

(2012) *Environment and Behavior*, 44(2), 166-196.

Biodiversity in the front yard: An investigation of landscape preference in a domestic urban
context.

Tim Kurz*¹ & Catherine Baudains²

¹*School of Psychology, Murdoch University, Australia*

²*School of Environmental Science, Murdoch University, Australia*

*Address for contact:

Dr Tim Kurz
School of Psychology
College of Life Sciences
Washington Singer Laboratories
University of Exeter
Perry Road
Exeter, EX4 4QG
UNITED KINGDOM

Phone: +44 (0)1392 724657

Email: t.r.kurz@exeter.ac.uk

Biodiversity in the front yard: An investigation of landscape preference in a domestic urban context.

It is being increasingly recognized that the success of efforts to preserve/restore biodiversity in urban areas is highly contingent upon the preferences of human urban dwellers. We investigated preference ratings for photos of high versus low habitat-providing garden landscapes among residents (n= 487) in two specific areas of Perth, Western Australia and their relationship with general environmental concern, attitudes towards native plants and attitudes towards urban biodiversity. We also investigated the impact of localized descriptive gardening norms. Our findings indicate that the distinction between high/low habitat-providing gardens was important to respondents' landscape preferences. The attitudinal variable with the strongest relationship to garden type preference was residents' attitudes towards native plants. Preferences were also highly related to prevailing gardening norms in respondents' local area. We discuss our findings in relation to the structure and dynamics involved in human perceptions of and interactions with urban landscapes.

Keywords: gardens, attitudes; aesthetics; perception; urban

Biodiversity in the front yard: An investigation of landscape preference in a domestic urban context.

The protection and restoration of sustainable ecosystems is one of the critical issues currently confronting planet Earth (Millennium Ecosystem Assessment, 2005). In the Australian context, an increasing number of plant and animal species are under growing threat due to destruction of native habitat, despite the well-documented cultural, aesthetic and recreational importance of native bushland to many Australians (Australian State of the Environment Committee, 2001). Furthermore, protection of biodiversity through native habitat provision in Australia is increasingly being raised as an issue of importance in urban areas, as well as the 'wilderness' areas that have more typically been the focus in such discussions (Australian and New Zealand Environment and Conservation Council and Biological Advisory Committee, 2001; Miller, 2005). This trend is also evident in other nations such as the United Kingdom (DEFRA, 2002). While the ecological importance of developing effective means by which to improve biodiversity in urban areas has been highlighted (Miller & Hobbs, 2002), the success of any such efforts is inseparably linked to the ways in which *human* members of urban ecosystems perceive and interact with the urban landscape (Davies, Webber & Barnes, 2004). Thus, the protection of biodiversity in urban areas is simultaneously an issue of both ecology and psychology. It is this relationship between urban landscape perceptions, attitudes and behaviors and their significance for urban biodiversity that is the focus of the current study.

Landscape preference

The examination within environmental psychology of the ways in which human beings perceive landscapes has been dominated by the study of what has become known as 'landscape preference' (Gärling, 1998). Arguments from an evolutionary perspective have posited the existence of an inherent aesthetic preference among human beings for landscapes with smooth ground planes that enable easy movement across them (Kaplan, Kaplan, &

Brown, 1989) and it has also been suggested that these types of landscapes are often more ecologically 'degraded' (e.g., lack of plant under-story) (Gobster, 1994; 1995), a proposition that has also gained support in some empirical work (e.g., Nassauer 1993; 1995). The assumption that innate human landscape preference may be, somewhat paradoxically, skewed towards less ecologically beneficial landscapes does not always hold however. For example, Williams and Carey (2002) found no evidence for a preference for landscapes of less ecological quality in a southeast Australian context. Laforteza, Corry, Sanesi & Brown (2008) also demonstrated in their examination of preference for different kinds of brown field site rehabilitation that residents actually preferred visualisations of more ecologically functional sites. Similar findings have also been obtained in relation to public aesthetic preference for visualisations of river restoration scenarios of differing eco-morphological quality (Junker & Buchecker, 2008). Thus, it would appear that there is no simple relationship between ecological quality and human landscapes preference.

Another feature of the landscape preference literature has been the suggestion that humans prefer highly 'natural' landscapes to those that are more human-dominated ('built') (Kaplan & Kaplan, 1989). Moreover, it has been suggested that exposure to such natural landscapes produces psychological and physiological benefits (Ulrich, 1986; Van den Berg, Koole & van der Wulp, 2003). At a more specific perceptual theory level, landscape preference research has examined the generalized perceptual structure of scenes and suggested a number of generic theoretical concepts that have been argued to underlie perception of all landscapes. The most dominant perceptual paradigm in this domain has been Kaplan and Kaplan's Landscape Preference Model (Kaplan & Kaplan, 1982; 1989; Kaplan, 1972; 1982; 1988; 1992), which argues, from a predominantly evolutionary perspective, that humans have adapted to prefer environments that are simultaneously a) easy to comprehend (or 'make sense of') and b) challenging/involving.

Individual differences in landscape preference

Of particular relevance to the research reported here, however, are the findings of Kaplan and Herbert's (1987) cross-cultural examination of landscape preference rating in which they had a range of photos of landscapes from south-western Western Australia aesthetically rated by a sample of students from a Western Australian university, a sample from a Michigan university, and also a group of members of the Western Australian Wildflower Society. The resulting ratings showed that the *within*-culture differences in ratings between Western Australian students and the WA Wildflower Society participants were greater than those between the West Australian and Michigan students, highlighting the potential importance of knowledge and/or more attitudinal or ideological variables in responses to landscapes. Indeed, as Zube observed in 1991, the majority of landscape perception and preference research conducted in the 25 years prior had suffered from a rather narrow focus that excluded analyses of "how individuals and groups use these landscapes...the meanings they associate with them and...the relative importance of aesthetic values compared with the host of other landscape values such as ecologic, historic, economic and symbolic" (p.331).

Since 1991 there have been some notable movements within the landscape preference literature towards addressing the extent to which preferences for particular *kinds* of landscapes might be moderated by demographic or attitudinal variables. For example, differences have been observed between farmer and non-farmer groups in relation to beauty ratings of agrarian and wilderness scenes (Brush, Chenoweth & Barman, 2000; Van den Berg, Vlek & Coeterier, 1998). Differences in landscape preference have also been observed as a function of specific attitudinal dimensions such as Thompson and Barton's (1994) Environmental Value Orientation (Kaltenborn and Bjerke, 2002). More specifically, Solvia and Hunziker (2009) have demonstrated that those who indicate higher concern for the

conservation of species and natural processes show preference for reforested alpine landscapes over cultural landscapes, with preference for cultural landscapes being related to higher utilitarian values.

Despite this growing interest in the intersection between ideology and aesthetics in the context of rural landscapes, there has, until recently, been far less work examining such factors in the *urban* domain. While many studies demonstrate a general preference for ‘natural’ over built landscapes, less work has focussed on preferences for different types of landscaping within the urban domain and the psychological factors that might produce individual and group differences in such preferences.

Landscape preference and urban ecology

This historical tendency towards a non-urban focus of landscape preference research mirrors a similar historical bias among conservation biologists towards the study of non-(human) populated areas. As Miller and Hobbs (2002) highlight, this is despite the fast-growing threat that urban expansion poses for the biodiversity values of a rapidly growing area of highly bio-diverse land. While some urban development does involve the retention of patches of remnant vegetation, the issue of habitat fragmentation poses a particular threat to the level of biodiversity within urban areas (Theobald and Hobbs, 2002). The establishment of ‘green corridors’ (or ‘biodiversity corridors’) to link up remnant patches of habitat is often proposed as a remedy to this situation (Niemela, 1999), however such potential corridors in urban areas are often comprised of small plots of privately-owned/occupied residential land (i.e. front/back yards). Consequently, the success of attempts to establish green corridors in urban areas often relies heavily upon the gardening activities that residents in a particular area adopt (e.g., the types of plants planted in gardens). Given that human activities have been shown to be the overwhelming influence on garden vegetation, understanding residents’ perceptions of and preferences for garden landscapes with differing levels of habitat-provision therefore becomes crucially important (Goddard, Dougill & Benton, 2009).

