EXURBAN BACKYARD PREFERENCES:
IMPLICATIONS FOR DESIGN TO ENHANCE ECOSYSTEM SERVICES

by
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Abstract

Large-lot exurban landscapes could incorporate ecological design in order to contribute ecosystem services. In our study, we use a survey of 126 Southeast Michigan homeowners to examine respondents' stated preferences for residential yard images, and compare those with reported current use and management of their actual yards. We found that stated preferences are not necessarily related to actual management behaviors. We use this finding, as well as other insights into homeowner preferences for yard appearance, to create design and planning recommendations. Aligning design and policy with homeowner preferences, yard activities, and ecological design goals could improve cultural sustainability and help ecological benefits last into the future.

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[1] *This thesis has not been formally reviewed by EPA. The views expressed in this presentation are solely those of the authors, and EPA does not endorse any products or commercial services mentioned in this paper*

Table of Contents

1. Introduction

Human preferences for different landscape characteristics have numerous implications for ecological function in residential landscapes. The space over which the homeowner can make landscaping decisions is the "yard," the entire parcel owned by a single homeowner. Management decisions in large-lot rural residential landscapes—exurbs, where property sizes frequently exceed one acre—impact ecosystem function because of their large spatial extent and the amount of open space present, whether this open space is private or public land.

Residential areas continue to expand outside of urban areas, and are likely to continue to expand into the future (Nickerson, Ebel, Borchers, & Carriazo, 2011). American homeowners often prefer single family homes in suburban-type landscapes, and such preferences perpetuate exurban development (Talen, 2003). Ecological design is one way to increase the ecological function of exurban landscapes; it aims to incorporate "nature's processes" as part of intentional landscape intervention (Van der Ryn and Cowan, 1996, p.34). Consequently, it may improve the ecosystem services of landscapes. This type of design is not currently the status quo in the United States, where high-input turf lawns dominate residential landscapes.

In this paper, we consider ecological design goals for residential landscapes, which could be considered a "novel ecosystem." In describing novel ecosystems, Perring, Standish and Hobbs (2013) make the point that not all restoration efforts should be aimed at returning an ecosystem to an historical ideal. Rather, novel ecosystems (especially urban areas) can be informed by historical ecosystems, but should not "place strictures" on restoration; instead, the focus should be on "maintaining global biodiversity and delivering ecosystem services as well as the traditional [restoration] goals…" (Perring et al., 2013, p.4; p.1). Consistent with this conception of novel ecosystems, this project supports the development of landscape designs that will appeal to residents based on their stated preferences, but will also construct and protect ecosystem services. With their low proportion of impervious surface, large-lot residential areas in particular provide an opportunity for constructing land-based ecosystem services.

Residential yard management behaviors are subject to the influence of cultural norms, from concern over what future buyers are likely to want to concern about what the neighbors will think (Nassauer, Wang and Dayrell, 2009; Schindler, 2012). The front yard-backyard distinction has evolved culturally over time, with the front yard generally being understood as a status symbol primarily for public display, and the back yard as a recreational, private space for personal use and enjoyment (Schroeder, 1993). Cultural norms are more influential in the front yard because it clearly exhibits residents' management choices (Jackson, 1987). Perceived as a more private realm (Schroeder, 1993; Bormann, Balmori, Geballe, 2001), backyards may allow for more innovative landscape styles that could contradict cultural norms in the front yard. Consequently, backyard management may differ substantially from front yard management behavior.

This paper examines homeowner preferences, behaviors, and management in exurban residential landscapes. Our overarching question is whether the more private realm, the backyard, may be more opportune than the front yard for incorporating ecological design. To examine potential for change in residential landscapes, we examined homeowners' preferences for experimental landscapes (not their own yards) and compared their preferences with the way they actually used and managed their own yards. Specifically, we investigated these research questions related to homeowner preference and behavior:

1. *Stated Preference*: Do homeowners state different preferences for the appearance of backyards than for the appearance of front yards? This has implications for design or planning to increase ecosystem services in backyards.
2. *Current Use*: Do homeowners use their backyards differently from their front yards? This has implications for design or planning that could increase ecosystem services in backyards
3. *Current Management Behaviors*: Are stated preferences for experimental landscapes related to current management behaviors? Some management choices for their yards could have implications for ecosystem services.

1.1 Ecosystem Services from Residential Landscapes

We examine various management behaviors that could affect ecosystem services in residential landscapes. Design can be used to directly incorporate landscape characteristics and elements that contribute to ecosystem services (Nassauer, 1995). Trees, native plants, patch size, and connectivity can enhance ecosystem services including carbon storage and habitat provision.

Trees: Studies consistently find that trees provide environmental benefits, such as carbon storage, indicating that tree planting is an important homeowner behavior (Davies, Edmondson, Heinemeyer, Leake, Gaston, 2011). Fissore et al. (2012) conducted a survey of 360 single-family Minnesota homes in order to assess the relationship between homeowner practices and nutrient and carbon flux. They found that property size and the number of trees on a property were related to higher carbon inputs and landscape accumulation (Fissore et al., 2012). Davies and Edmondson et al. (2011) measured carbon storage across the entire city of Leicester, UK and found that 97.3% of the above-ground carbon pool was in trees (Davies et al., 2011, p. 1125).

Habitat: Rudd, Vala and Schaefer (2002) modeled linkages necessary to create a landscape matrix suitable for a hypothetical species in British Columbia. They found that the number of linkages necessary would require connecting yards, boulevards, and rights-of-way into corridors and that "backyard habitat creation is the best approach to creating the largest ecosystem areas within a zone" (p 372). This is consistent with Forman's (1995) description of a landscape pattern typology that employs patches to create corridors for species movement and other ecological functions. For instance, Forman writes that large patches are essential to landscape function, but smaller patches can supplement larger patches by increasing heterogeneity and assisting with species

dispersal. Connectivity is an indispensable pattern characteristic for facilitating organismic movement among larger patches.

Similarly, we consider how elements within individual yards could potentially be small patches and assist the function of larger patches in the landscape. Patchiness is inherent in the urban landscape (Pickett, Cadenasso, McDonnell, Burch, 2009; Pickett, McGrath and Cadenasso, 2013). Yards, and backyards in particular, can be used to create corridors between these patches. Hansen et al. (2005) summarize several case studies that explore the effects of urban fringe development and rural residential development on biodiversity. Some species are adapted to humans and thrive in residential areas, whereas native species often decline.

While exurban landscapes may enhance potential carbon cycling in trees and habitat functions, there are numerous other impacts of "sprawl," such as the carbon costs of more extensive vehicular travel and reduced transportation connectivity (e.g. Ewing, 1997, Ewing, 2005, Kahn, 2000) Recognizing these impacts, we focus specifically on the ecological potential of exurban residential landscapes, which are the dominant extant landcover type in American metropolitan areas.

