

# Literature Supporting Claims Regarding the Health and Well-Being Benefits of Green Industry Products (flowers, shrubs, trees, etc.)

## *Listed in chronological order*

**Zick, C. D., et al. (2013). "Harvesting More Than Vegetables: The Potential Weight Control Benefits of Community Gardening." *American Journal of Public Health* 103(6): e1-e6.**

Objectives. We examined the association of participation in community gardening with healthy body weight. Methods. We examined body mass index (BMI) data from 198 community gardening participants in Salt Lake City, Utah, in relationship to BMI data for 3 comparison groups: neighbors, siblings, and spouses. In comparisons, we adjusted for gender, age, and the year of the BMI measurement. Results. Both women and men community gardeners had significantly lower BMIs than did their neighbors who were not in the community gardening program. The estimated BMI reductions in the multivariate analyses were -1.84 for women and -.36 for men. We also observed significantly lower BMIs for women community gardeners compared with their sisters (-.88) and men community gardeners compared with their brothers (-1.33). Community gardeners also had lower odds of being overweight or obese than did their otherwise similar neighbors. Conclusions. The health benefits of community gardening may go beyond enhancing the gardeners' intake of fruits and vegetables. Community gardens may be a valuable element of land use diversity that merits consideration by public health officials who want to identify neighborhood features that promote health. [ABSTRACT FROM AUTHOR]

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**Tsunetsugu, Y., et al. (2013). "Physiological and psychological effects of viewing urban forest landscapes assessed by multiple measurements." *Landscape and Urban Planning* 113(0): 90-93.**

The present study investigated the physiological and psychological effects of viewing urban forest landscapes on 48 young male urban residents. Four forested areas and four urban areas located in central and western Japan were used as the test sites. We found that in the forested areas, the subjects exhibited (i) significantly lower diastolic blood pressure, (ii) significantly higher parasympathetic nervous activity, but significantly lower sympathetic nervous activity, and (iii) significantly lower heart rate. The forest landscapes (iv) obtained better scores in subjective ratings, and (v) induced significantly less negative and more vigorous moods. Taken as whole, these findings suggest that even a short-term viewing of forests has relaxing effects. We have thus concluded that the approach taken in this study is useful in exploring the influences of urban green space on humans, as well as contributing to the planning and design of a healthy environment for urban residents.

**Lottrup, L., et al. (2013). "Workplace greenery and perceived level of stress: Benefits of access to a green outdoor environment at the workplace." *Landscape and Urban Planning* 110(0): 5-11.**

Dealing with stress and stress-related diseases is an increasing problem in both developed and developing countries and has an enormous cost for individuals, companies, and societies. A positive relationship between access to a green outdoor environment at work, and decreased stress has been found in previous studies, and this relationship is in line with a vast body of research in other contexts. The aim of this study is to investigate whether access to a green outdoor environment at work is related to employees' perceived level of stress and attitude toward the workplace. The study is based on data from a questionnaire answered by 439 randomly selected individuals in Sweden. The questionnaire addressed the respondents' level of stress and workplace attitude, and the characteristics and accessibility of the outdoor environment at the respondents' workplace. The results showed significant relationships between physical and visual access to workplace greenery, and a positive workplace attitude and decreased level of stress for male respondents. For female respondents, a significant relationship between physical and visual access to workplace greenery and a positive workplace attitude was found, but not between access to workplace greenery and level of stress. Furthermore, a positive workplace attitude was related to decreased levels of stress for female respondents, but not for male respondents. These findings support existing research which suggests that the workplace outdoor environment is an asset for employees' wellbeing and level of stress, and they indicate that gender plays a central role in realizing the benefits of such environments.

**Lachowycz, K. and A. P. Jones (2013). "Towards a better understanding of the relationship between greenspace and health: Development of a theoretical framework." *Landscape and Urban Planning* 118(0): 62-69.**

A growing body of evidence investigates whether access to greenspace, such as parks and woodland, is beneficial to well-being. Potential health benefits of greenspace exposure include opportunity for activities within the space and psychological benefits of viewing and interacting with nature. However, empirical research evidence on the effects of greenspace exposure shows mixed findings. Hence we suggest that the key questions of "if, why and how?" greenspace influences health remain largely unanswered. We argue that researchers have inadequately considered the causal pathways which drive the relationship. In particular, an improved understanding is needed of potential mediators and moderators. In this paper we draw on social-ecological theories and a review of the literature to develop a novel theoretical framework which summarises current knowledge about hypothetical causal pathways between access to greenspace and health outcomes. The framework highlights how mediators – such as use of greenspace and perceptions of the living environment – drive associations between access and both physical and psychological health outcomes. We propose key moderators based on evidence that associations between greenspace and health differ by demographic factors such as gender, ethnicity and socio-economic status, living context, greenspace type and climate. We discuss the evidence for how and why these factors act as moderators and consider the implications which arise from this improved understanding of the relationship between greenspace and health. In conclusion, we discuss how the framework can be used to inform planning of research studies, and how it may be developed in the future as more evidence emerges.