Much of the work that has examined interactions between humans and landscapes in the urban domain had been focused on *public* greenspaces, both in terms of the ways in which they are perceived by residents (Bonnes, Uzzell, Carrus & Kelay, 2007; Ozguner & Kendle, 2006) and the potentially restorative functions that they serve in relation to residents' health (Maller et al. 2008; van den Berg, Hartig & Staats, 2007; Tzoulas et al., 2007). Moreover, Fuller et al. (2007) have shown that the psychological benefit that urban dwellers derive from urban greenspace actually increases as a function of the species richness of the landscape in question. There has, however, been some suggestion that preference for more or less dense vegetation in contexts such as urban parks varies between individuals holding different attitudes. For example, Bjerke, Ost Dahl, Thrane & Strumse (2006) found that respondents' ratings of the appropriateness of more densely vegetated parks increased as a function of their motivation to view wildlife and, to a lesser extent, their scores on a measure of general environmental orientation.

There has, however, been less quantitative research into *private* domestic urban landscape preference. Although a small amount of work has recently emerged in the North American context (Larsen & Harlan, 2006; Yabiku, Casagrande and Farley-Metzger, 2008; Larson, Casagrande, Harlan & Yabiku, 2009), this work has generally been more focused on the issue of water conservation than biodiversity preservation. As such, the quantitative literature dealing with 'landscape preference' has not, to date, produced many studies that speak directly to the issue of biodiversity preservation and habitat-provision in people's own back/front yards. This has not been the case within other academic disciplines however. Disciplines such as anthropology, sociology, environmental history and human geography contain a large body of highly relevant qualitative and ethnographic literature that addresses this issue more directly. Indeed, the highly 'politicized' nature of landscape in post-colonial societies in the Southern Hemisphere such as Australia and New Zealand has been a topic of great interest within these disciplines (e.g., Head & Muir, 2004; Trigger, Mulcock, Gaynor &

Toussaint, 2007; Longhurst, 2006). Of particular relevance to the current research is Head and Muir's (2004; 2007) extensive program of research that analysed Australian backyards (and their human inhabitants) using semi-structured interviews, biogeographical mapping, and checklists of backyard contents. As part of their investigations around the issue of plant 'nativeness', Head and Muir divided their sample of residents into four categories on the basis of attitudes expressed in the interviews and checklists of backyard contents. The emergent "Gardener Types" included: "committed native gardeners" (who planted vegetation in their gardens that was native to Australia and often specifically endemic to their local area), "general native gardeners" (who planted a mixture of Australian natives and 'exotic', internationally imported, plant species), "non-native gardeners" (who only ever planted exotics) and "non-gardeners" (who didn't ever plant any plants in their garden). Head and Muir highlight the ways in which these different orientations to, and ways of interacting with, the backyard landscape are not only relevant for their ecological significance. They are also a potential source of social tension in situations where suburban neighbours' landscape ideologies and gardening practices greatly differ. The ideological aspects of the domestic urban landscape have also received attention in the Northern Hemisphere, such as in Bhatti & Church's (2000) work in the United Kingdom highlighting how home gardens and gardening relate to wider socio-cultural processes and Feagan & Ripmeester (2001) and Robbins' (2007) works on ideological struggles over the 'issue of lawn' in North America.

Given this recent explosion of interest within other social scientific disciplines and also the applied significance of the issue, it is surprising that the ideological or attitudinal aspects of landscape preference in the domestic garden domain has not been extensively examined from a quantitative perspective. One exception is the work of Joan Nassauer (1993; 1995). Nassauer and her colleagues have used computer-simulated images of front yards to highlight strong preferences among North American residents for domestic urban landscapes that signal what she terms intentions of 'human care' (e.g. large sections of

mowed turf)¹. While this work has not explicitly examined potential attitudinal influences on such preferences, it was found in one study (Nassauer, 1993) that residents who were members of a native plant society showed *less* tendency to rate more ecologically rich yard landscapes negatively. Furthermore, in a recent study (Nassauer, Wang & Dayrell, 2009), it was found that residents' preference for different computer-generated front yard landscapes could be highly influenced by experimentally manipulating perceptions of the gardening norms of hypothetical neighbours. This work therefore suggests that a) there may be a cultural normative preference for less habitat-providing garden landscapes in the North American context, b) this tendency may be reduced among certain opinion-based groups, and c) this tendency may be potentially overridden when local descriptive norms are perceived to prescribe more habitat-providing gardening styles.

The Current Study

The research reported here extends the work of Nassauer and colleagues in 4 ways. First, we investigate the possibility that the patterns of preferences identified in the North American context may not necessarily hold in different cultural contexts such as in Australia, as hinted at recently by Kirkpatrick, Daniels & Davidson (2009). Second, while the distaste for 'messy' high-habitat-providing gardens commonly identified by these researchers has been shown to be reduced in members of native plant societies, it is not clear exactly what might drive such individual differences in perception. Third, while Nassauer, Wang and Dayrell (2009) have demonstrated that *experimentally* manipulating descriptive norms in a hypothetical (computer-simulated) neighbourhood can influence landscape preferences for ecologically innovative versus conventional gardens, this has yet to be examined in real field settings using naturally-occurring geographical variation in local gardening practice norms. Finally, the relative influence of attitudinal variables and local norms have also not previously been looked at together in the context of the same study in a way that allows one to compare the relative strength of relationship between each and landscape preference.

The current study aimed to investigate the factors related to preferences for high versus low habitat-providing garden landscapes among residents currently living in two separate areas of the southern suburbs of Perth, Western Australia. The two study areas had been previously identified in the Perth Biodiversity Project as potential ecological corridors for re-connecting remnant bushland and green spaces by supporting conservation and biologically diverse choices on private land (Perth Biodiversity Project, 2007). In the present study, we asked residents living in these areas to rate a series of colour photos of front gardens that had been previously identified by a sample of expert ecologists as being either high or low in habitat provision. We also investigated (by way of written survey items) the relationship between preferences and the attitudinal variables of general environmental concern, attitudes towards native plants, attitudes towards preservation of urban biodiversity and attitudes to water conservation, as well as self-reported current gardening practices. Our delineation of participants into different types of gardening practices draws heavily on Head and Muir's (2004; 2007) typology described earlier.

The two areas ('corridors') sampled were also located within two separate local government areas, Melville Council and Fremantle Council. . The sample area within the two councils represented quite different physical environments, with the area in Fremantle having a high proportion of gardens containing native vegetation, and the area within Melville being highly dominated by gardens containing 'exotic' plants and large sections of neatly kept, well-reticulated lawn. As such, we were also able to investigate (in an indirect way) the potential relationship between localized descriptive norms relating to gardening practices (Cialdini, 2003) and measures of aesthetic landscape preference. In addition, we examined the relevance of demographic variables such as gender, age, ethnicity and household income.

In sum, this study examines the extent to which residents' aesthetic preferences for high and low habitat-providing garden landscapes are a function of demographic variables,

local gardening norms, current gardening practices and a set of gardening-relevant attitudinal variables.

Method

Sampling Procedures and Participants

Questionnaires were hand-delivered to the post boxes of all households within each of the two geographically defined sample areas, (1000 within Melville and 1000 within Fremantle). Of these 2000 questionnaires, 250 Melville residents (25.0%) and 237 Fremantle residents (23.7%) responded via the reply paid envelope supplied, giving an overall sample size of 487 respondents (overall response rate - 24.4%). There was a slight gender bias, with female respondents constituting 63% of the sample. This bias was particularly strong in Fremantle (73.5%), and may potentially reflect a gender difference in levels of interest around gardening in general. Gardening is an activity that, itself, has a slight gender bias in the Australian context. The Australian Bureau of Statistics' 2006 "How Australians Use Their Time" survey showed females had a higher participation rate (37%) for grounds and animal care than males (22%) (ABS, 2006).

Age data were collected in terms of age bands. The most populated age band in the sample of respondents was 46-55 years (29.6%), followed by 56-65 years (22.6%), 36-45 years (19.1%), over 65 years (14.5%), 26-35 years (9.5%) and 18-25 years (4.3%). This age distribution was relatively equivalent between the two council areas. Comparisons with ABS Census data from the census wards containing the two target areas indicated that our sample was slightly over-represented by older age groups and slightly under-represented by younger age groups. Again, we suspect that this discrepancy was a result of a greater interest in gardens and gardening among older age brackets.