1.2 Cultural and Social Norms and Residential Landscape Preferences

Broad cultural norms have a substantial impact on landscapes and human preference; as Nassauer (1993) writes, neatness "is a powerful means of communicating care and neighborliness…and has great cultural value" (p. 55). A challenge for ecological design is to create residential landscapes that are both ecologically beneficial and also perceived as neat (Nassauer, 1997).

Social norms have long been understood to influence human behavior. In an early psychological study on this phenomenon, Crutchfield (1955) demonstrated that subjects frequently gave obviously incorrect answers to simple logical or mathematical questions when led to believe that all other subjects in the group had given this false answer. Furthermore, Crutchfield found that the questions that seemed invulnerable to this type of influence were questions that dealt purely with preference. Numerous studies on this topic (e.g. Bikhchandani, Hirshleifer and Welch, 1992) have found similar results.

Neighborhood level social norms are also an important part of shaping homeowner preferences. Nassauer, Wang and Dayrell (2009) conducted a web survey of 494 homeowners in Southeast Michigan that tested the impact of neighborhood norms on homeowner preferences. Respondents were asked to imagine they were searching for a new home, and first selected a new home from a set of images of homes in the same price range as their current home. Next, they were randomly shown a set of three images of their "new neighbors" yards. There were three sets of neighbor images: one all conventional mown turf set, and two sets that included a mixture of native prairie planting yards, 50% tree yards, and conventional yards. Finally, respondents saw images of the home they selected with different landscape types. The landscapes presented ranged from conventional, to yards with native plants, to yards with large mature trees.

All of the images were of front yards, which are the most visible portion of the yard. The major finding of the study was that respondents were most likely to choose a front yard style for their new home that matched the style of the front yard images they were shown of their neighbors' yards (Nassauer et al., 2009).

A recent survey of 432 homeowners in Ohio also points to the importance of neighborhood norms. Blaine, Clayton, Robbins, and Grewal (2012) asked homeowners about chemical application to their yards, as well as questions about neighbors and motives for landscaping decisions. They found that concern for fitting in with the neighborhood was the main motive for lawn care decisions. Similarly, in a study in Australia, Kurz and Baudains (2010) also largely confirmed Nassauer's (2009) finding that neighborhood-scale social norms have a significant impact on preferences and behaviors in yard management. Their study of 487 residents in two Perth, Australia, neighborhoods found that although Australian preferences for conventional "gardens" were different from American preferences for conventional "gardens" (similar to the American "yard"), neighborhood-scale norms were significantly related to preference.

Preferences for neighborhood setting are also an important component when studying residential design. In a survey of 231 homeowners in Southeast Michigan, Kaplan and Austin (2004) examined respondents' satisfaction with nature near their homes. Their sample included residents from 11 open space communities (OSC) and 8 conventional communities (CC). They found that being able to see forests from home was correlated with satisfying experiences of nature, community, and peacefulness.

At the scale of individual yards, lawns and lawn maintenance have become an important status symbol, influencing the way people manage their yards (Blaine, Clayton, Robbins, and Grewal, 2012). Lawns are a "symbol of prestige" (Robbins and Sharp, 2004; Bormann et al., 2001). Technological advances in lawn mowing and chemical fertilizers put the lawn within reach of many homeowners (Schroeder, 1993; Robbins and Sharp, 2004).

1.3 Backyard and Front Yard Differences: Preferences, Uses, and Behaviors

Front and backyards generally have distinct social meanings and purposes in the United States; traditionally, the front yard is an ornamental space for public view, whereas the backyard is traditionally seen as a more private realm (Schroeder, 1993; Bormann, Balmori, Geballe, 2001). As the vernacular meaning of the yard has developed, the respective roles of the front and back yard have also evolved. In his description of the "popular yard," J.B. Jackson (1987) described the transformation of the backyard from a "utilitarian" place where animals were kept and laundry was hung to dry, to a private "relaxation" space (p. 27-28). He claimed, "The front yard has now become a space dedicated to showing that we are good citizens, responsible members of the community" (p. 29).

Several empirical studies have found differences in preferences for front and backyards. Two related studies in Phoenix, Arizona, studied yard preferences and differences

between preferences and ideals in front and backyards. Although the Phoenix climate is characterized by moisture and temperature constraints that are quite specific to desert biomes, differences between front and backyard preferences in Phoenix may shed light on preferences in different biomes. Both studies used the Phoenix Area Social Survey (PASS), which was conducted in person or over the phone in eight neighborhoods in Phoenix (Larsen and Harlan, 2006). The study used a set of images of four different front and backyard types, asked which they most preferred, then asked follow-up questions about why respondents had chosen a particular yard. The reasons people chose a yard as most preferred were grouped into reasons relating to maintenance, appearance, environmental concerns, and miscellaneous. In general: higher income was associated with not mentioning environmental concerns, while middle income was associated with maintenance concerns; preference for the desert landscape was associated with environmental and maintenance concerns; and preferring lawn or oasis was associated with concerns about appearance (Larsen and Harlan, 2006). The authors note that desert landscaping, which was generally most preferred in the front yard, but not the back, is "perceived by most as more socially correct," and conclude that "in the front yard, form follows fashion, while in the backyard, form follows fantasy" (Larsen and Harlan, 2006, p. 98). Larson, Casagrande, Harlan, and Yabiku (2009) used the same PASS survey in addition to a study of renters in university housing in order to compare yard preferences. They found significant differences in preferences for front and back yards. They note that appearance of the yard was particularly important in respondents' choice of a most preferred front yard.

Studies have also found a difference between front and backyard use. Examining the effects on the use of the front and back of homes in New Urbanist-style developments in Toronto, Hess (2008) found that a higher percentage of the respondents used their backyards for activities such as socializing, relaxing, and gardening despite the neighborhoods having been designed to encourage front yard use. Hess links this to a desire for privacy. There may be strong cultural drives for using backyards as the primary recreation space, even when designers attempt to use built form to alter behavior.

1.4 Governance and Market Strategies and Barriers

Governance and market forces can have significant impacts on the residential landscape. There are many reasons why homebuyers choose a particular home, and they may prioritize other considerations, including price and location, above the appearance of the residential landscape. Governance and market forces may also affect the appearance of the landscape, so homebuyers may not choose a home characterized by their most preferred yard.

Governance and market forces may also affect the land tenure characteristics of open space in exurban subdivisions: whether open space is part of private property included in individual lots, or public space: held in common among landowners in a subdivision or publicly owned. Lichtenberg, Tra, and Hardie (2007) explored the impacts of open space regulations on the amount and public or private open space found in Maryland subdivisions. The authors test a conceptual model of the impacts of land use regulation on open space using data from counties in the Washington/Baltimore metropolitan area.

They looked at the effects of minimum lot size requirements and Maryland's Forest Conservation Act. They found that "both regulation under [the act] and minimum lot size zoning imposed binding constraints, which developers met by expanding forested open space and by increasing lot size at the expense of other public open space" (Lichtenberg, Tra and Hardie, 2007, p. 212).

