes: Timing, location, and driving forces. Submitted to *Journal of Land Use Science*.

Milesi C., Elvidge, C.D., Dietz, J.B., Tuttle, B.J., Nemani, R.R., and Running, S.W. 2005. Mapping and modeling the biogeochemical cycling of turf grasses in the United States. *Environmental Management*. Online First. DOI: 10.1007/s00267-004-0316-2

Kaplan, R., and Austin, M.E. 2004. Out in the country: Sprawl and the quest for nature nearby. *Landscape and Urban Planning*, 69(2-3): 235–243.

Kolbe, P.T. & Gaylon, G.E. 2006. *Investment Analysis for Real Estate Decisions (6th Edition).* Dearborn Real Estate Education, Chicago, IL.

Leung, L. 1987. Developer behavior and development control. *Land Development Studies,* 4: 17-34.

Lubienski, C. (2005). Public Schools in Marketized Environments: Shifting Incentives and Unintended Consequences of Competition-Based Educational Reforms. *American Journal of Education*, 111(4): 464-486.

Nassauer, J.I. 1993. Ecological function and the perception of suburban residential landscapes. In Gobster, P.H., ed., *Managing Urban and High Use Recreation Settings, General Technical Report*, USDA Forest Service North Central Forest Experiment Station, St. Paul, MN.

Nassauer, J.I., 2004. Monitoring the success of metropolitan wetland restorations: cultural sustainability and ecological function. *Wetlands*, 24(4): 756–765.

Nassauer, J.I., Opdam, P., 2008. Design in science: extending the landscape ecology paradigm. *Landscape Ecology*, 23: 633–644.

Nassauer, J.I., Wang, Z., and Dayrell, E. 2009. What will the neighbors think? Cultural norms and ecological design. *Landscape and Urban Planning*, 92(3-4): 282-292.

Ryan, R.L. 2006. Comparing attitudes of local residents, planners, and developers about preserving rural character in New England. *Landscape and Urban Planning*, 75(1-2): 5-22.

Shaver, L. 2007. As Motor City housing markets fall off, Neumann goes to the auction block for a way out of there alive. *Big Builder Magazine*, September 6, 2007.

Southeast Michigan Council of Governments. 2008. *Population and Households in Southeast Michigan, 2000-2008*. SEMCOG, Detroit, MI.

US Census Bureau. 2008. *American Housing Survey for the United States: 2007*. US Department of Commerce, Washington, D.C.

Vigmostad, K. 2003. Michigan real estate developer perspective on development, sustainability, and nature: An autoethnography. Unpublished doctoral disseration, Michigan State University, Lansing, MI.

Wang, Z. 2008. Planning for open space conservator: Using GIS to match cultural values and ecological quality of open spaces. Unpublished doctoral dissertation, University of Michigan, Ann Arbor, MI.