THE ROLE OF NATURE PATTERNS IN THE PERCEPTION AND ACCEPTABILITY OF RURAL DENSITY

by

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To

বাবা আর মা

for your constant and unconditional commitment to my aspirations

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ABSTRACT

Continuing current low density patterns of housing development would have significant environmental impact. The urgency of adopting higher-density patterns, however, runs counter to what is acceptable to the public, especially in rural areas. Though it is widely assumed that the opposition is to density, the concerns may be about a wide range of factors that can be addressed in ways that would achieve greater environmental sustainability. The purposes of this dissertation are to (1) disentangle some of these concerns from density, and (2) address these concerns via design, policy, and participatory approaches in order to offset the perceived negative impacts of increasing density. In particular, the focus is on patterns that address the importance that the natural environment affords rural residents.

Rural residents in Southeastern Michigan completed a survey that included 16 scenes of residential developments, varying in density as well as the arrangement of housing and nature on the parcel. Their ratings of the acceptability of each scene as well as attitudes regarding a variety of planning approaches that might offset the perceived negative impacts of a hypothetical dense development were related to geo-coded and other environmental information.

Results show that acceptability is significantly affected by the pattern of vegetation; scenes showing clustered housing with expanses of forest cover are more acceptable than developments that have the same number of houses evenly dispersed. Independent ratings of the developments for *perceived* density also show that integrating forest cover reduces the perceived level of density. Responses to the planning approaches suggest that preserving local landscapes is more important to rural residents than reducing traffic, promoting mixed residential and commercial land uses, and other strategies that are popular in urban areas. Examination of rural experience provides further insights for understanding the variation in responses.

These results suggest that the perceived negative impacts of higher density can be mitigated by a variety of strategies that emphasize the preservation of nature. Given the environmental impact of low density residential development, such straightforward approaches can simultaneously address citizen concerns and advance the requirements of sustainability.

CHAPTER 1

INTRODUCTION

Low density residential developments have significant environmental impacts, including higher fuel consumption (Ewing, et al., 2007), fragmented ecosystems (Benedict & McMahon, 2002; Collinge, 1996), and loss of precious agricultural lands (American Farmland Trust, 2003). Such facts notwithstanding, these developments are currently the main thrust of the American housing market. Detached single family homes constitute 63% of the total housing stock—over 128 million homes—and nearly 40% of all new homes constructed occupy lots larger than one-half acre (US Census Bureau, 2008).

The environmental impact of residential development benefits from the adoption of higher-density developments, yet people often find higher density unacceptable. While higher-density developments are starting to appear in some areas (Smart Growth Network, 2006), opposition to density is a barrier to more widespread adoption, particularly in rural areas of the country where large homes on large lots are the norm.

But is it density per se that people find unacceptable? While planners express density as a ratio of housing units over land area, the opposition to density may be based on perceptions and imagery about density rather than this technical definition (Hamin, Cardasis, DiPasquale, & Kremer, 2007). The technical definition, however, is the basis of many development proposals and land-use policies. For example, many rural townships prohibit lot sizes that are smaller than a set minimum (e.g., 5 acres), thus effectively limiting the number of housing units per acre. While this directly addresses the density issue, there are a variety of concerns related to density that these policies do not effectively address.

Some of the concerns most commonly associated with high density development involve traffic congestion, decreased property values, increased crime, and overburdening of local infrastructures[1]. However, there is significant evidence refuting the link between density and these particular outcomes (Haughey, 2005). To say then that people are averse to density may be misleading. It may be more accurate to say that people are averse to the *stereotype* of density with the many implications they assume accompany it. Identifying density in terms of such a stereotype suggests an alternative approach to development that addresses the specific concerns people associate with density instead of trying to limit density levels.

Another concern raised by density may have to do with the aesthetics of such developments. Whyte (1968) characterizes one particularly undesirable form:

> With few exceptions, subdivisions homogenized the land with a pattern of curvilinear streets and equal-spaced lots that were everywhere the same, large lot or small, and in the denser areas, the pattern was compressed to the point of caricature. Even though lots were so small that houses would have only a few feet between them, the estate pattern was repeated, producing subdivisions that looked very much like toy villages with the scale out of whack. These were the boxes that so outraged people of sensibility and means. (pp. 200-201)

When the public's imagery of high density developments is based on this cookie-cutter style of development, the negative perceptions of high density are less surprising. The concern, however, may be about the manner in which such developments are designed rather than their density level.

The loss of landscapes is another source of concern. Studies have shown the importance of nearby nature and views in promoting residents' satisfaction (R. Kaplan & Austin, 2004; Kearney, 2006), maintaining rural character (Ryan, 2002; Tilt, Kearney, & Bradley, 2007), and enhancing place attachment (Ryan, 2005; Walker & Ryan, 2008). When new construction results in the loss of valued landscapes, the public's attitudes towards increasing density are likely to decline. Thus, negative attitudes about density may reflect concern for a wide range of issues, including housing design and the loss of nature, rather than the concept of density per se.

Restricting growth is one way to deal with concerns about density, but it is not always practical nor politically acceptable. An alternative to limiting density is to develop in a way that offsets citizen concerns. Smart Growth and New Urbanist movements have attempted to increase the

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[1] Churchman's (1999) thorough and well-documented discussion of density covers a wide range of concerns related to density from privacy and traffic to affordable housing, women's rights and sustainable development.

desirability of high density developments by integrating mixed uses (e.g., residential and shopping are in close proximity) and creating pedestrian friendly communities that minimize the necessity of cars for short trips (Downs, 2005). Campoli and MacLean's *Visualizing Density* (2007), which catalogs 300 developments at different density levels and in different contexts, demonstrates the breadth of design possibilities. It also emphasizes the importance of integrating new developments with the existing landscape. Arendt's (1996) conservation subdivision design is one example of how integrating natural areas into neighborhood layouts is not only less resource-intensive than traditionally designed neighborhoods, but residents find the views and access to nearby nature more satisfying despite the fact that lots are smaller and houses are closer together (R. Kaplan, Austin, & Kaplan, 2004).

While Arendt's contribution is a notable exception, much of the efforts towards promoting better forms of density have been made in the urban realm. Yet, rural areas often receive the brunt of new housing construction. Between 1982 and 2003, 52 million acres of rural lands (about the size of Kansas) were converted to developed uses (National Resources Conservation Service, 2007). Furthermore, the desire to live in rural places is still strong. As a New York Times columnist recently opined, people are "still drawn to virgin ground" and "still restless against limits" (Brooks, 2009). It would, therefore, be prudent to expect that development in rural areas will continue and to plan for it in ways that address people's concerns as well as land use sustainability.

Purpose

The overarching purpose of this dissertation is to carry out a careful analysis of the prevailing negative stereotypes about density. Such stereotypes pose a great challenge to the adoption of higher-density developments that are essential for a shift toward more sustainable housing. Though it seems intuitively accepted that people are averse to density, the concerns may be about a wide range of issues that are not necessarily linked to high density developments. Developing a better understanding of the role that common beliefs about density play in shaping people's attitudes towards development can lead to planning outcomes that are not only less likely to be sources of future regret, but may lead to more sustainable approaches to land use development.

Towards this end, this dissertation first provides an empirical basis for teasing apart density from pivotal design-related issues. Residential developments built at the same density level in fact may be designed in vastly different ways and may produce totally different responses from the public. While there are many aspects of design which could make a difference, this work focuses on the patterns of natural areas within the development parcel since the loss of nature as a result of development is a central concern for many local residents (Ryan, 2006). While much effort has been put into the design of higher-density developments, little work has been done to understand the psychological response to such developments. Designing density in a way that transcends existing stereotypes and addresses public concerns may be more likely to be adopted and less likely to lead to regret.

Second, the dissertation explores planning strategies that may compensate for higher-density developments. Planning strategies and policies at the neighborhood and region level constitute a complementary approach to improving designs. As with the case of design, understanding how the public responds to such policies is crucial to understanding which policies are likely to make a difference to the citizenry.

Third, the dissertation examines the psychological basis for opposition and explores participatory processes that may help address concerns about density. In a story that is often repeated, opponents to growth and development struggle valiantly against governments and profit-oriented businesses determined to develop land. In reality, these caricatures have done more harm than good in the pursuit of more sustainable development. A better understanding of the psychological basis of opposition to higher-density designs has potential to develop consensus about effective ways to accommodate density and to civilize what is too often a contentious debate.

Chapter overview

The chapters in this dissertation describe empirical studies and theory which tackle these objectives from a variety of angles, including design, policy, and public participation. The studies focus in particular on rural areas whose landscapes are being most dramatically impacted by new development, but that compared to urban settings, have received little guidance on how to better manage increasing density.

Chapter 2 examines the perception of physical density in terms of two issues: (1) the design of residential developments defined in terms of clustering or dispersed housing, and (2) the arrangement of natural elements such as canopy and lawns. The results from this study suggest that integrating expanses of tree cover may significantly reduce how dense a development seems. However, the fragmentation of nature (such as lawns) can limit its positive effects.

Chapter 3 addresses the broader issue of acceptability. Using the same visual images as the previous study, the study assesses the rural public's acceptance of higher-density developments. It also explores the role played by the residents' current living environment in their acceptability ratings of different types of residential developments. The results suggest that expanses of tree cover may improve the acceptability of higher-density developments though residents who live in more rural areas are less likely to be supportive in general.

Thus, Chapter 3 offers a contrast to the preceding chapter by considering acceptability instead of perception. It also provides a different kind of contrast with the following chapter by comparing different facets of the density issue on the part of the same rural residents.

Chapter 4 considers attitudes towards a variety of approaches, such as mixing land uses, preserving historically significant features, and maintaining scenic views, which arise in residential land use decisions. Such approaches are advocated by Smart Growth and other sustainability-oriented development strategies, yet the rural public's response to them is rarely heard. The results from this chapter suggest that preserving local landscapes is more important to rural residents than reducing traffic, promoting mixed-use, and other strategies that are popular in urban areas.

Chapter 5 examines some of the reasons for opposition to development from a psychological perspective. It first considers the NIMBY (Not In My BackYard) model and its limitations in explaining opposition to development. Then, based on the framework of the Reasonable Person Model (R. Kaplan & Kaplan, 2008), it addresses some of the challenges planners and the public face in moving towards more sustainable forms of development. A key element examined is the role that familiarity may play in the resistance to adoption of novel development patterns. Finally, the chapter discusses a variety of participatory processes that may help to reduce the conflict surrounding the density issue and move towards less resource intensive patterns of development.

CHAPTER 2

HOUSING AND NATURE PATTERNS IN THE PERCEPTION OF RURAL DENSITY

Background

Density is the focus of much debate about residential development. Local residents often oppose proposals for new development on the basis of density level. There is reason to question, however, whether it is, in fact, the density—a high ratio of units to acres—that is the disturbing issue or whether what upsets local residents is rather their perception of what density entails. Perceptions may be due to factors that go beyond the number of units on a given piece of land and may lend themselves to a variety of solutions that would make proposed developments more favorably received.

Some of the earliest work on density was done by Calhoun (1962) who studied the effects of crowding on rats and found psychopathologies for those reared in higher-density environments. His research inspired many further studies on the subject, particularly in the late 60s and throughout the 70s. During that time, the term “density” was used interchangeably with “crowding”, which led Stokols (1972) to distinguish between the two, describing density as a physical condition involving limitations of space, and crowding as an experiential state of people exposed to those physical conditions. A great deal of the research at that time concentrated on density in terms of the number of people per unit area as opposed to a broader sense of density, as used here, in terms of density at the neighborhood scale. The negative connotation of crowding and density have been a part of this long history[2] and are still reflected in the general public’s often negative stereotypes of density (Haughey, 2005).

While some studies on human populations support the negative stereotypes of living in high density environments (Evans, Saegert, & Harris, 2001), others have revealed various benefits to

[2] McClelland’s (1982) article provides a broader discussion of the density-related studies of that time.

higher-density living ranging from reduction in transportation needs (Ewing, 1997) and preservation of valued lands (Daniels & Lapping, 2005) to increased sense of community and community-oriented benefits (Duany, Plater-Zyberk, & Speck, 2000; Jacobs, 1961; Kim & Kaplan, 2004). Migration from the cities and the growth of suburbs, leading to the widely bemoaned residential patterns that have consumed much of the countryside (Whyte, 1968) are closely related to the debate about density.

Dating long before the current call for Smart Growth and New Urbanism (Calthorpe & Fulton, 2001; Duany, et al., 2000), Rapoport (1975) attempted to reexamine the factors that may contribute to the perception of density. He stated that “areas identical in terms of people per unit areas may have very different perceived densities” (p. 136) and suggested that the way people judge the density of a given environment depends upon the physical and social cues it provides. Included in his list of perceptual factors were several “physical, sensory stimuli which indicate the presence of people.” Among these was whether the space is “mostly man-made” as opposed to “mostly natural (much greenery),” (p. 138) with the latter presumed to be perceived as less dense. Some of Rapoport’s hypothesized factors influencing the perception of density are exemplified by Campoli and MacLean’s (2007) *Visualizing Density* which catalogs a remarkable variety of residential developments at a wide range of density levels giving one a sense that density can be designed in many ways—by reducing monotony, improving contextual compatibility, and preserving greenspace to name a few—and thereby influencing the perception of density.

Design, particularly the presence and arrangement of natural features, therefore may play a significant role in how people perceive the density of residential developments. The patterns with which natural elements are designed may also impact the amount of nature people perceive to be present in a given parcel. Nature near neighborhoods is an important feature for residents, particularly those living in more rural areas. Ryan’s (2002) study in rural Massachusetts found that developments with publicly visible farms and forests were more compatible with rural character.

Perception of natural elements could influence not only perceived density, as Rapoport suggested, but also the desirability of residential developments. Kearney’s (2006) study of communities in the Pacific Northwest revealed that density had little impact on neighborhood satisfaction levels; rather it was having shared nature spaces nearby and nature views from homes that increased satisfaction. Other studies have also documented the value of nature that is readily visible from the home (R. Kaplan, et al., 2004; Sullivan, 1996). It is important to note that since nature comes in a vast array of forms, its perception could vary widely depending on the type of nature utilized and the form it takes.

The importance of nearby nature in the design of residential neighborhoods, however, is often ignored by developers of traditional neighborhoods. Both for increasing density and for ease of site development, natural elements are often removed prior to construction. Small, fragmented lawns are often the only remnant of countryside left in such developments. Where trees are planted, they lack the maturity of the ones that had been removed and in many suburban developments, homeowners associations limit the species that are permitted. An alternate approach proposed by Arendt (2004) is known as a conservation subdivision. In these developments homes are constructed on the portion of the site that is least environmentally and culturally sensitive while maintaining large amounts of natural areas. These natural areas serve not only to preserve natural resources but also to provide residents with views of nature which are especially important to both residents of the neighborhood and the greater community (R. Kaplan, et al., 2004). Such conservation subdivisions can reduce the impact on the environment by leaving more unfragmented natural areas (Collinge, 1996), provide health benefits to residents (Jackson, 2003), and are also less expensive to build, easier to sell, and have a price premium over conventional subdivisions (Mohamed, 2006).

While conservation subdivisions have become somewhat more common, relatively few communities utilize this approach. One reason for lack of adoption may be that misconceptions and lack of familiarity about such designs lead to a lack of public support (Bosworth, 2007). This is particularly important in the proposal phase when public support is necessary for their implementation. Lacking familiarity with this approach, local residents may be critical of the somewhat smaller lot sizes and homes that are closer together. The perception of greater density, however, comes without appreciation of the ways these developments preserve natural resources and permit greater access to and views of nearby nature. If public opposition is largely based on density per se, conservation designs would be unlikely to gain favor.

Yet, the support of the public is pivotal if these alternative forms of residential development are to be adopted. By 2030, it is estimated that 60 million new homes will have to be built in order to accommodate population needs (Campoli & MacLean, 2007). While a portion of these needs may be met with multi-unit residences (e.g., apartment buildings), a great deal of it is likely to entail construction of new detached single-family homes. Such homes make up 63% of the total housing stock and tend to urbanize large areas of undeveloped lands (National Resources Conservation Service, 2007). In order to sustainably meet the needs of a growing population, it is necessary to understand what factors may influence public support for residential developments with a smaller environmental footprint. The issue of density is often raised as one of these factors.

Thus, the focus of the present study is to assess whether the perception of density can be influenced by design features of developments. Given the frequency of dismay about density when new developments are proposed in more rural settings, the study addresses detached single-family residential developments at lower density levels than urban settings. Specifically, it looks at how integrating nature, in different types and arrangements, into clustered residential developments may influence the perception of density relative to more dispersed layouts that are typical of traditional neighborhoods. It also considers whether people perceive density only in accordance with the technical definition of density (i.e., units/acre) or whether residential design patterns can influence how density is perceived. If indeed the design of nature in residential developments does impact how its density is perceived, incorporating such designs may present a way to offset people's concerns about higher-density developments.

Method

Independent variables: Density and design

The study was based on 16 aerial photographs of residential developments selected to represent a range of densities as well as different design characteristics.

Density

The gross density of each development was calculated by taking the total number of houses and dividing by the total acreage of land thus yielding the units/acre (ua) measure that is commonly used in planning. The aerial view of each development was framed to show 10 acres. Thus density was calculated by counting the number of houses and dividing by 10. Two density groups were chosen: *less than 2ua (low density)* and *2-4ua (high density)*. Though designated "low" and "high" throughout this document, it is important to acknowledge that while the 2-4ua group is high for many rural areas, it is well below the 4-6ua density considered the threshold for minimal bus service (Campoli & MacLean, 2002) and far below typical densities in urban areas.

Gross density (i.e., total land area in the denominator) was used because some developments selected for the study have extensive natural areas devoid of housing, a feature that net density, which calculates using only the land area occupied by housing, would not take into account. Gross density thus allows for a fair comparison between developments with and without undeveloped areas.

Design

Design, in the context of land use planning, can be thought of as the patterns by which humans purposefully structure the natural and built environment. Many factors subsumed by design, such as building materials, colors, and facades, are less evident from an aerial perspective. From the bird's-eye perspective utilized in this study, the design factor that is most readily apparent is the pattern of land utilization employed by the various developments. In particular, this study focuses on the pattern of natural elements (e.g., tree cover) within the developments and asks whether the pattern is related to the way people perceive density and vegetation.

Two types of design, *traditional* and *conservation*, were selected for study. Traditionally designed developments share several qualities—the housing is relatively evenly distributed lacking large areas of contiguous vegetation and leaving little undeveloped land. These sorts of arrangements are typical of development at the rural-urban fringe. Conservation developments are different from traditional developments in two major ways. First, a significant portion (at least 25%) of the land is left undeveloped. This land may consist of trees, grasslands, farmlands, and other non-development uses. Second, the undeveloped land remains unfragmented resulting in the housing being relatively concentrated in a portion of the scene instead of dominating it as in the traditional developments. Such patterns may play a key role in providing a view for homeowners as well as maintaining the quality of the viewshed for the wider community.

2x2 factorial design

Density and design are the two main independent variables, each with two levels. Each of the four combinations in this 2x2 factorial design (low density traditional, high density traditional, low density conservation, and high density conservation) was represented by four scenes in order to reduce the idiosyncratic elements in any specific setting (R. Kaplan & Kaplan, 1989). Figure 2.1 shows one of the four scenes for each combination of density and design.

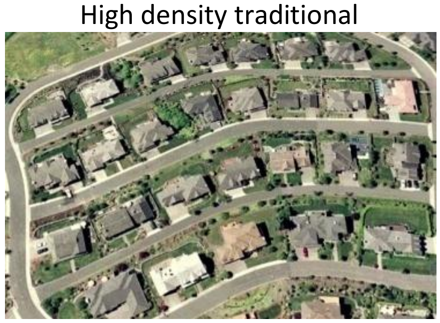
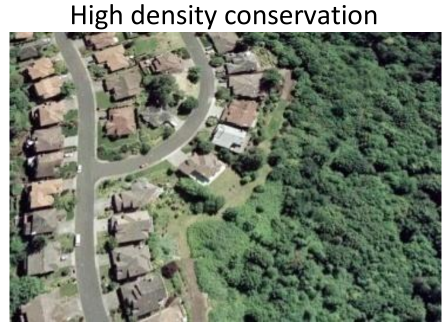
	Traditional design	**Conservation design**
Less than 2 units/acre (Low density)	Low density traditional 	Low density conservation 
2-4 units/acre (High density)	High density traditional 	High density conservation 

Figure 2.1 Scenes selected for density and design in a 2x2 factorial design

Environmental sampling

To better understand the effects of the two main variables in the study, several potentially confounding variables were controlled. The scenes were chosen to provide the highest possible resolution on a wide range of developments. Google Earth (http://earth.google.com/), a tool that provides 1-3 year old satellite imagery for the entire globe, met these constraints. However, in 2006, the time the scenes were selected, few regions provided imagery with a resolution level capable of creating sharp looking pictures for the survey. One exception to this was the area surrounding Portland, Oregon which, at 1 foot/pixel (Portland Metro, 2005), had some of the highest resolution imagery publicly available in the country.

The Portland Metro area was also desirable due to its use of an urban growth boundary (Daniels, 2001). In selecting scenes, neighborhoods near the edge of existing development were the primary focus. These neighborhoods are typically low density and border lands with a higher concentration of farmlands, forests, prairies, and other undeveloped blocks of land. Such neighborhoods can be challenging to find in sprawling cities such as Atlanta, but are readily apparent in the Portland area due to a well defined urban growth boundary.

To ensure that the selected scenes would be representative of the kinds of developments proposed in rural areas, none of the scenes included apartment buildings or condominium complexes. Instead, only single-family detached housing developments were shown. As mentioned previously, these developments are among the most popular for American consumers and consume more land than other types of residential development.

The scenes were also selected to display only one type of land use: residential. Also excluded were scenes that contained housing that looked old or dilapidated. All scenes were taken in the summer so trees were in full leaf. Since water has been shown to be a source of high preference (R. Kaplan & Kaplan, 1989), none of the study scenes included water features.

The scale of the scenes was also held constant. A 10-acre frame was chosen since it provides a small enough scale to allow participants to recognize individual components of the development such as houses, trees, and roads, yet it is a large enough scale to show patterns of how the land is utilized. Holding the acreage constant ensured that participants were responding not to the amount of land shown but rather to the patterns of development.

The perspective of the scenes was also controlled. The bird's-eye vantage point utilized in this study allows participants to see the density, design, and other structural aspects of the housing developments that would not be apparent in street level views. This perspective is commonly used in simulations and in photographs that present larger areas. People readily comprehend such oblique views; in fact the vantage point of a hilltop or upper floor of a high rise is often sought. This is also the view afforded from a plane window. The photographs were thus oriented to a 30° oblique angle which has been shown to give people a sense of the overall layout of a development (R. Kaplan, 1993) and permit comparisons between different designs (Arendt, 1999).

After selecting an initial set of pictures, a panel of 10 judges—a mix of graduate students, faculty members, and Ann Arbor citizens—rated them for the amount of trees, farmland, open space, and housing diversity. In order to check if the bird's-eye views were comprehensible, judges were also asked to note if they found anything confusing in the scenes. Any scenes that were found to be problematic with respect to comprehension were replaced. While these replacement scenes were chosen based on the feedback from the panel, the replacements were not judged by the panel.

The scenes were arrayed with eight per page, each color picture measuring 4 inches wide by 3 inches high. The scenes were corrected for color, contrast, and brightness.

Finally, ordering effects were controlled. The 16 development scenes were arrayed across two pages in a random order with respect to the two main constructs of density and design. While the use of different arrangements on the two pages for each participant would have been desirable, this was not feasible in the printing process.

Dependent variables: Perceived density and vegetation

Participants were told "the accompanying pages contain pictures of a variety of residential developments." They were asked to glance over the pictures prior to completing two sets of ratings provided on two sides of a page. The first side task was to rate each scene in terms of "housing density of the site," while the reverse side of the page requested ratings in terms of the "amount of vegetation." All ratings used a 5-point scale where 1 was "very low" and 5 was "very high."

Participants

Seven students enrolled in a graduate-level research methods course participated in the study and collected the data as part of a class exercise. The participants they selected were at least 18 years old and not enrolled in natural resources or urban planning programs. While no demographic information was gathered, class discussion revealed that the 55 individuals who provided ratings included a wide range in age, backgrounds, and current employment.

Data analysis

Measurement of vegetation and impervious surface

To understand the relationship between perceived and actual levels of density and vegetation, each of the 16 development scenes was measured for actual amounts of vegetation and impervious surface area that was visible. The number of pixels in the scene that represented impervious surfaces (e.g., roofs, streets, driveways, sidewalks) constituted the measure of impervious surfaces. For the scenes sampled in this study, the non-impervious surface pixels always represented some form of vegetation (e.g., farms, lawns, forest). Therefore, making a single measurement of impervious surface pixels gave the percentage of both impervious surface and vegetation in the scene. Figure 2.2 shows one of the scenes with the impervious surface pixels highlighted in red. In this scene, 24% of the scene is composed of impervious surface while the remaining 76% is vegetation.

Figure 2.2 Measuring percentage of impervious surface

Pre-defined and factor-analytic scene groupings

The perceived density and vegetation levels of the development scenes were analyzed using two different groupings of the scenes. The first grouping was based on the density and design designations used in selecting the scenes (see Figure 2.1). This grouping reflects the perspective of the expert planner in that it distinguishes developments based on calculated density and established design principles (traditional and conservation designs) that may not be apparent to non-experts. The analysis based on the pre-defined density and type of development is to understand how planner-envisioned approaches relate to perceptions of density and vegetation by the non-expert participants.

The second approach to analyzing the ratings was based on an exploratory factor analysis which identified the underlying perceptual categories of the participants. Factor analysis is not based on a ranking of scenes by their level of perceived density or vegetation but rather on the pattern of relationships across the scenes. If respondents have similar reactions to several scenes these will emerge as a category or factor. Since the categories are derived from the perceived density or vegetation ratings, rather than by asking participants to group scenes, the results reflect categories that can be quite different from a conscious effort to categorize.

Factor analysis and internal consistency

Factor analyses of the perceived density and vegetation ratings were performed using Principal Component extraction with Varimax Rotation, a form of orthogonal rotation that minimizes the number of variables that have high loadings on each factors and thereby most economically represents each factor. All factors whose eigenvalues were greater than one were retained and an examination of the Scree plot was used to confirm the resulting number of factors. Scenes with loadings of .45 or greater on no more than a single factor defined the factors. The factors were analyzed using Cronbach's internal consistency estimate of reliability (i.e., Cronbach's alpha) and were retained if the alpha was higher than 0.50. New variables were then created based on the mean rating for the scenes comprising the factor.

The four pre-defined group of scenes were also checked for internal consistency—a Cronbach alpha was calculated for each of the four groups using the same 0.50 threshold used in the exploratory factor analysis. Once the consistency of the development groups was verified, new variables were constructed by calculating the participants' mean rating of the scenes that formed the group.

Linear regression model with correlated errors

Because each participant was asked to rate 16 scenes (which can be considered the treatment conditions), the study has a repeated measures design which could mean that the ratings an individual gives to the 16 developments are correlated as a result of individual bias. To account for this bias, a linear model with correlated errors was utilized via the MIXED procedure in SPSS 16. Unlike a basic linear regression, this procedure accounts for any potential within-subject correlations through a flexible covariance matrix (West, Welch, & Galecki, 2006). The type of covariance matrix used in this analysis was unstructured.

In the pre-defined scene groups, both main and interaction effects of density and design on perceived density and vegetation were tested for significant differences. In the factor-analytic categories, a pairwise comparison of category means was carried out to show significant differences between categories.

Results

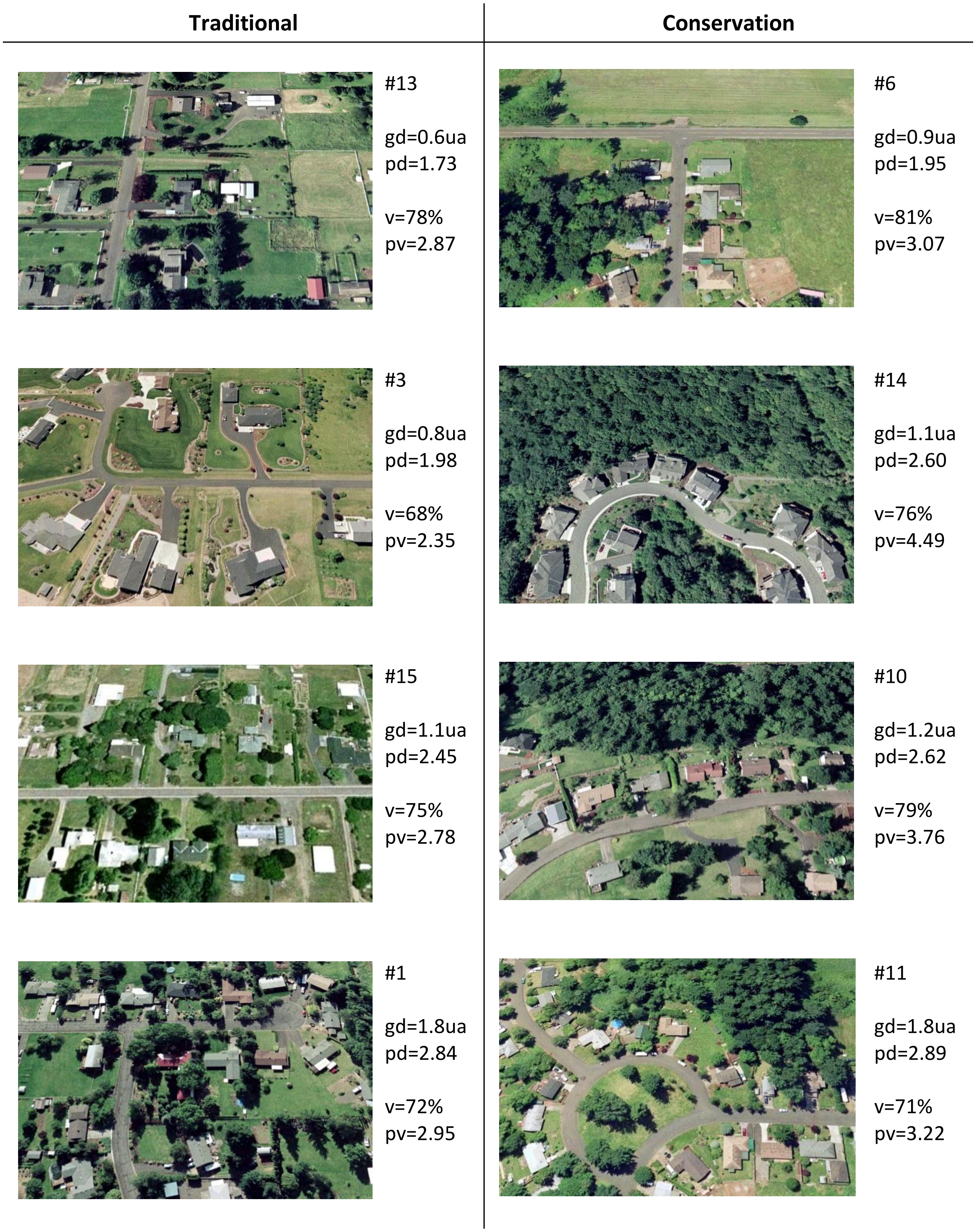
Pre-defined groups: The planner perspective

Density is a major component of the planning vocabulary. It is also at the core of residents' stated opposition to many proposed rural developments. It is thus useful to ask whether the public—here represented by the study participants—is relatively accurate in its assessment of density at the residential scale. More important, however, is whether the design of the development, particularly the amount and pattern of vegetation, affects the perception of density. In addition, the study examines the accuracy of the public's perception of vegetation and whether it is affected by the pattern with which natural features are laid out.