Household income was also measured in terms of income bands. For the benefit of an international audience, we note that an annual income of 100,000 Australian dollars was equivalent (at the time of data collection) to approximately US\$64,780, £45,548 or 50,880€.

For the 72% of the sample who chose to complete the (optional) question relating to household income, the data suggest that the sample was slightly more affluent than the average for the areas targeted, with approximately half of the sample (49%) having an annual household income of over 100,000 AUD, as compared to an ABS figure for the equivalent census ward area of only 42% of residents having an income over 100K per year.

Of those who responded to the survey, 82.9% lived in a home owned by themselves, their partner or one of their housemates, which was slightly higher than ABS census data figures for the area in question, which suggests a 73% rate of home ownership. Again, we would suggest that those who own their own homes are also more likely to take an interest in gardening, which may explain the higher proportion of home owners in our sample.

“Ethnicity” data were collected by asking participants to describe their ethnicity in their own words. Due to attitudes and behaviors in relation to native Australian plants being a key variable in our design, ethnicity responses were then placed in one of three categories, a) White/Anglo Australian, 66.6% of the sample), b) “Other Australian” (e.g., “Greek Australian” or “Chinese Australian”, 9.7% of the sample) and c) “Non-Australian” in cases where the term “Australian” did not appear in their ethnicity description (17.3% of the sample). None of our respondents self-categorised as Indigenous or Aboriginal Australian.

Observational Differences in Vegetation Environment Between Councils

The two sample areas were quite visually distinct from one another in terms of the vegetated landscape, with the Melville sample area having more manicured and domesticated gardens, which were generally lower in habitat provision due to the incorporation of mostly exotic plants and/or the predominance of large areas of paving or lawn. In contrast, many more gardens in the Fremantle sample area were found to contain a greater abundance of habitat-providing native plants and smaller amounts of lawn. This visual distinction between councils is illustrated with examples in Figure 1.

Measures

The first section of the questionnaire contained 24 colour photographs of different front gardens (taken front on), which participants were asked to rate on a 10-point scale in relation to how much they liked the garden depicted (1 = Dislike very much, 10= Like very much), and to what degree they would want it in their own garden (1= Would not want it at all, 10 = Would want it very much). Each photograph measured 9.5cm x 7cm and there were six photos presented per page.

Development of Stimulus Materials. To ensure that the photographs used within the questionnaire were an accurate representation of both ‘high’ and ‘low’ habitat gardens, 6 expert ecologists were asked to rate a larger set of 100 photographs of front gardens on a scale from 1 to 10 (1 = Very little provision of habitat, 10 = Very high provision of habitat). From the responses given, a set of 12 ‘high habitat’ and 12 ‘low habitat’ photos were compiled for use in the community survey. ‘High habitat’ photos had a mean habitat provision rating of 7 or above with no ratings less than 5 by any ecologist rater. ‘Low habitat’ photos had a mean habitat rating of 3 or below with no ratings above 3 by any ecologist rater. The actual houses within the pictures were blurred out to ensure that the built aspects of the depicted front yard did not influence participants’ ratings of the gardens. Examples of high and low habitat garden photos used are given in Figure 2.

A series of written questions followed, all of which used a 5-point Likert scale ranging between *strongly agree* (5) and *strongly disagree* (1). Participants’ attitudes towards urban biodiversity (6 items) and native plants (9 items) were measured using specially constructed scales (see appendix). Items on the urban biodiversity scale were designed to measure the extent to which the respondent valued the preservation of biodiversity in the urban environment. Items on the native plant attitudes scale were designed to tap into respondents’ general attitudinal position regarding the overall merits of native plants in the domestic urban landscape. These scales were pilot-tested on a small group of local residents prior to the wider survey being mailed out. Water conservation attitudes were measured using

a single item (“Residents should try to use as little water as possible on their gardens due to the scarcity of water supplies in Perth”). General environmental concern was measured with the 15-item Revised New Environmental Paradigm (NEP) scale (Dunlap, Van Liere, Mertig and Jones, 2000).

Reliability analyses using Cronbach’s alpha² on the three multi-item scales indicated that all represented reliable scales that appeared to measure one unidimensional latent construct - NEP ($\alpha = .86$), Attitudes Towards Native Plants ($\alpha = .83$) and Attitudes toward Urban Biodiversity ($\alpha = .78$).

Participants’ current gardening practices were measured by asking residents to choose the (one) description that best described their current gardening practices from a list containing 5 options (“I prefer a mixture of native and exotic (non-native) plants in my garden”; “I prefer to plant only exotic plants in my garden”; “I prefer to plant only native plants in my garden”; “I am not sure whether the plants I plant in my garden are native or exotic”; “I don’t ever plant new plants in my garden”). Answers to this question were used to categorize respondents as either ‘Mixed Gardeners’ (60.4% of sample), ‘Exotic Gardeners’ (9.8% of sample), ‘Native Gardeners’ (12.9% of sample), ‘Unaware Gardeners’ (9.3% of sample) or ‘Non-gardeners’ (7.7% of sample), broadly following Head and Muir’s (2004; 2007) category system referred to earlier. Finally, demographic questions were included relating to the participants age, gender, income, ethnicity and household ownership status.

Procedure

The questionnaires were hand-delivered to the post boxes of all households within our target areas in Melville and Fremantle, both of which were located within the proposed ecological linkages outlined in the Perth Biodiversity Project (1000 each per each target area). Each questionnaire was accompanied with a cover letter describing the study as a project interested in investigating residents’ gardening attitudes, practices and preferences. No mention of biodiversity issues was made in the cover letter. Each questionnaire package

included a reply-paid envelope that participants were instructed to use to mail the questionnaires back once completed. Reminder flyers were also hand-delivered a week later to the same 2000 households to encourage replies from those who had intended to return the survey but hadn't yet done so.

Results

Overall levels of aesthetic landscape preference for high vs. low habitat gardens

Because ratings of how much participants “Liked” the photos and how much they “Would like to have a garden like this at their home” were extremely highly correlated ($r = .98, p < .001$), we chose to only analyse the “Like” data. Reliability analyses using Cronbach's Alpha indicated that both the 12 low habitat photos ($\alpha = .92$) and 12 high habitat photos ($\alpha = .96$) represented reliable scales in terms of the liking ratings obtained. Moreover, a principal components analysis of the like ratings of all 24 photos (together) revealed a 1-factor solution, with all 12 high habitat photos loading positively on this (‘preference for high habitat’) factor and all 12 low habitat photos loading negatively on this same factor.

An index of ‘preference for high habitat gardens’ was then calculated for each participant by subtracting their mean like rating (on the 10-point scale) for the 12 low habitat photos from their mean like rating (on the same 10-point scale) for the 12 high habitat photos. Thus, a score of 0 on this index (referred to from now on as ‘Landscape Preference’) indicated no overall preference for either type of garden (mid-point of the scale), scores towards the positive end of the scale indicated an overall preference for high-habitat gardens and a negative score indicated an overall preference for low-habitat gardens. This Landscape Preference index was considered an appropriate representation of preference for each participant on account of an observed negative correlation between individuals' mean scores for the low and high habitat photos, $r(460) = -.40, p < .001$. Thus, it was indeed the case that the more respondents liked high habitat photos, the less they liked low habitat photos, and vice versa. This, combined with the clear factor structure outlined above and also the split-

half reliability (i.e. Cronbach's alpha) scores of over .95 for the like ratings of high and low habitat photos, led us to conclude that the use of such an index was appropriate.

For our overall sample, Landscape Preference fell just above the mid-point of the scale ($M = +0.99$, $SD = 3.23$), indicating that, on average, there was a very slight preference for high habitat gardens. Examination of the histogram indicated that preferences were relatively normally distributed around this mean, and ranged from -7.17 to $+9.0$.