Governance also mediates yard design and management, whether by promoting ecological design through permitting innovative techniques or prohibiting it through restrictive ordinances. Several methods of ecological residential subdivision design have been described, sometimes with corresponding case studies to evaluate their effectiveness. At the regional scale, Conway (2006) modeled land use change in New Jersey in order to test the ability of four different land use policies—cluster development, wetlands/buffers, and downzoning—to maintain protected green space connectivity. Conway found that none of these policies were adequate in preserving connectivity. The cluster scenario was the most effective in maintaining connectivity between green space patches. Under the model assumptions, however, the clustering approach only delayed development rather than preventing it completely. Consequently, open space in Conway's cluster scenario could be subject to subsequent development rather than maintaining connectivity among designated green spaces.

In contrast to the clustering approach, conservation subdivisions (CSDs) are an idea for clustering homes and also setting aside a predetermined proportion of land in a subdivision. Randall Arendt (2004) advocated for a 40-70% proportion of the subdivision to be set aside for conservation. Ideally, the land conserved would be based on environmental and social criteria, coordinated to provide a broad open-space framework, and would be legally preserved in perpetuity through an easement or similar mechanism (Arendt, 2004). Another potential advantage of conservation subdivisions is that they could provide flexibility for incorporating socially sustainable elements, such as a variety of lot sizes to allow for a variety of incomes (Allen, Moorman, Peterson, Hess, and Moore, 2012). For example, Allen et al (2012) describe a Habitat for Humanity development that incorporated attractive open space, which low-income housing often does not provide, simultaneously increasing ecological function and social justice. However, CSDs do not often live up to these ideals. As Göçmen (2013) notes from her examination of CSD ordinances in Wisconsin, in practice the most ecologically beneficial areas may not be preserved. Hostetler and Drake (2009) attempted to improve upon the CSD concept by incorporating habitat preservation into subdivision design, and emphasize the importance of regulating landscape elements at the scale of the individual yard.

Several studies have also investigated barriers to CSDs and other types of ecological design, and have found that policy barriers can prevent developers from pursuing these methods. Carter (2009) recommended that CSDs must be established as a "use-by-right" in the zoning code in order to be successfully implemented without lengthy delays that are costly deterrents to developers. Conservation subdivisions are expressly permitted in Section 506 of the Michigan's Zoning Enabling Act; in fact, local governments are required to allow them:

> …a qualified local unit of government shall provide in its zoning ordinance that land zoned for residential development may be developed, at the option of the landowner, with the same number of dwelling units on a smaller portion of the land than specified in the zoning ordinance, but not more than 50% for a county or township or 80% for a city or village, that could otherwise be developed, as determined by the local unit of government under existing ordinances, laws, and rules on the entire land area…" (Michigan Zoning Enabling Act, 2006 PA 110)

Göçmen (2013) explored land use regulations related to conservation subdivisions in Wisconsin and interviewed developers to analyze barriers to CSD development. In 15 out of the 19 jurisdictions she examined, all of the zoning districts required "additional steps" for approval that would not have been required in approving a conventional subdivision plan. Again, these additional requirements create additional costs for developers. Göçmen (2013) recommended including density bonuses in regulations permitting CSDs as an incentive to developers.

Non-policy barriers also limit the number of CSDs. In an Iowa study, Bowman and Thompson (2009) found that developers perceived a lack of interest or willingness to pay among homeowners. This belief caused developers to prefer developing conventional subdivision designs rather than CSDs.

Summary: Broad cultural norms, neighborhood norms, and governance and market forces often influence homeowner preferences, use, and management in residential landscapes. Backyards in particular have been found to have distinctive ecological and social characteristics: they can help link ecological corridors, and are used a more private space than the front yard, while front yards tend to evoke greater conformity, both to cultural and neighborhood scale norms. Governance can influence neighborhood and yard design, whether by restricting or permitting it. These elements—preference, management, governance, and market forces—come together to shape the residential landscape.

2. Methods

In the summer and fall of 2011, we conducted a web-survey of southeast Michigan homeowners in order to examine preferences and behaviors. We sent invitations to respondents who participated in our survey from 2005. This survey population had agreed to participate in on-line surveys, and lived in the 10-county region of Southeast Michigan, which includes the Detroit, Ann Arbor, and Flint Metropolitan Statistical Area, and 207 zip codes. Exurban homeowners were identified using zip codes that include municipalities that do not provide sewer or water, and use large-lot zoning. For our 2011 survey sample, we also sent invitations to two other households on the same street, drawn from www.yellowpages.com/whitepages. We mailed invitations to a total of 1301 addresses in June, with the incentive of being entered into a drawing for a home landscape design consultation. In October, we mailed a second reminder postcard with the incentive of $100 gift card. The Post Office returned 122 (9.4% of the initial 1301 cards) as undeliverable, so we removed these from our total. This survey methodology was in compliance with our institution's Institutional Review Board. We had a total of 126 usable responses (10.7%). We generated our survey using the survey company Qualtrics and downloaded our results into SPSS 20 and 21 for analysis.

Compared with census data from our survey area (United States Census Bureau, 2010), our sample tended to be older, to underrepresented those earning less than $49,000, and to overrepresented households with children. However, because all of our respondents were homeowners, these differences in demographics are not surprising.

Survey Instrument: Our survey instrument was an image-based web questionnaire. To measure their most preferred designs for front and back yards, respondents saw a series of front and backyard images, intentionally designed to display different yard characteristics (see Table 1) and were asked to select their most preferred yard. We also asked respondents forced-answer questions about yard management practices and uses in their actual yards in order to compare stated preferences with actual behaviors.

We used the following definitions and variables within the instrument and for our analysis:

Stated Preferences for Front and Backyard Images: In order to understand people's preferences for yards without being constrained either by what they actually had, we asked respondents to choose a new front yard and backyard for themselves, disregarding cost and imagining their own home in place of the one shown. Residents could only select one image from the set of front yards, and one from the set of backyards.

Respondents saw a total of five front yard types and nine backyard types (Table 1). Each respondent saw one of two replicates of each of the five front yard types and nine backyard types. The front yard images were digital visualizations intended to show a range of yard types from conventional to ecologically innovative. All front yard images were designed to convey "cues to care" (Nassauer 2011). Mature Tree and Young Tree

front yard images were heavily wooded. The Conventional yard was dominated by mown turf, while the 50% Native and 75% Native yards had native prairie planting gardens.

The backyard images were similarly intended to show a range of yard types, and also included specific elements, such as storage space and vegetable gardens, that may typically be found in the backyard. The Little Enclosure, Turf Dominated backyard was the most conventional, with nearly the whole yard in mown turf. Two backyard types (Native Woodlands with Turf Beneath and Native Woodlands with Little or No Turf), were dominated by large trees with little or no mown area. The Vegetable Garden, Play Area, and Storage Area backyard types included functional elements but otherwise were dominated by mown lawn. The Flower Garden type and Unmown with a Strong Mown Edge type include less turf. The Distant Wetland backyard type included some mown turf with a wetland visible in the distance.