Figure 2.3 and Figure 2.4 provide a visual array of the four pre-defined groups in order of increasing density, for low and high density, respectively. The traditional developments are in the left column and the conservation developments in the right column. Included with each scene are its gross density (gd), perceived density (pd), percent vegetation (v), and perceived vegetation (pv).

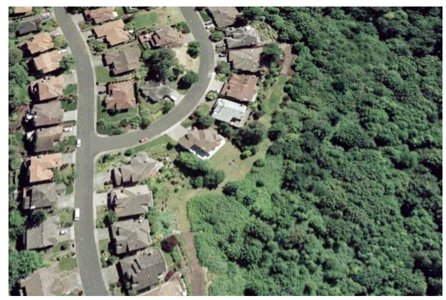
Perceived density

The accuracy of participants' estimates of density can be considered from a variety of perspectives. From one perspective, the correlation between the actual density (units/acre) and the perceived density ratings, the relationship is very strong ($r=.94$ for the 16 scenes). In addition, the mean perceived density ratings for the low and high density scenes (2.38 and 3.87 respectively, $p<.001$) indicate that participants had no difficulty in judging density for the visual material they were provided.



Note. gd=gross density in units/acre; pd=perceived density; v=percent vegetation; pv=perceived vegetation. Both perceived density and perceived vegetation are based on 5-point rating scale with 5=a great deal.

Figure 2.3 Low density (<2 units/acre) scenes shown in order of increasing gross density

Traditional		Conservation	
	#8 gd=2.7ua pd=4.29 v=47% pv=1.47		#7 gd=2.3ua pd=2.93 v=75% pv=4.11
	#4 gd=2.9ua pd=4.09 v=52% pv=2.07		#5 gd=2.6ua pd=3.53 v=71% pv=3.42
	#9 gd=3.7ua pd=3.98 v=56% pv=2.05		#2 gd=3.4ua pd=3.78 v=66% pv=2.67
	#12 gd=3.9ua pd=4.40 v=39% pv=1.81		#16 gd=3.8ua pd=3.93 v=62% pv=3.04

Note. gd=gross density in units/acre; pd=perceived density; v=percent vegetation; pv=perceived vegetation. Both perceived density and perceived vegetation are based on 5-point rating scale with 5=a great deal.

Figure 2.4 High density (2-4 units/acre) scenes shown in order of increasing gross density

These perspectives, however, do not take the different designs into account. A major focus of this study is to understand whether design, and in particular the use of vegetation, can influence the perception of density. Table 2.1 thus provides information about the perceived density for the two types of designs. Although the actual gross densities are comparable for the two types of designs (2.19 vs. 2.14), the traditional developments are rated somewhat higher than the conservation designs (3.22 vs. 3.03, p<.05).

Table 2.1
Perceived density measures by density and design type

			Perceived Density		
Pre-defined groups	**# scenes**	**Gross density (in ua)**	**Mean (5-pt. scale)**	**S.D.**	**Cronbach alpha**
Low density					
Traditional	4	1.08	2.25	.83	.57
Conservation	4	1.25	2.51	.87	.66
Total	8	1.17	2.38	.44	.74
High density					
Traditional	4	3.30	4.19	.82	.86
Conservation	4	3.03	3.55	.92	.81
Total	8	3.17	3.87	.47	.80
By design type					
Traditional	8	2.19	3.22[a]	1.09	.80
Conservation	8	2.14	3.03[a]	.67	.82
Total	16	2.16	3.12	.88	.84

[a] Differences in mean perceived density for entries marked with a superscript are significant at p<.05. All other differences in mean perceived density are significant at p<.001.

As shown in Figure 2.5, however, it is the interaction of density and design type that is significantly related to the perceptions of density. For the low density scenes, density is perceived to be somewhat greater in the case of conservation design than traditional developments. For the higher densities, by contrast, the conservation designs are seen as far less dense. It is also noteworthy that although the actual densities for the different design types are comparable, for the conservation designs the means are just more than a scale point apart (2.51 vs. 3.55, p<.001), while for the traditional designs the difference in perceived density is close to two scale points (2.25 vs. 4.19, p<.001). These interaction effect are significant at the p<.001 level.

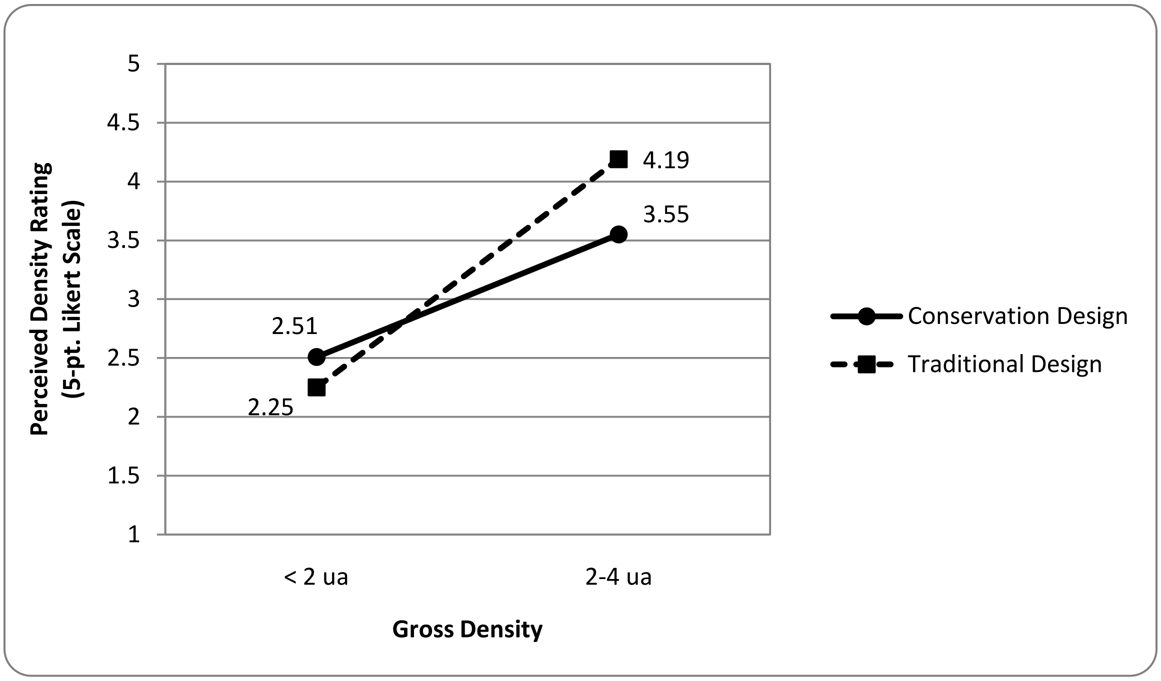


Figure 2.5 The effect of design and density on perceived density

Recall that the two major characteristics which distinguish conservation designs from traditional ones are (1) the presence of contiguous regions of vegetative cover, comprising at least 25% of the scene, and (2) maintenance of roughly equivalent density to traditional sites by concentrating the homes in the remaining space. The somewhat higher perceived density for the low density conservation designs thus reflects that the homes are less spread out than the low density traditional sites. At the higher densities, however, the houses in the traditional developments seem to fill the entire scene, creating the impression that there are more homes.

With the conservation developments, however, the expanses of forest cover in the higher density cases create a sense of greater spaciousness despite the fact that the actual densities are comparable for the two types of designs. Consider, for example, scenes in Figure 2.4 with comparable gross density (e.g., #8 and #5); the perceived density is far higher (4.29) for the traditional design than the conservation (3.53). Given past research has shown the importance of nature views to locals (Bryan, 2003; R. Kaplan, et al., 2004; Kearney, 2006), it would be interesting to know if participants were in any sense aware of the effect of forest cover on views.

Table 2.1 also shows the Cronbach alpha measurements of internal consistency for each of the groups based on the perceived density ratings. Both low density groups show somewhat low alpha coefficients suggesting that participants may be affected by other features in these scenes than the actual density. By contrast, the high density scenes are highly correlated suggesting that the number of homes may be a feature to which participants are responding.

Perceived vegetation

Participants were also asked to rate the scenes in terms of vegetation. These ratings can be compared to the actual vegetated area within each scene (i.e., percentage of pixels that are not impervious surfaces). The correlation for the 16 scenes between these two measures is .78. However, the relationship between actual vegetation and the ratings is much greater (.92) for the traditional design scenes and only .50 for the conservation developments. Since the amount, arrangement, and type of vegetation were defining differences between the two design types it is to be expected that these correlations would differ for the traditional and conservation developments. To understand these differences, however, it is useful to turn to analyses based on mean ratings.

Table 2.2
Perceived vegetation measures by density and design type

			Perceived vegetation		
Pre-defined groups	**# scenes**	**Vegetation %**	**Mean (5-pt. scale)**	**S.D.**	**Cronbach alpha**
Low Density					
Traditional	4	73	2.74	1.05	.87
Conservation	4	77	3.64	.99	.68
Total	8	75	3.19	.66	.89
High Density					
Traditional	4	48	1.85	.75	.62
Conservation	4	69	3.31	.96	.84
Total	8	58	2.58	.90	.74
By Design Type					
Traditional	8	61	2.29	.54	.84
Conservation	8	73	3.47	.61	.83
Total	16	67	2.88	.82	.90

Note. Differences in mean perceived vegetation are all significant at $p<.001$.

Table 2.2 provides information about the actual and perceived vegetation for each of the pre-defined groups as well as low and high density scenes and each design type. Given that the low density scenes have fewer houses, there is more room on the parcel for vegetation. One would thus expect differences in the actual amount of vegetation for low and high density (75% and 58%, respectively). Likewise, the ratings of perceived vegetation also show a higher mean for low density than high density (3.19 vs. 2.58, $p<.001$). However, since conservation developments emphasize preserving land, the amount of vegetation is relatively similar for the two density levels (77% for low density and 69% for high density). By contrast, the high density traditional group has far less vegetation (48%) than its low density counterpart (73%).

Though both low density groups have similar levels of actual vegetation, the perceived levels are quite different. The conservation developments are perceived to have far more vegetation than the traditional developments (3.64 vs. 2.74 respectively, $p<.001$). Similarly, the conservation development in the high density group is perceived to be more vegetated than its traditional counterpart (3.31 vs. 1.85 respectively, $p<.001$). This suggests that the stronger effect on perceived vegetation is from the arrangement of nature in the developments. This is shown by the distance between the solid (conservation) and dotted (traditional) lines in Figure 2.6.

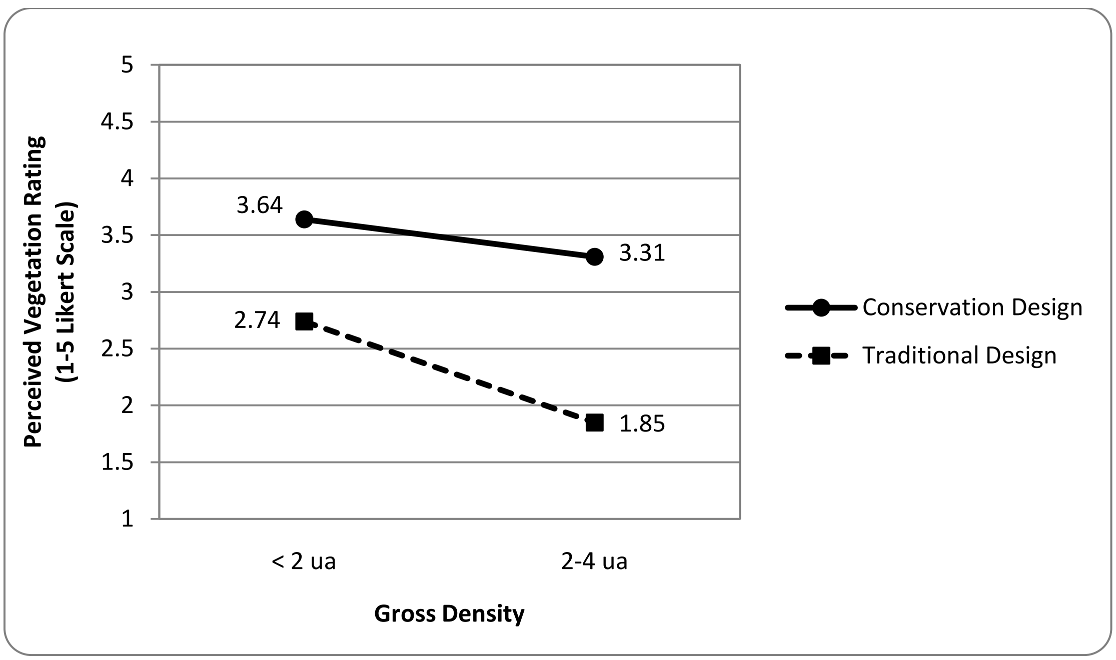


Figure 2.6 The effect of design and density on perceived vegetation

Conservation developments, with their contiguous expanses of tree cover, are perceived to have more vegetation than traditional developments which have comparable amounts of total vegetation but are fragmented instead of contiguous. One reason participants may be treating traditional developments so differently from conservation is that they are envisioning the effect of each on the quality of the overall viewshed. While small fragmented lawns may not make an impact, large areas of canopy may be more likely to do so.

Since higher-density developments have more houses per unit area of land leaving less room for undeveloped land, it might be expected that they are perceived to have less vegetation than lower density developments. It is particularly noteworthy then that the high density developments with continous areas of nature are perceived to be *more* vegetated than traditional developments which are at a low density level (3.31 vs. 2.74, $p<.001$). One possible explanation is that the conservation scenes utilized in this survey tended to have more canopy cover whereas the traditional scenes tended to have more lawns, suggesting that canopy is more likely to be interpreted as vegetation than lawns. The relatively high standard deviations for three of the low density scenes further supports this as they have the largest areas of lawn (Figure 2.3, scenes #3, #6, #13 with standard deviations of 1.23, 1.14, and 1.19, respectively). The somewhat lower alpha coefficients (.68) for the low density conservation scenes, which contain expanses of both lawn and canopy, could also reflect the ambivalence of judging vegetation for these disparate arrangements of nature. However, the alpha coefficient is even lower for the high density traditional group (.62) where the vegetation is most fragmented.

In addition to the main effects of design, Figure 2.6 also shows an interaction effect of density and design on perceived vegetation. The difference in perceived vegetation is more pronounced between the two high density groups than between the two low density groups (0.9 and 1.46 respectively, $p<.001$). As density increases, the degree of fragmentation in traditional developments increases (i.e., smaller and smaller patches of lawns for each house) and negatively influences the perception of vegetation while the extensive tree cover in the conservation developments makes any decrease in the overall amount of vegetation less perceptible. Examination of the scenes in Figure 2.4 supports this point. Even though the high density traditional scenes have on average 48% of the parcel covered with lawns, the level of vegetation in the scenes seems dramatically different from the high density conservation scenes. Thus, the interaction effect of density and design on perceived vegetation is explained by both the type and fragmentation of vegetation in the scene.

Factor-analytic categories: The layperson perspective

Exploratory factor analysis of the participants' ratings provide a way to understand the implicit categories that participants use in their judgments. Separate factor analyses were computed for the density and vegetation ratings. The resulting categories also provide insight into the relationship between the public's perception and the categorization based on the technical definition of density utilized by planners.

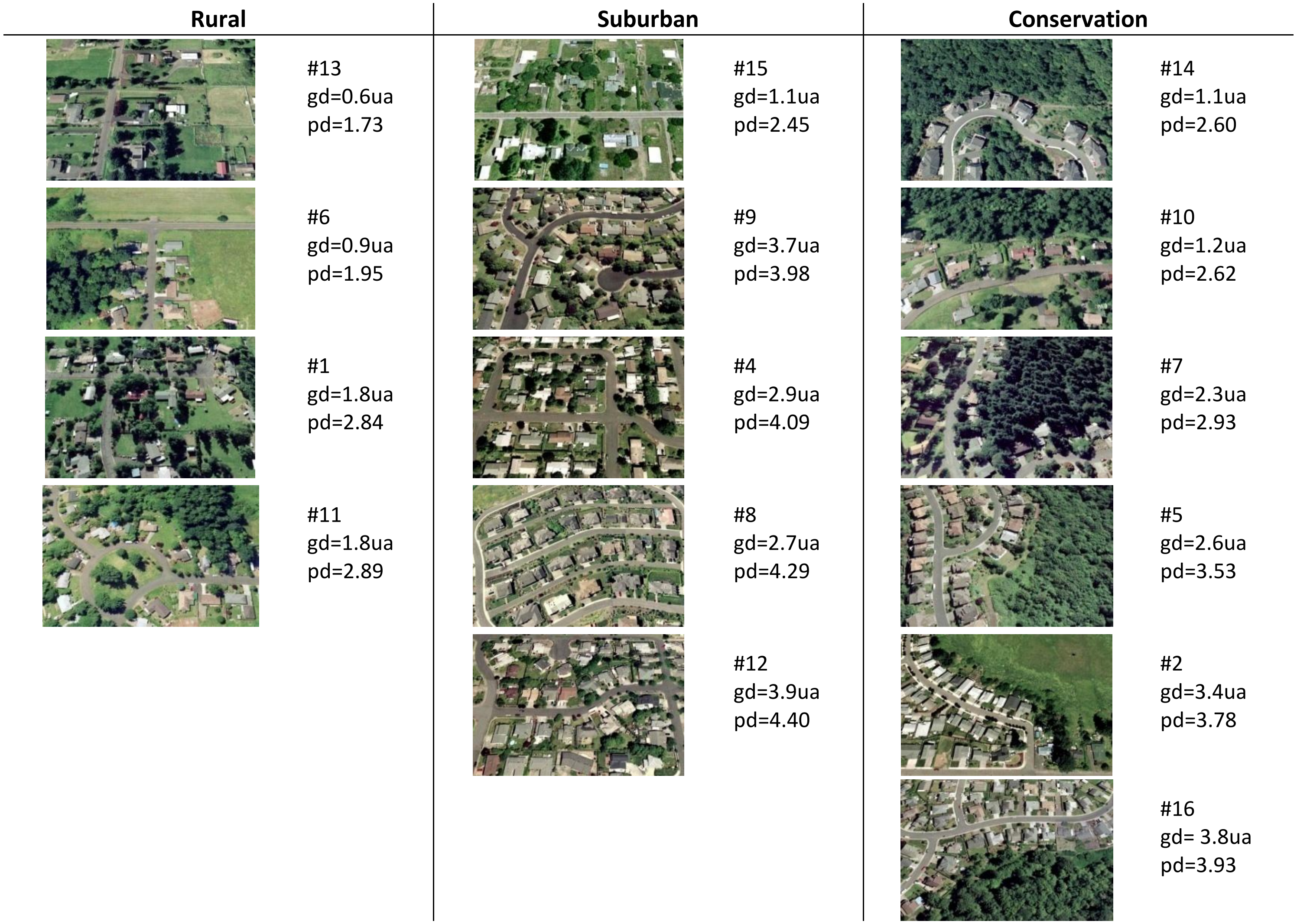
Perceived density

A factor analysis of the density ratings revealed three categories which can be characterized as: *rural*, *suburban*, and *conservation* (Figure 2.7). The *rural* category is composed of four scenes, all of which have a density level of less than 2ua. All of the scenes show significant amounts of undeveloped land, much of it as open space in the form of lawns or farm fields. While there is some amount of canopy cover in these scenes, it is not the dominant feature. Clustering or dispersion of houses does not seem to be a binding feature of this category suggesting that participants are more influenced by the amount of lawn than by the concentration of canopy.

The *suburban* category is characterized by scenes which are dominated by housing and have little vegetation. What vegetation exists is in the form of small patches of lawn near each house with very little continous nature visible. Scene #15 is somewhat an outlier in this category since it has far less housing (1.1ua compared to 2.7-3.9ua for the other scenes in the category) and significantly more nature. One explanation is that the pattern of trees and houses, instead of the amount, makes it look similar to the other scenes in this category. For example, the houses are interspersed with trees in both scene #15 and the higher density scenes. Another explanation may be that the housing in scene #15 is obscured making it difficult to tell exactly how much housing is actually there.

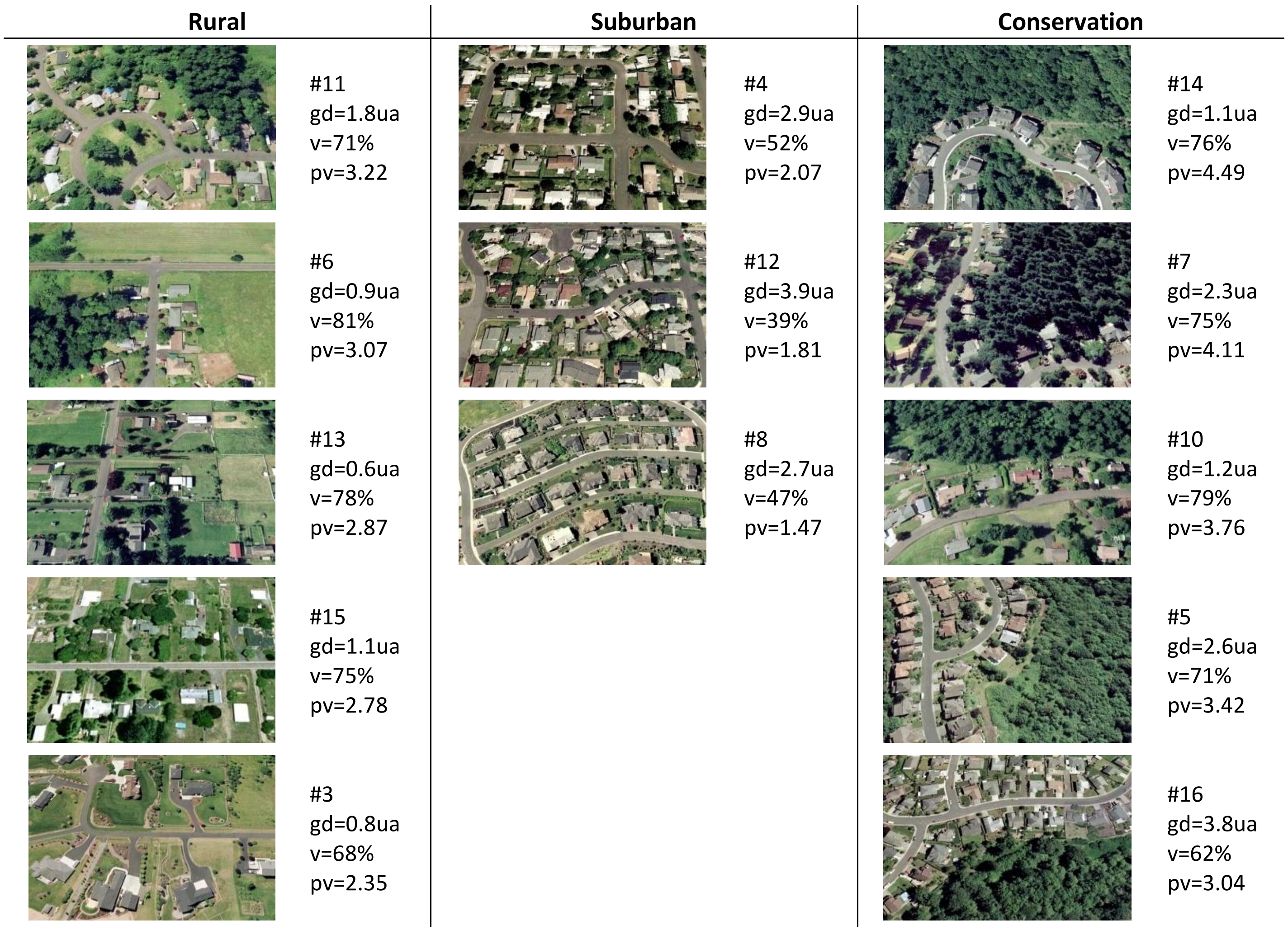
The most distinguishing feature of the *conservation* category is the high percentage of contiguous forest cover present in each scene. Curved street patterns are also prevalent in this category. The actual density levels represented in the category vary widely, between 1.1ua to 3.8ua, suggesting that participants are influenced by the presence of canopy even as they are judging density.

One scene (#3 in Figure 2.3) did not load on any of the three categories. The scene depicts very large homes on large lots with lawns dominating much of scene that is not occupied by housing.



Note. gd=gross density in units/acre; pd=perceived density. Perceived density is based on 5-point rating scale with 5=a great deal.

Figure 2.7 Perceived density categories each ordered in terms of increasing perceived density



Note. gd=gross density in units/acre; v=percent vegetation; pv=perceived vegetation. Perceived vegetation is based on 5-point rating scale with 5=a great deal.

Figure 2.8 Perceived vegetation categories each ordered in terms of decreasing perceived vegetation

While it might seem to fit in the *rural* category, the houses are much bigger and the tree cover far less than in the *rural* category.

Table 2.3 shows the three categories ordered in terms of decreasing perceived density, which also corresponds to decreasing amounts of gross density. The relatively large standard deviations reflect that there is a considerable range in perceived density ratings among the scenes comprising each category. The categories thus incorporate a variety of issues, rather than just mirroring gross density. The table also includes the Cronbach alpha coefficients which are above 0.8 for the *suburban* and *conservation* categories and just above 0.6 for the rural category. Correlations among the categories ranged between .21 and .30, implying little overlap.

Table 2.3
Perceived density categories

Categories	# scenes	Gross density (mean in ua)	Perceived Density: Mean (5-pt. scale)	S.D.	Cronbach alpha
Suburban	5	2.9	3.84	1.05	.86
Conservation	6	2.4	3.23	1.00	.84
Rural	4	1.3	2.35	0.86	.61

Note. Differences in mean perceived density are all significant at $p<.001$.

Perceived vegetation

The factor analysis of the vegetation ratings revealed three categories that are very similar to the density categories. Though there are some minor differences in the exact scenes comprising each category, the features contained in the scenes comprising each category are nearly the same. As such, the labels used to identify the categories are the same, namely *rural, suburban*, and *conservation* (Figure 2.8).

The *rural* category is characterized by a small number of houses surrounded by large amounts of open space. The open space generally takes the form of lawns or farm fields. While there is some canopy cover, it is far less than the developments in the *conservation* category. All of the developments in this category are in the pre-defined “low density” designation.

The developments in the *suburban* category have a large number of houses that are close together and have little vegetation except for small lawns for each of the individual properties. The fragmented lawns comprise nearly all the vegetation in these scenes.

Considering the relatively high density of these developments, it is remarkable that these scenes have between 40-50% of the parcel covered in vegetation.

Canopy cover is the dominant feature of the *conservation* category. These forested areas are contiguous and well demarcated. Furthermore, the type of vegetation is typically homogenous, lacking a mix of lawn and woods that is prevalent in the *rural* category. This homeogeneity creates an easily perceptible separation between developed and undeveloped areas.

Three scenes (#1 from Figure 2.3; #2 and #9 from Figure 2.4) were dropped from the factor analysis either because they loaded on two categories or did not load on any. Scene #1 loaded on the *rural* and *suburban* categories. It has a somewhat higher density, a feature it shared with the *suburban* categories, and also a mix of woods and lawn, a feature of the *rural* category. Scene #2 loaded on *rural* and *conservation* categories. Its area of contiguous undeveloped land is a feature it shares with the *conservation* scenes; however, unlike the conservation scenes the nature area is entirely composed of lawns making the scene more similar to others in the *rural* category. Scene #9 did not load on any of the categories.

Table 2.4 provides a summary of the three categories ordered in terms of decreasing perceived vegetation. The alphas for the *rural* and *conservation* categories are above 0.7 while the alpha for the *suburban* category is just above 0.5. The *suburban* category may be less cohesive because the amount of vegetation in these scenes is sparse and the type of vegetation is harder to distinguish as fitting a certain type. Correlations among the categories are somewhat higher than for the density categories, ranging between .54 (*suburban* and *conservation* categories) and .32 (*suburban* and *rural* categories).

Table 2.4
Perceived vegetation categories

			Perceived Vegetation		
Categories	**# scenes**	**Vegetation %**	**Mean (5-pt. scale)**	**S.D.**	**Cronbach alpha**
Conservation	5	73	3.76	.89	.72
Rural	5	75	2.86	1.09	.91
Suburban	3	46	1.79	.74	.51

Note. Differences in mean perceived vegetation are all significant at $p<.001$.

While the three categories parallel, to some extent, the categories based on perceived density, they are also noteworthy for their distinctness. The perceived vegetation ratings for the three categories are significantly different from each other, yet the actual amount of vegetation in the *rural* and *conservation* categories is virtually identical (75% and 73% respectively). This suggests that expanses of tree cover are perceived as vegetation more readily than fragmented areas of nature such as lawns. One explanation may be that the contiguous forests look untouched whereas the mixture of lawns and woods seem more manufactured. Another explanation may be that participants are implicitly considering how fragmentation might impact views and thus valuing uninterrupted nature for a thoroughly pertinent reason.

In contrast, the *suburban* scenes are perceived to have far less vegetation even though the actual amount of vegetation occupies nearly half of the parcel. The fragmentation of the nature areas as well as the large number of houses may be creating an overall impression of human-made development. Participants may also be considering the likely quality of the viewshed from public thoroughfares in which case unfragmented expanses of nature may be more valued.

The *conservation* category is also noteworthy in that it represents the widest density range (1.1ua – 3.8ua) of all the categories implying that even higher-density developments can be designed to be perceived as having a great deal of vegetation. Both the *rural* and *suburban* categories have much narrower density ranges (0.9-1.8ua and 2.9-3.9ua).

Discussion

Density is often the basis for opposition to proposals for new developments. This research has studied how people perceive density as well as vegetation levels in a variety of residential developments. The results suggest that the perceptions differ in important respects from the technical definitions used in the planning literature. While people are capable of judging density, their perception of density can be strongly influenced by a variety of design-related categories.

Using the ratings of perceived density, factor analysis showed that participants tend to focus both on the arrangement of nature patterns as well as density level, but to weigh these in different ways than used by planners. The wide range of density levels did not prevent the conservation developments to emerge as a coherent category. All of the scenes in the suburban category are of traditional design and, with one exception, is comprised of high density scenes. By contrast, the rural category included only low density developments. Thus, perception is influenced by the combination of vegetation patterns and housing arrangements.

At the same time, analyses based on the pre-defined groups based on design (traditional and conservation developments) and density (less than 2ua vs. 2-4ua) provide useful clues as to the relationship between the perception of density and vegetation. Here the results showed that as the actual density increases, contiguous expanses of natural areas, particularly forests, results in (1) a reduction in the perception of density and (2) an increase in the perception of vegetation. While at low densities the clustering of housing and nature areas may increase the perception of density relative to more evenly dispersed patterns, these same features reduce the perception of density at higher density levels. Also, whereas traditional developments at higher density levels are perceived to have low levels of vegetation, their conservation counterparts are seen to have much more vegetation. Indeed, the high density conservation group was perceived to be even more vegetated than the low density traditional group which has far more measured vegetation. Thus, integrating forested areas into higher-density development can be a particularly useful strategy for mitigating the perception of density and increasing the perception of vegetation.

The main findings thus are that perception of density can be influenced not only by the number of houses in a given area of land (the definition utilized by planners) but by other factors as well. These include the way the houses are arranged, and in particular how they are integrated with nearby nature.