Scores on the attitude scales for the sample as a whole

Mean scores on the New Environmental Paradigm (NEP), Attitudes Towards Native Plants and Attitudes toward Urban Biodiversity were calculated for each participant by reversing the negatively worded items and then calculating the mean across all items on the scale. As mentioned previously, a single-item measure was used to measure attitudes towards water conservation. As such, scores on each scale ranged from 1 to 5, with higher scores indicating higher levels of endorsement of the 'pro-environmental' position on each issue respectively.

Scores on the Urban Biodiversity scale ($M = 4.31$, $SD = .61$) and Water Conservation scale ($M = 4.32$, $SD = .76$) were both skewed towards the 'pro-environmental' end of the scale. Scores on the NEP scale were closer to the mid-point of the scale ($M = 3.68$, $SD = .56$), with mean scores for Attitudes to Native Plants being the closest of all the scales to the scale midpoint of 3 ($M = 3.24$, $SD = .69$).

Correlations

Correlations were conducted to examine the bivariate relationships between all 4 attitudinal measures, as well as between each of these measures and Landscape Preference. As can be seen in Table 1, scores on the three attitude scales (Urban Biodiversity, Native Plants and NEP) were moderately (but significantly) positively correlated with one another (r s ranging from .48 to .55). Attitudes towards water conservation were also significantly

positively correlated with these three scales, but to a lesser magnitude (r s ranging from .23 to .34).

In terms of the relationship between the four attitudinal variables and preference for high/low-habitat garden landscapes, Attitudes Towards Native Plants showed the strongest (positive) bivariate relationship to Landscape Preference, $r(450) = .69$, $p < .001$. Attitudes Towards Urban Biodiversity was the next most positively correlated with Landscape Preference, $r(452) = .54$, $p < .001$, followed by general environmental concern (NEP), $r(440) = .49$, $p < .001$. Finally, Attitudes to water conservation showed a relatively weak (but significant) positive relationship with Landscape Preference, $r(459) = .28$, $p < .001$.

Differences in Landscape Preference across gardener types

Prior to conducting our multivariate analysis of landscape preference, a preliminary between-groups ANOVA was conducted to examine whether Landscape Preference differed (in a univariate sense) between residents who reported having different current gardening practices. Results of this analysis indicated a significant difference between the Current Gardening Practices groups, $F(4,401) = 4.3$, $p = .002$, $\eta_p^2 = .041$, the nature of which is depicted in Figure 3.

A model of landscape preference

A hierarchical multiple regression was performed to examine the unique contribution of each of our various attitudinal and demographic variables to variation in Landscape Preference amongst respondents. In the first step, we included the demographic variables (Ethnicity, Gender, Age and Income). In the second step of the regression we added Council Area, in order to ascertain how much unique variance was accounted for by the different physical environment (i.e. gardening norms) in each of the two sample areas, above and beyond any demographic differences. In the third step we added the dummy-coded variables relating to Current Gardening Practices. “Native Gardeners” was used as the omitted/reference category when dummy-coding the 5 levels of the Current Gardening

Practices variable due to this group displaying the highest landscape preference index scores (as shown in Figure 3). In the final step we added our four attitudinal variables (Native plants, NEP, Urban Biodiversity and Water Conservation) to examine the extent to which these further added to the predictive power of the model and to test whether Current Gardening Practices remained a significant predictor after the inclusion of the attitudinal variables. Theoretically speaking, in this final step we wished to ascertain whether respondents' current behavioral practices had an influence on landscape preferences that was independent of any potential overlap with the attitudinal variables. Such a finding would, for example, suggest that native gardeners may have simply had more exposure to habitat providing gardens and plants through the particular kinds of gardening activities that they have been involved with in the past. We refer the reader to the summary of this hierarchical regression analysis provided in Table 2, including all relevant statistical findings. In the interests of being economical with space we do not reproduce the numerical information in the table in our account of the regression findings presented below.

The overall model accounted for almost two thirds of the variance in landscape preference and was highly significant. In step 1, we see that, of the demographic variables entered, Ethnicity had the strongest relationship with Landscape Preference, with those who identified as 'Australian' showing greater preference for high habitat gardens than those who did not. Age and Income were also significant (negative) predictors of landscape at this first step, such that being younger or less wealthy was related with higher net preference for high habitat gardens. Gender, however, had no discernable influence. Overall, these four demographic variables accounted for 15% of the variance in Landscape Preference.

When Council Area was added to the model at step 2, we see that it becomes by far the strongest predictor of landscape preference in the model and adds an additional 25% of explained variance to that which was accounted for by the demographic variables at step 1. Ethnicity remains a significant predictor, although its reduction in beta weight from .33 to .18

implies that some of the effect of ethnicity can be accounted for by Council Area. Age and Income drop out completely as significant predictors with the addition of Council Area to the model, suggesting that the effect of these variables can be accounted for by common variance with Council Area.

The addition of Current Gardening Practices to the model in step 3 produces no dramatic change in the explanatory power of Ethnicity and Council Area. Current Gardening Practices is shown at this step as a significant independent predictor of landscape preference, with all of the dummy-coded variables relating to the two-way comparison with Native Gardeners being significant. The addition of this variable at step 3 accounted for an additional 7% of the variance in Landscape Preference. However, importantly, Current Gardening Practices completely drops out as a significant predictor when our four attitudinal variables are added to make up the full model in step 4. This suggests that there was little variance explained by Current Gardening Practices that could not simply be accounted for by that which it shared in common with the attitudinal variables. The addition of the attitudinal variables accounted for an additional 20% of the variance in Landscape Preference, over and above the demographic, geographical and behavioral variables entered in the previous 3 steps. In the full model at step 4, we see that a Native Plant attitude becomes the strongest independent predictor of Landscape Preference, followed by Council Area. The NEP and Ethnicity are the only other variables that remain significant predictors, although only marginally in the latter case ($p = .04$).

Given that council of residence was shown to be related to Landscape Preference, we also took the precaution of testing whether this effect of Council might have been influenced by how long a respondent had lived in their council area, which would again indicate a potential 'mere exposure' effect. To this end, a Council Area x Length of Residency (less than 1 year vs. 1-5 years vs. more than 5 years) ANOVA was performed with Landscape Preference as the dependent variable. This analysis showed no significant main effect of

Length of Residency, $F(2,452) = .42, p = .66$, and, most importantly, no significant interaction between Length of Residency and Council Area, $F(1,452) = .15, p = .87$.

Discussion

The purpose of the present study was to investigate suburban residents' landscape preferences for high versus low habitat-providing front yard landscapes in an Australian context. In addition, we sought to examine how such preferences might be related to levels of general environmental concern, attitudes towards native plants, attitudes towards preservation of urban biodiversity and attitudes towards water conservation, as well as self-reported current gardening practices. Moreover, we were interested to see whether the differing local descriptive norms around gardening practices in the two areas sampled may also be related to residents' reactions to visual representations of different types of urban landscapes.

The distribution of preference for high and low habitat-providing landscapes

The first conclusion that we draw from our findings is that the distinction between high and low habitat-providing gardens was important in terms of our respondents' urban landscape preference, as evidenced by the clear one-factor structure that emerged from our principal components analysis and the fact that this one factor was loaded onto positively by the high habitat photos and negatively by the low habitat photos. Contrary to Nassauer's (1993; 1995) findings in North America, however, our sample of respondents did not show a strong bias towards more traditional, orderly, low-habitat providing urban landscape images. Rather, preferences were fairly normally distributed around a mean that actually fell slightly towards the high habitat-providing side of the scale midpoint. While some may seek to question whether we may have just happened to receive replies to our survey from a more ecologically-minded set of participants, the fact that only 12% of the sample reported staunchly 'native' garden practices would tend to suggest that this was not necessarily the case.