Follow-up: Reasons for Stated Preference: We asked follow-up questions to determine what people liked about the yards they most preferred. Respondents selected from a list of items (such as neatness, privacy, or the large trees, see Table 2) the items that they liked about their most preferred yard; these reasons were then coded into binomial yes/no variables. We used crosstabs and a Chi-Square statistic to compare the preferred yards with the reasons for preference. Some of the reasons for preference related to specific physical attributes of the yard, such as "the trees," while others were more subjective characteristics, such as privacy and neatness.

We also tested whether there was a significant front yard-backyard difference between each of the characteristics respondents reported liking about the front and backyard. For each characteristic (such as "the flowers" or "the privacy") we used a McNemar test to test for significant differences. The McNemar Test compares the number of respondents who selected a given characteristic as a reason for selecting their most preferred front yard versus the number who selected the given characteristic as a reason for selecting their most preferred backyard. The wording of each item was the same in the front and backyard except for the items relating to trees: in the front yard, residents could select "the large trees" or "the number of trees," but we operationalized these items as "it's sunny" or "it's shady" in the backyard.

Yard Use: Respondents indicated the ways they use their actual yards. First, they selected all the activities they did in their front and backyards from a list. Then they chose the three activities that they most frequently did in the front and back yard. These responses were also coded into binomial yes/no variables. We used McNemar's test in order to determine whether respondents used their front and backyards significantly differently for the same activity.

Yard Management, Demographic Variables, Neighborhood Fit: We examined whether preferring "more-wooded" or "less-wooded" types in either front or backyard, both yards, or one yard over the other (more-wooded in back and front, more-wooded only in front, more-wooded only in back, less wooded in both front and back), had any relationship with the yard management, demographic variables, or a desire to fit into the

neighborhood. We used these variables in crosstabs using a Chi-Square statistic (or Fisher's Exact test if the cell counts were below five) with respondents' yard preferences:

Management Behaviors:
-Lawn Mowing: We asked respondents to indicate the proportion of their lawn that was mown, which we then aggregated into a binomial variable "less than half mown" (n=36) or "more than half mown" (n=74).
-Trees: Respondents reported the number of large trees (greater than 12" diameter at breast height) currently on their property as well as the number of trees they had planted.
-Leaf Disposal: Respondents indicated how they had most disposed of leaves on their property the previous fall: nothing/left in place, composted/moved, mulching mower, curb, burned

Neighborhood Variables and Factors Affecting Yard Care
-Neighborhood Fit: We asked respondents to indicate how much their desire to fit into the neighborhood affected their yard care choices using a 5-point Likert scale, which we then aggregated into two categories: affects very little and affects.
-The Environment and Neatness: We also asked respondents how much protecting the environment affected their yard management decisions, which we aggregated from a 5-point Likert scale into three categories: affects very little, somewhat effects, affects very much. We asked them the same question about neatness and aggregated the scale into the same three categories.

Demographic
-Age: We asked respondents for their age, which we then categorized as less than 50 and 50 or over.
-Children: Respondents indicated whether or not they had children at home.

We compared how people responded to neighborhood norms in their practices versus their stated preferences. We used the follow-up question about why they had chosen the particular front and backyard image they chose as their most preferred, and looked at whether fitting in with their current neighborhood was a factor in determining their preference. We compared that with the question that asked how much of their current yard management decisions were affected by a desire to have their yard fit in with the rest of the neighborhood.

3. Results

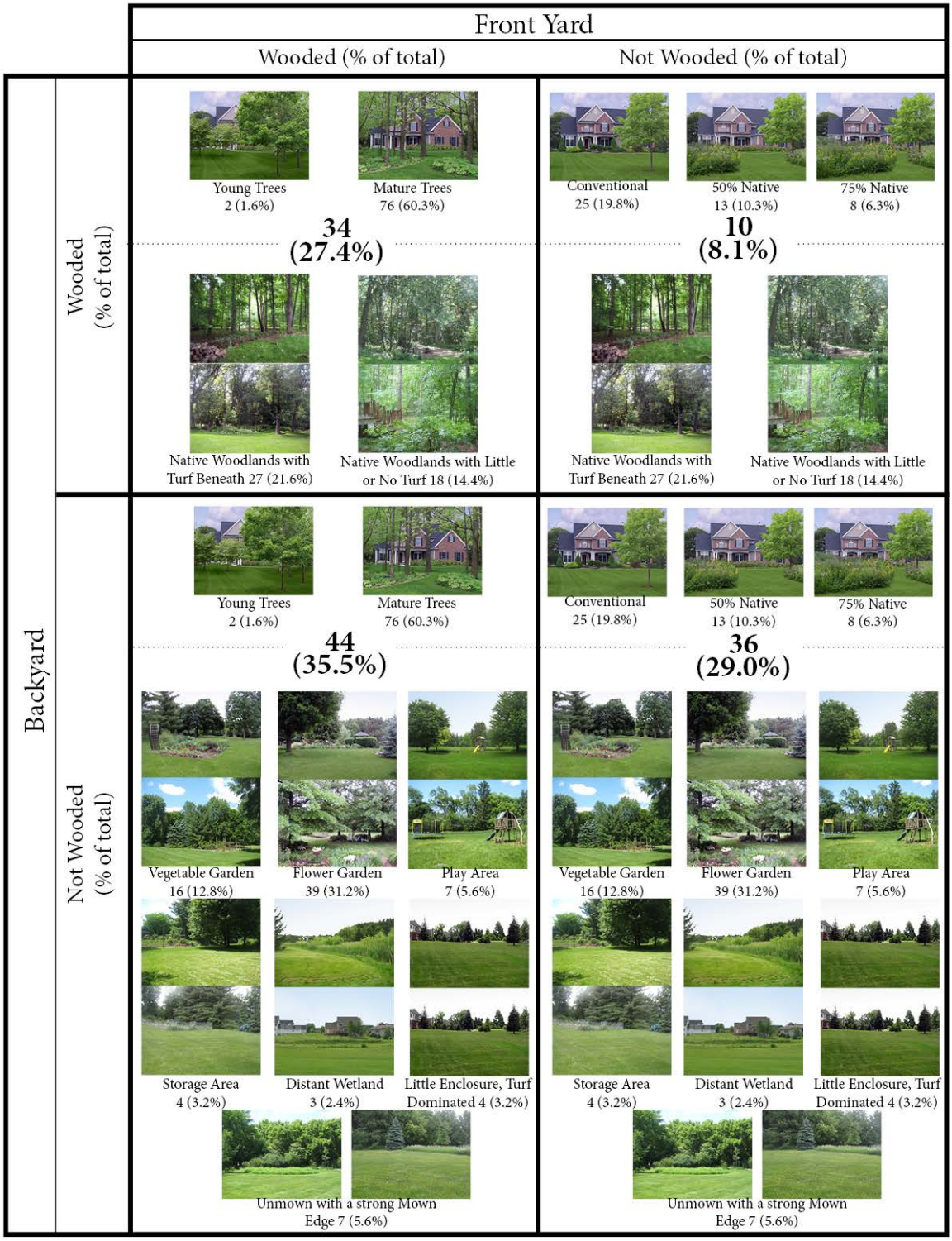
3.1. Stated Preferences for Front and Backyard Images:

Table 1 shows the distribution of respondents' preferred front and backyards, and groups them by whether the yard was heavily wooded ("more wooded") or not ("less wooded"). The majority of respondents (61.29%) chose Mature Trees as their preferred front yard, while only 19.8% chose the Conventional yard (Table 1). The two most popular backyards also had a small amount of turf visible: the Native Woodlands with Turf Beneath (21.6%) and the Floristic Zone of Care (31.2%) yards were the two most preferred. The Native Woodlands with Little or No Turf was third most preferred (14.4%).

We aggregated the most preferred yard variables into "more wooded" or "less wooded" for both the front and backyards. Using cross-tabs, we developed a 4-part variable (Table 1). Most respondents (62.9%) chose a more wooded front yard, while most 64.5% preferred a less wooded backyard. Combined, 36.0% of respondents preferred the two heavily treed backyards (Native Woodlands with Turf Beneath and Native Woodlands with Little or No Turf).

A cross tabulation of more wooded and less wooded front and backyard types shows that the greatest number of respondents chose a more wooded front yard and a backyard that was less wooded (Chi-square = 6.035, $p<0.05$). Choosing a more wooded front yard is not dependent on choosing a more wooded backyard. Of those who chose a more wooded front yard, over half chose a backyard that was less wooded (55.0%). Of the respondents who chose a more wooded backyard, 77.3% also chose a more wooded front yard. Only 8.1% of respondents chose a less wooded front and backyard.

[Table 1: More Wooded/Less Wooded Front and Backyard Typology]



Follow-up Questions about Stated Preference: There were several significant differences between front and backyards in what people said they preferred about their most preferred yards, particularly relating to neatness, trees, privacy, wildlife, and fitting into the neighborhood (Table 2). The most frequently selected reason for choosing a most preferred front yard was "the number of trees." This was followed by neatness. The two most frequent reasons for selecting a most preferred backyard were looking good for wildlife and privacy. Neatness was generally important, but more often important in choosing the most preferred front yard. Interestingly, neatness was far more important in the front yard than in the backyard for those who most preferred both a more wooded front and backyard, as well as those who most preferred a less wooded front and backyard. Those who preferred more wooded front yards were most likely to state that the large trees or the number of trees was important in their choice. Privacy was important to more of those who preferred more wooded backyards. Those who preferred a less wooded front and backyard were less likely to prefer a backyard because it looked good for wildlife.

Flowers: There was no statistically significant difference in choosing "the flowers" as a reason for respondents selecting their most preferred front and backyards. People who chose only a more wooded backyard had the highest proportion selecting that the flowers were something they liked about their most preferred front yard, but the difference was not statistically significant among the four yard types (Fisher's Exact Test = 7.047, $p>0.05$). "I like the flowers" in the backyard was statistically different for the overall sample (Fisher's Exact Test = 13.272, $p<0.05$). People who chose the more wooded backyard were less likely than those who selected a less wooded backyard to indicate that the flowers were something they liked about their most preferred backyard. There were no flowers prominent in the heavily wooded images.

Neatness: There was a significant difference in whether respondents chose neatness as a reason for selecting their most preferred front and backyard (Chi-Square: 14.922): a higher percentage of respondents indicated that neatness was a reason for selecting their most preferred front yard (71%) than indicated it was a factor in selecting their most preferred backyard (54%). There were significant differences across the four yard types in identifying neatness as a reason for selecting their most preferred backyard (Fisher's Exact Test: 13.272, $p<0.05$). A higher percentage of respondents who did choose a less wooded front yard indicated that neatness was a reason for selecting their most preferred front yard: 90.0% of those who chose only a more wooded backyard, and 86.1% of those who chose a less wooded front and backyard selected neatness as a factor in selecting their most preferred front yard (Table 2).

Trees: There were statistically significant differences in selecting "large trees" as a reason for choosing a most preferred front yard and "its shady" (Chi-square: 17.413) or "its sunny" (Chi-square: 3.234) in the backyard, as well as a significant difference in "the number of trees" and "its shady" (Chi-square: 6.071) or "its sunny" (Chi-square: 0.151). Respondents who chose both more wooded front and backyards were very likely to indicate that "the large trees" (91.2%) and "the number of trees" (91.2%) were what they preferred in the front yard (Table 2). Both of these front yard characteristics were

statistically significantly different across the four yard types (Large Trees: Fisher's Exact Test=61.831; $p<0.05$, Tree Number: Fisher's Exact Test=30.197, $p<0.05$).

Privacy: There was a significant difference in whether respondents chose privacy as a reason for selecting their most preferred front and backyard, with a higher percentage of respondents selecting it in the backyard (Chi-Square 6.759). Privacy as a reason for choosing a given front or backyard was statistically significant across the four types (Front yard: Fisher's Exact Test=19.569, $p<0.05$; Backyard: Fisher's Exact Test=11.554, $p<0.05$). The group of respondents who chose both a more wooded front and backyard had different responses in the front yard than in the backyard; just over half (55.9%) of the respondents who chose both a more wooded front and backyard indicated that privacy was a reason for selecting their most preferred front yard, while 82.4% indicated that this was a factor in choosing their most preferred backyard (Table 2). Of those who selected a less wooded front and backyard, only 22.2% indicated that privacy was a reason they chose their most preferred front yard.

Wildlife: There was a significant difference in whether respondents chose wildlife as a reason for selecting their most preferred front and backyard (Chi-Square 11.885). Overall, a higher percentage of respondents indicated that attracting wildlife was a reason for choosing their most preferred backyard (71.8%) than front yard (52.4%). Respondents with different yard types were significantly different in identifying "looks attractive to wildlife" as a reason for choosing their most preferred front yard (Fisher's Exact Test=11.872, $p<0.05$) and most preferred backyard (Fisher's Exact Test-10.958, $p<0.05$). Compared with those who chose a less wooded front and backyard (30.6%), respondents who chose a more wooded backyard, but not a more wooded front yard, more frequently selected "wildlife" as a reason for choosing their most preferred front yard (40.0%)

Neighborhood: Respondents with different yard types were not significantly different in identifying "fitting in" with the neighborhood as a reason for choosing their most preferred front or backyard (Front yard: Fisher's Exact Test=1.587, $p>0.05$; Backyard: Fisher's Exact Test=0.396, $p>0.05$)

Environment: Looking good for the environment was statistically different for front yards (Fisher's Exact Test= 12.098, $p<0.05$) and backyards (Fisher's Exact Test=13.325, $p<0.05$). Those who selected a more wooded yard, whether front, back, or both, had over 50% of respondents say that "it looks good for the environment" was a reason for selecting their most preferred backyard, while less than a third of those who selected a less wooded front and backyard said that looking good for the environment was a reason for their choice.