- Sites which show clustered housing and expanses of contiguous, demarcated natural areas tend to be viewed as less dense than developments which have the same number of houses evenly dispersed in an area lacking contiguous vegetation.
- The amount of vegetation is not as important as the type of vegetation in impacting the perception of density. Lawns, which are the major form of vegetation in typical suburban neighborhoods, do little to reduce the perception of density. By contrast, the presence of canopy is a strong component in offsetting the impression of density.
- The arrangement of the vegetation plays a key role in impacting the perception of density. Fragmented vegetation contributes to a sense of greater density while contiguous tree cover reduces the sense of density. For example, c*onservation* scenes (based on factor analysis) with unfragmented canopy cover were perceived as far more vegetated than *suburban* developments which have many fragmented

lawns. While this effect is partially accounted for by the difference in the actual amount of land devoted to vegetation, the *conservation* developments were also perceived to be more vegetated than *rural* developments although they do not differ in the quantity of natural elements. The critical difference is in the configuration of the natural areas. In the *rural* developments the vegetated areas consist of a fragmented mix of woods and lawn, whereas the *conservation* scenes have a contiguous expanse of vegetation that is homogenous in its composition.

Implications and Conclusions

Density issues are frequently raised as residents voice opposition to proposed new developments. Yet continuing the low density pattern of residential development that has transformed vast amounts of forest and farmland is not a viable solution. Local planners, developers, and the citizenry must seek solutions that are environmentally sustainable.

This study provides some concrete information to inform this debate. The perception of density of residential developments can be influenced by the design of the developments and particularly by the ways that the natural environment is incorporated. Expanses of forest cover can reduce the perception of density and increase the perception of vegetation. While this study considered developments from an aerial perspective, there is likely an implicit assumption on the part of the participants that the existence of nearby forest meant that views around the conservation development were more likely to be far superior to those near the traditional developments.

These findings support the use of conservation developments (Arendt, 2004) which group housing in order to preserve ecologically and culturally important elements on a given parcel. Unlike developments that merely cluster homes in close proximity with little attention to the natural environment, conservation designs pay close attention to the role played by the natural setting, especially their impact on the quality of the local viewshed.

Given that the public's aversion to density readily results in unsustainable forms of residential development, understanding factors which influence the perception of density can lend planners and developers an alternative framework. The study suggests that developments can be designed to support housing needs without sacrificing human or environmental needs.

CHAPTER 3

HOUSING AND NATURE PATTERNS IN THE ACCEPTABILITY OF RURAL DENSITY

Background

People choose to live in the country for its privacy, relative value, proximity to open space, and for its rural character (McGranahan, 2008; Ryan, 2006). Ironically, these features which influence people to move to rural areas are being degraded by that very migration. As more people move out to the country, the privacy it affords residents is often lost. Open spaces and other natural areas are consumed by new construction. As views of natural landscapes are lost, the character of rural communities is eroded. It is not surprising then that residents of rural communities often oppose proposals for new development. Development brings an urban transformation which produces the kind of environment that residents have moved to the country to avoid.

Expression of these concerns often involves density. A 1999 National Association of Home Builders (NAHB) survey found that while many residents support urban growth boundaries and preservation of farmlands, they would not support higher-density housing in their communities (Carliner, 1999). This sentiment is manifested in local ordinances which limit the density level of residential developments to specific lot sizes such as 2 or 5 acres. However, the language of these ordinances does not distinguish between the multiple ways in which density can be designed. Rather, it marks all developments above a certain density threshold as unacceptable. Though these regulations are written to reduce the subdividing of the land in an effort to maintain rural character, they can have the opposite effect. The sprawling large house lots often destroy the very site features that originally created a sense of rural character (Arendt, 2004; Ryan, 2002).

While opposition to density may reduce the influx of new residents in some cases (McGranahan, 2008), closing the door to development in general is not practical given a growing population and its affinity for the countryside. Neither is opposition to density responsive to sustainability considerations. It often leads to legal battles between township residents and developers in which the latter, having more financial and legal resources than those of local resident groups, often prevail. As a result, residents frustrated by these changes and wishing to maintain a rural lifestyle move even farther away and in the process exacerbate suburban sprawl. On the other side, developers, preferring to avoid the burdens of opposition, choose to develop in communities where the regulations are less stringent leading to leap-frog development in places of least resistance (Ewing, 1997). Thus, opposition to development has led to unintended and undesirable outcomes for both residents and the environment. The polarized debate, pitting growth against preservation, has also obscured opportunities for finding multiply desirable forms of developments that can meet both the environmental and social concerns of the citizenry.

Density may seem to be the primary issue because lot size has been a strong focus of the way houses are marketed and because alternative residential patterns are less available. While the prevalence of low density development has been cited as indication of public preference (Carliner, 1999; Gordon & Richardson, 1997), there is reason to question whether preference or availability more accurately reflects residential choice. Research on housing preferences has focused primarily on residential patterns, such as large homes on large lots, which are widely available on the market while ignoring those that are less common. Myers and Gearin (2001, p. 639) note that "survey researcher's practice of bundling housing characteristics into stereotypical descriptions obscures consumer preference or distaste for specific residential amenities." In other words, limitations in sampling a wide range of housing patterns might indicate that the only type of residence that people care for is low density. These sampling limitations arise because most studies consider housing preference on the basis of the development options that are available in the market (Morrow-Jones, Irwin, & Roe, 2004). Innovative forms of development therefore get less attention simply because they are less common and participants, with little experience with these alternatives, may be more likely to prefer options that are more familiar.

While density is often the rallying cry for opposition, density per se may only be a part of the concerns that reflect citizens' negative sentiments. For instance, dense developments may seem out of context in a rural setting (Campoli & MacLean, 2007). Nature views, which are very important to residents and strongly characterize the rural landscape (Ryan, 2002), are often lost as a result of sprawling low density development. Threats to a sense of community and loss of an ability to make one's living are also issues that residents see as going along with more development (Tilt, et al., 2007). These concerns suggest a much broader scope of issues than would be solved by simply limiting density.

An alternative to limiting density is to develop designs that offset citizen concerns regarding it. Arendt (1999) argues that many developments destroy rural character through inattention to important site features and that what should be controlled is the *pattern* of development instead of the density. One pattern found to be important to rural residents is being able to live in places with nearby open spaces and views of nature (R. Kaplan & Austin, 2004). In the same vein, housing developments with trees tend to be more preferred than developments without (Sullivan, 1994). Another pattern is to have views of the country from roads and other public realms (Ryan, 2002). Similarly, residents approve of using agricultural buffers to shield development from public view (Sullivan, Anderson, & Lovell, 2004).

Arendt's (1996) conservation subdivision design is an example of a comprehensive approach that incorporates these landscape patterns. His approach involves preserving the most important parts of a parcel and clustering the houses on the other parts of the site. By doing so, desirable natural areas are preserved and housing is built with a smaller environmental footprint. As such, it is an example of residential development that addresses some of the concerns of rural residents (e.g., the loss of rural landscapes). While conservation designs hold the potential to offset opposition to higher-density development, there is little empirical evidence to support this claim. The present study addresses this gap by considering the relative acceptability of conservation design patterns compared to more traditional development patterns. It also considers the impacts of such designs at a variety of density levels. The aims of the research are:

1. To understand how rural residents perceive different development patterns and how acceptable they find them in the rural context.
2. To explore design patterns that would offset rural residents' concerns about density and are more sustainable than typical low density developments.
3. To examine group differences in how rural residents perceive housing development based on their amount of experience in rural areas.

Method

The study was based on 16 aerial photographs of residential developments selected to represent a range of densities as well as different design characteristics. The photographs were selected based on two main constructs—density and design—using the environmental sampling methodology outlined by Kaplan and Kaplan (1989).

Study participants were mailed a two page survey (see Appendix B) along with two pages of color pictures of residential developments. The mailing also included a cover letter which requested the resident's help with a short survey about "possibilities for new residential development in their communities." The surveys had return postage printed on the back so participants were asked to return the survey, by folding it in half and sealing the edge.

Main independent variables: Density and design

Density

The gross density of each development was calculated by taking the total number of houses and dividing by the total acreage of land thus yielding the units/acre (ua) measure that is commonly used in planning. The aerial view of each development was framed to show 10 acres. Thus, density was calculated by counting the number of houses and dividing by 10. Two density groups were chosen: *less than 2ua (low density)* and *2-4ua (high density)*. Though designated "low" and "high" throughout this document, it is important to acknowledge that while the 2-4ua group is high for many rural areas, it is well below the 4-6ua density considered the threshold for minimal bus service (Campoli & MacLean, 2002) and far below typical densities in urban areas. Furthermore, while 2-4ua may not constitute high density development from a planning perspective, it may appear that way to the rural residents responding to the survey especially when considering the fact that over 80% of the lots in the six township study site are larger than a quarter acre.

Gross density (i.e., total land area in the denominator) was used because some developments selected for the study have extensive natural areas devoid of housing, a feature that net density, which calculates using only the land area occupied by housing, would not take into account. Gross density thus allows for a fair comparison between developments with and without undeveloped areas.

Design

Design, in the context of land use planning, can be thought of as the pattern by which humans purposefully structure the natural and built environment. Many factors subsumed by design, such as building materials, colors, and facades, are less evident from an aerial perspective. From a bird's-eye perspective the design factor that is most readily apparent is the pattern of land utilization employed by the various developments. In particular, this study focuses on the pattern of natural elements within the developments and asks whether the patterns might be related to acceptability.

Two types of design, *traditional* and *conservation*, were selected for study. Traditionally designed developments share several qualities— the housing is relatively evenly distributed lacking large areas of contiguous vegetation and leaving little undeveloped land. These sorts of arrangements are typical of recent development at the rural-urban fringe. Conservation developments are different from traditional developments in two major ways. First, a significant portion (at least 25%) of the land is left undeveloped. This land may consist of trees, grasslands, farmlands, and other non-development uses. Second, the undeveloped land remains unfragmented resulting in the housing being relatively concentrated in a portion of the scene instead of dominating it as in the traditional developments. Such patterns may play a key role in providing a view for homeowners as well as maintaining the quality of the viewshed for the wider community.

2x2 factorial design

Density and design are the two main independent variables, each with two levels. For each of the four combinations in this 2x2 factorial design (low density traditional, high density traditional, low density conservation, and high density conservation) was represented by four scenes in order to reduce the idiosyncratic elements in any specific setting (R. Kaplan & Kaplan, 1989). Figure 3.1 shows one of the four scenes for each combination of density and design.

Environmental sampling

To better understand the effects of the two main variables in the study, several potentially confounding variables were controlled. The scenes were chosen to provide the highest possible resolution on a wide range of developments. Google Earth (http://earth.google.com/), a tool that provides 1-3 year old satellite imagery for the entire globe, met these constraints.

	Traditional design	Conservation design
Less than 2 units/acre (Low density)	Low density traditional 	Low density conservation 
2-4 units/acre (High density)	High density traditional 	High density conservation 

Figure 3.1 Scenes selected for density and design in a 2x2 factorial design

However, in 2006, the time the scenes were selected, few regions provided imagery with a resolution level capable of creating sharp looking pictures for the survey. One exception to this was the area surrounding Portland, Oregon which, at 1 foot/pixel (Portland Metro, 2005), had some of the highest resolution imagery publicly available in the country.

The Portland Metro area was also desirable due to its well-known urban growth boundary (Daniels, 2001). In selecting scenes, neighborhoods near the edge of existing development were the primary focus. These neighborhoods are typically low density and border lands with a higher concentration of farmlands, forests, prairies, and other undeveloped blocks of land. Such neighborhoods can be challenging to find in sprawling cities such as Atlanta, but are readily apparent in the Portland area due to its urban growth boundary. The neighborhoods were chosen to be similar to kinds of developments that might be proposed in rural Southeastern Michigan (where the study participants reside). Though the Pacific Northwest has different species of vegetation than would be familiar to residents of Southeastern Michigan, the scale and angle of the photographs make it unlikely that such distinctions would be noticeable.

To ensure that the selected scenes would be representative of the kinds of developments proposed in rural areas, none of the scenes included apartment buildings or condominium complexes. Instead, only single-family detached housing developments were shown. According to the American Housing Survey (2006), this type of home makes up 62% of all homes in the US and nearly 70% of all new construction between 2000 and 2004. These homes are among the most popular for American consumers and consume more land than other type of residential development. In the 6 townships studied, over 99% of the land utilized for housing is single family residential (Southeastern Michigan Council of Governments, 2008).

The scenes were also selected to display only one type of land use: residential. Also excluded were scenes that contained housing that looked old or dilapidated. All scenes were taken in the summer so trees were in full leaf. Since water has been shown to be a source of high preference (R. Kaplan & Kaplan, 1989), none of the study scenes included water features.

The scale of the scenes was also held constant. A 10-acre frame was chosen since it provided a small enough scale to allow participants to recognize individual components of the development such as houses, trees, and roads, yet it is a large enough scale to show patterns of how the land is utilized. Holding the acreage constant ensured that participants were responding not to the amount of land shown but rather to the patterns of development.

The perspective of the scenes was also controlled. The bird's-eye vantage point utilized in this study allows participants to see the density, design, and other structural aspects of the housing developments that would not be apparent in street level views. This perspective is commonly used in simulations and in photographs that present larger areas. People readily comprehend such oblique views; in fact, the vantage point of a hilltop or upper floor of a high rise is often sought. This is also the view afforded from a plane window. The photographs were thus oriented to a 30° oblique angle which has been shown to give people a sense of the overall layout of a development (R. Kaplan, 1993) and permit comparisons between different designs (Arendt, 1999).

After selecting an initial set of scenes a panel of 10 judges—a mix of graduate students, faculty members, and Ann Arbor citizens—rated them for the amount of trees, farmland, open space, and housing diversity. In order to check if the birds-eye views scenes were comprehensible, judges were also asked to note if they found anything confusing in the scenes. Any scenes that were found to be problematic with respect to comprehension were replaced. While these replacement scenes were chosen based on the feedback from the panel, the replacements were not judged by the panel.

The scenes were arrayed with eight per page, each measuring 4 inches wide by 3 inches high. The scenes were corrected for color, contrast, and brightness and were professionally printed on high-quality paper using industrial color printers.

Finally, ordering effects were controlled. The 16 development scenes were arrayed across two pages in a random order with respect to the two main constructs of density and design. While the use of different arrangements on the two pages for each participant would have been desirable, this was not feasible in the printing process.

Other independent variables

Respondent environment from self-report and GIS

Information about the participants' home environment was included in the survey and also collected from geo-coded addresses. Participants provided information about their current home environment including the size of the property, whether they lived on a farm, had barns, and whether they had paved roads. In addition they were asked about their views of nature, farmland, and housing. Since each survey was coded for its geographic location, GIS parcel data for each respondent was used to access information such as the number of nearby houses, proximity to cities and roads, assessed home valuations, and lot size.

Further information about each address was obtained from the 2001 National Land Cover Database (NLCD), a land use map of the entire United States. Using statistical estimation methods applied to satellite-based images of the earth, researchers categorized US land uses at a 30 meter/pixel resolution. The database characterizes 29 different land uses including canopy cover, impervious surfaces, lawn, and croplands. The accuracy of estimates range from 83-91% for impervious surfaces and 78-93% for canopy cover (Homer, Huang, Yang, Wylie, & Coan, 2004).

By combining the NLCD database with each respondent's location, amount of canopy, lawn, crops, pasture, and impervious surface were measured around each parcel (see Figure 3.2 and Figure 3.3). These were calculated using a circular buffer of radii 300, 750, 1500, and 3000 feet around each residence and then measuring the amount of land cover within the buffer. Varying the radius gives different size viewsheds which have been shown to make a difference in perceptions of one's environment (Kweon, Ellis, Lee, & Rogers, 2006).

One of the problems with this approach is that the NLCD database is 5 years older than the survey sample. While this may be a short enough time frame to assume that land use patterns have not changed dramatically in the study area, smaller changes that may have occurred in the 5 years would likely be due to development and therefore result in decreased canopy cover, increased impervious surfaces, and less farmland. Inferences about the results based on the NLCD must consider this shortcoming.

In order to maintain anonymity, only addresses were used in collecting data about respondent environments. Furthermore, the environmental data collected was only used in aggregate over all the participants—individual parcels and their locations were not singled out.

Attitude, lifestyle, and demographics

The survey also included items about attitude, lifestyle, and demographics. One item asked residents to rate how development made their community better or worse. Residents were also asked how long they have lived in their current residence and whether they farmed the land, either as a source of income or not. Weekly commuting distance and work status was also collected. Household composition, education, gender, and age rounded out the demographic portion of the data collection and would help compare the participant group to the broader population of the study site.

Dependent variable: Acceptability

The survey instrument was designed to assess how acceptable rural residents find various forms of relatively low density residential development, presented as 16 aerial photographs. Participants were asked to rate the photographs for "how acceptable [they] would find the pictured developments had they been proposed." The 5-point Likert scale ranged from "absolutely not acceptable" to "very acceptable".

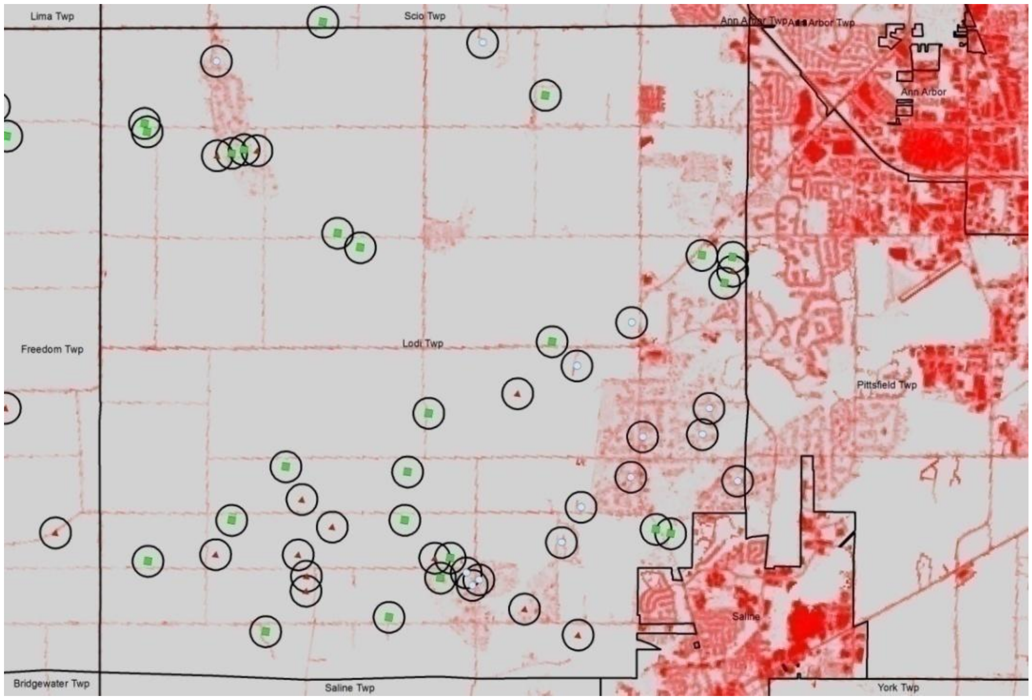


Figure 3.2 Impervious surface near respondents
(750 ft. radius viewshed shown, darker red implies more impervious surface)

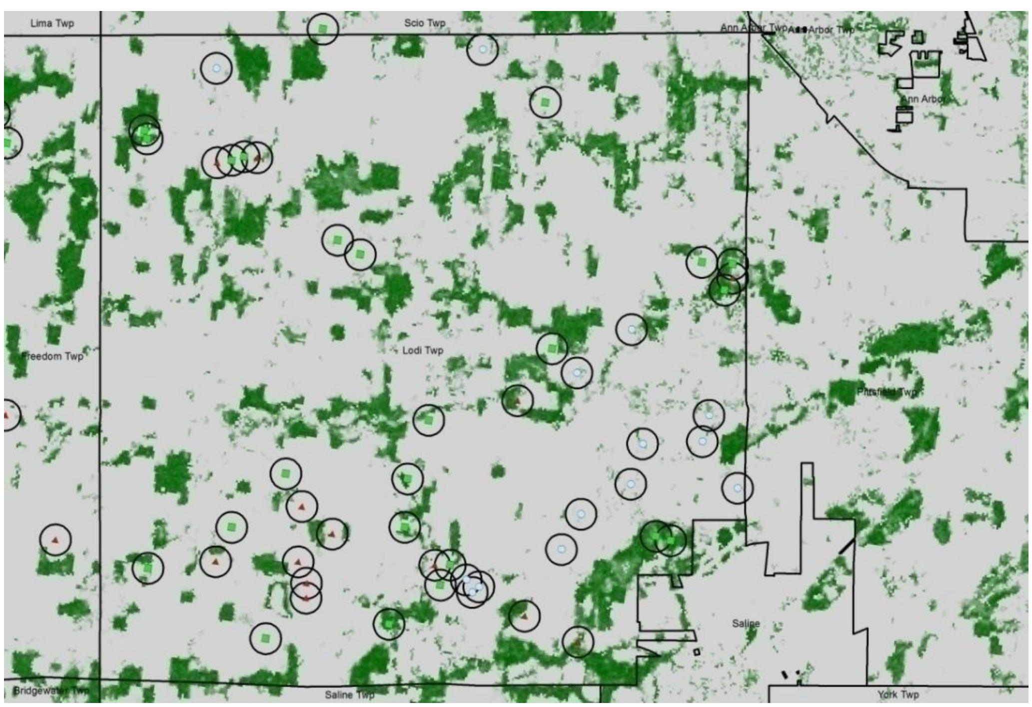


Figure 3.3 Canopy cover near respondents
(750 ft radius viewshed shown, darker green implies more canopy cover)

Participants

Study area

Residential development in Southeastern Michigan has grown westward from the Metro Detroit area over the past several decades. Washtenaw County, which lies some 40 miles west of downtown Detroit, fits in this pattern of development. The study was conducted in six townships outside the urban centers of the county (see Figure 3.5). The combined population of these townships is 40,249 which makes up about 12% of the county population of 352,248 (Southeastern Michigan Council of Governments, 2008).

These townships maintain rural qualities, with significant amounts of farmlands and natural areas, but are also under development pressures. Specifically, the type of development most commonly being proposed and developed is single family residential. These are typically defined as free-standing detached buildings with only one housing unit. Virtually none of the developments are apartments or other multiple family units. Despite the lack of developments which allow for high density, the single family residential parcels in the study site span a wide range of densities—lot sizes can be as small as a one-eighth of an acre to larger than 100 acres. Of the 12,116 parcels in the study area (Southeastern Michigan Council of Governments, 2008), 80% are larger than a quarter of an acre (equivalent to a density level of less than 4ua) and 55% are larger than 1 acre.

The total land area of the six township study site is roughly 133,000 acres. As shown in Table 3.1, farmland is by far the predominant land use, while residential development accounts for about 14 percent.

Table 3.1
Major land uses in 6 township study site
(Southeastern Michigan Council of Governments, 2008)

Land Use	Acreage	Total Land (%)
Farmland	62,997	48
Woodlands / Grasslands	41,115	31
Residential	18,941	14
Parks / Cemeteries	2,033	2
Commercial / Industrial / Institutional	1,470	1
Other	5,273	4

With respect to government, Michigan is a home rule state. This means that each township defines its own land use policies such as setting minimum lot sizes to reduce density. Each township also has its own planning commission which helps determine which development proposals are accepted or rejected. The people who serve on the commissions are most often local citizens who have little formal planning experience (R. Kaplan, Kaplan, & Austin, 2008) but may have lived in the community for many years. Though there is a master plan laid out by the county government, it is only a guiding tool lacking the force of law. Therefore, decisions made by citizen-planners have a major impact in shaping the rural landscape and the sustainability of the larger region outside township borders. This issue is pivotal because resident opposition effectively means local government opposition since citizens, as opposed to professional planners, often make up the planning boards in rural townships (R. Kaplan, et al., 2008). While this study does not focus on planners in particular, there is some evidence to suggest that attitudes towards development are similar between rural residents and rural township commissioners (Ryan, 2006).

Population Sampling

To sample the residents of the six townships in the study area, a GIS database of parcels and addresses was obtained from Washtenaw County. One of the problems with such databases is that the parcels are not necessarily indicative of owner-occupied homes. Some examples of these problematic parcels might be vacant lots, rental properties, commercial parcels, parcels owned by trusts, etc.

Several measures were taken to ensure the validity of the parcel data and select those with owner-occupied residences. First, only parcels marked by the county surveyor as Residential or Agricultural were included. Others, such as Commercial, Industrial, Vacant, etc. were dropped. Second, since parcels without a street address do not have a house on the parcel, only parcels which had a valid street address were included. Third, the GIS database lists both the owner and current occupant of the parcel. In some cases, the occupant or the owner is not listed which could mean that the data are not current. To ensure that there was an occupied house on the parcel, only those records where the owners and the resident were identical were included. While this does ensure use of current data, it could potentially exclude a number of residents who rent instead of own their homes.

After ensuring the GIS database included only residential parcels, there were 12,047 candidate households for the study. Further restricting this pool was another sampling concern that some small residential parcels were adjacent to large non-residential (i.e., agricultural) parcels. Figure 3.4 is an example of this configuration—the residential parcel is the dark region in the center which is adjacent to the lightly shaded agricultural parcel. The owners of these smaller lots often own the adjacent lands (e.g., the farmhouse sits on the smaller parcel while the farmland is on the larger parcel) and thus actually have much larger parcels that are indicated by the lot size of the smaller residential parcel. Because lot size was an important variable in the study (explained below), these problematic parcels were dropped.

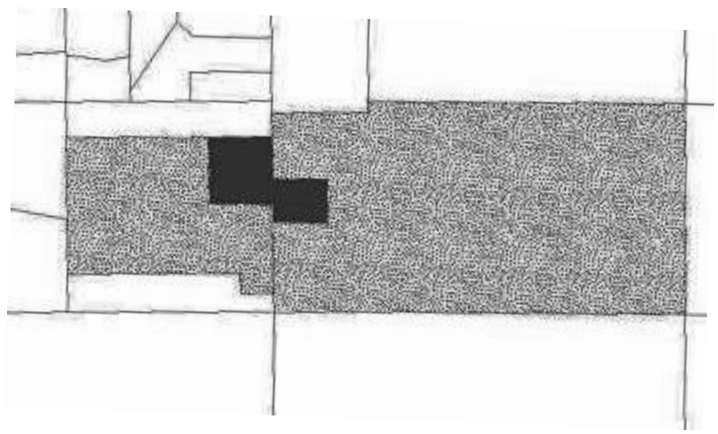


Figure 3.4 Small residential lot adjacent to a large agricultural lot

A further consideration in selecting study participants was the potential influence of residing on a major state roads. To control for this only parcels within the townships that are at least 1 mile from major roads were included. This additional criterion reduced the candidate population to 8,481 parcels.

This population was then stratified into three groups based on lot sizes of 1-2 acres, 5-8 acres, and 10-40 acres. The discontinuities between the groups were intended to increase the likelihood of a stronger geographic and experiential distinction between the residents of each group. The size of each group was 2,855, 379, and 700 respectively, or about 46% of the parcels. From each of these three strata, 300 residences were randomly selected yielding a total sample of 900. The random sampling ensured that systematic differences in the sample did not lead to differences in acceptability, the main dependent variable.

About the participants

Of the 900 surveys sent out, 15 were returned to sender due to vacant lots, 7 as undeliverable, and 4 because the intended recipient was temporarily away, reducing the original sample to 874. A total of 182 surveys were completed yielding a response rate of 21%. Broken down in terms of the three lot size strata, the sample sizes were 295, 289, and 290 in the 1-2, 5-8, and 10-40 acre lots, respectively. This yielded roughly equivalent return rates across the lot size groups at 22%, 21%, and 20% respectively.

Figure 3.5 shows the spatial distribution of the respondents by lot size group. The blue circles indicate residents who live on 1-3 acre parcels. Green squares represent 5-8 acre parcels and red triangles represent 10-40 acre parcels. The distribution is relatively evenly spread with a slight tendency for smaller lots to be near the village boundaries of Saline and Dexter. This is not surprising since higher-density development often occurs near larger population centers.

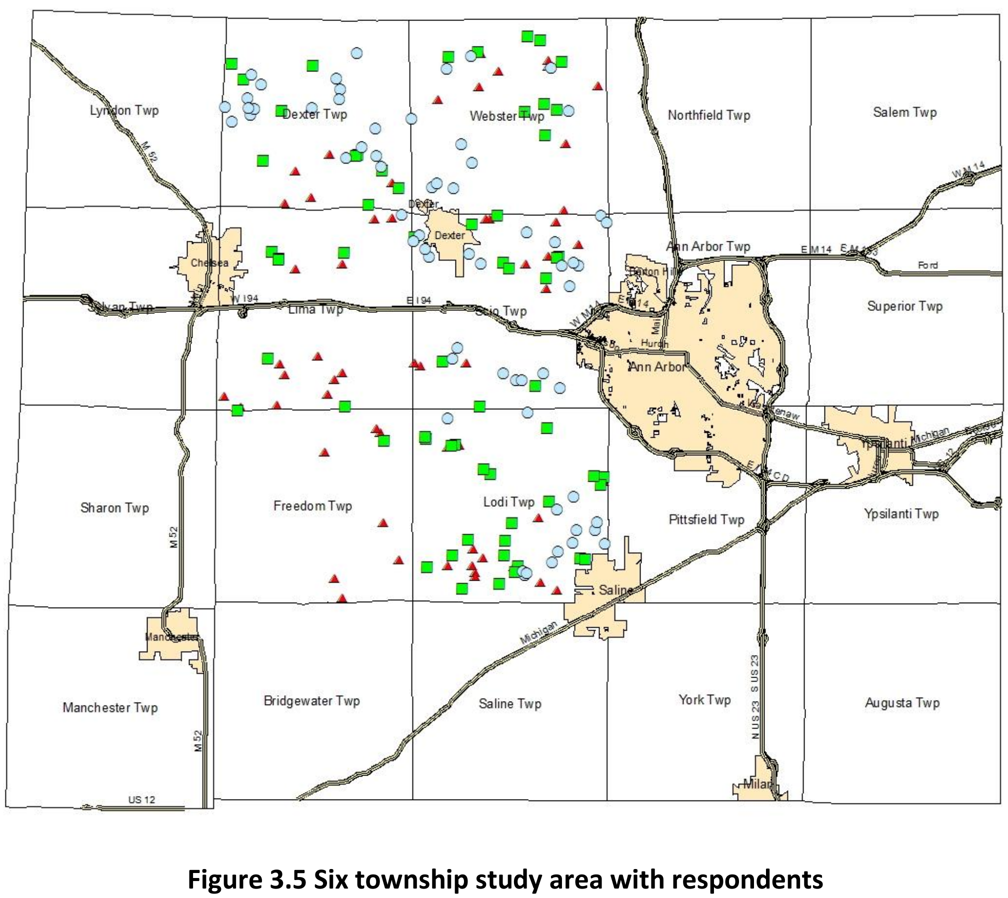


Figure 3.5 Six township study area with respondents
(1-2 acre lots: blue circles, 5-8 acre lots: green squares, 10-40 acre lots: red triangles)

The question of whether the study sample reflects the population from which it was taken was addressed by comparing the two with respect to lot size, household composition, age, and education. Table 3.2 is a summary of this comparison.

Table 3.2
Comparison of respondent and six township study area

	Six Township Area	**Respondents**
Number of households	12,116 households	182 households
Population	Population: 36,701	N/A
Population over 21	Population: 25,367	N/A
Lot Size Distribution (based on # households)		
1-2 acre	2,935 (24% of total households)[b]	64 (35% of respondents)
5-8 acre	433 (4%)[b]	61 (34%)
10-40 acres	872 (7%)[b]	57 (31%)
Household Composition (based on # households)		
Avg. Size	2.7[b]	2.8
Live Alone	1,927 (16%)	14 (8%)
w/ Children under 18	4,787 (40%)	59 (35%)
Housing Tenure		
Owner-occupied	10,738 (84%)	175 (96%)
Renter-occupied	1,378 (11%)	1 (1%)
Age (based on population over 21)		
21-40	8,193 (32% of population)	16 (9%)
40-60	12,729 (50%)	119 (66%)
Over 60	4,445 (18%)	46 (25%)
Education (based on population over 21)		
< Undergraduate education	26% of population	48 (27%)
Undergraduate education +	74%	132 (73%)

[a] The information for the six township site includes all areas, while the sample was selected to exclude homes within a mile of major roads.
[b] Statistics obtained from Census 2000 (US Census Bureau, 2000) unless indicated by a superscript in which case they were calculated from Washtenaw County parcel data.