Attitudes and landscape preference

Given the high degree of variability in residents' preference for high vs. low habitat garden aesthetics, the key theoretical question becomes one of attempting to explain or predict this variability. The *attitudinal* variable with the strongest relationship with landscape preference in the present study was residents' attitudes towards the merits of native plants in the urban landscape, with a much weaker (but still significant) influence being found in relation to a more global environmental attitude/ethic (as measured by the NEP), and attitudes towards the importance of promoting urban biodiversity more generally were found not to be a significant independent predictor. Those residents who endorsed attitudinal items relating to the aesthetic and ecological merits of planting native plants were much more likely to respond positively to images of high habitat gardens in comparison to low habitat gardens. This result has some resonance with the arguments of Kaiser, Wolfing and Fuhrer (1999), among others, that attitudes can be found to predict environmental behaviors but often only when one measures both the attitude and the behavior at the same level of *specificity*. For example, attitudes towards catching the bus might predict bus-ridership behavior, but general environmental concern is less likely to predict bus ridership. Our findings here would seem to suggest that more specific attitudes are also more strongly related to the ways in which people react to urban landscapes of differential ecological quality. It is interesting to note that this also supports Bjerke, Ost Dahl, Thrane & Strumse's (2006) finding mentioned earlier, whereby residents' engagement with wildlife observation was a stronger predictor of preference for more densely vegetated urban parks than their scores on the NEP. What appears to be most strongly relevant to urban landscape preference, at least in the Australian context, is not necessarily some form of general environmental ethic *per se* or even an appreciation of the importance of urban biodiversity, but rather, residents' *specific* stance regarding the issue of 'planting native'.

Of the four issues investigated in our attitude scales, attitudes towards native plants also appeared to be the issue over which residents were most divided, with scores being widely

distributed around a mean that fell very close to the mid-point of the scale. Head and Muir's (2004; 2007) research has suggested that residents' attitudes towards the issue of native planting tend to be highly divided in Australian suburbs and our findings here support this suggestion. Attempting to change residents' gardening practices towards practices that entail more 'gardening for habitat' is likely to be far more difficult than simply educating them in the ecological benefits of doing so. The majority of our participants expressed relatively high levels of endorsement for the merits of promoting urban biodiversity (in *principle*). However, different attitudes towards the merits of plant 'nativeness' seem to correspond with fundamentally different responses to particular garden aesthetics, with potentially large implications for how residents garden, in *practice*.

Of course, we must note that the correlational nature of the present study does preclude us being able to draw definitive conclusions regarding the direction of the causal relationship between landscape preferences and attitudinal variables. This is a problem that can also be identified in relation to the between-group differences in landscape preferences observed between native plant society members and the more general population by Kaplan, Kaplan and Brown (1989) and Naussauer (1993) outlined earlier. In both these studies, and our own research reported here, a key question becomes whether individuals who hold particular attitudes towards plant 'nativeness' come to perceive landscapes in a fundamentally different way as a result, or whether those predisposed to a certain kind of landscape aesthetic are more likely to endorse a native planting ethic (and be more likely to get involved in native plant societies) as a result. Teasing apart this issue of direction of causality should be an important focus of future research because it would appear to hold important practical implications. If attitudes do drive reactions to landscapes, for example, then the key focus of efforts by policy makers, practitioners and researchers should be developing ways of changing attitudes towards the merits of native plants. If more 'unconscious' aesthetic preferences drive attitudes to native plants, however, then the path forward in terms of

promoting urban biodiversity may well be much more difficult. A useful first step towards addressing these questions would be longitudinal investigations of potential changes *over time* in landscape preferences among, for example, students enrolled in ecology-related university courses in comparison to control groups enrolled in non-ecology-related courses.

Landscape preference and current gardening practices

When analysed in terms of simple effects, garden landscape preferences were found to be highly related to the current gardening practices engaged in by the respondents. As one might expect, self-identified ‘Native Gardeners’ showed a visual preference for high habitat gardens, while ‘Exotic Gardeners’ showed a preference for low-habitat gardens. What is perhaps more surprising, however, is that those residents who reported planting a *mixture* of native and exotic plants in their garden (and who constituted 60% of the respondents) *also* showed a mean preference for high habitat gardens over low habitat gardens. Although this preference was not as strong a preference as observed among the ‘Native Gardeners’ group, this is nevertheless an encouraging finding for those engaged in the promotion of ‘gardening for habitat’ in urban areas. It suggests a degree of positive aesthetic evaluation of high habitat garden landscapes that extends beyond merely those residents who are already firmly committed to native gardening practices. As our multivariate regression analyses revealed, however, these differences in landscape preference between those engaged in different types of gardening practices become non-significant when entered into a model containing our other (demographic and attitudinal) variables. Specifically, as shown in our hierarchical regression analyses, the variance in landscape preference explained by gardener type overlapped very strongly with that explained by our four attitudinal variables (with native plants attitudes, of course, being the strongest predictor of the four). Thus, attitudes towards native plants (and to a lesser extent, general environmental concern) appear to be highly related to both how residents respond to the aesthetics of habitat-providing front yard landscapes and also the types of gardening practices that they are engaged in.

Local gardening norms

The significant differences in landscape preferences between the Fremantle and Melville geographical areas were particularly interesting, with residents in Fremantle (where high habitat gardens were more normative) showing a mean preference for high habitat gardens and residents in Melville (where low habitat gardens were more normative) showing a mean preference for low habitat gardens. Of particular interest is our finding that this effect of local norms remained significant even after controlling for all other variables in our model, many of which might have been strong candidates for explaining the between-council differences in landscape preference, such as ethnicity, current gardening practices, or our attitudinal variables. It is particularly fascinating, we believe, that which council respondents lived in remained the second strongest of only four independent predictors of landscape preference in the final step of our hierarchical regression. It would appear, therefore, that there was simply something about living in Fremantle versus Melville that influenced urban landscape preference above and beyond all of the other variables measures here.

Two potential explanations for this influence of geographical location could be a) visual exposure/familiarity, and b) the influence of local descriptive norms, as previously suggested in the experimental simulation work of Nassauer, Wang and Dayrell (2009). In relation to the former, we might hypothesize that, given the differences in visual landscape within the two geographical areas, the residents in Melville were simply more used to seeing low-habitat front yard landscapes in their day-to-day lives, as compared to the Fremantle residents, who were more commonly exposed to high-habitat front yard landscapes. However, our failure to find a significant interaction between Council and Length of Residency does not really support such an explanation. Localized descriptive norms, on the other hand, are (theoretically speaking) something that individuals can ‘read off’ the social world that surrounds them (Ford, Armstrong, Boxer & Edel, 2008). As such, they would be less likely to require long periods of exposure/acquisition in order to influence perceptual preference. As

such, the influence of Council Area on landscape preference may be partly a function of residents being affected by their perceptions of what most other local residents *do* (in relation to gardening), that is, local descriptive norms. Thus, our findings here would appear to provide field validation for Nassauer, Wang and Dayrell's (2009) recent experimental demonstrations of the powerful influence of local descriptive norms on residents' domestic urban landscape preferences.

Formation of local norms

On an even more fundamental level, however, it is interesting to consider where 'geographical' differences in attitudes, preferences and gardening practices might originally stem from. That is, might it be that residents of a particular 'ideological bent' tend to be attracted to an area like Fremantle and, once there, somewhat autonomously garden in particular ways? Another factor that may warrant consideration is the *history* of a suburban area in terms of when it was established and the particular gardening 'fashions' that may have prevailed in the wider society at that particular time (see Seddon, 1997). A way of potentially integrating these accounts might be to postulate a process of dynamic social impact (Latene, 1996; Latene & Liu, 1996) being at play. Such an account would propose a network of residents (or "agents", in the language of agent-based-modeling) interacting in an interdependent fashion over a period of time to bring about a particular (potentially skewed) distribution of both physical garden landscapes and attitudes across physical space. Along this line, our ongoing follow-up work aims to study the specific geographical distribution of preferences, attitudes and practices to the level of the household (c.f., Fernandez, Brown, Marans, & Nassauer, 2005), with these data being overlaid (using GIS techniques) with observational ecological data relating to structural features of front gardens across the same area (using a similar approach to Alessa, Kliskey & Brown, 2008). Having established these baseline 'maps', we then plan to study emergent properties of the networks in response to the

targeting of specific ‘nodes’ (or ‘champion households’) through community-based intervention/behavior change strategies.