"It looks good for the environment" was statistically different across the four backyard types. People who chose a more wooded front yard were the most likely to select this answer, but those who only chose a more wooded front yard and not a more wooded backyard had a higher proportion (68.2%) of people who selected that they like it because it "looks good for the environment" than those who selected both a more wooded front and backyard (58.8%).

Maintenance: Maintenance was not statistically different across the four yard types as a reason for liking the most preferred front or backyard. (Front yard: Fisher's Exact Test= 2.657, $p>0.05$; Backyard: Fisher's Exact Test=0.443, $p>0.05$)

Gardening: Gardening was only given as a reason for choosing a most preferred backyard. Gardening was statistically different among the four yard types (Fisher's Exact Test=11.035, $p<0.05$). Respondents who chose both a more wooded front and backyard were the least likely to select that gardening was a reason for choosing their most preferred backyard, but those who chose only a more wooded backyard were about as likely as those who did not to choose gardening as a reason for selecting their most preferred backyard.

Overall Front and Backyard Differences: In summary**,** neatness, privacy, and wildlife appear to have different levels of importance in front and backyards: a higher percentage of respondents indicated that neatness was an important in selecting their preferred front yard (71.0%) than in they did in the backyard (54.0%), while the reverse was true for wildlife (front yard: 52.4%, backyard: 71.8%) and privacy (front yard: 41.1%, backyard: 61.3%).

[Table 2: More Wooded/Less Wooded Typology with Follow-Up Questions]

	Both More Wooded	**More Wooded BY only**	**More Wooded FY only**	**Both Less Wooded**	Total	Chi-Square	Fishers
	Percent of total within each category				Percent of total respondents	(*=sig. at 0.05 level)	(*=sig. at 0.05 level)
What they liked							
FLOWERS							
FY:	11 (32.4%)	7 (70.0%)	19 (43.2%)	21 (58.3%)	58 (46.8%)	7.167	7.047
BY:	7 (20.6%)	3 (30.0%)	26 (59.1%)	19 (52.8%)	55 (44.4%)	13.522*	13.720*
				McNemar	p>0.05	7.304	
NEATNESS							
FY:	22 (64.7%)	9 (90.0%)	26 (59.1%)	31 (86.1%)	88 (71.0%)	9.424*	9.320*
BY:	10 (29.4%)	8 (80.0%)	25 (56.8%)	24 (66.7%)	67 (54.0%)	13.464*	13.272*
				McNemar	**p<0.05**	**14.922**	
TREES							
FY: (The large trees)	31 (91.2%)	2 (20.0%)	37 (84.1%)	6 (16.7%)	76 (61.3%)	59.842*	61.831*
			vs. Shady:	**McNemar**	**p<0.05**	**17.413**	
			vs. Sunny:	**McNemar**	**p<0.05**	**3.234**	
FY: (The number of trees)	31 (91.2%)	4 (40.0%)	40 (90.9%)	17 (47.2%)	92 (74.2%)	31.327*	30.197*
			vs. Shady:	**McNemar**	**p<0.05**	**6.071**	
			vs. Sunny:	**McNemar**	**p<0.05**	**0.151**	
BY: (Its shady)	21 (61.8%)	4 (40.0%)	23 (52.3%)	9 (25.0%)	57 (46.0%)	10.636*	10.739*
BY: (Its sunny)	8 (23.5%)	4 (40.0%)	17 (38.6%)	20 (55.6%)	49 (39.5%)	7.526	7.524
PRIVACY							
FY:	19 (55.9%)	0 (0.0%)	24 (54.5%)	8 (22.2%)	51 (41.1%)	18.628*	19.569*
BY:	28 (82.4%)	7 (70.0%)	25 (56.8%)	16 (44.4%)	76 (61.3%)	11.354*	11.554*
				McNemar	**p<0.05**	**6.759**	
WILDLIFE							
FY: (Looks good for wildlife)	21 (61.8%)	4 (40.0%)	29 (65.9%)	11 (30.6%)	65 (52.4%)	11.919*	11.872
BY: (Looks good for wildlife)	27 (79.4%)	8 (80.0%)	36 (81.8%)	18 (50.0%)	89 (71.8%)	11.929*	10.958*
				McNemar	**p<0.05**	**11.885**	
NEIGHBORHOOD							
FY:	14 (41.2%)	5 (50.0%)	14 (31.8%)	14 (38.9%)	47 (37.9%)	1.484	1.587
BY:	13 (38.2%)	4 (40.0%)	19 (43.2%)	16 (44.4%)	52 (41.9%)	0.328	0.396
				McNemar	p>0.05	37.970	
ENVIRONMENT							
FY:	20 (58.8%)	3 (30.0%)	30 (68.2%)	12 (33.3%)	65 (52.4%)	12.215*	12.098
BY:	19 (55.9%)	7 (70.0%)	29 (65.9%)	10 (27.8%)	65 (52.4%)	13.377*	13.325*
				McNemar	p>0.05	37.989	
MAINTENANCE							
FY:	15 (44.1%)	6 (60.0%)	19 (43.2%)	21 (58.3%)	61 (44.1%)	2.657	2.657
BY:	17 (50.0%)	5 (50.0%)	20 (45.5%)	19 (52.8%)	61 (49.2%)	0.443	0.519
				McNemar	p>0.05	25.956	
GARDENING							
BY: (It is a good place to garden)	11 (32.4%)	6 (60.0%)	29 (65.9%)	24 (66.7%)	70 (56.5%)	11.212*	11.035*
TOTALS (% of total)	**34 (27.4%)**	**10 (8.1%)**	**44 (35.5%)**	**36 (29.0%)**	**124 (100%)**		

3.2. Yard Use

People use front and backyards significantly differently for most listed activities (Table 3). More respondents reported using their backyard for all activities when asked to select all the ways they use their yard. Viewing wildlife, relaxing outdoors, having parties, children's play space, storage space, gardening, and having a place for pet exercise were all identified as backyard activities or uses by more respondents than as front yard activities. The only activities that were not statistically different between the ways people report using their front and backyards was vehicle storage and "other." However, when asked to select the three ways they most frequently use their yard, more respondents reported using their front yard (51.6%) for viewing from inside the home more than the backyard (31.7%).