Due to the stratification of the original sample into three lot size groups, the larger acreage lots were relatively oversampled with respect to the overall population. However, this was done intentionally to give an equal weight to residents who, by virtue of living on larger lots may reflect more rural attitudes. As indicated in Table 3.2, the sample reflected the six township area in terms of many demographic variables. Some possible deviations to note include the percentage of households with children and those with only one person were somewhat lower than the general population implying that multiple person households without children were somewhat overrepresented. With respect to age, the 21-40 range is undersampled while the over 40 range is somewhat oversampled. It is worth noting that the information for the townships includes all areas, while the sample was selected to exclude homes within a mile of major roads. Whether this affects sociodemographic variables is not known.

Data analysis

Pre-defined and factor-analytic scene groupings

Acceptability ratings for the development scenes were analyzed using two different approaches to grouping of the scenes. The first, a pre-defined grouping, was based on the density and design constructs that were used to select the development scenes (see Figure 3.1). This grouping reflects the perspective of the expert planner in that it distinguishes developments based on calculated density and established design principles (traditional and conservation designs). It is around these distinctions that planners are often making land use decisions and designing policies. The analysis based on the pre-defined density and development type distinctions then is to understand how planner-envisioned approaches relate to perceptions of acceptability by rural residents.

Rural residents may not share the planners' perspectives in viewing the scenes of different developments. The second approach to analyzing the acceptability ratings of the scenes was thus based on an exploratory factor analysis to permit examination of the underlying perceptual categories for the participants. Factor analysis is not based on how acceptable each scene is but rather on the pattern of relationships across the scenes. If respondents have similar reactions to several scenes these will emerge as a category or factor. Since the categories are derived from the acceptability ratings rather than by asking participants to group scenes, the results reflect categories that can be quite different from a conscious effort to categorize.

The two approaches to grouping the development scenes—pre-defined and factor-analytic—give us two different and useful ways to look at these data. Each approach takes a different slice of the development scenes and provides a measure of the relative acceptability of the different groups. However, while the pre-defined groups allow for the analysis of main and interaction effects of density and design, the factor-analytic approach allows us to identify the categories participants implicitly use when considering proposed developments and to reveal the differences between those and the pre-defined groups. Thus, each grouping provides a lens through which to view the data, one to view the public's categorizations of developments and the other to reveal the interactions between density, design, and acceptability.

Factor analysis and internal consistency

In the exploratory approach, a factor analysis of the acceptability ratings was performed using Principal Component extraction with Varimax Rotation, a form of orthogonal rotation that minimizes the number of variables that have high loadings on each factor and thereby most economically represents each factor. All factors whose eigenvalues were greater than one were retained and an examination of the Scree plot was used to confirm the resulting number of factors. Scenes with loadings of .45 or greater on no more than a single factor defined the factors. The factors were analyzed using Cronbach's internal consistency estimate of reliability (i.e., Cronbach's alpha) and were retained if the alpha was higher than .50. New variables were then created based on the mean rating for the scenes comprising the factor.

The four pre-defined scene groups were also checked for internal consistency—a Cronbach alpha was calculated for each of the four groups using the same .50 threshold used in the exploratory factor analysis. Once the consistency of the development groups was verified, new variables were constructed by calculating the participants' mean rating of the scenes that formed the group.

Linear regression model with correlated errors

Because each participant was asked to rate 16 scenes (which can be considered the treatment conditions), the study has a repeated measures design which could mean that the ratings an individual gives to the 16 developments are correlated as a result of individual bias. To account for this bias, a linear model with correlated errors was utilized via the MIXED procedure in SPSS 16. Unlike a basic linear regression, this procedure accounts for any potential within-subject correlations through a flexible covariance matrix (West, et al., 2006). The type of covariance matrix used in this analysis was unstructured.

In the pre-defined scene groups, both main and interaction effects of density and design on acceptability were tested for significant differences. In the factor-analytic categories, a pairwise comparison of category means was done to identify any significant differences between categories.

Cluster analysis

To better understand the potential diversity of item ratings among the study participants, a cluster analysis was performed. Cluster analysis is an exploratory tool for empirically indentifying groups of cases (i.e., participants) with similar profiles across variables. It finds cases in the sample with similar scores on the variables of interest (in this case, categories constructed from the factor analysis) and puts them together to form clusters of respondents (Rapkin & Luke, 1993). The Two-Step Cluster Analysis procedure in SPSS 16 is advantageous in that it automatically finds the optimal number of clusters by comparing across multiple clustering solutions and selecting the one that maximizes within-cluster homogeneity and generates the greatest possible difference among the clusters. The resulting clusters can be thought of as survey participant profiles—they share similar perspectives about the different types of developments as reflected in their pattern of acceptability ratings. A one-way ANOVA was then used to examine the relationship among these clusters with respect to attitude, lifestyle, environmental, and demographic factors.

Results

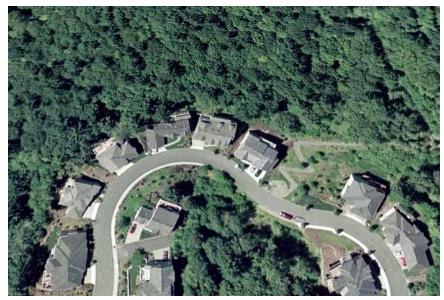
Pre-defined groups: The planner perspective

Housing density is a major component of the planning vocabulary. Likewise, residential design patterns, both conventional ones typical of many suburbs and innovative ones such as clustering and conservation designs, are ideas that were devised by planners (Arendt, 1996; Whyte, 1964). While issues of density and design are often raised by planners, homebuilders associations, and Smart Growth advocates, there is little empirical research to show how the public responds to development strategies which deal with these two constructs. This section discusses participants' ratings based on how planners have envisioned density and its design in residential developments.

Figure 3.6 and Figure 3.7 provide the acceptability means for the traditional and conservation scenes at low and high density levels respectively. The scene that received the highest mean acceptability rating, 3.80, shows the lowest density of any of the scenes and is perhaps most typical of rural residences in the study area with open fields, farms, and widely dispersed housing. However, the contrast between this scene (#13) and #3 is noteworthy. The latter also shows traditional design and is comparable in its low density (0.8ua vs. 0.6ua, respectively). Scene #3, however, received the lowest acceptability rating of any of the 8 low density scenes (mean 3.20). By contrast, the scene receiving the second highest acceptability rating (#14, mean=3.71), is in the conservation group. Unlike #13, it shows closely packed housing surrounded by a great deal of contiguous canopy cover. The acceptability ratings of the other low density scenes, regardless of design, are all around 3.4.

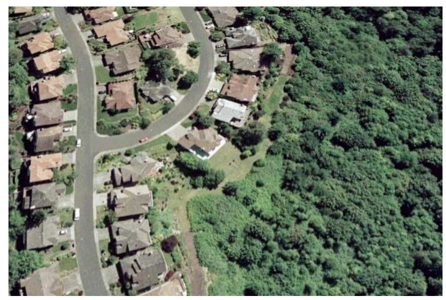
It is not surprising that the high density scenes were generally rated as less acceptable. There is, however, one notable exception: scene #7 with a mean no different than the pattern for the low density scenes. Although its density is 2.3ua compared to the 0.9ua of #14, it too is a conservation design with substantial canopy cover. Tied for least acceptable, with means of 1.68, scenes #8 and #12 are both from the high density traditional group. Though high density is generally less acceptable, the differences based on the two design types are significant. This is further discussed in the following sections.

Figure 3.8 shows the correlations among the four pre-defined development groups. The highest correlation is between the two high density groups (.68) suggesting that participants are responding to the shared feature of high density rather than distinguishing between designs. The correlation between the low density groups is somewhat lower (.53) but can be explained using the same line of reasoning that the developments share a similar density level. Correlations among the two groups depicting conservation development is also strong (.54), while for the traditional developments the lack of relationship suggests that density plays an important role in distinguishing among such developments.

Traditional		Conservation	
	#13 gd=0.6ua acc=3.80		#6 gd=0.9ua acc=3.45
	#3 gd=0.8ua acc=3.20		#14 gd=1.1ua acc=3.71
	#15 gd=1.1ua acc=3.35		#10 gd=1.2ua acc=3.43
	#1 gd=1.8ua acc=3.38		#11 gd=1.8ua acc=3.40

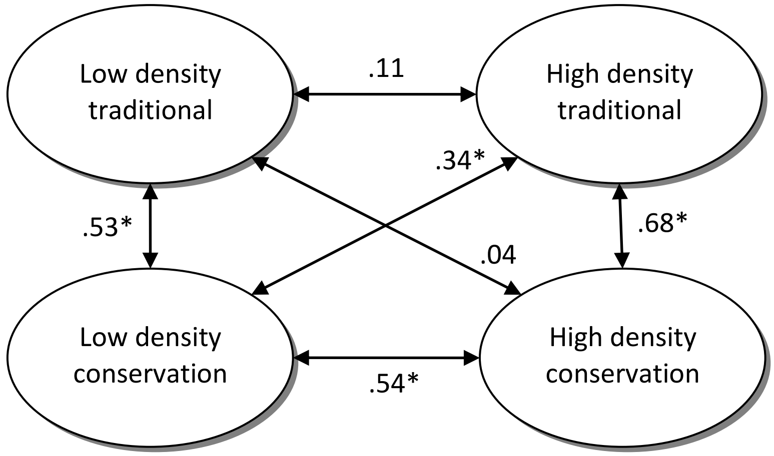
Note. gd=gross density in units/acre; acc=acceptability. Acceptability is based on 5-point rating scale with 5=very acceptable.

Figure 3.6 Low density (<2 units/acre) scenes shown in order of increasing gross density

Traditional		Conservation	
	#8 gd=2.7ua acc=1.68		#7 gd=2.3ua acc=3.44
	#4 gd=2.9ua acc=2.02		#5 gd=2.6ua acc=2.70
	#9 gd=3.7ua acc=2.07		#2 gd=3.4ua acc=1.87
	#12 gd=3.9ua acc=1.68		#16 gd=3.8ua acc=2.11

Note. gd=gross density in units/acre; acc=acceptability. Acceptability is based on 5-point rating scale with 5=very acceptable.

Figure 3.7 High density (2-4 units/acre) scenes shown in order of increasing gross density



*Correlations significant at p<.01.

Figure 3.8 Correlations between pre-defined groups

Table 3.3
Acceptability by density and design

Pre-defined groups	# scenes	Gross density (in ua)	Acceptability Mean (5-pt. scale)	S.D.	Cronbach alpha
Low density					
Traditional	4	1.08	3.43[a]	1.14	.81
Conservation	4	1.25	3.50[a]	1.01	.80
Total	8	1.17	3.47[b]	1.08	.85
High density					
Traditional	4	3.30	1.86	1.05	.83
Conservation	4	3.03	2.53	1.24	.90
Total	8	3.17	2.20[b]	1.20	.90
By design type					
Traditional	8	2.19	2.65[c]	1.35	.78
Conservation	8	2.14	3.01[c]	1.23	.86
Total	16	2.16	2.84	1.31	.88

[a] Differences in acceptability in groups with four scenes are all significant at p<.001 except for the pair sharing a superscript.
[b] Difference in acceptability between high and low density groups is significant at p<.001.
[c] Difference in acceptability between traditional and conservation groups is significant at p<.001.

Density, design, and acceptability

Table 3.3 summarizes the mean acceptability ratings and standard deviations for the pre-defined scene groups. It also shows the average gross density for each group as well as the Cronbach alpha coefficient of internal consistency. Though the scenes were chosen to have approximately the same densities, the challenge of sampling led to a slight difference between the groups for a given density level. For example, there is a difference of 0.2ua between the conservation and traditional developments in the low density group. Because the scene is framed at 10 acres, this corresponds to an average difference of two houses between the groups.

The acceptability of development in rural areas is impacted strongly by the overall density of proposed development. For the developments at a density level of less than 2ua, residents rated the acceptability at a mean of 3.47, between "somewhat acceptable" and "acceptable" on the 5-point scale. By contrast, for the higher density scenes (2-4ua), the mean of 2.20 is not only significantly lower ($p<.001$), but also reflects a rating closer to "not acceptable."

Visual features which distinguish high density developments include more housing, more impervious surface (e.g., sidewalks, roads, housing footprints) and less vegetation. Ryan (2006) has shown that developments that appear suburban are not compatible with rural character. One explanation may be that features like open space which correspond to rural character are not apparent in the high density scenes. Additionally, it is possible that the least preferred high density scenes (such as the traditional high density ones in Figure 3.7) are the furthest from the type of development that are comfortable and familiar to rural citizens and may likely be the very sort of developments that they are trying to avoid when they move to the country. By contrast, the lower density developments, with fewer houses and ample vegetation, may be more compatible with existing patterns of rural development.

However, there is a striking difference between the conservation and traditional design within the high density group. Because of the 10-acre view shown in each of the scenes, the traditional high density developments give the impression that there is hardly room for anything but housing, creating an apparently unending sea of development. By comparison, the high density scenes with conservation designs may give less of this impression.

Accordingly, the design of the developments also play a strong role in ratings of acceptability. Of the two types of designs, conservation developments are significantly more acceptable than the traditional design scenes (means 3.01 and 2.64, respectively, $p<.001$). Although the mean acceptability rating for the conservation scenes is just at mid-scale, for the traditional designs it is between "somewhat acceptable" and "not acceptable".

Recall that the two major characteristics of conservation designs which distinguish it from traditional ones are 1) the presence of contiguous regions of undeveloped land, primarily forest cover, that make up at least 25% of the scene and 2) more closely packed housing which utilizes the remaining space such that the overall density is roughly equivalent to its traditional counterparts. It is useful then to consider that though rural residents are considered to be averse to density, there are circumstances when they find housing that is more closely packed together—a hallmark of high density developments—to be a more acceptable form of development than housing that is widely dispersed. This suggests that residents are more accepting of closely packed housing as long as the development is designed to preserve and incorporate nearby natural elements.

Interaction effects

While opposition to density has been reported previously (Churchman, 1999; Pendall, 1999), one of the aims of this study is to understand how design might offset the drawbacks of density. The comparison of traditional and conservation designs shows moderately more acceptance of conservation design. Looking at how density and design interact, however, gives a clearer picture of how residents feel about conservation designs at high vs. low density levels.

Figure 3.9 shows the mean acceptability ratings for each of the four groups of scenes. It makes clear that, as discussed earlier, low density developments (less than 2ua) are consistently more acceptable than higher-density developments (2-4ua) and conservation designs are moderately more acceptable than traditional designs. There is also a significant interaction effect of density and design. At the low density level, residents rated conservation developments statistically the same as traditional developments (3.50 and 3.43 respectively, $p=.26$). At the high density level however, conservation designs are rated significantly more acceptable than their traditional counterparts (2.53 and 1.86 respectively, $p<.001$).

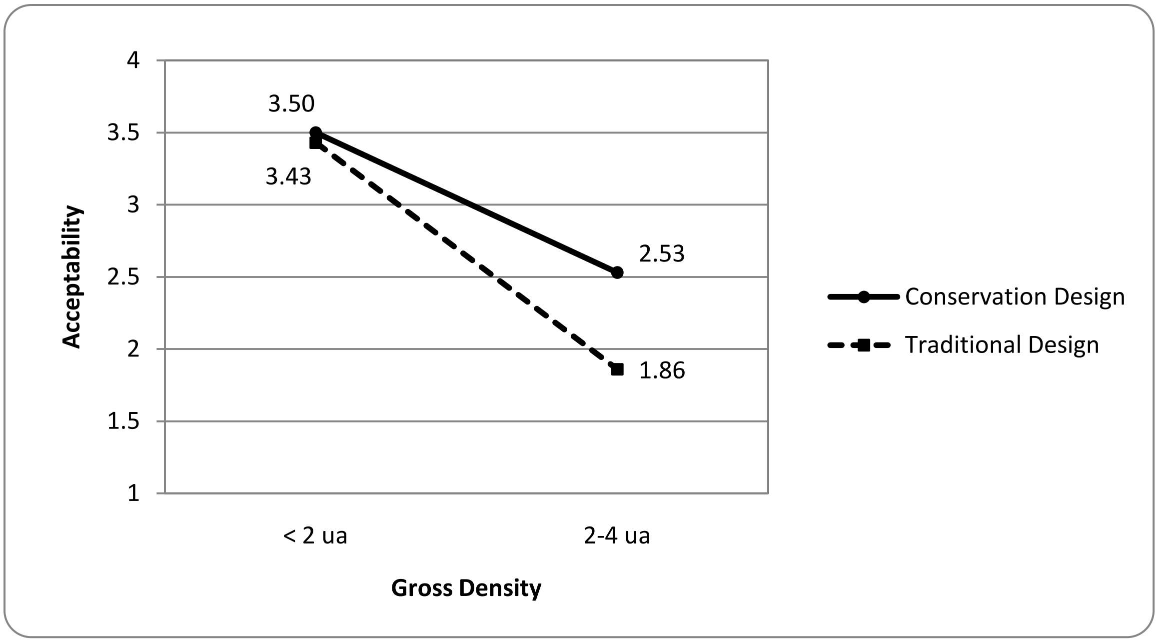


Figure 3.9 The effect of density and design on acceptability

A concrete example of this effect may be helpful. In each of the two figures below, the developments are roughly equal in terms of gross density, but the scene on the left is a traditional design while the one on the right employs conservation design techniques. For the developments in Figure 3.10, the acceptability ratings are roughly the same despite a substantial difference in design. In the higher-density developments in Figure 3.11, the conservation development is rated significantly higher (2.70 compared to 1.68, $p<.001$) possibly due to the presence of contiguous canopy cover. It is noteworthy that this higher acceptability rating is despite the fact that the conservation development shown has houses built on smaller, more closely packed lots than the traditional development to its left.

These results suggest that the difference between traditional and conservation designs described in the previous section hold only in the high density cases. More importantly, incorporating contiguous expanses of tree cover into the pattern of housing design plays an increasingly important role in higher-density developments. Furthermore, the results suggest that residents may be willing to accept developments of higher density in their communities even when it means building smaller houses on smaller lots. As communities try to accommodate new growth and deal with public concerns about increasing density, these are

Traditional	Conservation
Gross density = 1.1ua Mean acceptability = 3.35 	Gross density = 1.2ua Mean acceptability = 3.43 

Note. Difference in means is not significant (p=.30).

Figure 3.10 Two low density developments employing different designs

Traditional	Conservation
Gross density = 2.7ua Mean acceptability = 1.68 	Gross density = 2.6ua Mean acceptabilty = 2.70 

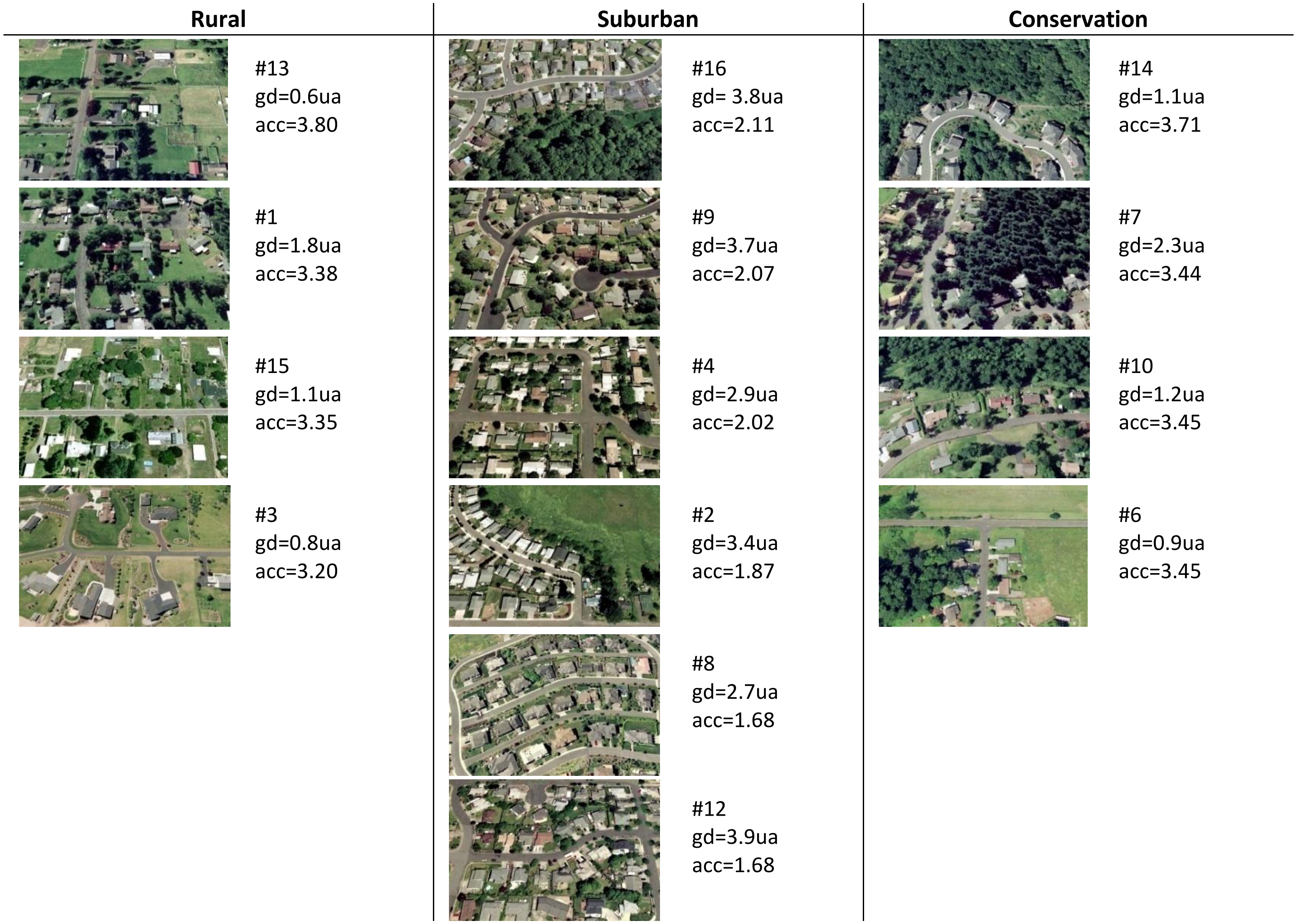
Note. Difference in means is significant at p<.001.

Figure 3.11 Two high density developments employing different designs

vital facts for planners and developers to keep in mind. Through conservation designs, planners and developers might be able to mitigate negative public responses towards higher density.

Factor-analytic categories: The rural resident perspective

When rural residents look at proposals of residential developments, they may not organize them according to specific design strategies or numeric density values as planners and developers would. These experts often have different preferences from the public (Ryan, 2006) which could potentially influence land use decisions they make on behalf of their constituents. Therefore, it is important to consider how rural residents perceive the developments independent of experts' notions of density and design. To answer this question, a factor analysis of the acceptability ratings was carried out.



Note. gd=gross density in units/acre; acc=acceptability. Acceptability is based on 5-point rating scale with 5=very acceptable.

Figure 3.12 Factor-analytic categories, each ordered in terms of increasing acceptability

Perception of developments

Factor analysis of the acceptability ratings for the 16 scenes revealed three categories of residential developments, which can be characterized as *rural, suburban*, and *conservation* (Figure 3.12).

The *rural* category is composed of four scenes which are typical of low density developments found in rural areas. Housing is widely dispersed with a considerable amount of land devoted to lawn and pastures. While there are trees, they are not arranged in a contiguous manner as they are in the *conservation* category.

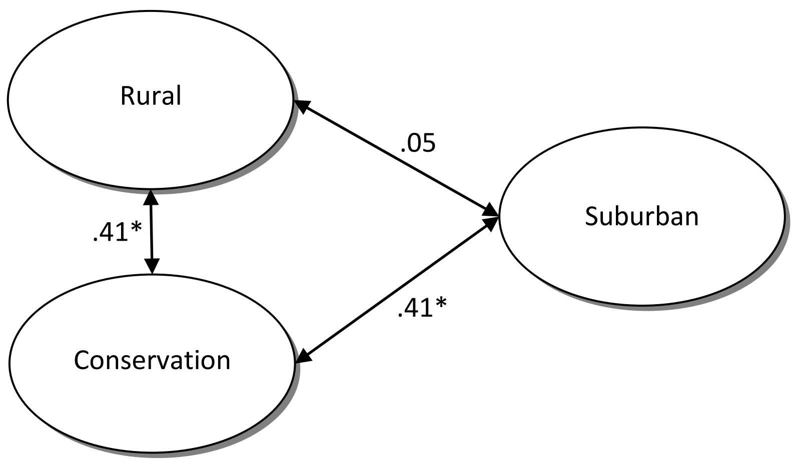
The *suburban* category is made of six scenes and represents high density development. Housing dominates the scene while vegetation plays a limited role. What vegetation exists does so mostly in the form of lawns around each of the houses. The housing is closely packed together such that many of the houses appear to share backyard space. Four of the developments in this group can be characterized as cookie-cutter developments with similar housing and little nature. The remaining two (scenes #2 and #16) utilize a conservation approach. While these two contain more contiguous areas of nature, the number of houses in the scene seems to override the influence of these natural elements. This can explain why the scenes fit in the *suburban* category and not in the *conservation* one.

The four scenes comprising the *conservation* category all have relatively low density with contiguous tree cover. Also, nearly all the houses in these scenes have views of nature, and views of roads or someone else's backyard occurring rarely. Such views may not only be important to potential homeowners, but also to local residents who value the quality of the viewshed from public vantage points. It may be worth noting that these characteristics are absent from the other conservation design scenes—the two in the *suburban* category (#16 and #2) and the two scenes which failed to uniquely load on a single category (#5 and #11).

The two developments that are not included in any of the categories (Scene #5 in Figure 3.7 and #11 in Figure 3.6) were dropped because they loaded on multiple categories above the .45 loading criterion. Though one explanation may be that the multiple loadings reflect issues of adequate sampling, it could also be that participants perceived unique patterns in these two developments. Identifying differences between these two isolates and the developments comprising the three categories can reveal characteristics of the categories which might otherwise not be apparent.

Scene #11 loaded on both the *conservation* and *rural* categories and is an example of a development that is borderline in density, neither very high nor very low, with some massed vegetation and some dispersed. Its layout with a circular street pattern is unique among the set of scenes. Scene #5, which loaded on both the *conservation* and *suburban* categories, has housing that is (1) clustered together, much like two of the scenes in the *suburban* category, (2) contiguous canopy cover, like all the *conservation* scenes, and (3) curved streets which is common to both categories. It is unique from the conservation scenes however in that the backyards for one house are separate from backyards of another.

Figure 3.13 shows the relatively low correlations among the three categories suggesting that there is little overlap in the way people perceive them. As shown in Table 3.4, Cronbach alpha coefficients for each category is greater than .80 suggesting highly coherent categories.



*Correlations significant at p<.01.

Figure 3.13 Correlations between categories

Acceptability of categories

Table 3.4 shows the acceptability of the three categories in order of decreasing means. The *suburban* category with its relatively high density of development and lack of vegetation was rated significantly lower in acceptability than either of the other two categories. By contrast, both the *conservation* and *rural* scenes have fewer houses and more vegetation. Though the *conservation* scenes utilize clustered housing and contiguous tree cover while the *rural* scenes have dispersed housing with fragmented vegetation, both categories are statistically at the same level of acceptability. This implies that residents are making a perceptual distinction among the three categories where the *suburban* category seems to be strongly based on the number of houses, while the other two show that the vegetation patterns and distribution of houses impact how non-expert residents perceive developments that are at similar density levels.

Table 3.4
Acceptability of categories

Pre-defined groups	# scenes	Gross density range (in ua)	Acceptability Mean (5-pt. scale)	S.D.	Cronbach alpha
Conservation	4	.9-2.3	3.51[a]	1.03	.81
Rural [b]	4	.8-1.8	3.43[a]	1.14	.81
Suburban	6	2.7-3.9	1.90	1.06	.90

[a] Differences in acceptability are all significant at p<.001 except for the pair marked with the subscript which had p=.07.
[b] This category is composed of the same scenes as the pre-defined low density traditional group.

Taken together with the results from the Chapter 2, which showed that contiguous nature can reduce the perception of density, this suggests that integrating forests into the design of clustered residential developments can help to create more sustainable developments that are perceived to be less dense and at least as acceptable as traditional forms of development.

Individual differences in acceptability

Individual differences can play a considerable role in perceptions of the environment (R. Kaplan & Kaplan, 1989). In particular, how familiar one is with the rural environment could influence how acceptable one finds different types of residential developments. Ryan (2002), for example, found that residents of smaller lots were more likely to find cookie-cutter developments more compatible with rural character than owners of large rural parcels.