Conclusions

The current study has demonstrated that, in the context of urban gardens, the distinction between garden landscapes that provide high levels of habitat for native wildlife and those that do not is highly implicated in residents’ garden landscape preferences. Moreover, our findings suggest that garden landscape preferences appear to be related to more than simply generic perceptual reactions to visual structure attributable to (potentially genetically inherited) perceptual processes. As is being increasingly recognized in both the field of environmental psychology and other social scientific disciplines, human perceptions of, and interactions with, the urban landscape are highly imbued with social psychological, ideological, and socio-cultural meaning. Our results also highlight that although the attitudes of individuals appear to be important to the ways in which people perceive and interact with urban landscapes, such preferences and practices are also highly influenced by the local social and environmental context. Gaining a greater understanding of the structure and dynamics of such psychological and social factors promises to form a crucial part of ongoing interdisciplinary efforts to preserve biodiversity in the urban landscapes within which an increasingly large number of us live and work.

Acknowledgements

The authors would like to acknowledge Michelle Sermon, Sophie Rothwell and David Edwards for their contribution to the collection of data for this project. We would also like to acknowledge the financial and/or in-kind support provided by the two local government authorities involved in the research (City of Fremantle and City of Melville). We would also like to thank Ngaire Donaghue, Michelle Ryan, Barbara Brown and two anonymous reviewers for helpful comments on earlier versions of the paper.

Appendix

*Attitudes towards Native Plants Items (*indicates reversed items)*

1. Native plants are often unsuitable for the spaces available in smaller gardens*
2. Residents should consider removing established plants from their garden if the plants are not native to the area
3. Residents should try to grow plants for their garden from locally sourced seed
4. I think gardens that contain exotic (rather than native) plants look more green and lush*
5. It is important for residents to try to choose plants for their garden that are native to their specific local area
6. The problem with native plants is that they often look scraggly and untidy*
7. It is best to plant native plants in the garden because they attract birds
8. Residents should plant native plants in their gardens because they require less watering
9. I think that exotic plants such as roses are more pretty than native plants*

*Attitudes towards Urban Biodiversity Items (*indicates reversed items)*

1. We do not need to worry too much about the impact of human-built urban developments on animals*
2. The choices that residents make about the types of plants that they put in their gardens have implications for the surrounding environment
3. Habitat protection is not really a particularly important environmental issue in cities*
4. It is important that native animals in urban areas be provided with appropriate natural habitat
5. The issue of biodiversity is only relevant to wilderness areas like National Parks*
6. It is important to me that areas of bushland in my suburb are retained, rather than being developed for housing

Notes

- ¹ It is interesting to note that similar findings relating to the aesthetic importance of markers of 'human intent' has also been found in simulation studies relating to brown fields rehabilitation sites (Hands & Brown, 2002).
- ² This statistic represents, conceptually, the average intercorrelations between scores on all items on the scale.

References

- ABS (2006) *How Australians Use Their Time, 2006*, 'Table 4: All persons, primary and secondary activities: by sex, data cube: Excel spreadsheet, Australian Bureau of Statistics Cat. no. 41530DO001, viewed 21 October 2009, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4153.02006?OpenDocument>
- Alessa, L., Kliskey, A. & Brown, G. (2008) Social-ecological hotspots mapping: a spatial approach for identifying coupled social-ecological space. *Landscape and Urban Planning*, 85, 27–39
- Australian and New Zealand Environment and Conservation Council and Biological Diversity Advisory Committee (2001) *Biodiversity conservation research: Australia's priorities*. Canberra: Department of the Environment, Water, Heritage and the Arts.
- Australian State of the Environment Committee. (2001) *Australia state of the environment 2001: Independent report to the commonwealth minister for the environment and heritage*. Melbourne: CSIRO Publishing.
- Bhatti, M. & Church, A. (2000) 'I never promised you a rose garden'; gender, leisure and homemaking. *Leisure Studies*, 19, 183–97.
- Bjerke, T., Ost Dahl, T., Thrane, C. & Strumse, E. (2006) Vegetation density of urban parks and perceived appropriateness for recreation. *Urban Forestry & Urban Greening*, 5, 35–44.
- Bonnes, M., Uzzell, D., Carrus, G. & Kelay, T. (2007) Inhabitants' and experts' assessments of environmental quality for urban sustainability. *Journal of Social Issues*, 63(1), 59-78.
- Brush, R., Chenoweth, R. & Barman, T. (2000). Group differences in the enjoyability of driving through rural landscapes. *Landscape & Urban Planning*, 47, 39-45.
- Cialdini, R. (2003). Crafting normative messages to protect the environment. *Current Directions in Psychological Science*, 12, 105-109.

- Davies, R., Webber, L., & Barnes, G. (2004). Urban wildlife management- it's as much about people! In D. Lunney & S. Burgin (Eds.) *Urban wildlife: More than meets the eye*. Mosman: Royal Zoological Society of New South Wales.
- DEFRA. (2002). Working with the grain of nature. London: Defra Publications.
- Dunlap, R.E., Van Liere, K.D., Mertig, A.G., & Jones, R.E. (2000). Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, 56, 425-442.
- Feagan, R. & Ripmeester, M. (2001). Reading private green space: Competing geographic identities at the level of the lawn. *Philosophy and Geography* 4(1), 79-95.
- Fernandez, L. Brown, D., Marans, R., Nassauer, J. (2005). Characterizing location preferences in an exurban population: Implications for agent-based modeling. *Environmental Planning B*, 32, 799-820.
- Ford, T., Armstrong, C., Boxer, J., & Edel, J. (2008). More than “just a joke”: The prejudice-releasing function of sexist humor. *Personality & Social Psychology Bulletin*, 34, 159-170.
- Fuller, R. A., Irvine, K. N., Divine-Wright, P., Warren, P. H. & Gaston, K. J. (2007) Psychological benefits of greenspace increase with biodiversity. *Biology Letters*, 3, 390-394.
- Gärling, T. (1998). Introduction: Conceptualizations of human environments. *Journal of Environmental Psychology*, 18, 69–73.
- Gobster, P. H. (1994). The urban savanna: Reuniting ecological preference and function. *Restoration and Management Notes*, 12, 64-71.
- Gobster, P. H. (1995). Aldo Leopold's ecological aesthetic: Integrating aesthetic and biodiversity values. *Journal of Forestry*, 93(2), 6-10.
- Goddard, M.A., Dougill, A. J. & Benton, T.G. (2009) Scaling up from gardens: biodiversity conservation in urban environments. *Trends in Ecology and Evolution*, 25(2), 90-98.

- Head, L., & Muir, P. (2004). Nativeness, invasiveness, and nation in Australian plants. *Geographical Review*, 94(2), 199-217.
- Head, L. & Muir, P. (2007) *Backyard: Nature and culture in suburban australia*. Wollongong: University of Wollongong Press.
- Junker, B. & Buchecker, M. (2008) Aesthetic preferences versus ecological objectives in river restorations. *Landscape and Urban Planning*, 85, 41–154
- Kaiser, F., Wolfing, S. & Fuhrer, U., (1999) Environmental attitude and ecological behaviour. *Journal of Environmental Psychology*, 19, 1-19.
- Kaltenborn, B., and Bjerke, T. (2002). Associations between environmental value orientations and landscape preferences. *Landscape and Urban Planning*, 59, 1-11.
- Kaplan, R., & Herbert, E. J. (1987). Cultural and sub-cultural comparisons in preferences for natural settings. *Landscape and Urban Planning*, 14, 281-293.
- Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. Cambridge, UK: Cambridge University Press.
- Kaplan, R., Kaplan, S., & Brown, T. (1989). Environmental preference: A comparison of four domains of predictors. *Environment & Behavior*, 21, 509-530.
- Kaplan, S., & Kaplan, R. (1982). *Cognition and environment*. New York: Praeger.
- Kaplan, S.(1972).The challenge of environmental psychology: A proposal for a new functionalism. *American Psychologist*, 27, 140–143.
- Kaplan, S.(1982).Where cognition and affect meet: A theoretical analysis of preference. In P.Bart, A.Chen, & G. Francescato (Eds.), *Knowledge for design* (pp. 183–188).Washington, DC: Environmental Design Research Association.
- Kaplan, S. (1988). Perception and landscape: Conceptions and misconceptions. In J. L. Nascar (Ed.), *Environmental aesthetics* (pp. 45–55).Cambridge: Cambridge University Press.