[Table 3: Use Differences between Front and Backyards]

Activity	**Front**	**Back**	**Front Most**	**Back Most**
Viewing wildlife/feeding birds	**51 (40.5%)**	**102 (81.0%)***	**43 (34.1%)**	**59 (46.8%)***
Sports/exercise/walking	**10 (7.9%)**	**42 (33.3%)***	3 (2.4%)	8 (6.3%)
Relaxing/lounging/eating	**38 (30.2%)**	**105 (83.3%)***	**20 (15.9%)**	**75 (59.5%)***
Car or other motor vehicle or boat storage or maintenance	20 (15.9%)	26 (20.6%)	13 (10.3%)	5 (4.0%)
Parties/events, etc	**8 (6.3%)**	**77 (61.1%)***	**3 (2.4%)**	**24 (19.0%)***
Childrens' play space	**29 (23.0%)**	**52 (41.3%)***	21 (16.7%)	22 (17.5%)
Other storage	**1 (0.8%)**	**28 (22.2%)***	1 (0.8%)	6 (4.8%)
Viewing it from inside your home	93 (73.8%)	100 (79.4%)	**65 (51.6%)**	**40 (31.7%)***
Gardening	**75 (59.5%)***	**101 (80.2%)***	62 (49.2%)	63 (50.0%)
Pet exercise space	**33 (26.2%)**	**67 (53.2%)***	**20 (15.9%)**	**43 (34.1%)***
Other	3 (2.4%)	9 (7.1%)	-	3 (2.4%)
I do not use my front yard	**12 (9.5%)**	**1 (0.8%)***	-	-
*McNemar Test Significant at p<0.05				

3.3. Current Yard Management: Influences and Practices

In addition to the ways people indicated choosing their most preferred front and backyard image, we also asked respondents about the reasons why they manage their actual yard the way they do, as well as how they manage it. Several neighborhood variables strongly affected respondents' actual yard management decisions regardless of yard type. These included neighborhood fit, the environment, and neatness; the majority of respondents in almost every yard type reported that fitting into the neighborhood, caring for the environment, and neatness affected their management behaviors. None of the "neighborhood," "factors affecting yard care," or "demographic" variables were statistically significantly different across the four yard types.

[Table 4: More Wooded/Less Wooded Typology by Neighborhood, Factors Affecting Yard Care, and Demographic Variables]

	Both More Wooded	More Wooded BY only	More Wooded FY only	Both Less Wooded	TOTAL	Chi-Square	Fishers
Neighbor-hood/ Demographic Variables	Percent of total within each category				Percent of total respondents	(*=sig. at 0.05 level)	
NEIGHBOR-HOOD FIT							
Affects very little (1+2)	7 (23.3%)	2 (20.0%)	7 (18.9%)	9 (26.5%)	25 (22.5%)	0.627	0.697
Affects (3+4+5)	23 (76.7%)	8 (80.0%)	30 (81.1%)	25 (73.5%)	86 (77.5%)		
FACTORS AFFECTING YARD CARE							
The environment							
Affects very little (1+2)	2 (6.7%)	3 (30.0%)	1 (2.7%)	5 (14.7%)	11 (9.9%)	10.084	9.275
Somewhat affects (3)	10 (33.3%)	3 (30.0%)	10 (27.0%)	13 (38.2%)	36 (32.4%)		
Affects very much (4+5)	18 (60.0%)	4 (40.0%)	26 (70.3%)	16 (47.1%)	64 (57.7%)		
Neatness							
Affects very little (1+2)	1 (3.3%)	1 (10.0%)	1 (2.7%)	2 (5.9%)	5 (4.5%)	3.719	3.999
Somewhat affects (3)	5 (16.7%)	0 (0.0%)	8 (21.6%)	5 (14.7%)	18 (16.2%)		
Affects very much (4+5)	24 (80.0%)	9 (90.0%)	28 (75.7%)	27 (79.4%)	88 (79.3%)		
DEMO-GRAPHIC							
Age							
Less than 50	15 (44.1%)	6 (60.0%)	17 (38.6%)	12 (33.3%)	50 (40.3%)	2.595	2.589
50 or over	19 (55.9%)	4 (40.0%)	27 (61.4%)	24 (66.7%)	74 (59.7%)		
CHILDREN							
NO	22 (64.7%)	5 (50.0%)	26 (59.1%)	23 (63.9%)	76 (61.3%)	0.897	0.979
YES	12 (35.3%)	5 (50.0%)	18 (40.9%)	13 (36.1%)	48 (38.7%)		

[Table 5: Effect of Neighborhood Influence: Preference vs. Management]

		Front Yard			Backyard		
		No	Yes	Chi-Square	No	Yes	Chi-Square
Neigh-borhood Fit	**Affects very little**	15 (23.1)	10 (21.7)	2.392	13 (20.6)	12 (25.0)	0.329
	Somewhat affects	22 (33.8)	10 (21.7)		19 (30.2)	13 (27.1)	
	Affects very much	28 (43.1)	26 (56.5)		31 (49.2)	23 (47.9)	

Actual Yard Management: The next set of results related to how people reported managing their actual yards. Lawn mowing is the only management behavior that was significantly different across yard types (Fisher's Exact Test = 12.144, $p < 0.05$). Those who chose a more wooded front yard were less likely to mow more than half of their lawn than those who did not choose a more wooded front yard. The most distinctive difference is in respondents who chose only a more wooded backyard or both a less wooded front and backyard: these respondents were very likely to mow more than half of their lawn (Table 6). Respondents who selected a more wooded backyard only (77.8%) were most likely to mow more than half of their property, while 88.2% of respondents who selected neither a more wooded front nor backyard mowed more than half.

[Table 6: More Wooded/Less Wooded Typology by Management Behaviors]

	Both More Wooded	**More Wooded BY only**	**More Wooded FY only**	**Both Less Wooded**	**TOTAL**	**Chi-Square**	**Fishers**
Management Behaviors	Percent of total within each category				Percent of total respondents	(*=sig. at 0.05 level)	
LAWN MOWING							
Less than half lawn	13 (43.3%)	2 (22.2%)	17 (47.2%)	4 (11.8%)	36 (33.0%)	12.144*	12.655*
More than half lawn	17 (56.7%)	7 (77.8%)	19 (52.8%)	30 (88.2%)	73 (67.0%)		
TREES							
Large Trees							
0	6 (20.0%)	3 (30.0%)	5 (13.5%)	7 (20.6%)	21 (18.9%)	4.018	4.318
1-9	16 (53.3%)	3 (30.0%)	18 (48.6%)	19 (55.9%)	56 (50.5%)		
10 or more	8 (26.7%)	4 (40.0%)	14 (37.8%)	8 (23.5%)	34 (30.6%)		
Trees Planted							
0	6 (20.0%)	3 (30.0%)	8 (21.6%)	7 (20.6%)	24 (21.6%)	3.368	3.521
1-9	14 (46.7%)	6 (60.0%)	19 (51.4%)	14 (41.2%)	53 (47.7%)		
10 or more	10 (33.3%)	1 (10.0%)	10 (27.0%)	13 (38.2%)	34 (30.6%)		
LEAF DISPOSAL							
Nothing/ left in place	6 (21.4%)	1 (11.1%)	6 (17.1%)	9 (28.1%)	22 (21.2%)	10.307	8.061
Composted/ moved	10 (35.7%)	2 (22.2%)	14 (40.0%)	9 (28.1%)	35 (33.7%)		
Mulching mower	6 (21.4%)	1 (11.1%)	8 (22.9%)	7 (21.9%)	22 (21.2%)		
Curb	4 (14.3%)	2 (22.2%)	5 (14.3%)	5 (15.6%)	16 (15.4%)		
Burned	2 (7.1%)	3 (33.3%)	2 (5.7%)	2 (6.3%)	9 (8.7%)		
***some columns do not add up to the totals because not all respondents answered all questions**							