To find distinct groups of respondents in terms of difference in their acceptability ratings, a cluster analysis was performed using the acceptability ratings of the 16 scenes as the clustering variables. Since 19 of the respondents did not complete all the ratings and the Two-Step Cluster procedure in SPSS drops any cases with missing data, the clustering was done with a sample size of 163. The Bayesian clustering algorithm produced two groups of respondents which are

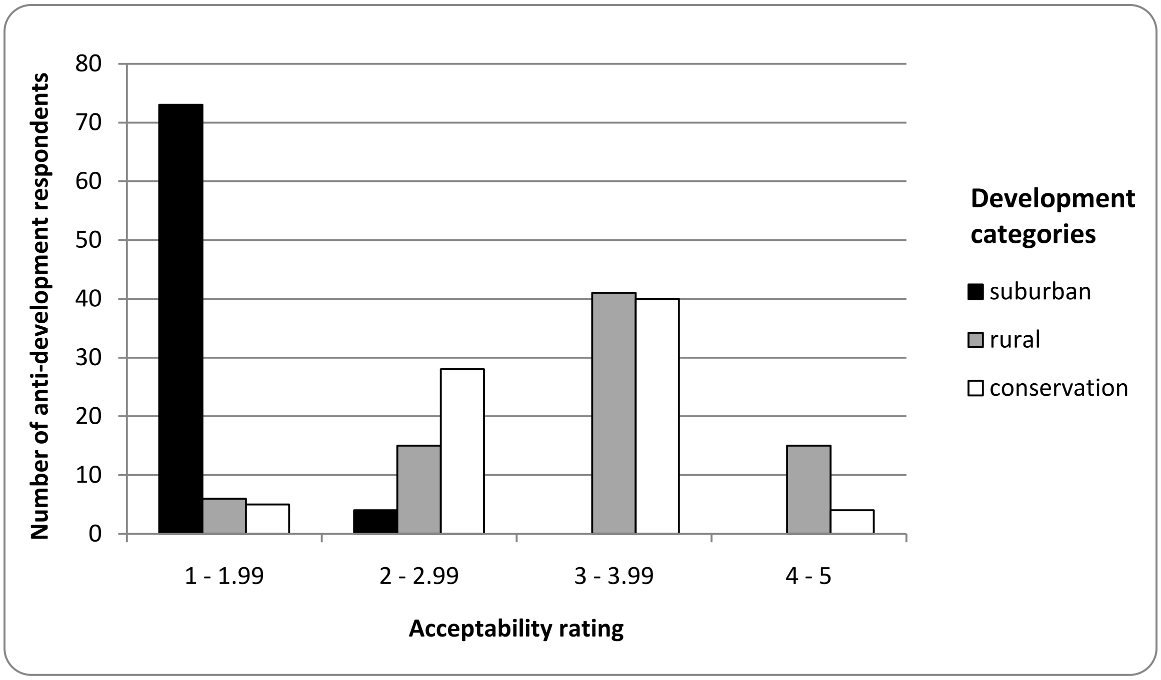


Figure 3.14 Distribution of anti-development respondents' ratings of categories (N=77)

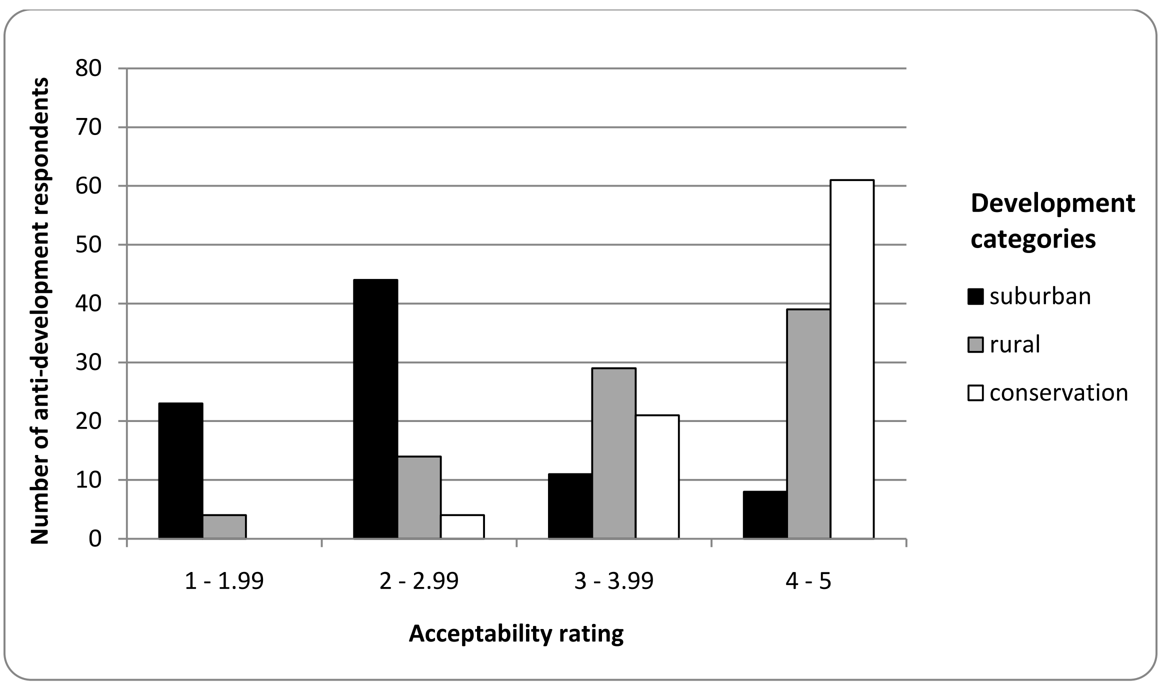


Figure 3.15 Distribution of moderate respondents' ratings of categories (N=86)

distinguished primarily by ratings of the *suburban* category. The first cluster (N=77), shown in Figure 3.14, is characterized by a strong opposition to the *suburban* category (all of the respondents in this group gave it a rating less than three) and mid-level acceptance of the *rural* and *conservation* categories (the majority gave it a rating between three and four). For this reason, this cluster of respondents is described as *anti-development*. The second cluster (N=86), shown in Figure 3.15, is characterized by high acceptability ratings for the *conservation* category (61 gave the conservation category a rating greater than four) and a more mild opposition to developments in the *suburban* category. *Moderate* is the term used to describe this second cluster

Table 3.5 along with Figure 3.16 show the mean acceptability ratings of each respondent cluster for the three development types. The differences among all the cluster means are significant at the $p<.001$ level. This is to be expected as the cluster analysis maximizes the difference among the clustering variables.

The *rural* category has the smallest difference in acceptability between members of the two clusters. This may be because the *rural* category represents the kind of development that is most familiar to both clusters of participants. Nonetheless, the *moderate* cluster rates these significantly higher than the *anti-development* participants. For the latter, rural is the most acceptable of the three development categories. By contrast, the differences between the two clusters are quite large—greater than one point on the rating scale—for each of the other two categories, *suburban* and *conservation*. It is noteworthy that for the sample as a whole the acceptability of *conservation* and *rural* developments is not significantly different; however, when separating respondents into the two clusters, there is a significant difference for each cluster between the two development types. This suggests that *conservation* developments are not equivalent to *rural* developments for all participants but rather those who are more supportive of development are more favorable to *conservation* developments. Those who are in the *anti-development* cluster, while less accepting of any development, are relatively more accepting of *rural* than conservation developments.

Table 3.5
Acceptability based on respondent clusters

		Development categories[a]		
Respondent cluster	**N**	**Suburban**	**Rural**	**Conservation**
Moderate	86	2.45	3.64	4.01
Anti-development	77	1.30	3.21	2.96

[a] All differences in acceptability between clusters and categories are significant at p<.01.

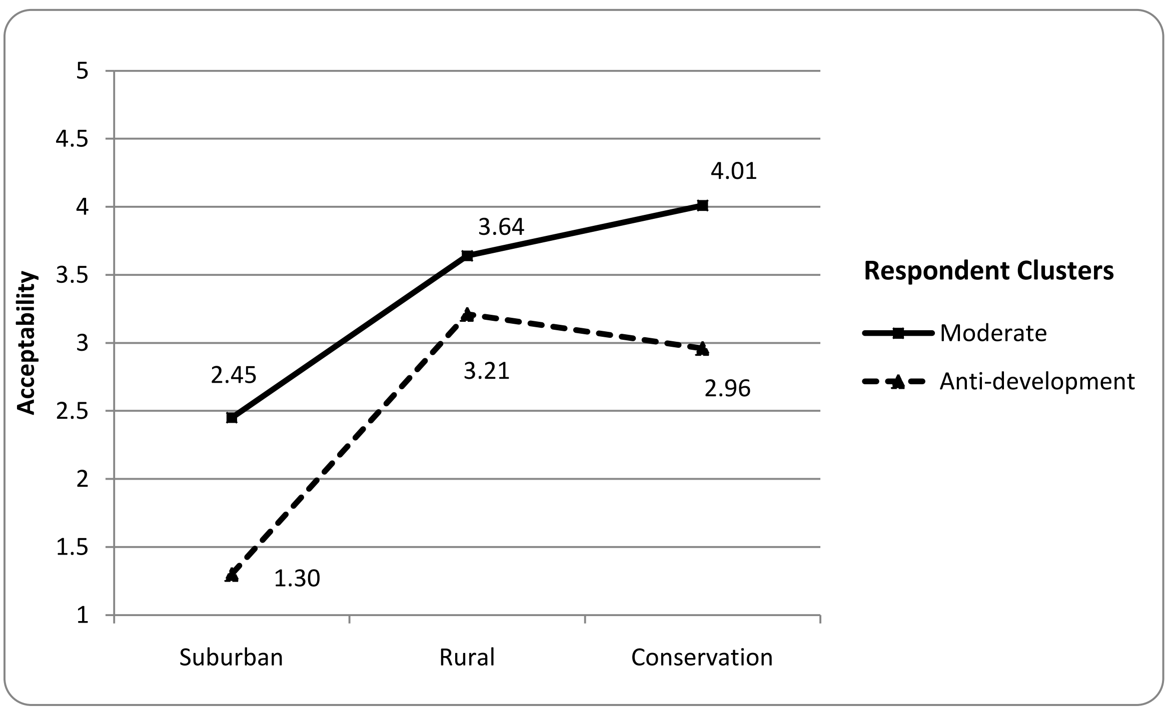


Figure 3.16 Acceptability based on respondent clusters

Rural experience and acceptability

One of the ways to assess the criterion validity of the clusters (i.e., how useful they are in the prediction of outcomes) is through significance tests using variables that were not used in the clustering procedure (Ketchen & Shook, 1996). In this case, the environmental and demographic variables collected in the survey and post-survey GIS data collection were particularly pertinent as a way to extend our understanding of the differences between the two clusters . In the sense that the typical procedure to examine the role of individual differences is to enter demographic variables as potential moderators using ANOVA, the process followed here may seem backwards. Rapkin and Luke (1993), however, argue that using ANOVA in the traditional way often leads to very meager differences in acceptability ratings; they provide the following rationale for cluster analysis:

> Rather than treating aggregate effect sizes and p values as gauges of strength of monolithic linear relationships, it seems more tenable to state hypotheses about the prevalence of associations, and to articulate the conditions under which such associations are observed. (pp. 253-254)

Thus, all of the demographic and geographic information collected was tested for significant differences between the clusters.

Table 3.6 summarizes the significant findings. The *anti-development* cluster is characterized by participants with more rural experience. They live on larger lots further away from the city and with fewer houses nearby (i.e., lower density). They have slightly better tree views out their window and their housing is typically older. By contrast, the *moderate* participants have less rural experience, are slightly younger, and are more positive about the impacts development has had on their communities. The negative impacts of development are felt more strongly by the *anti-development* cluster which explains their lower ratings of development.

While these variables all show a significant difference it would be inappropriate to conclude, for example, that all large-lot residents are against development. The ranges shown in the table are strikingly similar. In other words, owning a large lot does not preclude the possibility that an individual might take a moderate stance on development.

Table 3.6
Variables significantly distinguishing the anti-development and moderate clusters

	Anti-development	Moderate	Significance
Lot Size	9.9 acres Range: 1 - 40 acres	6.8 acres Range: 1 - 39 acres	p<.01
Number of houses within 750 ft radius	8 Range: 1 - 31	11 Range: 1 - 31	p<.005
Distance to nearest city/village	2.9 mi Range: 0.2 - 5.8	2.4 mi Range: 0.1 - 6.1	p<.05
Year Built	1972 Range: 1840 - 2005	1984 Range: 1872 - 2006	p<.005
Perceived impact of development (1=much worse… 5=a lot better)	2.2 Range: 1 - 4	2.4 Range: 1 - 5	p<.005
Tree Views (1=not at all dominant… 5=very dominant)	4.4 Range: 2 - 5	4.0 Range: 1 - 5	p<.05
Age	52 Range: 30 - 90+	48 Range: 21 - 89	p<.05

Table 3.6 shows the range of each variable to emphasize this point. Cases in which the ranges are meaningfully different (e.g., tree views, age) indicate a clear distinction between the clusters. For example, none in the *anti-development* cluster are less than 30 years of age while some in the *moderate* cluster are in that age bracket. Also, no one in the *anti-development* cluster rates the tree views with a one ("not at all dominant") on the 5-point scale while some *moderates* do. And while the mean difference in the perceived impact of development is relatively small (2.2 vs. 2.4), only participants in the *moderate* cluster indicated that development had made their community "a lot better" (rating of 5 on the scale).

It is also important to mention the variables that were not significantly different between the two clusters (p>.05). These included a variety of environmental variables (e.g., nearby farmland, impervious surface, lawn areas) and demographic variables (e.g., household size, gender). There were no significant differences between farmers and non-farmers though previous research has shown that to be a predictor of attitudes about development (Smith & Sharp, 2005). This may be due to the small number of farmers in the overall sample. Length of residence also made no significant difference though other research has shown this to be an important variable (Tilt, et al., 2007). This also may be a result of inadequate sampling due to a large number of non-responses on the item.

Discussion

The opposition to density is one reason for sprawling development at the rural-urban fringe. Even moderately high density developments, such as the 2-4ua developments in the high density scenes in this study, are relatively unacceptable to rural residents. However, this study shows that what is important to residents is not only the density of the developments but also the way in which they are designed.

One of the main findings of this study is that housing patterns which preserve substantial areas of contiguous nature within the development, particularly in the form of canopy, are more acceptable forms of higher-density development than the cookie-cutter developments that are often proposed in rural areas. While typical suburban developments seem out of context in rural areas (Campoli & MacLean, 2007) and incompatible with rural character (Ryan, 2006), conservation developments are more appropriate for the rural context because they preserve some of the landscape that rural residents hold dear. Remarkably, the rural residents surveyed here reported finding conservation developments to be as acceptable as large-lot developments even though the housing in conservation developments is necessarily closer together and sometimes has the monotony of suburban homes—reasons often cited in explaining opposition (Campoli & MacLean, 2007; Sullivan, 1996). This suggests the powerful role preserving nature can play in overcoming some of stereotypic opposition to high density development.

While planners tend to distinguish developments on the basis of density and different design approaches, residents perceive developments differently. In the low density cases, participants clearly differentiated between developments that have dispersed housing (i.e., *suburban*) and ones that have clustered housing with contiguous tree cover (i.e., *conservation*). However, while this difference was clear at the lower density levels, participants did not make the distinction for the highest density developments. This was reflected in the *suburban* category which combined high density developments of both traditional and conservation designs. One explanation may be that the sheer number of houses in the scene overrides the perception of nature in the conservation designs. Another may be that the limited visual scene also plays a significant role. The presence of 30-40 homes in a 10-acre scene may seem like too many homes for the area; however if a larger context were shown, natural areas may be more visible. Furthermore, since participants responded to 16 particular scenes, other contextual factors (e.g., roads, architectural issues) may have had an influence. Finally, it is possible that rural residents in particular see most high density development as the same since they are more familiar with lower density developments (see Chapter 5).

It is important to emphasize that the perceptual categories identify scenes that are implicitly seen as having thematic similarity rather than designating categories based on the acceptability of the scenes. Thus the fact that highest density scenes comprise the *suburban* category does not imply that these are necessarily equivalent in acceptability, nor that all high density scenes would accrue to a single category. In fact, two of the high density conservation scenes, while meeting the loading criterion for the *suburban* category, each also loaded on another category and were, therefore, excluded. Furthermore, as the pre-defined high density groups show, the conservation developments are found to be more acceptable than the traditional developments. The two scenes that were excluded in the perception-based analysis, both in the middle of the density range (1.8 and 2.6ua), have relatively more trees than the *suburban* scenes and are both favored to any in that category. Furthermore, the scene with the most canopy in the *suburban* category has the highest mean acceptability. This suggests that the presence of tree cover which is typical of conservation designs can significantly improve acceptability.

Features which are lacking in the *suburban* category also reveal some interesting design patterns. First, the *suburban* developments do not afford nature views for all the housing whereas the other types of development do. Second, *suburban* developments also do not offer much privacy in backyards since the lots are placed in a back-to-back fashion without any buffer separating them. Finally, *suburban* developments have some amount of vegetation in lawns, but the vegetation is fragmented as opposed to the larger contiguous expanses of tree cover that are perceived as distinctly different.

The study also finds that people with more rural experience find development less acceptable. As residents become more tied to the rural landscape and way of life, they become more opposed to development which threatens those very qualities. While those with less rural experience tend to be more supportive of development, even residents most negative about development find proposals entailing development acceptable as long as it is clear that the elements of the rural landscape would be maintained. This may be particularly important as the perception of what developments are acceptable for rural communities may shift over time as residents become more familiar with alternative patterns of development. Conservation designs therefore provide a reasonable starting point for more sustainable and acceptable residential developments at the rural-urban fringe.

Implications and Conclusions

While residents often express opposition to higher density, continuing with low density patterns is not a sustainable option. The findings from this study suggest some opportunities to move towards more sustainable patterns:

Residential development design. While density is an important variable, housing and nature patterns play a key role in the acceptability of residential developments. Incorporating buffers to protect privacy of each backyard is one important pattern. Ensuring that all residents have nature views is another.

- Site designs which integrate clustered housing with expanses of tree cover tend to be more acceptable to residents in rural communities than developments which have the same number of houses evenly dispersed in an area lacking contiguous vegetation. This supports the use of Arendt's (1996) conservation subdivision design which utilizes smaller lots for housing while emphasizing the preservation of natural elements on the parcel. Unlike cluster developments, conservation designs pay close attention to the role played by the natural setting, especially with respect to the impact on the quality of the local viewshed.
- Contiguous canopy cover is shown to be more acceptable than fragmented lawns. However, it is common practice to clear the parcel of existing trees prior to development and then plant young trees after the housing is constructed. Though this practice is thought to minimize construction costs, grading an entire parcel can actually be more expensive than preserving open spaces from the outset (Carter, 2009; Mohamed, 2006). More important, it would be a long time before local residents find

the resulting development acceptable given how long it takes for the young trees to reach maturity. Therefore, building around existing forested areas during home construction may be an economical way to develop satisfying forms of development.

Planning and policy. Local residents may in fact be supportive of higher-density developments if valued lands and their views are preserved. However, existing zoning regulations which restrict density through minimum lot sizes may encourage developers to build on as much of the parcel as legally permitted. Instead, policies should make preservation of natural areas within new residential developments the norm while designating traditional developments, which only maximize the number of houses on the parcel, as special cases requiring permission from local planning commissions. Such policies have been enacted in Hamburg Township, MI and have preserved over 2000 acres (Arendt, 2006).

- Proposals for new development should incorporate imagery about how the site is going to be designed rather than characterize it by a measure of density. Such imagery should convey the impact of the development on the natural elements of the parcel as well as on the quality of local viewshed. Before and after pictures may provide one useful way to generate this imagery.
- Residents who live in more rural settings (e.g., further from cities, more nearby nature) tend to be less supportive of development, particularly when it results in dramatic changes to the landscape (i.e., *suburban*). However, development patterns which are perceived as a *small* change to the landscape may be received more reasonably. Preserving portions of the parcel and creating buffers to limit the impact of new housing on local views are examples of ways to minimize impact of development.

The 2007 special issue of *Landscape and Urban Planning* devoted to Cities and Sustainability (Jones & Jones, 2007) invited key researchers to "identify commonalities and differences in their approaches to tackling issues surrounding sustainability." The editors found one of the common themes among articles to be the importance of the quality of design and experiential aspects of place in creating sustainable places. The overarching aim of the research presented here has been to explore factors which may offset concerns about density. Low density developments are not sustainable (Burchell, et al., 2002; Ewing, 1997), but higher-density developments are often built in a way that rural residents find unacceptable. The present research has shown that residential developments that are more acceptable require a strong emphasis on preserving natural areas within those developments. Such a strategy is multiply desirable—not only can it move residential development towards sustainability, it can also offset people's concerns over density by creating the kind of places that promoted migration to rural areas in the first place.

CHAPTER 4

RURAL RESIDENTS' PERCEPTIONS OF FACTORS INTENDED TO OFFSET DENSITY

Background

Opposition to increased density in rural areas is a common occurrence. The debate is usually framed in terms of two competing alternatives: "Growth" versus "No Growth." Growth is typically driven by population increases and the potential it brings for economic gain. Existing landowners can profit from selling their undeveloped lands to prospective developers who can subdivide the land and build houses for new residents. Municipal funds also increase as more properties are added to the tax roll. Reasons for opposition to growth are far harder to quantify in economic terms—they range from loss of privacy and rural character to a more general fear of losing a way of life. The two perspectives are in stark contrast and this has led to numerous conflicts about whether to build in undeveloped rural areas.

Over the last decade, the Smart Growth movement has attempted to demonstrate that the thorny problems related to development, such as sprawl, can be addressed without eliminating development altogether (Daniels, 2001). The multiplicity of approaches advocated by Smart Growth are complementary, but at different scales. At the neighborhood scale, the emphasis is on revitalizing existing homes and buildings as well as mixing land uses to geographically integrate residential and commercial uses. At the town or city scale, Smart Growth advocates creating more pedestrian-friendly communities and emphasizing public transit. At the regional scale, the main approaches involve raising densities in existing developed areas and limiting outward extension of development in order to preserve lands.

The Smart Growth Network (SGN)—a partnership between the U.S. Environmental Protection Agency and several non-profit and government organizations—has documented the successes of Smart Growth approaches in realms ranging from urban to rural (Smart Growth Network, 2006). While most of the approaches are represented in the urban realm, only those related to the preservation of land are represented in the rural realm. Essentially, the Smart Growth approach follows what Rusk (1999) calls the “inside-outside” strategy—protecting rural open space and redeveloping existing downtowns. While land preservation can help minimize the loss of important natural resources, it does little to help rural communities accommodate the significant portion of the population wishing to live on the “outside.” Without guidance on this issue from SGN and other planning visionaries, rural communities are left to deal with development using the “Growth” and “No Growth” framings which too often leads to outcomes that are unacceptable to proponents on either side.

Smart Growth approaches have generated enthusiasm in the planning community, yet their implementation is impaired by a lack of citizen support. For instance, states are unlikely to limit the outward extensions of new development because landowners in outlying areas want to be able to profit from the development of their land and these owners far outnumber those in favor of expansion-limiting policies (Downs, 2005). While approaches such as purchase and transfer of development rights of undeveloped lands can in some cases stem landowners financial concerns, they only work when landowners choose these options over selling their lands for residential development. In addition to rural landowners, citizens whose tax dollars would fund Smart Growth measures also show a lack of support. Mohamed (2008) found that only 37% of survey respondents would be willing to pay (in the form of taxes) for both preservation of open space and redevelopment of downtowns—approaches that need to be employed together in order to be effective.

One of the main reasons for this lack of support is the resistance to higher density from homeowners living in places where such development is proposed (Downs, 2005; Pendall, 1999). Ample evidence of such resistance exists in the form of widespread low density housing. However, while some suggest the prevalence of low density development indicates a public preference for it (Carliner, 1999; Gordon & Richardson, 1997), others have questioned whether this pattern reflects preference or the predominantly available option (Myers & Gearin, 2001). Alternatively, the public may fear outcomes associated with higher-density housing, including traffic congestion, decreased property values, increased crime, and overburdening of local infrastructures (Haughey, 2005). Other issues are related to loss of rural landscapes and the wildlife habitats and views they afford (R. Kaplan, et al., 2004; Ryan, 2002). Concerns over such density-related factors impede the progress of Smart Growth and related sustainable development approaches.

Yet, higher density is necessary in the shift toward more sustainable development. Low density residential patterns permanently convert vast amounts of natural and agrarian lands (National Resources Conservation Service, 2007). The extent of lands developed under low density patterns (i.e., 1-40 acres/unit) is vast—covering 25% of the total land in the coterminous U.S. (D. G. Brown, Johnson, Loveland, & Theobald, 2005). With an expected 60 million new homes to be built in the next 20 years (Campoli & MacLean, 2007), a sensible plan for accommodating increasing density in rural areas is imperative.

Addressing the density-related concerns of residents in rural areas is a crucial step in developing such a plan. There is little empirical evidence focusing on attitudes of rural citizens towards specific development policies such as those advocated by Smart Growth. As development has particularly impacted rural areas it is important to gain a better understanding of these residents. Their attitudes toward Smart Growth approaches are particularly pertinent if these alternatives are to be implemented. It is not hard to imagine that rural residents may be appalled at the thought of mixed-use shopping areas or mass transit in their small towns. Avoiding such signs of a more hectic life may be among their reasons for moving to the country. Yet, rural residents also show a great deal of interest in preserving natural and culturally significant elements of their communities (Ryan, 2002) and, in this sense, they are supportive of the basic principles of Smart Growth. However, as Fischel (2001) notes, while citizens may support the notion of Smart Growth in the abstract, they may oppose its specific implementation when it involves density increases in their community.

However, the “No Growth” option is not feasible. Sustainably accommodating growth requires a variety of approaches at multiple levels, such as those advocated by Smart Growth. A central component of these approaches involves increasing density. The implementation of these strategies hinges on the support of the public, particularly in rural areas where development covers far larger areas of land than in urban areas. Yet, rural residents, being accustomed to low density lifestyles, are likely to be averse to proposal for higher-density developments in their communities. The present research addresses some of the concerns about higher-density residential development in rural areas. It focuses on approaches intended to offset the negative impact of increased density in rural areas. The specific aims of this research are:

1. To understand how rural residents perceive different development approaches and their potential impact in the rural context.
2. To discover development approaches that residents feel might offset the negative impacts of growth in rural areas.
3. To explore the role of the amount of rural experience in how residents perceive such development approaches.

Method

Sampling development approaches

To begin the process of understanding approaches rural residents felt might make development more acceptable, an interview technique known as Conceptual Content Cognitive Map (3CM) was employed. 3CM is a card sorting technique that reveals the different knowledge structures people have about an issue (Kearney & Kaplan, 1997). Five rural residents were asked the following question:

> When new development is proposed in rural areas people often raise many concerns. If you were discussing with a friend ways in which rural development could be made more acceptable to you, what things would you be sure to mention?

Participants were asked to write each of their responses on separate 3x5 index cards. When finished listing their ideas, participants organized the index cards according to categories of their choosing. The index cards were then collected and the categories recorded. Each interview took roughly 20-30 minutes.

Since no two people came up with the exact same items or categories, similar items were combined into meaningful and cohesive categories. While only five people took part in the 3CM portion of the study, the breadth of their ideas is as noteworthy as the commonality among their themes. Table 4.1 shows categories which included at least five items as well as the researcher's designation for the category, the number of responses incorporated in the category, and a sampling of quoted responses.

Table 4.1
3CM Summary

Environmentally friendly development [12 items] "Leave the natural environment as is." "Link agricultural lands and natural lands within or between subdivisions." "Don't impinge on current residents' use of the land (for example, if a nearby forest is used for walking, it should not be cut down)." "Study animal movement/migration—don't build in the middle."
Views and visual appearance [10 items] "New development should not alter my view." "Build into the existing landscape. The visual (and ecological) impacts would be less drastic." "Houses that look like they belong together." "Stick with established architectural materials and styles." "Don't arrange residences in uniform pattern (cul-de-sac, grid)."
Transportation [6 items] "Make community less dependent on cars." "Make services available within walking distance." "Network of bike paths." "Accommodate for different traffic flows (tractors, bikes, etc.)."
Density [6 items] "Denser development with preserved greenspace." "Confine/concentrate developed areas." "Single house on 10 acres may not be the best use of space." "Houses should not be too close together."
Better planning [5 items] "Identify critical natural and agricultural resources and preserve them." "Identify 'sacrifice' areas which are best suited for development."

The most frequently mentioned items fit in the category of environmentally friendly development which covered issues ranging from preservation of agricultural lands to protection of wildlife habitats. Views and visual appearance was the next most frequently mentioned category and dealt with the manner in which development can limit its visual impact on the rural landscape. The transportation category included items related to automobile and bike use as well as traffic flow issues. Approaches related to density and better planning were also frequently mentioned. Categories which included fewer than five items and were not shown in Table 4.1 included sense of community, lawns, and privacy. Some of these suggestions could only be categorized as novel approaches and included ideas such as "prevent air traffic overhead", "hide power lines", and "design buildings so most of it is underground".

The suggestions to improve development reflected a variety of scales including house (e.g., "stick with established architectural materials and styles"), neighborhood (e.g., "link agricultural lands and natural lands within or between subdivisions"), community (e.g., "network of bike paths"), and ecological (e.g., "leave the natural environment as is"). The interviewees did not seem to distinguish among the levels suggesting that the range of development approaches that may make a difference is broad and should not be confined to a single-level approach.

The categories generated from the 3CM were used to create a list of development approaches that might offset the negative impacts of residential development. Approaches that were most frequently mentioned were included in the final list while items mentioned once or twice were dropped. The wording of the items was modified to correspond with the framing of the survey question but captured the gist of their suggestions. In addition to the items from the 3CM, items were included to reflect recommendations in the Smart Growth literature (Duany, et al., 2000; Smart Growth Network).

The 20 approaches reflect diverse ways that development may be seen as more responsive to the residents' concerns. The items, listed in random order with respect to the original categories, reflected approaches such as green building, preservation of farmland and historic features, maintenance of scenic views, and provisions for better civic services (see survey in the Appendix A for a full list of items).

Procedure

The development approaches were given the following scenario:

> Imagine a developer plans to build a new development of 150 single family homes in your community. Listed below are some ways that might reduce these negative impacts. To what extent would the plan be better or worse if it were to incorporate each of these possibilities:

The scenario was framed to acknowledge that residential development might have negative impacts. This was important because the study population was composed of rural residents many of whom may see development in a negative light. The goal was to acknowledge this downside of development with the hope that this concession would help participants more openly consider factors which might improve the situation.

To make clear the potentially negative and positive sides of the approaches, the 7-point rating scale for the N items ranged from -3, the plan would make things "a lot worse," to +3, the plan would make things "a lot better." The midpoint, zero, was defined as "no effect." Though participants had the option to say that the offset would make things worse, it turned out that nearly all of the average ratings of the items were on the positive side of the scale. In the final analysis, the scale was recoded to range from 1 to 7 in order to avoid sign-related errors.

Study participants were mailed a survey along with a cover letter (see Appendix B) which requested the resident's help with a short survey about "possibilities for new residential development in their communities." The surveys had return postage printed on the back so participants were asked to return the survey, by folding it in half and sealing the edge.

Respondent environment from self-report and GIS

Information about the participants' home environment was included in the survey and also collected from geo-coded addresses. Participants provided information about their current home environment including the size of the property, whether they lived on a farm, had barns, and whether they had paved roads. In addition they were asked about their views of nature, farmland, and housing. Since each survey was coded for its geographic location, GIS parcel data for each respondent was used to access information such as the number of nearby houses, proximity to cities and roads, assessed home valuations, and lot size.

Further information about each respondent was obtained from the 2001 National Land Cover Database (NLCD), a land use map of the entire United States. Using statistical estimation methods applied to satellite-based images of the earth, researchers categorized US land uses at a 30 meter/pixel resolution. The database characterizes 29 different land uses including canopy cover, impervious surfaces, lawn, and croplands. The accuracy of estimates range from 83-91% for impervious surfaces and 78-93% for canopy cover (Homer, et al., 2004).

By combining the NLCD database with each respondent's location, amount of canopy, lawn, crops, pasture, and impervious surface were measured around each parcel (see Figure 4.1 and Figure 4.2). These were calculated using a circular buffer of radii 300, 750, 1500, and 3000 feet around each residence and then measuring the amount of land cover within the buffer. Varying the radius gives different size viewsheds which have been shown to make a difference in perceptions of one's environment (Kweon, et al., 2006).

One of the problems with this approach is that the NLCD database is 5 years older than the survey sample. While this may be a short enough time frame to assume that land use patterns have not changed dramatically in the study area, smaller changes that may have occurred in the 5 years would likely be due to development and therefore result in decreased canopy cover, increased impervious surfaces, and less farmland. Inferences about the results based on the NLCD must consider this shortcoming.

In order to maintain anonymity, only addresses were used in collecting data about respondent environments. Furthermore, the environmental data collected was only used in aggregate over all the participants—individual parcels and their locations were not singled out.

Attitude, lifestyle, and demographics

The survey also included items about attitude, lifestyle, and demographics. One item asked residents to rate how development made their community better or worse. Residents were also asked how long they have lived in their current residence and whether they farmed the land, either as a source of income or not. Weekly commuting distance and work status was also collected. Household composition, education, gender, and age rounded out the demographic portion of the data collection and would help compare the participant group to the broader population of the study site.