- Kaplan, S.(1992). Environmental preference in a knowledge-seeking, knowledge- using organism. In J.Barkow L.Cosmides, & J.Tooby(Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 581–598). NewYork: Oxford University Press.
- Kirkpatrick, J., Daniels, G., & Davidson, A. (2009). An antipodean test of spatial contagion in front garden character. *Landscape & Urban Planning*, 93, 103-110.
- Lafortezza, R., Corry, R. C., Sanesi, G. & Brown, R. D. (2008) Visual preference and ecological assessments for designed alternative brownfield rehabilitations. *Journal of Environmental Management*, 89, 257–269.
- Larson, K. L., Casagrande, D., Harlan, S. L., & Yabiku, S. T. (2009) Residents’ Yard Choices and Rationales in a Desert City: Social Priorities, Ecological Impacts, and Decision Tradeoffs. *Environmental Management* 44, 921–937.
- Larsen, L. & Harlan, S. (2006). Desert dreamscapes: Residential landscape preference and behaviour. *Landscape and Urban Planning*, 78, 85-100.
- Latene, B. (1996). Dynamic Social Impact: The Creation of Culture by Communication *Journal of Communication*, 46, 13-25.
- Latene, B., & Liu, J. (1996). The intersubjective geometry of social space. *Journal of Communication*, 46, 26-34.
- Longhurst, R. (2006). Plots, plants and paradoxes: contemporary domestic gardens in Aotearoa/New Zealand. *Social & Cultural Geography*, 7, 581- 593.
- Maller, C., Townsend, M., St Leger, L., Henderson-Wilson, C., Pryor, A., Prosser, L. and Moore, M. (2008) *Healthy parks, healthy people. The health benefits of contact with nature in a park context: A review of relevant literature*. Melbourne: Deakin University.
- Accessed online from:
<http://www.healthyparkshealthypeoplecongress.org/images/stories/hphp%20research.pdf>

- Millennium Ecosystem Assessment (2005). *Ecosystems and Human Well-being: Synthesis*. Washington, DC: Island Press.
- Miller, J. R. (2005) Biodiversity conservation and the extinction of experience. *Trends in Ecology and Evolution*, 20, 430-434.
- Miller, J. R., & Hobbs, R.J. (2002). Conservation where people live and work. *Conservation Biology*, 16(2) 330-337.
- Niemela, J. (1999). Ecology and urban planning. *Biodiversity and Conservation*, 8, 119-131.
- Nassauer, J. (1993). Ecological function and the perception of suburban residential landscapes. In P. Gobster (ed.) *Managing urban and high use recreation settings, general technical report*, USDA Forest Service North Central Forest Exp. Sta., St. Paul, MN.
- Nassauer, J. (1995). Messy ecosystems, orderly frames. *Landscape Journal*, 14, 161-170.
- Nassauer, J., Wang, Z. , Dayrell, E. (2009). What will the neighbors think? Cultural norms and ecological design. *Landscape and Urban Planning*, 92, 282-292.
- Orians, G. H., & Heerwagen, J. H. (1992). Evolved responses to landscapes. In J. H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adaptive mind: Evolutionary psychology and the generation of culture* (pp. 555-579). New York: Oxford University Press.
- Özgüner, H. & Kendle, A. D. (2006) Public attitudes towards naturalistic versus designed landscapes in the city of Sheffield (UK). *Landscape and Urban Planning*, 74, 39–157.
- Perth Biodiversity Project (2007). Capacity of Perth's local governments to conserve biodiversity: Survey analysis report. Perth: Western Australian Local Government Association. Available online at:
http://www.walga.asn.au/about/policy/pbp/publications/capacity_of_Perths_lg_to_conserve_biodiversity.pdf
- Robbins, P. (2007). *Lawn people: how grasses, weeds, and chemicals make us who we are*. Philadelphia: Temple University Press.

- Seddon, G. (1997). *Landprints : reflections on place and landscape*. Cambridge: Cambridge University Press.
- Solvia & Hunziker (2009) How do biodiversity and conservation values relate to landscape preferences? A case study from the Swiss Alps. *Biodiversity Conservation*, 18, 2483–2507.
- Theobald, D. M. & N. T. Hobbs. (2002). A framework for evaluating land use planning alternatives: protecting biodiversity on private land. *Conservation Ecology*, 6 (1): <http://www.consecol.org/vol6/iss1/art5> .
- Thompson, S. & Barton, M., (1994). Ecocentric and anthropocentric attitudes toward the environment. *Journal of Environmental Psychology*. 14, 199–210.
- Trigger, D., Mulcock, J., Gaynor, A., & Toussaint, Y. (2007). Ecological restoration, cultural preferences and the negotiation of ‘nativeness’ in Australia. *Geoforum*, 39 1273–1283.
- Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kaźmierczak, A., Niemela, J. & James, P. (2007) Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review. *Landscape and Urban Planning*, 81, 167–178
- Ulrich, R. (1986). Human responses to vegetation and landscapes. *Landscape and Urban Planning*, 13, 29-44.
- Van den Berg, A. E., Hartig, T., & Staats, H. (2007). Preference for nature in urbanized societies: Stress, restoration, and the pursuit of sustainability. *Journal of Social Issues*, 63, 79-96.
- Van den Berg, A., Koole, S., & van der Wulp, N. (2003). Environmental preference and restoration: (How) are they related? *Journal of Environmental Psychology*, 23, 135-146.
- Van den Berg, A.E., Vlek, C.A.J., & Coeterier, J.F. (1998). Group differences in the aesthetic evaluation of nature development plans: A multilevel approach. *Journal of Environmental Psychology*, 18, 141-157.

- Williams, K.J.H., & Cary, J. (2002). Landscape preferences ecological auality, and biodiversity protection. *Environment and Behavior*, 34(2), 257-274.
- Yabiku, S., Casagrande, D. & Farley-Metzger, D. (2008). Preferences for landscape choice in a southwestern desert city. *Environment and Behavior*, 40, 382-400.
- Zube, E. (1991). Environmental psychology, global issues, and local landscape research. *Journal of Environmental Psychology*, 11, 321–334.

Table 1. *Correlation matrix for the attitudinal variables and Landscape Preference.*

	Landscape Preference	Urban Biodiversity	Native Plants	NEP	Water Conservation
Landscape Preference	1	.542**	.694**	.490**	.275**
Urban Biodiversity		1	.545**	.548**	.233**
Native Plants			1	.480**	.347**
NEP				1	.321**
Water Conservation					1

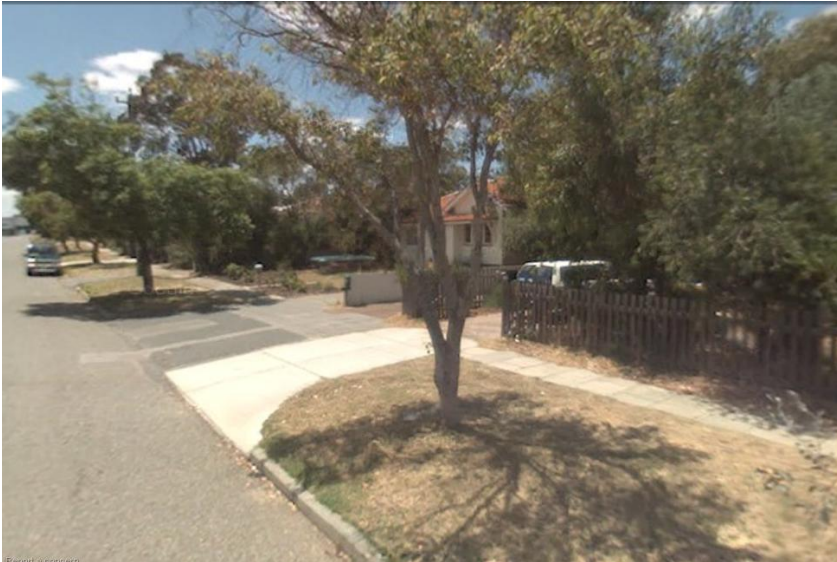
** . Correlation is significant at the 0.01 level (2-tailed).