4. Discussion:

We found that homeowners state different reasons for choosing their most preferred front and backyards. In our study, the fact that choosing a more wooded front yard was not dependent on choosing a more wooded backyard also indicated that people have different preferences for front and backyards. Generally, our findings contribute to the understanding of the front yard as a place for show and the backyard as a more private realm. The reasons respondents gave for selecting their most preferred front and backyards give insight into how people perceived the yards they were viewing. Trees and neatness were the most frequent reasons for selecting a front yard, while the appearance of being attractive to wildlife and providing privacy were the most frequent reasons for selecting a backyard. Neatness was also selected as a reason for choosing a most preferred front yard more often than in the backyard, while a higher proportion of respondents selected privacy and viewing wildlife in the backyard. For design recommendations, these characteristics are important to incorporate.

In addition to having different preferences for front and backyard characteristics, respondents also reported using their front and backyards differently. Consistent with the understanding of backyards as a more private realm, respondents used their backyards for a wider variety of activities (e.g., relaxing, hosting parties), and front and backyard use was significantly different for nearly all of the activities. The only activity for which the front yard was used more than the backyard was “viewing from inside the home”, which was identified as the most frequently front yard activity (when respondents selected the way they used their yards most). This contributes to our understanding of the front yard as a place mostly for show, whereas the backyard is more for personal, private use.

Our last set of results compared how people manage their actual, current yards, why they manage them the way they do, and whether these behaviors related to stated preferences. In our previous investigations based on this survey population and dataset, we found relationships between a desire to fit in the neighborhood and current yard management behaviors. However, in this study, our results indicate that there is no relationship between stated preference for a hypothetical yard in the four yard types and a desire to fit in with the neighborhood in actual yard management, or stated yard preference in the four yard types and actual yard management behaviors, with the exception of lawn mowing. Those who chose a less wooded front yard were far more likely to mow less than half of their lawn, which is also an indicator of a less conventional management style. Yet notably, we did not find a relationship between the number of trees present on respondents’ properties—or the number of trees respondents planted—and the four yard types. The fact that fitting into the neighborhood was not statistically significant across the four yard types suggests that neighborhood context might play a different role in determining actual behaviors than it does in stated preferences that are not constrained by neighborhood contextual information.

The difference between stated preferences and management behavior is particularly evident in our finding related to stated preference for more wooded yards compared with current management behavior. For example, of respondents who preferred both a more

wooded front and backyard, only about a quarter (26.7%) of those respondents reported having 10 or more large trees on their property, nearly the same percentage as those who preferred both a less wooded front and backyard (23.5%). These results could indicate that respondents' real world behaviors are constrained by variables that were not captured by their stated preferences for hypothetical yard choices. These variables could include constraints posed by neighborhood norms that contradict personal preferences and constraints posed by market supply that does not offer preferred choices. Both potential neighborhood effects and potential limits on market supply imply a potential latent market demand for alternative forms of subdivision design. It could be that respondents had preferences that were not reflected in the properties they actually owned and in their behaviors managing those properties. In addition, the most frequently preferred yards were characterized by ecologically beneficial characteristics like large trees in the front yard, and large trees or low-turf backyards.

The preference results relating to trees and parcel characteristics, such as privacy, are important to our study, because they can be incorporated into ecological design to increase ecosystem services and increase patch connectivity. Trees provide habitat, privacy, and carbon storage, while native plants are also usually attractive to wildlife (Hansen et al., 2005; Davies et al., 2011; Fissore et al., 2012). Also, our results indicate that our respondents thought large trees could be perceived as neat: 89.5% of those who chose the Mature Tree front yard indicated that neatness was an important factor in their choice. This could suggest that while neatness is very important in the front yard, even front yards that are not dominated by open turf may be perceived as neat, and thus valued.

5. Conclusion

Developing more ecologically designed neighborhoods that fit with stated preferences could allow more people to purchase homes that meet their needs, and also have a home landscape they desire. The conservation subdivision approach provides several advantages over conventional subdivisions in its ability to incorporate ecological design and land preservation, while also aligning with homeowner preferences. However, the way conservation subdivisions are often designed does not optimally achieve ecological goals or resident satisfaction. Based on our results and previous literature, we propose that design and policy can be employed to increase ecosystem services through ecological design in residential areas.

The preference for yard designs including many trees suggests that conservation subdivision designs that preserve connected patches of wooded areas could be a preferred landscape type. Wooded areas provide many ecological benefits, such as habitat and carbon storage (Davies et al., 2011; Fissore et al., 2012; Rudd et al., 2002). Past studies have shown the areas that are conserved in a CSD are not necessarily the most ecologically beneficial, or do not connect well to the larger landscape (Göçmen, 2013). Conservation subdivisions provide a more ecologically beneficial alternative to conventional subdivisions, but developers may not include the most ecologically significant land, or know how best to design the subdivision to match preferences and achieve ecological design goals (Arendt, 2004). In Michigan, conservation subdivisions are specifically enabled, but this does not guarantee that land will be conserved to optimize ecological function (Michigan Zoning Enabling Act 2006). This lack of detail in ordinances suggests that adding language requiring ecological design principles could improve ecosystem services, and possibly better align developments with a broader array of homeowner preferences (Hostetler and Drake, 2009).

Furthermore, the importance of neighborhood-scale influence makes conservation subdivisions uniquely suited to incorporate ecological design into a subdivision design so that the landscape is already in place when residents move in. As the existing neighborhood context has an influence on preference, this may help to promote ecological design on individual yards as well (Nassauer, 2009). Similarly, by aligning the appearance of residential landscapes with preference, these ecological designs will also be more culturally sustainable (Nassauer, 1997).

Our study suggests that homeowners may have unrealized preferences for the appearance of their yards that are different from the way they currently manage their yards. When viewed as novel ecosystems, residential landscapes can use innovative methods to incorporate ecological design and ecosystem services. If design and policy align with homeowner preferences, yard activities, and ecological design goals, landscapes will be more likely to last and provide ecological benefits into the future.

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