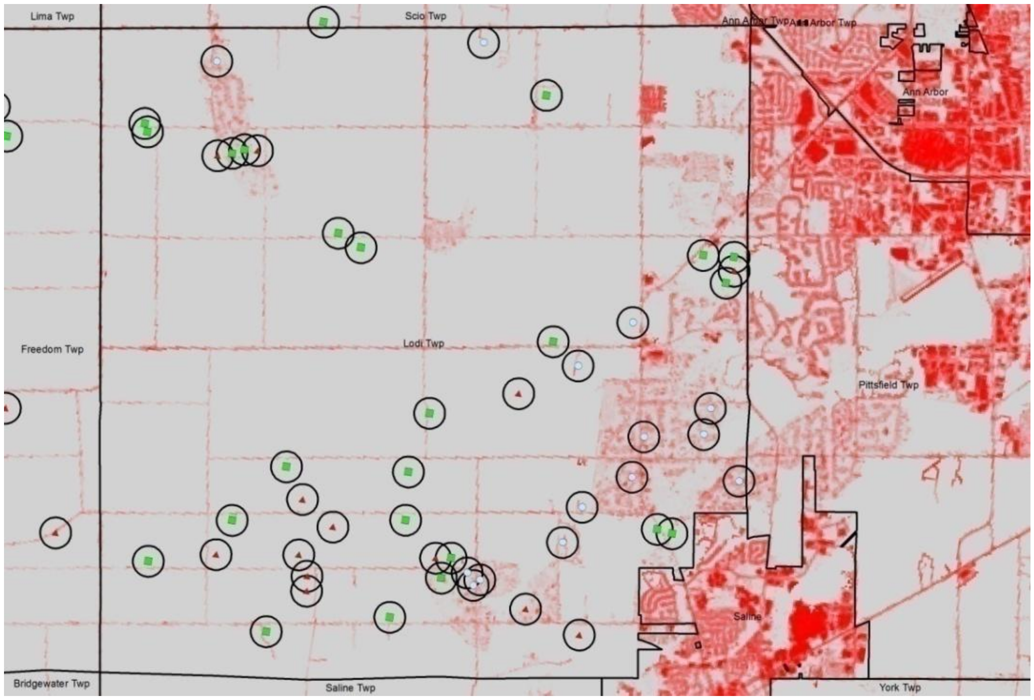


Figure 4.1 Impervious surface near respondents
(750 ft radius viewshed shown, darker red implies more impervious surface)

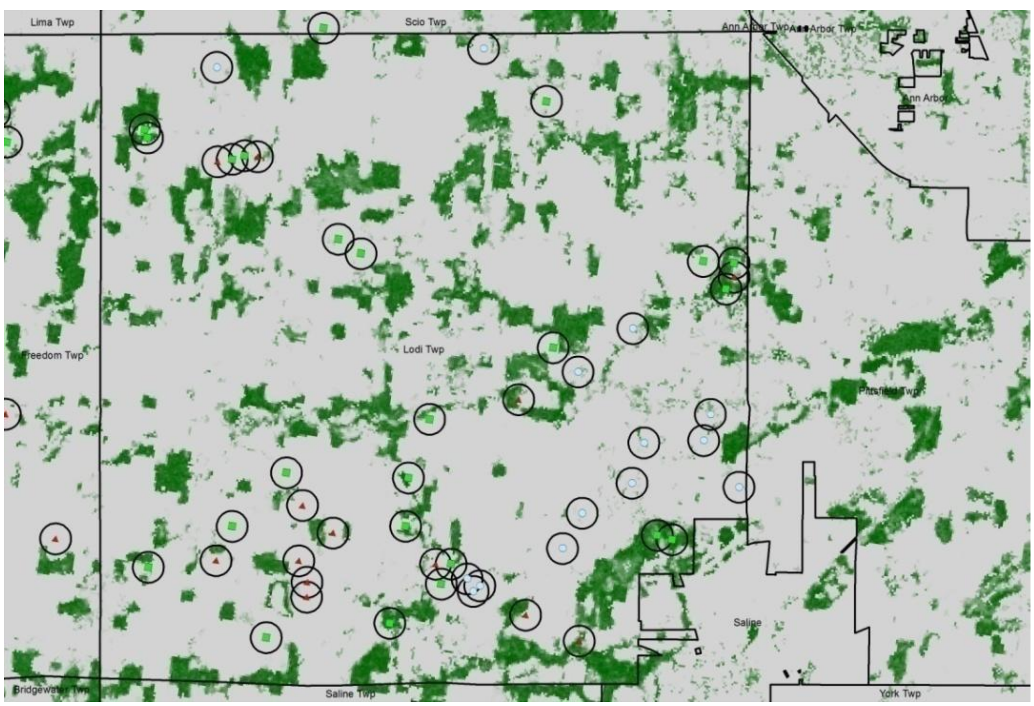


Figure 4.2 Canopy cover near respondents
(750 ft radius viewshed shown, darker green implies more canopy cover)

Participants

Study area

Residential development in Southeastern Michigan has grown westward from the Metro Detroit area over the past several decades. Washtenaw County, which lies some 40 miles west of downtown Detroit, fits in this pattern of development. The study was conducted in six townships outside the urban centers of the county (see Figure 4.4). The combined population of these townships is 40,249 which makes up about 12% of the county population of 352,248 (Southeastern Michigan Council of Governments, 2008).

These townships maintain rural qualities, with significant amounts of farmlands and natural areas, but are also under development pressures. Specifically, the type of development most commonly being proposed and developed is single family residential. These are typically defined as free-standing detached buildings with only one housing unit. Virtually none of the developments are apartments or other multiple family units. Despite the lack of developments which allow for high density, the single family residential parcels in the study site span a wide range of densities—lot sizes can be as small as a one-eighth of an acre to larger than 100 acres. Of the 12,116 parcels in the study area (Southeastern Michigan Council of Governments, 2008), 80% are larger than a quarter of an acre (equivalent to a density level of less than 4ua) and 55% are larger than 1 acre.

The total land area of the six township study site is roughly 133,000 acres. As shown in Table 4.2, farmland is by far the predominant land use, while residential development accounts for about 14 percent.

Table 4.2
Major land uses in six township study site
(Southeastern Michigan Council of Governments, 2008)

Land Use	Acreage	Total Land (%)
Farmland	62,997	48
Woodlands / Grasslands	41,115	31
Residential	18,941	14
Parks / Cemeteries	2,033	2
Commercial / Industrial / Institutional	1,470	1
Other	5,273	4

With respect to government, Michigan is a home rule state. This means that each township defines its own land use policies such as setting minimum lot sizes to reduce density. Each township also has its own planning commission which helps determine which development proposals are accepted or rejected. The people who serve on the commissions are most often local citizens who have little formal planning experience (R. Kaplan, et al., 2008) but may have lived in the community for many years. Though there is a master plan laid out by the county government, it is only a guiding tool lacking the force of law. Therefore, decisions made by citizen-planners have a major impact in shaping the rural landscape and the sustainability of the larger region outside township borders. This issue is pivotal because resident opposition effectively means local government opposition since citizens, as opposed to professional planners, often make up the planning boards in rural townships (R. Kaplan, et al., 2008). While this study does not focus on planners in particular, there is some evidence to suggest that attitudes towards development are similar between rural residents and rural township commissioners (Ryan, 2006).

Population sampling

To sample the residents of the six townships in the study area, a GIS database of parcels and addresses was obtained from Washtenaw County. One of the problems with such databases is that the parcels are not necessarily indicative of owner-occupied homes. Some examples of these problematic parcels might be vacant lots, rental properties, commercial parcels, parcels owned by trusts, etc.

Several measures were taken to ensure the validity of the parcel data and select those with owner-occupied residences. First, only parcels marked by the county surveyor as Residential or Agricultural were included. Others, such as Commercial, Industrial, Vacant, etc. were dropped. Second, since parcels without a street address do not have a house on the parcel, only parcels which had a valid street address were included. Third, the GIS database lists both the owner and current occupant of the parcel. In some cases, the occupant or the owner is not listed which could mean that the data are not current. To ensure that there was an occupied house on the parcel, only those records where the owners and the resident were identical were included. While this does ensure use of current data, it could potentially exclude a number of residents who rent instead of own their homes.

After ensuring the GIS database included only residential parcels, there were 12,047 candidate households for the study. Further restricting this pool was another sampling concern that some small residential parcels were adjacent to large non-residential (i.e., agricultural) parcels. Figure 4.3 is an example of this configuration—the residential parcel is the dark region in the center which is adjacent to the lightly shaded agricultural parcel. The owners of these smaller lots often own the adjacent lands (e.g, the farmhouse sits on the smaller parcel while the farmland is on the larger parcel) and thus actually have much larger parcels that are indicated by the lot size of the smaller residential parcel. Because lot size was an important variable in the study (explained below), these problematic parcels were dropped.

A further consideration in selecting study participants was the potential influence of residing on a major state roads. To control for this only parcels within the townships that are at least 1 mile from major roads were included. This additional criterion reduced the candidate population to 8,481 parcels.

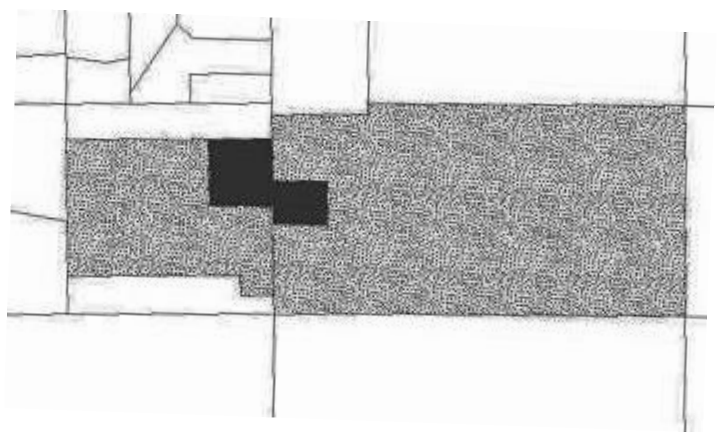


Figure 4.3 Small residential lot contained on a large agricultural lot

This population was then stratified into three groups based on lot sizes of 1-2 acres, 5-8 acres, and 10-40 acres. The discontinuities between the groups were intended to increase the likelihood of a stronger geographic and experiential distinction between the residents of each group. The size of each group was 2,855, 379, and 700 respectively, or about 46% of the parcels. From each of these three strata, 300 residences were randomly selected yielding a total sample of 900. The random sampling ensured that systematic differences in the sample did not lead to differences in perceived impact of the development approaches, the main dependent variable.

About the respondents

Of the 900 surveys sent out, 15 were returned to sender due to vacant lots, 7 as undeliverable, and 4 because the intended recipient was temporarily away, reducing the original sample to 874. A total of 176 surveys were completed yielding a response rate of 20%. Broken down in terms of the three lot size strata, the sample sizes were 295, 289, and 290 in the 1-2, 5-8, and 10-40 acre lots, respectively. This yielded roughly equivalent return rates across the lot size groups at 21%, 20%, and 19% respectively.

Figure 4.4 shows the spatial distribution of the respondents by lot size group. The blue circles indicate residents who live on 1-3 acre parcels. Green squares represent 5-8 acre parcels and red triangles represent 10-40 acre parcels. The distribution is relatively evenly spread with a slight tendency for smaller lots to be near the village boundaries of Saline and Dexter. This is not surprising since higher-density development often occurs near larger population centers.

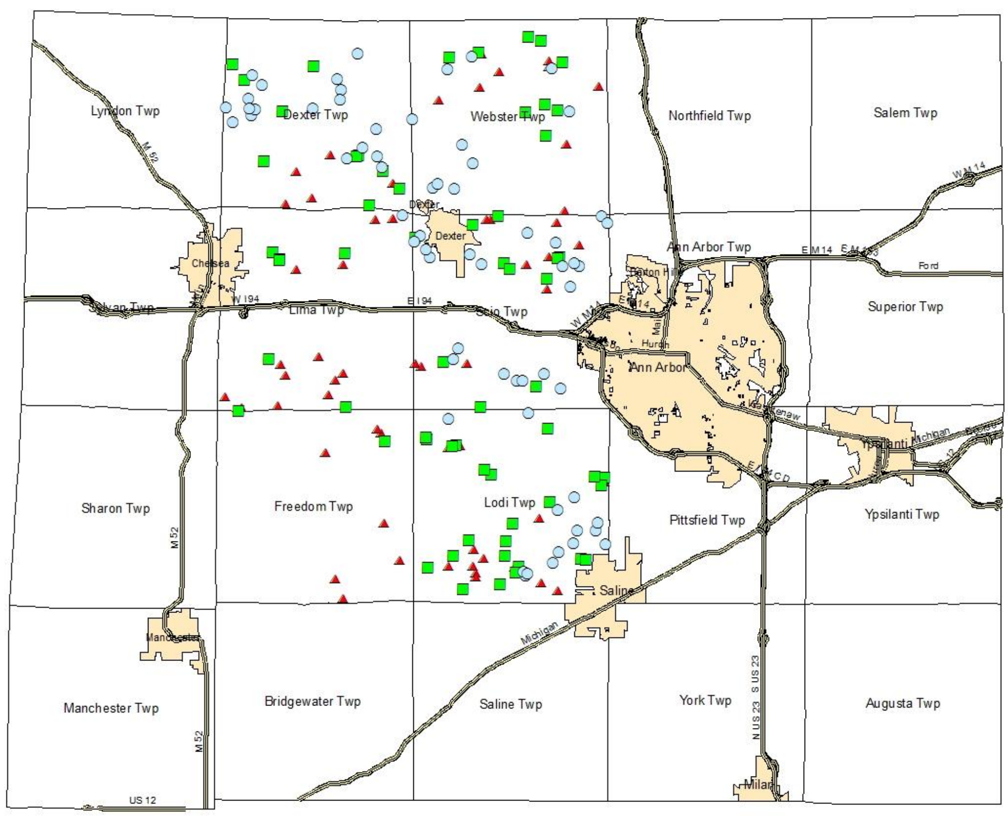


Figure 4.4 Map of six township study area with respondents
(1-2 acre lots: blue circles, 5-8 acre lots: green squares, 10-40 acre lots: red triangles)

The question of whether the study sample reflects the population from which it was taken was addressed by comparing the two with respect to lot size, household composition, age, and education. Table 4.3 is a summary of this comparison.

Table 4.3
Comparison of respondent and six township study area

	Six Township Area[a]	Respondents
Number of households	12,116 households	176 households
Population	Population: 36,701	N/A
Population over 21	Population: 25,367	N/A
Lot Size Distribution (based on # households)		
1-2 acre	2,935 (24% of total households)[b]	62 (35% of respondents)
5-8 acre	433 (4%)[b]	59 (34%)
10-40 acres	872 (7%)[b]	55 (31%)
Household Composition (based on # households)		
Avg. Size	2.7[b]	2.8
Live Alone	1,927 (16%)	12 (7%)
w/ Children under 18	4,787 (40%)	57 (32%)
Housing Tenure		
Owner-occupied	10,738 (84%)	175 (99%)
Renter-occupied	1,378 (11%)	1 (1%)
Age (based on population over 21)		
21-40	8,193 (32% of population)	16 (9%)
40-60	12,729 (50%)	113 (64%)
Over 60	4,445 (18%)	46 (26%)
Education (based on population over 21)		
< Undergraduate education	26% of population	46 (26%)
Undergraduate education +	74%	128 (73%)

[a] The information for the six township site includes all areas, while the sample was selected to exclude homes within a mile of major roads

[b] Statistics obtained from Census 2000 (US Census Bureau, 2000) unless indicated by a superscript in which they were calculated from Washtenaw County parcel data.

Due to the stratification of the original sample into three lot size groups, the larger acreage lots were relatively oversampled with respect to the overall population. However, this was done intentionally to give an equal weight to residents who, by virtue of living on larger lots may reflect more rural attitudes. As indicated in Table 4.3, the sample reflected the six township area in terms of many demographic variables. Some possible deviations to note include the percentage of households with children and those with only one person were somewhat lower than the general population implying that multiple person households without children were somewhat overrepresented. With respect to age, the 21-40 range is undersampled while the over 40 range is somewhat oversampled. It is worth noting that the information for the townships includes all areas, while the sample was selected to exclude homes within a mile of major roads. Whether this affects sociodemographic variables is not known.

Data analysis

Factor analysis and internal consistency

A factor analysis of the development initiative ratings was performed using Principal Component extraction with Varimax Rotation, a form of orthogonal rotation that minimizes the number of variables that have high loadings on each factor and thereby most economically represents each factor. All factors whose eigenvalues were greater than one were retained and an examination of the Scree plot was used to confirm the resulting number of factors.

Items with loadings of .45 or greater on no more than a single factor defined the factors. The factors were analyzed using Cronbach's internal consistency estimate of reliability (i.e., Cronbach's alpha) and were retained if the alpha was higher than .70. New variables were then created based on the mean rating for the items comprising the factor.

Linear regression model with correlated errors

Because each participant was asked to rate 20 different development approaches (each of which can be considered a treatment conditions), the study had a repeated measures design which could mean that the ratings an individual gives to the approaches would be correlated as a result of individual bias. To account for this bias, a linear model with correlated errors was utilized via the MIXED procedure in SPSS 16. Unlike a basic linear regression, this procedure accounts for any potential within-subject correlations through a flexible covariance matrix (West, et al., 2006). The type of covariance matrix used in this analysis was unstructured. Using this model, a pairwise comparison of category means was carried out to investigate differences between categories.

Cluster analysis

To better understand the potential diversity of item ratings among the study participants, a cluster analysis was performed. Cluster analysis is an exploratory tool for empirically indentifying groups of cases (i.e., participants) with similar profiles across variables. It finds cases in the sample with similar scores on the variables of interest (in this case, categories constructed from the factor analysis) and puts them together to form clusters of respondents (Rapkin & Luke, 1993). The Two-Step Cluster Analysis procedure in SPSS 16 is advantageous in that it automatically finds the optimal number of clusters by comparing across multiple clustering solutions and selecting the one that maximizes within-cluster homogeneity and generates the greatest possible difference among the clusters. The resulting clusters can be thought of as survey participant profiles—they share similar perspectives about the different types of development approaches as reflected in their pattern of ratings. A one-way ANOVA was then used to examine the relationship among these clusters with respect to attitude, lifestyle, environmental, and demographic factors.

Results

Five of the 20 items had mean ratings in the “no effect” range, and five others had means greater than 2.0 (where 3 signifies “much better”). However, rather than look at the items individually in terms of the degree of endorsement, it is useful to first examine how participants perceived the range of approaches provided.

Perception of development approaches

Factor analysis of the 20 ratings revealed three categories that distinguish participants’ perceptions of the development approaches. These categories are characterized as *preservation*, *green infrastructure*, and *civic development*. Table 4.4 shows the three categories ordered by decreasing means. Each category has a Cronbach alpha score greater than 0.7 suggesting high coherence.

Table 4.4
Categories of development approaches

Category names and items	Mean[a]	S.D.	Alpha
PRESERVATION	**2.26**	**1.16**	**.80**
Maintaining the rural character of the community	2.48	0.97	
Preserving wildlife habitat corridors	2.47	1.05	
Maintaining scenic views	2.45	0.94	
Preserving agricultural lands within the township	2.35	1.20	
Using trees and shrubs to screen new development from view	2.04	1.19	
Keeping development close to town center and existing developments	1.73	1.37	
GREEN INFRASTRUCTURE	**1.92**	**1.23**	**.74**
Landscaping with native plants and grasses	2.04	1.04	
Preserving historically significant features	1.98	1.06	
Ensuring effective treatment of wastewater on the property	1.95	1.53	
Using "green" building techniques	1.76	1.25	
CIVIC DEVELOPMENT	**0.51**	**1.81**	**.82**
Creating a network of community bike paths	1.38	1.67	
Providing better emergency (police/fire) and medical services	1.36	1.29	
Building more schools nearby	0.16	1.77	
Installing traffic calming devices (such as speed bumps)	0.09	1.78	
Building a community center with gym and classrooms	0.08	1.70	
Creating a village center with small convenience shops	0.02	1.96	
Building wider streets to accommodate traffic	-0.01	1.97	

[a] Items were rated on a scale of -3 to 3. Difference in means between the three categories are significant at the p<.001 level.

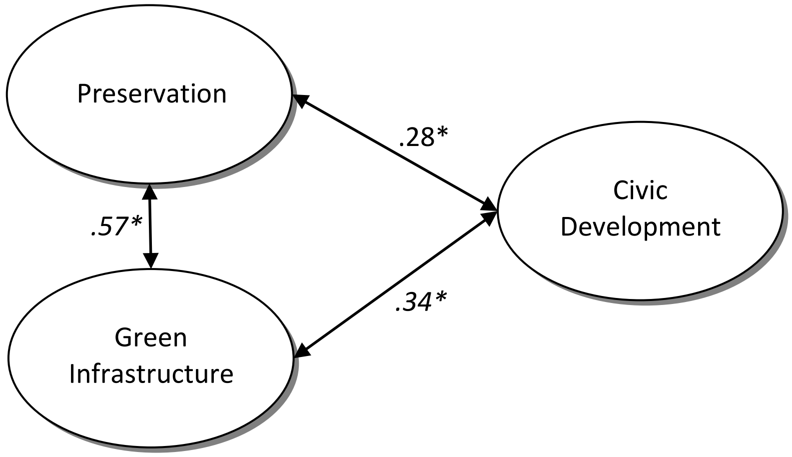
Preservation, the highest rated category, incorporates a diversity of ways to preserve the existing conditions, with particular emphasis on the maintenance of rural character and wildlife habitats. It also emphasizes a preservation of the visual components of the rural landscape, including the scenic resource and using trees and shrubs to screen new development from view. Of the three categories, the items in the *preservation* category are most concerned that development is carried out with a careful eye towards not disturbing the existing environment. This explains why the final item of the category is to keep development close to city centers so as to minimize the impact of development on rural areas.

Green infrastructure, the category rated second highest, includes approaches which would reduce some of the negative impacts of growth at diverse scales ranging from new buildings to historical features and degrees of technological innovation. The items addressing environmental concerns are landscaping with native plants and grasses, ensuring effective treatment of wastewater on the property, and using green building techniques. Preserving historically significant features can protect not only culturally important structures but culturally significant natural features as well. As such, these items follow a theme that is appropriately labeled as *green infrastructure*, allowing for growth with minimal ecological impact.

Civic development, the lowest rated category, focuses on building infrastructure to accommodate population increase. These items include better emergency and medical services, installation of traffic calming devices, and building more schools. They are markedly different from the first category in that the items here refer to continued development whereas the *preservation* category deals with keeping things as they are. And while the *green infrastructure* items do have more to do with building than the *preservation* category, they are still less explicit about development than the *civic development* category. For example, the *green infrastructure* category refers to “Using ‘green’ building techniques”, while the *civic development* category more explicitly mentions development in “creating a village center with small convenience shops”.

Of the three items that are not included in any of the category categories, one—“Offering homes of varying styles within the development”—was dropped because it loaded on both the *green infrastructure* and *civic development* categories. “Matching existing architectural styles of the region” did not load on any of the categories above the 0.45 threshold and was therefore dropped. The third item, “reducing lot size in exchange for more preserved natural areas,” loaded on a category unique from the other three, but since the category had only one item, it also was dropped from the analysis.

As shown in Figure 4.5, the correlations among the categories suggest that there is only modest overlap in the way people perceive the three categories. The highest correlation is between the *preservation* and *green infrastructure* category (r=0.57) which share an environmentally friendly theme (e.g., preserving wildlife habitat corridors from the *preservation* category and landscaping with native plants and grasses from the *green infrastructure* category) but are distinguished by the fact that *preservation* items have less to do with building on or modifying the environment as the *green infrastructure* items.



* Correlations significant at p<.001.

Figure 4.5 Correlation between categories

Comparing perceived impact of development approaches

The *preservation* items are rated somewhat higher than the *green infrastructure* items (mean of 2.26 and 1.92 respectively). Both of these categories are rated markedly higher than the *civic development* category (mean of 0.51). The difference in means among each of the three categories is significant at the p<.001 level.

The *preservation* category not only has the highest mean but also the lowest standard deviation (1.16) of any of the categories suggesting greater consensus among the participants with respect to the *preservation* category. By contrast, the standard deviation for the *civic development* category, at 1.81, shows the substantial range of sentiment about these items. The varying levels of consensus are visualized in the distribution of ratings for each of the categories as shown in Figure 4.6. 93% of the population agreed that *preservation*-based approaches would make development "Better" or "A lot better" and 86% felt the same about *green infrastructure* approaches, but only 31% rated *civic development* at those levels. Thus, there is significant variability regarding *civic development* approaches while there may be something of a ceiling effect *preservation* and *green infrastructure* approaches.

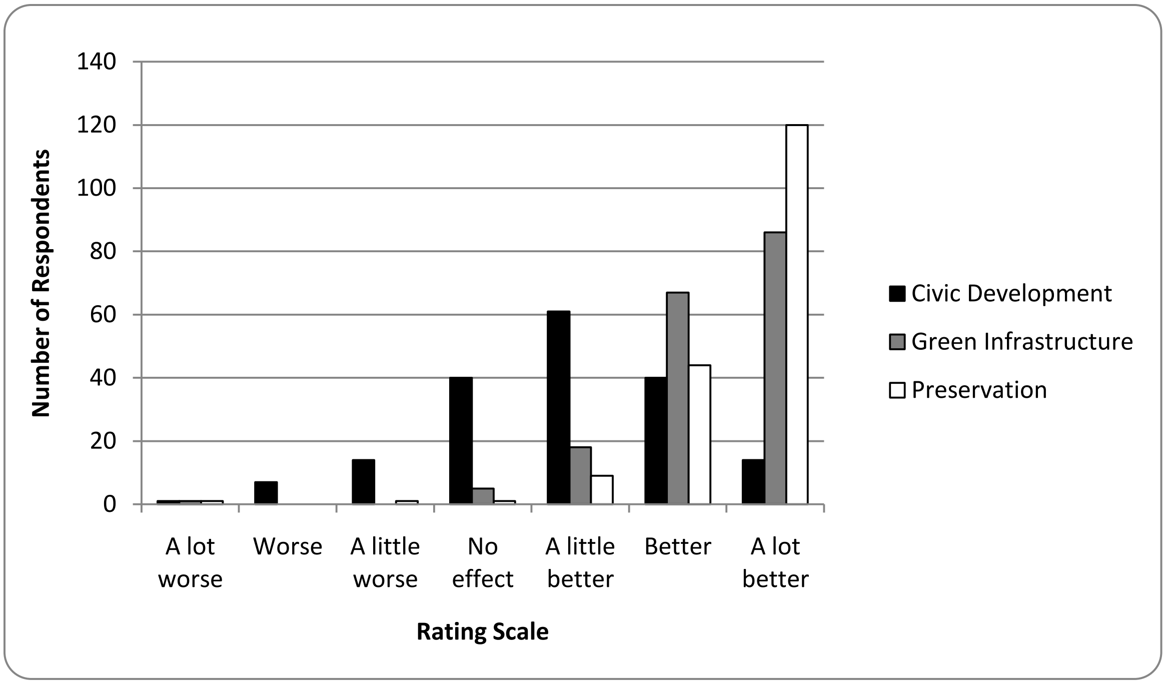


Figure 4.6 Distribution of ratings for each category

Individual differences toward development approaches

Since the categories of development approaches are positively correlated yet reflect very different stances with respect to development it could be useful to know more about the patterns among these categories with respect to the participants in the sample. While for the sample as a whole the *civic development* category is least favored, did some participants see it as more desirable? Were some participants particularly adamant in their stance?

Using participants' mean scores for the development categories, the Two-Step Cluster procedure identified respondent clusters that maximize the differences in the patterns of the attitudes. The procedure yielded three clusters of respondents (Figure 4.7) that were distinguished in large part by ratings of the *civic development* category. While two of the clusters are indistinguishable with respect to the *preservation* and *green infrastructure* categories, they differ markedly in their acceptance of the *civic development* approaches. The cluster with the negative attitudes is thus labeled *anti-civic development*, while the other group, *positive*, has higher ratings on this category. The third cluster, labeled *moderate*, is particularly notable for the far weaker endorsement of the *preservation* and *green infrastructure* categories.

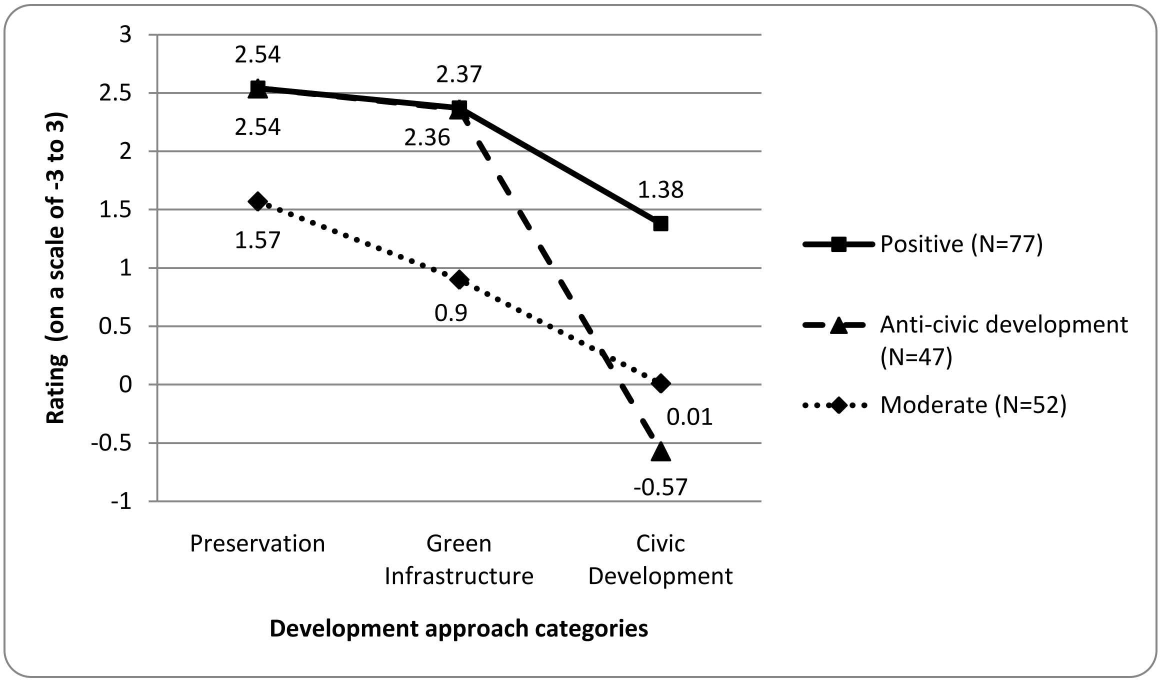


Figure 4.7 Respondent cluster ratings of development approaches

Other than the two virtually identical ratings shown in Figure 4.7, all other comparisons are significant at p<.01.

Table 4.5 provides information about the variability, or dispersion, shown by each of the clusters with respect to each of the categories. Here again, the *positive* and *anti-civic development* clusters are similar except that the scores for the latter group reached far into the negative range for the *civic development* category while the scores were all positive for the *positive* group. The *moderate* cluster, by contrast, was widely dispersed, covering most of the 7-point rating scale for each of the three categories.

Thus, while for the entire sample (N=176), *civic development* is perceived to have the least positive impact (mean=0.51), this analysis reveals stronger support from participants in the *positive* cluster (N=77, mean=1.38). On the other hand, participants in the *anti-civic development* and *moderate* clusters (combined N=99) perceive *civic development* approaches to have no positive impact. Members of the *moderate* cluster (N=52) also represent a more cautious attitude towards *preservation* and *green infrastructure* approaches than is reflected by the sample as a whole.

Table 4.5
Variability among clusters

Cluster	N	Development approach categories: Preservation	Green infrastructure	Civic Development
Positive	77	2.54[a,c] Range: 1.7 to 3	2.37[b,c] Range: 1.5 to 3	1.38 Range: 0.1 to 3
Anti-civic development	47	2.54[a,d] Range: 1.2 to 3	2.36[b,d] Range: 1.3 to 3	-0.57 Range: -2.6 to 1
Moderate	52	1.57 Range: -3 to 2.8	0.90 Range: -3 to 1.8	0.01 Range: -3 to 2.1
Entire sample	176	2.26 Range: -3 to 3	1.92 Range: -3 to 3	0.51 Range: -3 to 3

[a,b,c,d] All differences are significant at p<.01 level except for the pairs marked with the same superscript.

Rural experience and perceived impact of development approaches

Since the clusters of respondents showed a marked difference in ratings of the alternative development approaches, it would be useful to understand the factors which might explain these differences. For instance, what distinguishes residents who support *civic development* approaches from those who do not? Why are some residents less enthusiastic about *preservation* approaches while others strongly endorse them?