Table 2. Summary of multiple hierarchical regression analyses for landscape preference on demographic variables, council area, current gardening practices and attitudinal variables (standardized betas marked for significance level).

	<i>beta</i>	<i>SE b</i>	<i>Std. β</i>
Step 1			
Ethnicity (0= 'non-Australian', 1= 'Australian')	2.90	.49	.33***
Gender (0=female, 1=male)	-.49	.38	-.07
Age	-.49	.15	-.19**
Income	-.21	.10	-.12*
Change Statistics		$R^2_{ch}=.15,$ $F_{ch}(4,285)=12.27, p<.001$	
Step 2			
Ethnicity	1.58	.43	.18***
Gender	-.06	.32	-.01
Age	-.12	.13	-.05
Income	.07	.09	.04
Council Area (Fremantle=0, Melville=1)	-3.64	.33	-.56***
Change Statistics		$R^2_{ch}=.25,$ $F_{ch}(1,284)=119.70, p<.001$	
Step 3			
Ethnicity	1.01	.43	.12*
Gender	-.13	.30	-.02
Age	-.22	.12	-.08
Income	.06	.08	.03
Council Area	-3.20	.33	-.49***
Native Gardeners (0) vs. Mixed Gardeners (1)	-1.049	.42	-.16*
Native Gardeners (0) vs. Exotic Gardeners (1)	-1.99	.63	-.18**
Native Gardeners (0) vs. Unaware Gardeners (1)	-2.92	.64	-.26***
Native Gardeners (0) vs. Non-gardeners (1)	-2.97	.63	-.25***
Change Statistics		$R^2_{ch}=.07,$ $F_{ch}(4,280)=8.50, p<.001$	
Step 4 (Full model)			
CONSTANT	-10.58	1.51	
Ethnicity	.69	.34	.08*
Gender	.18	.25	.03
Age	-.13	.1	-.05
Income	.11	.07	.07
Council Area	-1.9	.28	-.30**
Native Gardeners vs. Mixed Gardeners	.36	.35	.05
Native Gardeners vs. Exotic Gardeners	.68	.55	.06
Native Gardeners vs. Unaware Gardeners	-.54	.55	-.05
Native Gardeners vs. Non-gardeners	-.98	.52	-.08
Native Plants attitudes	2.24	.25	.46**
NEP	.81	.25	.14*
Urban Biodiversity attitudes	.43	.26	.08
Water Conservation attitudes	-.08	.18	-.02
Change Statistics		$R^2_{ch}=.20,$ $F_{ch}(4,276)=42.03, p<.001$	
Overall Model		$R^2_{Adj}=.65, F(13,276) = 42.61, p<.001$	

Note: $p<.05^*$, $p<.01^{**}$, $p<.001^{***}$

(a)



(b)



Figure 1. Photographs illustrating prototypical urban landscape for both Council F (a), and Council M(b)

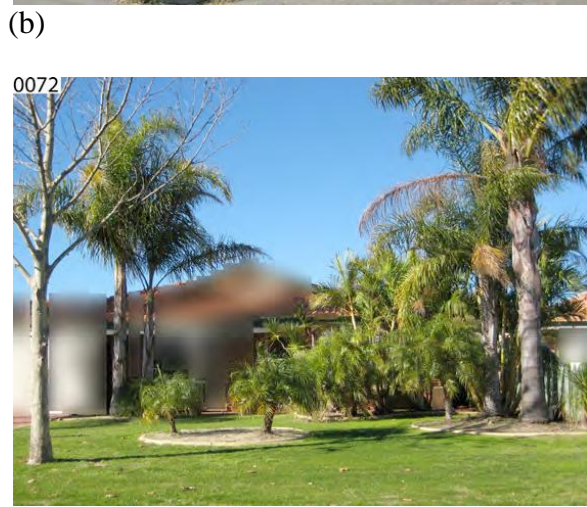


Figure 2. Examples of high (a) and low (b) habitat garden photos used in the questionnaire.

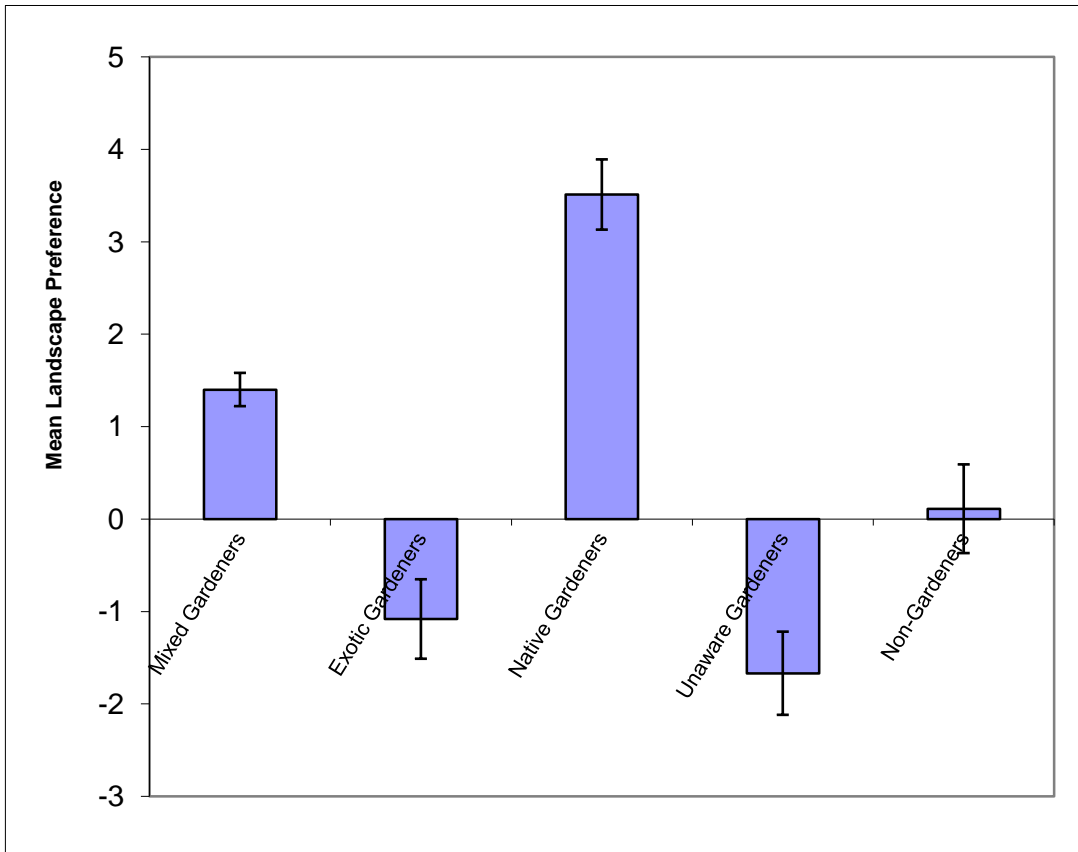


Figure 3. Mean level of Landscape Preference, as a function of respondents' current gardening practices (positive scores denote net preference for high-habitat images, negative scores denote net preference for low-habitat images).

Two-sentence biographical sketches and full contact details for both authors

Tim Kurz has recently taken up the position of Senior Lecturer in Public Responses to Climate Change in the School of Psychology at the University of Exeter in the United Kingdom. His main research interests focus on social psychological aspects of environmental sustainability, the social construction of gender, and processes of social influence within groups and across space.

Address for contact:

Dr Tim Kurz
School of Psychology
College of Life Sciences
Washington Singer Laboratories
University of Exeter
Perry Road
Exeter, EX4 4QG
UNITED KINGDOM
Phone: +44 1392 724657
Email: t.r.kurz@exeter.ac.uk

Catherine Baudains is a Lecturer in environmental education for sustainability in the School of Environmental Science and the School of Education at Murdoch University in Perth, Western Australia. Her research interests include the role of urban gardening in habitat provision and conservation, developing environmental and lifestyle education programs, and workplace travel plans.

Address for contact:

Dr Catherine Baudains
School of Environmental Science
Murdoch University
South Street
Murdoch
Western Australia 6150
AUSTRALIA
Phone: +61 8 9360 6393
Email: c.baudains@murdoch.edu.au