To characterize the clusters based on the demographic and geographic information collected in the survey, an ANOVA was utilized to test for significant differences between the clusters. With only a few exceptions discussed below, the significant differences were between the *positive* and *anti-civic development* clusters, as summarized in Table 4.6.

The respondents in the *anti-civic development* cluster tend to live on larger lots, further from the city and with fewer houses nearby (i.e., lower density). They also have about half as much impervious surface in a 750 ft viewshed around their homes as those in the *positive* cluster and their homes are more likely to be on unpaved streets. Significantly larger percentages of residents in this cluster have sheds or barns (81% to 58%), grow food on their property (60% to 36%), and live on a farm (26% to 8%). In other words, the respondents in the *anti-civic*

Table 4.6
Variables significantly distinguishing the positive and anti-civic development clusters

	Positive	Anti-civic development	Significance
Perceived change from development (1=much worse… 5=a lot better)	2.4 Range: 1 - 4	1.9 Range: 1 - 3	p<.01
Lot Size (self-reported)	4.5 acres Range: 1/8 - 10+ acres	8.6 acres Range: 1 - 10+ acres	p<.01
Number of houses within 750 ft radius	11 Range: 1 - 31	6 Range: 1 - 31	p<.005
Distance to nearest city/village	2.3 mi Range: 0.1 - 5.6	3.1 mi Range: 0.3 - 5.8	p<.05
Impervious surface within 750 ft radius	99 sq ft Range: 0 - 483	47 sq ft Range: 0 - 170	p<.05
% living on unpaved streets	52%	77%	p<.05
% with sheds or barns on property	58%	81%	p<.05
% growing food on property	36%	60%	p<.05
% living on a farm	8%	26%	p<.05

development cluster can be characterized as living in areas with less development and in a more agrarian situation. It is not surprising, therefore, that these respondents have a more negative view than those in the *positive* cluster in response to the question about how development had changed their community (1.9 to 2.4 on a 5-point scale, p<.01).

In general, the areas where members of the *anti-civic development* cluster live would be unlikely to include the services and facilities included in the *civic development* category (e.g., village centers, wider streets, traffic-calming devices). By contrast, participants in the *positive* cluster, residing in less rural areas, are characterized by their higher ratings of the items included in this category. It is thus not surprising that the *positive* cluster participants rate the perceived change from development more positively—although the mean for this cluster, 2.4, is well below mid-scale. The relatively unfavorable attitudes and perceptions regarding development on the part of both these clusters of rural residents are congruent with their high endorsement of both the *preservation* and *green infrastructure* approaches.

While mean scores on these variables all show a significant difference one must be careful not to draw the wrong interpretation. For instance, although lots sizes differ significantly, it would be inappropriate to conclude that owners of large lot are all against *civic development.* The lot sizes for each cluster span the entire range of the sample. In other words, some participants who own homes on very large lot indicate a positive stance on *civic development*. By including the range for each variable Table 4.6 emphasizes the considerable variation among participants within each cluster. For some variables, however, these ranges are distinctly different. For example, none of the respondents in the *anti-civic development* cluster perceive change from development as leading to any improvement; the highest ratings on this item are at midscale indicating there would be no change.

While all the variables in Table 4.6 distinguish the *anti-civic development* and *positive* clusters, only two variables differentiated the *anti-civic development* participants from *moderates*. One of these is the perceived change due to development. As just noted, the *anti-civic development* participants generally perceived the change negatively; the *moderates*, by contrast, were significantly more positive (means 1.9 vs. 2.5, $p<.01$). The *anti-civic development* participants are also far more likely to live on unpaved streets (77% to 23%, $p<.05$). This more rural environment of *anti-civic development* participants reflects their stronger support of *preservation* and *green infrastructure* approaches that maintain the quality of those settings.

The *moderates* and *anti-civic development* participants are similar in having about 60% growing food on their property. This is the only variable where the *moderates* differ significantly ($p<.05$) from the *positive* cluster. While only one variable is significantly different between these clusters, it follows the trend that those living a more rural lifestyle tend to be less optimistic about possibilities of making development more acceptable.

Discussion

Residential development in rural areas often meets opposition from local residents who are concerned about the impact of development on their communities. This study has aimed to better understand ways in which those negative impacts may be mitigated by focusing on how rural residents who are facing a hypothetical development scenario perceive the efficacy of a variety of development approaches.

The initial part of the study utilized an open-ended 3CM interview to discover some approaches that might be appropriate for rural communities in southeastern Michigan. Though the number of participants in the sample was small, the range of their responses was quite broad encompassing concerns about green development to better regional planning. Of these issues, those related to environmentally sensitive development and maintenance of rural views and landscapes were mentioned most frequently. This is particularly noteworthy since many regional plans (which include rural areas) raise issues such as sustainably supporting population growth and providing transportation to rural areas but say little about accommodating higher density while maintaining the natural and cultural heritage of rural areas (Calthorpe & Fulton, 2001; Smart Growth Network, 2006).

The ideas supplied by the 3CM interviewees as well as recommendations that are central to the Smart Growth movement (Daniels, 2001; Downs, 2005), were the basis for a more systematic effort to understand how rural residents perceive a variety of development approaches. Results from the 20 approaches included in the survey yielded three main themes: *preservation*, *green infrastructure*, and *civic development*. One of the major findings of the study is that there is great consensus among rural participants that *preservation* approaches, such as the conservation of agricultural lands and wildlife habitat corridors, have the most potential to offset the negative impacts of increasing residential density in rural areas. This finding is supported by a 1999 National Association of Homebuilders survey on housing preferences. When asked what builders could do to improve or preserve the environment, 87% said "leave or plant as many trees as possible" (Ahluwalia, 1999). This suggests that to build support among community members for development proposals planners and developers may want to place emphasis on preserving as much agricultural and natural lands as possible.

Much of the emphasis in the *preservation* approaches as well as suggestions from 3CM interviewees was on the nature views impacted by development (e.g., maintenance of scenic views, screening new development from public vantage points). This corroborates findings in other studies in which rural residents stress the importance of views of the natural and cultural landscape (Ryan, 2002; Sullivan, et al., 2004). The negative impact of development on the visible landscapes, such as through the loss of forested and agrarian lands, can leave a lasting impression on the part of the viewer. Similarly, development plans that are visually perceived as out of context may be less desirable (Campoli & MacLean, 2007). For example, very high density developments built far away from any other development may seem out of place. One way to handle this issue is to build closer to existing development (an item well supported by survey participants), however doing so without providing access to open space and nature views could negatively impact residents' satisfaction with such places (Kearney, 2006). Furthermore, landscape changes may lead residents to experience psychological impacts including a decline in focus and tranquility as the restorative properties of the environment are diminished (R. Kaplan, Kaplan, & Ryan, 1998; S. Kaplan, 1995). Thus, as people become aware of change through visual alteration, developing with an emphasis on minimizing this visual change can not only address resident desires but also environmental concerns.

Of the three categories, only *civic development* has items with average ratings below 1.5. Nonetheless, the ratings for these items are, on average, neutral rather than negative. There is also considerably more variation in attitudes about these services and facilities than for the *preservation* and *green infrastructure* approaches. Two items ("creating a network of bike paths" and "providing better emergency [police/fire] and medical services") have markedly higher means than the others in the category. In many ways, these two items signal a contrast between rural and suburban areas. Whereas rural residents who responded to the survey are more supportive of opportunities for outdoor recreation and better access to emergency services, they are not as supportive of approaches, like creating village centers and installing speed bumps, which may represent a shift to a more suburban lifestyle. Furthermore, general attitudes towards *civic development* approaches seem to go hand in hand with perceptions of how development has changed the community—those who feel development has impacted community more negatively tend to be less optimistic about the potential for *civic development* approaches.

Examination of individual differences among the participants are particularly useful for understanding the variability in attitudes toward the different development approaches. This study found three distinct clusters among the participants. Two of the clusters perceive the *preservation* and *green infrastructure* categories similarly, and positively, but differ widely on their views of *civic development.* While there is a broad range of attitudes even among the clusters, in general, the people who have a negative view of *civic development* tend to have more experience living in rural areas (e.g., live on larger lots, live farther away from development, live on unpaved streets). They may see installing traffic calming devices and building village centers, not as ways of mitigating the effects of development, but as examples of the very development they do not wish to see in their communities. Therefore, planners must be wary in assuming the universality of *civic development* approaches—such approaches may for some people represent a potential means of mitigating the effect of development, while for others *is* the very notion of development.

Implications and Conclusions

Increasing density is one of the tenets of Smart Growth and one of the requirements to stem the prevalence of unsustainable land use patterns in residential developments. However, such an approach often meets resistance from local residents, particularly in rural areas. The findings from this study suggest a variety of development approaches to offset the negative impacts of density increases in rural areas:

- The broad and significant support for *preservation* approaches suggests a pattern of development that retains as much of the existing landscape as possible. Conservation subdivision designs (Arendt, 2004) provide one example of development which accommodate density increases in rural areas while paying close attention to these desired preservation measures.
- Drastic visual changes to the landscape are more likely to leave a negative impression on local residents. The *preservation* approaches emphasize the importance of limiting the impact increased density may have on the quality of the local viewshed. Using natural buffers to screen developments from public view provide one way to minimize the visual impact of increasing density (Ryan, 2002; Sullivan, et al., 2004).

- Rural residents in this study are supportive of raising density near existing developed areas, but since at least some of those residents are living far away from any other development, this could be interpreted as a “not in my backyard” sentiment. However, residents also found adding density to existing development to be congruent with preservation approaches suggesting that they would be supportive of nearby development if it is done in conjunction with other preservation measures.

The general lack of enthusiasm by the participants in this study toward approaches typical of *civic development* is not always shared by promoters of Smart Growth and other organizations advocating for sensible development approaches. Championed approaches such as promoting mixed use and public transportation have much utility in urban and suburban areas but may not be appropriate to many residents of rural areas. Rural residents may have a hard enough time agreeing to pave their neighborhood streets let alone allowing buses or light rail into their communities. The change from their existing way of life is perceived as too drastic.

While Smart Growth approaches are not exclusively along the lines of the examples included in *civic development,* there has been little coherent guidance on how to best develop in rural areas. Advocacy for preserving farmland and other natural areas often does not take any development into account. In the absence of viable and sensible development approaches, rural areas are growing helter-skelter with out-of-context developments and an increasingly dissatisfied rural public. The findings of this study show that regardless of the kinds of rural experience, participants strongly support *preservation* and *green infrastructure* approaches, suggesting that such approaches have a strong potential for building consensus among differing groups. These provide a variety of ways that can offset the negative impacts of development in rural areas. While available and well documented, many of these approaches are insufficiently emphasized by the planning and development community. The benefits of doing so are clear—they would meet practical development needs without sacrificing local culture and the environments on which they depend.

CHAPTER 5

OPPOSITION TO DENSITY: A PSYCHOLOGICAL PERSPECTIVE

Thousands of decisions made through the interaction of planners, developers, financiers, and local citizens have transformed the U.S. countryside into a patchwork of residential and commercial development. Between 1992 and 2001, an average of 2.2 million acres of rural lands were converted to developed uses each year (National Resources Conservation Service, 2007). Low density residential developments occupy a great deal of these lands, covering 25% of the coterminous U.S. Such space-hungry urbanization results in loss of agricultural lands, destruction of species' habitats, more air and water pollution, and an increased dependence on diminishing fossil fuels. In addition, the psychological impact of the loss of these valued lands cannot be understated. While this impact is more challenging to quantify, the opposition to growth provoked by several decades of undesirable development patterns suggests that the conversion of rural lands strikes at a raw nerve in the American public.

The question of whether and how to grow has been the subject of countless planning discussions and often the source of significant conflict between proponents and opponents of growth (see Chapter 4). Activists' opposition to residential development has sometimes succeeded in its efforts to curb development (McGranahan, 2008), but developers' financial resources and persistence in legal battles often give them the edge in such conflicts. When development happens in spite of local opposition, not only does it lead to undesired development, it may exacerbate citizens' negative perceptions of the development process and promote a sense of hopelessness. On the other side, when local activists deny growth outright, the ability to find common ground is compromised. Both types of responses can reduce the chance for a more reasonable discussion that could lead to more innovative, sustainable, and people-friendly approaches to development that all parties could support.

Yet, these descriptions of the parties involved are somewhat of a caricature. Not all developers are growth advocates. Nor are all activists completely against growth. Ignoring the multiplicity of individual motivations may only exacerbate local conflicts. Given the right context, all parties may be more reasonable than others may expect. This chapter presents a psychological framework, the Reasonable Person Model (R. Kaplan & Kaplan, 2008), as a way to better understand land use conflicts. In addition to providing an explanatory model, the framework's emphasis on contextual factors suggests opportunities for reducing the current conflict surrounding land use decisions and building consensus around more sustainable patterns of development. Before introducing this alternative framework, however, the literature on NIMBY, the most commonly utilized explanation for opposition to new development, is discussed. Though often mentioned, its limitations are also important to recognize.

NIMBY: A damaging caricature

The model predominantly used to explain local opposition to development is denoted by the acronym NIMBY (Not In My BackYard). The academic literature on NIMBY began in the 1980s as an attempt explain and deal with local opposition to the siting of facilities that serve overall society but are undesirable to the nearby public. That these objectionable facilities typically require land to be repurposed explains their own acronym: LULU (Locally Undesirable Land Uses). Examples of LULUs include hazardous waste sites, nuclear power plants, prisons, and homeless shelters. More recently, wind farms, which are an important source of renewable energy, have been added to the list since they are perceived as being loud, dangerous to birds, and negatively impacting the visual quality of the countryside (Wolsink, 2007). Similarly, compact, higher-density residential developments are often the object of public opposition despite their potential for reducing greenhouse gas emissions (Ewing, et al., 2007).

Three NIMBY perspectives: Ignorance, Self-interest, and Prudence

In a review of the NIMBY literature, Freudenburg and Pastor (1992) identify three distinct perspectives that attempt to explain public opposition. In the first perspective, NIMBYism is characterized by ignorance of the issues and irrational behavior. The argument for this perspective is based on the discrepancy between real and perceived risks where local opponents to LULUs tend to perceive greater risks than are considered warranted by experts in a given domain. The claim is that laypeople's inability to accurately estimate risks are at the root of their ignorance and lead them to make decision irrationally with respect to the available scientific evidence. For example, some of the risks most commonly associated with higher-density development involve traffic congestion, decreased property values, increased crime, and overburdening of local infrastructures; however, there is significant evidence refuting the link between density and these particular outcomes (Haughey, 2005).

While it is true that there is a major difference in risk perception, citizens often have reason to question the value of expert risk analysis given frequent examples of expert claims which have turned out to be wrong (Cerf & Navasky, 1984). Experts who are familiar with a particular approach or technology may actually *underestimate* its risk (Rayner & Cantor, 1987). Furthermore, the consequences of utilizing only expert knowledge, which often comes from a top-down perspective, undervalues local knowledge and has led to disastrous outcomes (Scott, 1998). Thus, while the inferiority of the lay perspective is often apparent in political settings (e.g., public hearings), empirical evidence supporting this characterization of NIMBYism is lacking. A more accurate perspective may be that, as Slovic (1987) stated, “there is wisdom as well as error in public attitudes and perceptions.”

The second perspective, instead of painting the public as ignorant, views NIMBYism as a self-interested response, which disregards environmental or societal benefits. This would predict that local residents would oppose local housing low-income housing developments if they associate it with a reduction in their property values. Neighbors are not the only self-interested actors in this perspective—developers and governments are likewise aiming to promote the goals of capital (Lake, 1993). While many rural residents support larger minimum lot sizes in order to protect lands from development, developers prefer regulations for smaller lots based on the conventional notion that profit is primarily a function of the number of houses that can be built on the parcel. Likewise, governments are often concerned with attracting new businesses and residents in order to maintain the tax base and sustain local budgets.

The rational free-market philosophy is a foundation of this perspective: individuals acting to maximize their profit potential (e.g., the economic value of homes and property) will ultimately serve the greater good. Yet the greater social good is not always served. As Freudenburg and Pastor (1992) note, achieving such objectives “may mesh only imperfectly with the good of society as a whole”. Because the rational approach requires a value to be placed on different outcomes, those that are difficult to quantify in terms of dollars and cents, such as loss of wildlife habitats or scenic views, are often acknowledged as externalities but tend to be underrepresented in this perspective.

Freudenburg and Pastor's (1992) third NIMBY perspective deviates significantly from the first two. Instead of framing opposition as being based on individual ignorance or parochial self-interest, this perspective characterizes NIMBYism as a prudent and reasonable response to new development. Schively (2007) describes this perspective of NIMBYism as "exemplifying democracy, effectively facing challenges despite seemingly little potential for influence." In direct contrast to the perspective that citizens inaccurately estimate the risks associated with development, this perspective portrays concerned citizens as acting reasonably in distrusting scientists and having legitimate causes for concern. Furthermore, this prudent NIMBYism serves a wider social good as expressed by Mitchell (1992):

> It could be argued that political gridlock is almost essential if a limits-to-growth sentiment is ever fully to emerge in throwaway societies.

As such, this final perspective on explaining opposition to development emphasizes the human capacity to understand relevant issues and act accordingly.

Contextual factors

While the preceding perspectives describe individual motives that explain opposition to LULUs, other perspectives focus on contextual factors. For instance, Kemp (1990) describes opposition to a radioactive waste facility in which "structural, institutional, and contextual factors" were driving factors for the discussion. In his example, the agency promoting the facility was perceived as untrustworthy and this drove some locals to abstain from participating in the process. Of those who did, many expressed their distrust, thus setting a tone of confrontation which prevented more constructive debate. Furthermore, the siting process involved showing the public a map of geologically suitable locations for the waste facility and this prompted upset responses from those living nearest to those locations even though the intent of the meeting was more general.

The regulatory framework under which public feedback is solicited can also have an influence. Often the purpose of local land use regulations is to protect personal property as opposed to broader ecological or cultural concerns. Therefore, claims that connect development with a negative impact on personal property are more likely to succeed than those made for a wider public interest (Burningham & O'Brien, 1994). For example, a rural resident claiming that the development of a high density subdivision will lower the value of his nearby property has greater chance of success than a claim that such development will destroy the rural character of the countryside. In this way, the regulatory emphasis on personal property rights shifts the discussion towards self-interested arguments and away from global concerns. In the process, it also perpetuates the perspective that opponents to development are driven by selfish motives instead of social concerns.

Limitations

Despite the significant amount of literature on the NIMBY phenomenon and its acceptance in some settings as a valid model for explaining local opposition to development, it suffers from a number of inadequacies.

First, participants in locational conflicts see NIMBY as a pejorative term and see the label as potentially devaluing their input, thus setting the stage for confrontation. Furthermore, the scope of the term has widened to include not only local opponents to development but all who have a negative stance toward development regardless of proximity or rationale. Lumping all these people under the NIMBY umbrella, while a convenient tool for those wishing to cast doubt on the true motives of opponents to development (Wolsink, 1994), obscures a diversity of public opinions and creates false impressions of reasons for their opposition. Thus, as Burningham (2000) has noted, it is not helpful language.

Second, building on the first shortcoming, the NIMBY model provides only a caricature of the perceptions, motivations, and decision making processes that may drive the opposition to development. Opponents of development are characterized as only looking out for their bottom line with no concern for societal effects and as being incapable of understanding the range of issues involved. By assuming people act only out of self-interest, it creates conflict between developers and citizens since each side acts under the assumption that the other side is only looking after its own material gain. Adding to this conflict is the presumption, despite evidence to the contrary, that local knowledge of the citizenry is inferior to expert perspectives. Instead of changing individual attitudes towards development, these NIMBY characterizations often foster helplessness and disengagement, particularly for citizens who anticipate their communities will be irreversibly and negatively changed.

Third, while contextual factors are raised in the NIMBY literature, it lacks a cohesive framework that incorporates the relationship between the psychological motivations for opposition and the contextual factors which may interact with it. Furthermore, while NIMBY analyses tend to focus on how contexts lead to undesirable outcomes (e.g., lack of trust, unproductive participation), there may be many kinds of contexts that do just the opposite. Under the appropriate circumstances, public participation could be less about conflict and confrontation and more about exchange of ideas, reasonable compromise, and consensus building.

The inadequacies of the NIMBY model call for a different approach, one that would develop a more realistic characterization of the people involved, relying not on simple stereotypes but rather a deeper understanding of psychological factors which drive the decision making that ultimately impacts the landscape. Such an approach is the subject of the remainder of this chapter.

Human information processing challenges in land use planning

The Reasonable Person Model (RPM) represents an alternative way to explain opposition to development as well as an approach to reduce conflict, build consensus, and foster public engagement in the planning process. The RPM is a framework for explaining human functioning with respect to the contexts, situations, and environments that carry the potential to "bring out the best in people" (R. Kaplan & Kaplan, 2008). In order to achieve this goal, the model focuses on an issue pivotal to all human transactions: information. According to the Kaplans, "information is what we store, trade, hide, and act on. We are overwhelmed by it, yet endlessly seek it. We cannot act without it." The land use decision-making process involves no shortage of information. Communication among government officials, planners, developers and local citizens provides but one example of how information is relayed and utilized in the process.

Information processing is an activity that we engage in every day, whether we are conscious of it or not. We sense objects, events, and other forms of information in the real world and use it to build corresponding structures, or mental models, in our minds. The information upon which we base our models can come from a variety of sources—experiences of daily life, classes one has taken, meetings attended, places where one has lived, the media, neighbors, and governments. The benefits of having mental models are succinctly described by Craik (1943):

> If the organism carries a "small scale model" of external reality and of its own possible actions within its head, it is able to try out various alternatives, conclude which is the best of them, react to future situations before they arise, utilize the knowledge of past events in dealing with the present and future, and in every way to react in a much fuller, easier, and more competent manner to the emergencies which face it.

Put another way, we learn from a vast array of experiences in the world and the resulting knowledge is stored in our mental models. These models, in turn, allow us to bring our past experience to bear on the present, predicting future outcomes, making appropriate plans, and taking necessary action. The land use planning process relies on, and often, is encumbered by, all of these processes.

Challenges in land use planning

RPM offers a useful perspective for examining three challenges that contribute to land use conflicts and impede the adoption of more sustainable development approaches. The first involves the role of familiarity and experience in shaping preferences. The second challenge concerns the role of experience and familiarity in how people perceive risks. The third challenge deals with the role of affect, in particular negative emotions, in the land use decision making process. Each of these is discussed in the following sections.

Familiarity and preference

Mental models help us recognize what things are familiar and what things are not. Familiar things have been experienced extensively in the past and are strongly coded in our mental models. Experience can come in one of two forms, either directly from personal experience (e.g., learning one's way around by trial and error, traveling to a different country, living through an earthquake) or indirect forms (e.g., getting directions from friends, reading stories from the media, seeing references in movies). Both forms can influence the development of mental models. How effectively experience is stored in the mind (i.e., how familiar it becomes) depends on many factors including the frequency, interestingness, vividness, and credibility of the sources of information.

Familiarity can influence preferences, but the relationship is not straightforward. Table 5.1 shows the complexity of the interactions between familiarity and preference using some colloquial phrases that may be familiar to the reader. In some cases, familiar things may be preferred over the less familiar. For example, rural residents accustomed to living with few people nearby may be averse to the prospect of a nearby neighborhood development since it represents a change from the familiar. However, things that are too familiar may be boring and lead to a desire to try something new. For example, some residents of rural areas, being intimately familiar with its isolation, may prefer to live in a vibrant and densely populated city.

Table 5.1
Familiarity x preference matrix

	Low preference	High preference
Low familiarity	That's weird	I've never seen anything like that before! Wow! That's neat!
High familiarity	That old stuff again!	No place like home

Note. Reproduced from Kaplan and Kaplan's *Cognition and Environment* (S. Kaplan & Kaplan, 1982, p. 78)

Similarly, while people may be averse to some unfamiliar things, they may be engaged and interested by others. Thus, it is important to recognize that familiarity does not pre-determine the preferred outcomes. More important, the notion that the unfamiliar might be interesting suggests a possible way to help people overcome fears of the unknown.

Despite the multiple possibilities, several studies support a positive relation between familiarity and preference. Zajonc's (1980) laboratory studies showed that repeated exposure to stimuli can improve attitude toward the stimuli. Such a so-called exposure effect has been found for a wide range of information sources. For instance, people learn to like unfamiliar music after hearing it multiple times (Peretz, Gaudreau, & Bonnel, 1998). People also make investments in companies and financial instruments with which they are familiar either through their profession or because they live in close proximity to the company's location (Huberman, 2001; Massa & Simonov, 2006).

Research on preference for buildings in urban areas shows that for older types of buildings familiarity is positively correlated with preference; however, for more contemporary buildings the link was negatively correlated suggesting that content can play an important role (Herzog, Kaplan, & Kaplan, 1982). Cross-cultural studies on landscape preference (Herzog, Herbert, Kaplan, & Crooks, 2000; R. Kaplan & Herbert, 1987) show a general trend between familiarity and preference for different types of landscapes, though these authors caution that familiarity is unlikely to be the only predictor of preference.

Preference for housing may also be influenced by familiarity. Chapters 3 and 4 of this dissertation provide evidence that residents living near urbanized areas—as indicated by higher housing density, smaller lots, more roads, and greater proximity to city centers—are more likely to find proposals for future development proposals acceptable than those living in more rural areas. This suggests that one's daily experience with a particular environment may lead one to prefer environments of a similar nature. This is supported by Ryan's (2005) research which showed that those with more environmental experience with a particular place show greater attachment, or emotional bonds, to it.

However, familiarity is not always positively correlated with preference. Participants of the study presented in Chapter 3 perceived developments in three different ways—rural, suburban, and conservation. While the first two are likely familiar patterns, the conservation developments are probably less experienced or familiar. Nevertheless, conservation developments were preferred over the two more familiar types. Furthermore, as the saying goes, familiarity can breed contempt. Some forms of residential developments are so familiar that they have earned colloquialisms; "McMansions" and "cookie-cutter developments" are two noteworthy examples, both generally used to reflect negative sentiments. Here, the kind of familiarity is important. While some rural residents may abhor the thought of living in the suburbs, their familiarity with it may be based on many negative associations rather than a clear, vivid, or even direct experience with living in such places (S. Kaplan & Kaplan, 1982).

Table 5.2 shows the three development types cast in terms of the familiarity x preference matrix shown previously. In particular, the conservation type is categorized as unfamiliar while rural and suburban are grouped as having high familiarity. The descriptors in the table highlight some specific features which might influence the direction of preference. While this casting is not empirically based, it does show the complex relationship between familiarity and preference. People with the same level of familiarity may be influenced by different aspects of the developments. For example, while some may prefer rural settings for their natural surroundings, others may dislike its isolation. Though conservation developments may be generally less familiar, some may prefer it for its affordance of nearby nature, while others dislike it for its loss of privacy. Incorporating some desirable elements may be a way to overcome the apprehension about novel approaches to development.

Thus, different levels of familiarity can be positively and negatively related to preference. However, given the objective of this chapter to address land use decisions, it is worth noting

Table 5.2
Familiarity and preference for different development types

	Low preference	High preference
Low familiarity:		
Conservation design	Loss of privacy	Affords nearby nature
High familiarity:		
Rural	Isolation	Farm context; isolation
Suburban	Lack of nature; cookie-cutter	Accessibility; neighbors

that the rural residents who vote, attend public hearings, and serve on planning boards may be more likely to be familiar with the rural environment and prefer it as well. When less familiar development approaches are proposed, they may be opposed in order to preserve the rural environment that is both familiar and preferred.

In addition to having imagery about specific settings, mental models represent the many patterns that comprise daily life. As such, being accustomed to and enjoying consumption-based lifestyles (e.g., inexpensive gasoline, McMansions) may lead to envisioning the future that also incorporates such easy access to resources. More realistic scenarios that are less resource-dependent may seem far less desirable. Thus, the combination of familiarity and preference presents a significant challenge in persuading the public to adopt more sustainable forms of development that may be both less familiar and preferred (e.g., higher-density developments).

Nor is the challenge of familiarity unique to the general public. For homebuilders, familiar building methods may lead to destruction of wildlife habitats even in developments built for the purpose of conservation (Hostetler & Drake, 2008). For planning officials, the challenge is to achieve a better understanding of the needs and preferences of the general public. This too is a challenge in understanding the power in the familiar, since the vast experience of the professional planner often leads them to be overconfident in their own knowledge (Kahneman & Tversky, 2004) while undervaluing that of local people. Thus, the bias towards the familiar presents a challenging obstacle as communities attempt to overcome fears of typical growth patterns as well as confusion about novel approaches that are intended to provide more sustainable alternatives.

Perceived risks

Mental models store not only things (e.g., landscapes) and how we feel about those things (e.g., our preferences), but also how things are related to each other. Such associations help us predict what follows what. For example, one might associate nearby high density development (the cause) with declines in one's property values (the effect). When mental models associate a cause with a negative effect, it is known as a perceived risk.

The issue of perceived risk is central to planning. Planning academics see sprawling development patterns and associate with it the risk of global climate change (Ewing, et al., 2007). Planning practitioners deal with the perceived risk of not being able to accommodate future growth or not being able to meet local budget constraints. Developers invest millions of dollars in buying property under the risk that local regulations or opposition will not permit them to build. And local citizens oppose development based on a wide range of potential risks, among them crime, traffic, lower property values, loss of views, and destruction of rural character (Haughey, 2005; Ryan, 2002). Thus, different parties may oppose or support development based on the risks they perceive might be entailed.

Differences in experience may also explain why planners and other experts tend to perceive risks differently than the lay public. For instance, in addressing proposals for new development, the general public may fear losing their views, whereas planners and homebuilders tend to place less emphasis on nature views, woods, and open fields (Ryan, 2006). Whereas planners' experiences may be centered around a formal planning education and frequent professional activities (i.e., reading planning proposals, working with GIS, projecting future growth scenarios), local citizens' experience may not only be far more diverse (e.g., citizens come from all sorts of professions), but their daily interaction with the local environment and community may lead them to value aspects of the landscape and perceive risks to it in very different ways from experts. Their focus may be on certain species of wildlife, the architecture of an old neighborhood, views from particular vantage points, or hidden places offering solitude. Thus, when development poses a risk to these familiar aspects, differences in experience can lead to a conflict between planning experts and the local public.

Affect

Public participation related to land use decisions is often fraught with feelings of frustration, confusion, and irrelevance. Such contexts readily generate ill will; lack of respect and empathy for fellow humans are all too common. Though the issue of emotions in decision making has been notably neglected (Gigerenzer, 2001), appreciation of the role of affect might be helpful for understanding the emotional, seemingly irrational, responses that often occur in development debates as well as for finding ways to mitigate this negative affect.

One important characteristic of affect is that its influence on decision making is often not apparent to the decision-maker (Peters & Slovic, 2000). People often have a hard time explaining the reasons for their preferences even though their judgments come quickly and easily. For example, a citizen may decide based on a picture of a proposed development that it would be acceptable, but may not be able to explain the rationale for opposing it. People often first make an intuitive judgment and then go back to explain the logical reasoning that led to the decision (Gigerenzer, 2007). This presents a challenge in that intuitive preferences with little rationale are often disregarded by decision-makers.

It is useful to distinguish between two types of affect that are relevant to the land use context. The first type of affect is directed towards things or ideas. As discussed previously in the context of preference, mental models encode not only things but also our feelings about those things. This affect, in turn, informs our decisions. For example, citizens may intuitively feel averse to the idea of high density residential development and then take action to prevent it.

Experience plays a role in developing affective valuations. Past experience with high density developments that have damaged local landscapes lead one to code such development negatively. Additionally, sometimes unfamiliar things may be more prone to negative affect than familiar things (Zajonc, 1980). As such, negative affect may exacerbate the challenges associated with familiarity discussed previously

The second type of affect results from contexts. Unlike the first type, it is not a function of past experience, but rather an innate response to situations that are supportive or detrimental to information gathering (S. Kaplan, 1991). For instance, contexts that are confusing may lead people to avoid them. Visiting a city where one always feels lost may make one feel like never returning. A presentation in which the speaker is making 15 main points may provide some people in the audience sufficient reason to leave. Having an automatic mechanism for avoiding such contexts would have been beneficial to our ancestors. Affect provided and continues to provide a mechanism that helps us avoid situations that are confusing, boring, or irrelevant.

Thus when the information being conveyed at public hearings is technical, dense, or seemingly irrelevant it is understandable that some people in the audience with tune it out or head for the door. Additionally, people do not appreciate being told what to do. Not only can such attempts lead them to only avoid such situations, they may even go so far as to do the opposite of what they were told (Brehm, 1966; Fitzsimons & Lehmann, 2004; Miron & Brehm, 2006). Finally, when citizen viewpoints are not heard and respected, it can lead to great deal of negative affect.

Negative affect, whether catalyzed by ideas, context, or process, can undermine the development of mental models. Processing information is hard enough without the added difficulty of overcoming feelings of boredom or disrespect. Citizens who are asked to accept assumptions about growth may have a difficult time overcoming their negative reactions to it and may not engage reasonably in the participatory process. If planners ignore these negative feelings and push forward in conveying information, it may be ineffective, or worse, it may cause the public to "dig in their heels" (Elbow, 1981) with respect to their current perspective. Promoting positive affect through listening and respect may be the first, albeit often ignored, step in conveying information.

The Reasonable Person Model

The previous sections explained the challenges associated with human information processing many of which result from differences in prior experience. Awareness of differences in experience is important for many reasons, not least of which is that people build new mental models and modify existing ones based on their prior experience. However, the past cannot be changed. Let us return to the Reasonable Person Model (RPM) to examine possibilities for dealing with sustainability issues, land use conflicts, and changes that are not perceived as welcome. How might such situations be handled in ways that reduce the negative emotions and lead to mutual understanding?

The Reasonable Person Model (R. Kaplan & Kaplan, 2008) provides a framework for the motivations that drive the process of acquiring and utilizing information. RPM posits that people are driven by and derive satisfaction from three domains of informational needs. The first, *building mental models*, deals with the human motivation to acquire knowledge about relevant issues. The second, *being effective,* concerns the satisfaction drawn from using that knowledge with competence and clearheadedness. The final domain, *meaningful action*, refers to the desire to use one's knowledge to make a difference. Each of these domains is interrelated—one cannot make a difference if one is not competent with one's knowledge; at the same time, one's feelings of competence can be enhanced by successful action. Without adequate mental models, competence is undermined and meaningful action can lead to unintended consequences.

Each of these domains can also be influenced for better or worse by contextual factors. Well structured communication tools can promote understanding of relevant issues and increase citizens' capacity to deal competently with complex issues. Planning forums which provide opportunities for the public to understand and explore complex issues not only support meaningful action but may also civilize the participation process. Moving beyond the unsustainable development patterns that are now the status quo requires more adequate ways to conceptualize and address problems such as density, traffic, and loss of nature views. The following sections describe some possibilities to utilize the three motivational factors in the RPM framework towards this end.

Building models

Building mental models can be a motivating factor for both planners and the public. People are drawn to supportive contexts that provide an opportunity for understanding that which was once confusing. In such supportive contexts, people are more likely to be willing to explore concepts that are novel and unfamiliar. Unfortunately, in planning contexts where knowledge is being shared (e.g., public hearings about proposed development, envisioning sessions to plan the future of the community), confusion, boredom, and irrelevance are frequent sources of frustration. By creating more supportive contexts in which knowledge can be shared, exploring challenging issues and achieving understanding can instead be sources of satisfaction.

Model building for planners

To facilitate knowledge sharing, planners must develop mental models of the public's existing mental models. As mentioned earlier, planners, and the public have different experiences and thus different mental models, familiarities, and perceptions of risk. Frequently, planners share information with the public without an understanding of what the public knows, values, prefers, and fears. This is especially true with respect to the knowledge about and value of local landscapes which are often seen differently by planners and the public (Broussard, Washington-Ottombre, & Miller, 2008; Ryan, 2006). Without understanding the public's starting point, planners are unlikely to be able to connect new information to existing models leading to little hope of helping the public build models of the issues being conveyed.

One approach to understanding the public's mental models is through interviews and surveys. Though in principle these methods should help planners learn public perspectives, the fact that planners are designing them—choosing important issues, discarding irrelevant ones, framing questions—means that they often capture a narrow and distorted perspective of the public. To address these concerns, a technique known as the Conceptual Content Cognitive Mapping (3CM) (Kearney & Kaplan, 1997) was designed for assessing people's knowledge structures in complex domains. In this technique, participants are asked to identify what they perceive to be the most important factors of a particular issue (e.g., residential development in rural areas) and write them down on cards. Then they are asked to group the cards into meaningful categories. The generation of issues and their categorization can be a powerful tool for comparing mental models among stakeholders (Kearney, Bradley, Kaplan, & Kaplan, 1999).

A variation of this approach is to gather a broad list of potentially important factors within the problem domain and have participants select factors they consider to be important and then organize them into meaningful categories. Participants are free to add any factors they may feel that are important but not contained in the original list. This modified approach may be better suited for situations involving a large number of participants. The 3CM can be used in conjunction with conventional survey techniques. It is particularly useful to identify important themes to address in more detail in a later survey.

The 3CM task has been used to identify mental models of stakeholders in timber-related disputes (Kearney, et al., 1999), resident perceptions of rural character (Tilt, et al., 2007), and attitudes toward residential development in rural areas (see Chapter 4). This approach not only allows experts to gain a better understanding of lay knowledge, but it is also satisfying for participants in that the process of considering relevant factors and their relationships in a structured setting can help them achieve clarity on a complex domain.

Another approach to understanding the public perspective is through visual preference research (R. Kaplan & Kaplan, 1989). In this method, participants are asked to rate a set of images depicting development alternatives. As opposed to open-ended questions which ask the public what they want, the presentation of alternatives gives some structure for participants to meaningfully respond. Planners and developers play an important role here in narrowing down the daunting number of possible alternatives while still providing a wide enough sample to ensure a variety of development characteristics (e.g., housing styles, road widths, proximity to nature) are represented. Furthermore, the use of images concretely and quickly communicates to the public in a way that prose often cannot achieve (as an example, the reader might try to imagine a planned unit development at 20 units/acre). Urban Advantage (http://www.urban-advantage.com) provides some vivid examples of what such images may look like. The resulting data from such research can then be used to develop an understanding not only of how people prefer different types of developments, but also the characteristics which differentiate one type from another.

Another useful approach relates public values to specific geographic locations (G. Brown, Smith, Alessa, & Kliskey, 2004). Participants identify areas of the landscape that are important based on different values (e.g., aesthetic, economic, recreational, biodiversity) and may have different levels for each (e.g., 50, 20, 10, and 5 points). This task has participants place dots coded with these values and point levels onto a map of a study region. The total number of chips is limited to require participants to identify places that are most important, however not so limited to make them feel that there is no choice (in this study, there were 12 values, each with 6 dots). Aggregating responses leads to multiple maps, each highlighting regions of consensus for each of the values. Layering these maps on top of each other then reveals important geographical regions for a wide range of values. Thus, it helps planners and the public discover the kinds of areas that community members agree to be worth protecting as well as places that may not be as important to locals.

All three of these approaches can be thought of as different forms of listening—an activity that is pivotal, but too often trivialized, in the land use decision making process. Sharing knowledge is a two-way process. When planners are intent to “educate” the public without listening to and developing a model of the public perspective, not only does it undermine the planners’ attempt to share information; it also leads to the public’s feeling disrespected and fosters disengagement and helplessness. Under such conditions, it is unlikely that motivations to understand and explore will overcome the strong feelings of negative affect associated with not being heard. Instead, listening to the public perspective can help the planner better share information in a relevant way and also incorporate local values and insights in crafting solutions to communal problems. For example, as shown in Chapter 2, the visual preference method was useful in showing that high density development is more acceptable when nearby nature is less fragmented and trees are a relatively high percent of the nature present. While the stereotype is that residents find all high density development unacceptable, understanding the actual public perspective may lead to residential development designs that accommodate growth without sacrificing local values.

Model building for the public

A better understanding of the public's mental models can be useful for planners in their efforts to provide information to the public. Such efforts are often ineffective because people readily distrust or ignore information that is not related to their own knowledge and do not like being told what to do (especially with respect to their own communities). Instead of telling people what they ought to do, the Kaplans (2008) suggest "a more appropriate alternative is to view the process as one of helping a fellow human build a model." In other words, planners should engage the public in expanding their own mental models. However, familiarity with unsustainable land use patterns can present a challenge to adopting more sustainable, but unfamiliar, forms of development. Although literal familiarity cannot be provided, a sense of familiarity can. Another approach is to encourage the public to explore alternatives and develop solutions appropriate for their locale.

Enhancing sense of familiarity with alternatives

In some cases it may be possible to enhance a sense of familiarity by providing some form of direct experience. For example, if it were feasible to conduct field trips to existing sites with different types of housing and land use patterns citizens could become familiar with alternatives. While this is a helpful approach, it is often not possible to arrange. Familiarity can also be gained through various indirect means. A great deal of experience is gained by such vicarious means ranging from brief descriptions of existing situations to more elaborate presentations of case studies. Descriptions of a variety of development can help the public become familiar with the relationship between development decisions and their outcomes. In some contexts, the use of multiple case studies can lead to better learning than a single first-hand experience (Monroe & Kaplan, 1988).

More generally, the use of story can be a powerful tool for enhancing the sense of the familiar. Stories are useful in that they can provide both vivid imagery and concreteness, and provoke anticipation and interest on the part of the listener. Stories come in many forms and through many venues. Public media are an important source of such imagery and often rely on first-hand reports from individuals who have experience in the settings that are described. While the media devote more time and space to stories about negative events, there are many alternative sources of stories related to environmental issues and ways to mitigate negative consequences. These could be websites created by planning organizations, such as Smart Growth, more local groups, or more general sources such as the TreeHugger blog (http://www.treehugger.com/) which daily aggregates news on various environmental issues from a wide range of news sources, from local to global. In some cases, these sources may be more appropriate for helping the public learn more about alternative site developments.

Visual material can play an important role in providing information to enhance people's understanding of different possibilities. For example, Alternative Futures Analysis uses visualization approaches to help the public make decisions regarding land use (Baker, et al., 2004). Participants are shown maps and animations depicting three future scenarios of how land might be utilized. Additionally they are shown how the land is currently being utilized as well as how it was utilized in the past. Showing past, present, and future landscapes succinctly tells the story of landscape change over time. It helps the public become more familiar with the kinds of changes that have been occurring.

The process of sharing these snapshots in time also contains an element of mystery—participants are first shown the present scenario and asked to project how things will change over time. This engages the public in a concrete prediction problem and mentally commits them to a hypothesis. Then they are shown the past scenario which, as Hulse (2007) has mentioned, can be surprising to residents since they often underestimate the amount of landscape change that can occur in a short amount of time. This self-realization in turn helps the public recognize some gaps in their knowledge and builds consensus around appropriate ways to accommodate practical growth scenarios. This process might be generalized to approaches that create a context for people to make guesses or hypotheses and then challenge these hypotheses with vivid imagery.

In addition to story and workshops that provide ways to visualize the past and future, visual preference research can also help to enhance the sense of familiarity with alternative forms of development as well as potentially overcoming stereotypes. For example, in the research discussed in Chapters 2 and 3, participants were asked to rate a variety of residential development alternatives. As mentioned previously (see Table 5.1), the patterns of these ratings revealed three main types of development that are recognized by the public—rural, suburban, and conservation. Suburban subdivisions have been the dominant type of development since the 1950s while rural developments, with single homes on large lots, are a variation of the long-dominant country farm. Based on the amount of time these two developments have been in the public psyche, it could be argued that the rural and suburban categories are familiar to people. However, the conservation category, which integrates higher-density housing with large areas of canopy, presents a newer and less familiar approach.

Exposure to the currently unfamiliar conservation approach would be beneficial in two ways. First, participants discover that there are forms of development that do not fit standard land use stereotypes. When the development cannot be easily pigeon-holed (i.e., just another cookie-cutter development), it may be easier to perceive it with fewer pre-conceived notions. Second, exposure to such developments helps the public build mental models of them and adds to their comfort with the notion that such developments could fit in their communities.

Exploration

An underutilized approach to helping the public develop mental models is to help them explore the complexity of their own models. The public has a great deal of knowledge and implicit theories that they bring to the planning context. Much of the planner's job, instead of educating the public, should be to facilitate the exploration of these existing models. While being told can lead to negative reactions, people may be more likely to understand and accept new ideas when they arrive at their own conclusions through a process of self discovery (S. Kaplan, 2000).

The exploratory process can not only lead the public to become clearer with their knowledge, but also help them recognize its deficiencies. When such gaps are discovered by the public instead of being received as a rebuke from experts, the public may be more willing to ask for help in filling that gap. One way to provide help is in the form of options that the public can further explore. This approach is beneficial in that, when asking for help, people may be more likely to remember any new knowledge they receive (Bransford, et al., 2003; Graesser & Person, 1994).

Some of the methods described in the previous section for fostering the planner's understanding of the public's mental models can also be useful for facilitating this exploration process. For example, visual preference research invites the public to critically explore various alternative forms of development. In the 3CM task, the process of writing down the concepts one sees as being important can be thought of as a form of exploration of one's knowledge and consideration of the variety of factors that are salient in a particular situation. Organizing these concepts also helps the participants explore them and relationships among them. Learning about other people's 3CM responses can also effectively expose gaps in knowledge. Thus, tools and contexts which promote exploration as opposed to being informed can be effective for helping the public build models.

Being effective

Fostering civil and productive public participation requires not only helping the public build models, but also creating contexts where they can utilize them effectively. Whereas being helpless and ineffective is a common source of the public's frustration, being effective can provide a source of satisfaction. Competence is one of the dimensions included in the RPM framework as central to being effective.

Competence

White (1959) identified the desire for competence as a primary human motivation. Competence is intimately related to the process of acquiring information (De Young, 1996)—when people are overwhelmed and confused by the information, they feel incompetent . Yet, many planning contexts put the public in that very predicament. This is further exacerbated by the fact that planners' competence with technical issues surrounding land use decisions are likely to be far greater than that of the average citizen. As a result, planners tend to assume that what is easy for them is easy for the public. Since planners are typically creating the contexts for public participation and conveying information to the public, this can create problems in sharing information.

For example, planning documents are often prohibitively challenging for the public to comprehend (Sullivan, Kuo, & Prabhu, 1996). They often provide far too much technical jargon and make many assumptions about the public's knowledge. The Sullivan et al. study showed that using less jargon, more consistent formatting, and more cues to guide the reader can raise the level of understanding. Furthermore, the combination of text with visual and spatial imagery does a better job of conveying information than text alone (R. Kaplan, et al., 1998) and can help people participate in a competent manner.

A related issue is that of information overload. The human mind is capable of dealing with 5±2 chunks of information at a time (Mandler, 1975a, 1975b). Planning documents, presentations, and other tools for sharing information with the public often exceed this limit and lead participants to feel incompetent. In order to provide contexts where people can demonstrate competence instead of feeling overwhelmed by information, planners must be aware of the conservative nature of the learning process. Familiarity rarely results from a single exposure to an idea, but rather comes slowly after many repeated exposures in a variety of engaging contexts. In this sense, time is also a critical factor. Squeezing a little more information into already limited time is tempting, but will likely defeat one's intention. Providing fewer chunks of information at a time and allowing people the opportunity to control the flow of information are ways of managing the human cognitive limitations. This less-is-more sort of restraint on the part of the competent planner is essential to allowing the public a sufficient level of confidence and competence.

Meaningful action

People are motivated to use their knowledge to make a difference. Citizens often feel that their participation has little impact on the outcome of the planning process. A consistent pattern of ineffectual participation not only leads the public to disengage themselves from civic affairs, but also fosters what Kaplan describes as "the pervasive malaise of helplessness" (S. Kaplan, 2000, p. 506). Planners too may feel helpless that their well-intentioned efforts to facilitate participation so often make little impact in building consensus and lessening conflict surrounding development. In order to foster meaningful participation, planners and the public alike must feel needed and respected. Furthermore, one needs evidence that one's action actually do make a difference.

Feeling needed

Although public hearings are typically open to all members of the public, many citizens are not heard from in the planning process. Sometimes public hearings are only publicized to community members who live near a proposed development site, although it would make sense to involve as many citizens as possible since such developments have an accumulated effect impacting a larger area. While other planning forums such as visioning sessions may be more broadly publicized, the citizens who attend may only provide a narrow view of the public perspective. Getting a diverse range of citizen participation (e.g., elderly, children, disabled, cultural minorities) requires more than simply notifying the public; citizens must be feel they can easily provide input and that their input can make a difference.

Even if the time and place for a public event are widely broadcast and convenient, many individuals are reluctant to express their views at such venues. Thus other means need to be used to make the public feel their views are considered. The tools listed at the PlaceMatters website (http://www.smartgrowthtools.org/) provide possibilities using computer and internet technologies to make the participation process easier for the public. For example, the Interactive Visioning Survey uses widely located kiosks and a website to help people visualize proposed designs and to gather their feedback. CommunityViz (http://www.placeways.com/communityviz/) and Sketchup (http://sketchup.google.com) are two 3D visualization tools that allow for an interactive design process. Another tool is called Covision (http://www.covision.com) and it uses networked laptop computers to poll participants in large meetings to provide real-time feedback.

Such participatory tools have the potential to be helpful, but there is a danger as well. The planners' facility with planning tools, documents, maps, and models can make the public feel inadequate and unneeded by comparison. For example, finely crafted scale models of proposed development may be very pleasing to the eye of the expert planner, however they make participation more challenging in that citizens may feel the final product has already been selected and that there is no room left for public input (R. Kaplan, Kaplan, & Deardorff, 1974). Furthermore, the authoritativeness with which a model is presented can overshadow its shortcomings in data or design (Monmonier, 1993; Obermayer, 1998) suggesting that beautiful models can mislead the public.

By contrast, simpler, less perfect, models may make the public feel that their participation will make a difference. For example, in Box City (http://www.cubekc.org/), which describes itself as "a simple, but complex, community-based education activity," participants use cardboard boxes, construction paper, scissors, and glue to build three-dimensional models of relevant parts of their communities (Snyder & Herman, 2003). They can then move them around and manipulate them to envision new possibilities for these places. In such a context the public is more likely to feel that a solution has not already been selected and the civic officials do not come across as self-assured. Creating a context which is humble and even playful with respect to ideas for the future can help the public feel in partnership with planners and officials in the planning process. The participatory process can feel more genuine giving the participants the sense that their input matters.

Utilizing such basic tools and processes is not only useful for making the public feel needed but can also give planners a sense of meaning. As Hakim Yamini, a well-respected planner who used the Box City technique, noted "I have never felt so hopeful about the outcome of a workshop. With the Box City process, the participants know and understand in a concrete way what they are asking for" (Center for Understanding the Built Environment, 1995). This feedback suggests that using simple tools and processes enhance the planner's sense of meaning in the process in that they are more able to achieve their objective of supporting local needs. This is in sharp contrast to the perspective that planners are made irrelevant by "dumbing down" their processes.

While such approaches have distinct advantages, it may be challenging for the experts to present material that they consider to be incomplete or imperfect. After all, this defies their training about professional expectations. Their expertise is likely to lead to a misguided expectation of the kinds of information that are necessary for effective participation (e.g., a beautiful model is necessary to talk about development proposals). Furthermore, the ease with which technology can create fancy models makes it difficult to choose cardboard and crayon. However using technology for its own sake can be detrimental to participatory process. Choosing how it is used is an important job for the planning profession. An awareness that in many cases less perfect promotes better participation may help provide some necessary restraint towards that job.

Evidence of one's impact

When citizens do take part in community decisions they appreciate knowing that their input was considered. Decisions that entail voting provide such information as the results are announced. Thus citizens who did participate in the vote have a sense that their input was counted. However, when there is no indication of the impact of their input, citizens may feel that their participation was a wasted effort. This can lead some citizens to abstain from future participatory opportunities and others to engage in a less than reasonable way. Thus, knowing the impact of one's input is important to the participatory process.

Stories of the impact of past citizen feedback can provide an effective way to show how public input has made a difference. One such story comes from the city of Chattanooga, Tennessee which held an envisioning process in the 1980s, called Vision 2000, and its success led it to become an exemplar of functional public participation (Kwartler & Longo, 2008). Stories of local successes may be even more convincing in that citizens may be familiar with the changes which arose from the participatory process.

Feedback can take several forms. Verbal or written communication between officials and the public is one form of feedback. For example, when a survey was used for gaining public input aggregate results should be provided to the public. If one is aware that one's participation in a survey resulted in the preservation of a nearby nature area, one may feel more empowered by one's role in the process. Such feedback, however, is for the entire sample and individuals may not be sure how their response fits into a summary statistic that is supposed to represent their input. One way to deal with the challenge of providing individualized feedback for large numbers of participants is to present results visually. For example, Alessa, Kliskey, and Brown (2007) worked with mapping geographical areas that are valued by the public and showed a summary map with all participants' valued areas. Not only does such a visualization approach include all participants, it also clearly shows regions that are highly valued by many people and those areas that are valued by a minority.

Perhaps the most obvious form of evidence of public impact, or lack thereof, is the landscape that is ultimately created. There is hardly a more vivid form of feedback than the landscape one navigates each day. Whether and how each piece of community land is used for neighborhood, farmland, parkland, or streets is the final result of the planning process and reflects the cumulative effect of decisions made by citizen planners and commissioners. When the general public has effectively influenced these decisions, the landscape is a telltale marker of their having made a positive difference in their community. However, when landscapes are changed in opposition to public values, needs, and preferences, it can be all the more frustrating to experience the consequences on a daily basis.

Finally, providing feedback is also beneficial in that it explicitly demonstrates that citizens are being listened to and respected. When the public feels that their input is valued, it may facilitate a mutual development of ideas between planners and the public. This, in turn, could lead to more compromise and consensus in the final decisions taken. In this way, providing feedback has a great deal of potential for reducing the negative affect surrounding land use debates and promote meaningful action.

Concluding comments

Conflicts surrounding land use decisions have been a roadblock to innovating and building consensus around alternative land use patterns that are more sustainable than the status quo. The challenges to reducing these conflicts include overcoming biases towards more familiar land use patterns (e.g., low density residential developments which are dependent on the automobile), bridging the perceptual gap between experts making decisions and the public who have to live with the outcomes, and managing the negative emotions that fuel conflicts.

NIMBY, a predominant model for explaining the reasons for such conflicts, generally assumes that the public's opposition to development is based on a narrow-minded self-interest and that they are either incapable or unwilling to look at perspectives beyond their own interests. Not surprisingly, such a model has done little to help quell the conflict surrounding land use decisions.

The Reasonable Person Model provides a way to understand some of these conflicts and to consider approaches that could bring opposing sides closer to solutions. It supports the perspective that, while people may indeed be concerned with the value of their homes, they are also capable of considering the bigger picture. Such a notion could not be more timely as the American public gets ever more polarized in their views towards environmental issues that are impacted by land use choice (Sunstein, 2002, 2006). The key factor in bringing out this more reasonable behavior is how information is exchanged and the contexts which provide it. Communication and exchange of ideas between decision-makers and the public requires appreciation of the differences of perspectives and the challenges of changing one's mental models. The public is helped by opportunities to explore new concepts and directions in ways that can increase the sense of familiarity despite insufficient experience. The decision makers, in turn, need to understand local needs and take advantage of local knowledge. Such steps are important both for achieving viable solutions and for creating a context that fosters civility and respect.

The idea that information drives human concerns paints a very different picture of our motivations than the self-interested parochialism depicted by NIMBY models. The RPM describes people as deriving satisfaction from being competent and effective, and being able to develop and use mental models for achieving meaningful outcomes. Under the right circumstances, people are eminently capable of acting more reasonably than might be expected and to do so for the greater good. Planners can play a vital function in helping to create the appropriate context for such behavior to flourish. The opportunities for creatively engaging the public in decisions regarding the future of our shared landscapes are numerous and, given the unsustainable patterns which continue to consume these lands, the need is great.

APPENDICES

Appendix A: Table of development approaches and mean ratings (in order of decreasing means)

Development approaches	Mean	S.D.
Maintaining the rural character of the community	2.48	0.97
Preserving wildlife habitat corridors	2.47	1.05
Maintaining scenic views	2.45	0.94
Preserving agricultural lands within the township	2.35	1.20
Using trees and shrubs to screen new development from view	2.04	1.19
Landscaping with native plants and grasses	2.04	1.04
Preserving historically significant features	1.98	1.06
Ensuring effective treatment of wastewater on the property	1.95	1.53
Using “green” building techniques	1.76	1.25
Keeping development close to town center and existing developments	1.73	1.37
Offering homes of varying styles within the development	1.68	1.40
Creating a network of community bike paths	1.38	1.67
Providing better emergency (police/fire) and medical services	1.36	1.29
Matching existing architectural styles of the region	1.22	1.23
Reducing lot size in exchange for more preserved natural areas	0.74	2.00
Building more schools nearby	0.16	1.77
Installing traffic calming devices (such as speed bumps)	0.09	1.78
Building a community center with gym and classrooms	0.08	1.70
Creating a village center with small convenience shops	0.02	1.96
Building wider streets to accommodate traffic	-0.01	1.97

Appendix B: Cover letter and survey

NATURAL RESOURCES AND ENVIRONMENT
UNIVERSITY OF MICHIGAN

Hello,

I would appreciate your help with a short survey. It is part of a study of people's feelings about possibilities for new residential development in their communities. I hope the results of the study will help local planners and township officials in Washtenaw County to build places that better meet the needs of residents.

The survey, which others have found to be engaging, involves rating pictures of different residential developments and answering a few questions. It should take about 15 minutes. I assure you that your responses will remain anonymous.

If you have any questions or comments please let me know, by email or phone. Many thanks for your help!

Sincerely,

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1) *Imagine your township's planning commissioners are seeking residents' input about the growth of the township. Consider the various residential developments in the attached 2 pages of photos. Feel free to browse through all the photos before answering the following question.*

Please rate each image for how acceptable you would find the pictured developments had they been proposed?

<u>Photo page 1</u>

1 2 3 4 5 **Picture 1** 1 2 3 4 5 **Picture 2**
1 2 3 4 5 **Picture 3** 1 2 3 4 5 **Picture 4**
1 2 3 4 5 **Picture 5** 1 2 3 4 5 **Picture 6**
1 2 3 4 5 **Picture 7** 1 2 3 4 5 **Picture 8**

<u>Photo page 2</u>

1 2 3 4 5 **Picture 9** 1 2 3 4 5 **Picture 10**
1 2 3 4 5 **Picture 11** 1 2 3 4 5 **Picture 12**
1 2 3 4 5 **Picture 13** 1 2 3 4 5 **Picture 14**
1 2 3 4 5 **Picture 15** 1 2 3 4 5 **Picture 16**

SCALE
1=Absolutely not acceptable
2=Not acceptable
3=Somewhat acceptable
4=Acceptable
5=Very acceptable

2) *Imagine a developer plans to build a new development of 150 single family homes in your community. Listed below are some ways that might reduce these negative impacts.*

To what extent would the plan be better or worse if it were to incorporate each of these possibilities:

-3 -2 -1 0 1 2 3 X Preserving historically significant features
-3 -2 -1 0 1 2 3 X Using "green" building techniques
-3 -2 -1 0 1 2 3 X Landscaping with native plants and grasses
-3 -2 -1 0 1 2 3 X Creating a village center with small convenience shops
-3 -2 -1 0 1 2 3 X Matching existing architectural styles of the region

-3 -2 -1 0 1 2 3 X Building more schools nearby
-3 -2 -1 0 1 2 3 X Maintaining the rural character of the community
-3 -2 -1 0 1 2 3 X Creating a network of community bike paths
-3 -2 -1 0 1 2 3 X Preserving wildlife habitat corridors
-3 -2 -1 0 1 2 3 X Building wider streets to accommodate traffic

-3 -2 -1 0 1 2 3 X Using trees and shrubs to screen new development from view
-3 -2 -1 0 1 2 3 X Keeping development close to town center and existing developments
-3 -2 -1 0 1 2 3 X Maintaining scenic views
-3 -2 -1 0 1 2 3 X Providing better emergency (police/fire) and medical services
-3 -2 -1 0 1 2 3 X Ensuring effective treatment of wastewater on the property

-3 -2 -1 0 1 2 3 X Offering homes of varying styles within the development
-3 -2 -1 0 1 2 3 X Building a community center with gym and classrooms
-3 -2 -1 0 1 2 3 X Preserving agricultural lands within the township
-3 -2 -1 0 1 2 3 X Installing traffic calming devices (such as speed bumps)
-3 -2 -1 0 1 2 3 X Reducing lot size in exchange for more preserved natural areas

SCALE
-3=a lot worse
-2=worse
-1=a little worse
0=no effect
1=a little better
2=better
3=a lot better
X=don't know/ no opinion

<u>Other ideas that would make this new development more acceptable:</u>

3) Please let us know a little about yourself and your household.

How many people share your household (including yourself)? _____
Of those, how many are under 18? _____ Over 65? _____

How many years have you lived in your current residence? _____
How long do you plan on staying? ☐<1 year ☐1-2 yrs ☐ 2-5 yrs ☐ 5-10 yrs ☐ 10+ yrs ☐ don't know

Do you rent or own your home? ☐ rent ☐ own

Why did you choose your current home?

What do you like least about where you live?

Since you've been in your current home, has residential development made your community:
☐ Much worse ☐ A little worse ☐ No change ☐ A little better ☐ A lot better

What is the approximate size of your property **in acres**?
☐ <1/8 ☐ 1/8 ☐ 1/4 ☐ 1/2 ☐ 1 ☐ 2 ☐ 5 ☐ 10 ☐ 10+ ☐ don't know

☐ Yes ☐ No Is the street you live on paved?
☐ Yes ☐ No Do you have any sheds, barns, or other outbuildings on your property?
☐ Yes ☐ No Do you live on a farm?
☐ Yes ☐ No Do you use your land to grow any fruits/vegetables or raise livestock?
☐ Yes ☐ No Do you derive a substantial amount of your income from farming?

Are you a farmer? ☐ Yes, full-time ☐ Yes, part-time ☐ No

Work status (check all that apply):
☐ Work full-time ☐ Work part-time ☐ Homemaker ☐ Retired ☐ Student ☐ Other_________

Average number of miles you drive per week: _____

How dominant are each of the following in the view from your home?

1 2 3 4 5	Busy streets
1 2 3 4 5	People
1 2 3 4 5	Other houses
1 2 3 4 5	Trees
1 2 3 4 5	Gardens
1 2 3 4 5	Parked cars
1 2 3 4 5	Sidewalks
1 2 3 4 5	Farm fields

SCALE
1=not at all dominant
2=not very dominant
3=somewhat dominant
4=dominant
5=very dominant

Which of the following best characterizes your formal education?
☐ Less than high school
☐ High school/GED
☐ Some college
☐ 2 year college degree
☐ 4 year college degree
☐ Master's degree
☐ Doctoral degree

Gender: ☐ male ☐ female

Age: ☐ <21 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61-70 ☐ 71-80 ☐ 81-90 ☐ 90+

Please keep the photo page and return this survey. All you need to do is fold the survey in half and seal it closed (with tape or a staple). Postage is pre-paid, just drop it in the mail. Many thanks for your participation!

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Pg. 1

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Pg. 2

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