**Kalkstein, L. S., David Sailor, Kurt Shickman, Scott Sheridan, and Jenni Vanos (2013). *Assessing the Health Impacts of Urban Heat Island Reduction Strategies in the District of Columbia.***

This study estimates possible reductions in heat-related mortality in the District assuming the installation of urban heat island reduction measures and determines if the number of days with weather conditions that are historically associated with high mortality will decrease significantly using cooling strategies. The study team identified four actual multi-day heat events, calculated excess mortality during those events, and modeled the impact of increased surface reflectance and increased vegetative cover on meteorological conditions and expected mortality. The study found that a 10-percentage point increase in urban surface reflectivity could reduce the number of deaths during heat events by an average of 6%. Adding a 10% increase vegetative cover to the increases

in reflectivity yielded an average 7% reduction in mortality during heat events. During the decades between 1948 and 2011, an average of 285 people died of heat-related causes (Kalkstein et al., 2011). A 6–7% decrease in mortality would save approximately 20 lives per decade. In addition, an even larger reduction would be expected in hospital admissions from heat-related illness, although this was not a specific finding of this analysis. Changes in temperature and humidity (as measured by dew point temperature) in both scenarios were relatively minor, yet were significant enough to contribute to the reduction of deaths. The District, given its current policy landscape and development, could achieve the increases in reflectivity and vegetation used in this study. Increasing District-wide roof reflectivity by 10 percentage points is achievable by converting dark grey roofs to white roofs on approximately 25 percent of the District's buildings. Assuming the average roof lasts 20 years, the District could achieve this with end-of-life roof replacements in slightly more than 5 years. Achieving the same increase in reflectivity for pavements would require the conversion of 50 percent of District pavements from dark asphalt to a slightly lighter option like grey concrete. A significantly smaller percentage of pavements would need to be converted if cool coatings were applied where feasible.

**Jungels, J., et al. (2013). "Attitudes and aesthetic reactions toward green roofs in the Northeastern United States." *Landscape and Urban Planning* 117(0): 13-21.**

Green roofs may provide environmental, aesthetic, and social benefits. Their environmental benefits have been the subject of considerable research in the past decade; the aesthetic and social aspects, however, have received less attention. Some authors have questioned the visual appeal of some green roof designs. Nonetheless, little research has examined aesthetic reactions toward green roofs or attitudes concerning them. We conducted visitor surveys at seven green roofs in the Northeastern US to assess visitors' aesthetic reactions to different types of green roofs, determine general attitudes toward green roofs, and assess values concerning benefits and costs associated with them. Attitudes toward green roofs were positive with higher importance being placed on green roof benefits than costs. Aesthetic reactions were, in general, positive. Aesthetic reactions to roofs dominated by stoloniferous grasses were more negative than to either sedum-dominated or mixed perennial roofs. Principle component analysis showed that negative aesthetic reactions were associated primarily with a perception of messiness. Furthermore, respondents felt that the grass-dominated roofs blended less well with the building and surrounding landscape. Aesthetic reactions were positively correlated with attitudes and importance placed on the benefits of green roofs. Positive visitor reactions to sedum-dominated extensive roofs is a favorable result for the green roof industry as these are the most common type of green roof and this suggests that there is high promotion potential if more of these roofs are designed to be visible from street level.

**Jo, H., et al. (2013). "Physiological and Psychological Response to Floral Scent." *HortScience* 48(1): 82-88.**

To better understand how fragrance may enhance human health, this study examined psychophysiological responses to Japanese plum blossom fragrance. Although previous studies used essential oils or fragrance components, the present study measured the effects of floral scent naturally diffused by the plant itself to simulate the way we generally experience natural scent in everyday life. Subjects were Japanese males (n = 26), and the data collected included cerebral and autonomic nervous system activities, semantic differential (SD) scale, and profile of mood states (POMS). Exposure to the fragrance significantly activated the sympathetic nervous system and the cerebral areas related to movement, speech, and memory. SD scale and POMS results showed the fragrance evoked cheerful, exciting, and active images and changed mood states by enhancing vigor while suppressing feelings of depression. These findings indicate that contact with a floral scent such as plum blossom fragrance can improve mood states and may foster the brain functions of memory, speech, and movement, potentially leading to improvements in emotional health, depression, and memory disorders.

**Giner, N. M., et al. (2013). "Understanding the social determinants of lawn landscapes: A fine-resolution spatial statistical analysis in suburban Boston, Massachusetts, USA." *Landscape and Urban Planning* 111(0): 25-33.**

This study examines the influence of social processes on the spatial distribution of residential lawns, one of the most prominent anthropogenic environmental challenges in US urban/suburban areas today. Specifically, we examine how three theoretically informed social drivers of urban vegetation patterns—population density, social stratification, and lifestyle behavior—explain two measures of residential lawns at the US Census block group (CBG) scale in suburban Boston, MA, USA. Using fine-spatial resolution (0.5 m) remotely sensed data, we map land cover from which we generate two lawn measures: (1) “percent lawn cover,” which is the overall percentage of land in a CBG containing lawn, and (2) “percent lawn realized stewardship,” which is the percentage of non-developed land in a CBG containing lawn. We use spatial regression to find that population density and lifestyle behavior, proxied by percentage of single-family detached homes, average household size, and percentage of protected land in the CBG—are the key social processes driving the spatial distribution of both lawn measures in our study area. Results also show that spatial regression provides theoretical insight into additional, unspecified processes influencing the spatial distribution of lawns, net of the effects of the independent variables. These findings contribute to the existing understanding of the social processes influencing the residential lawn landscape, and are therefore useful for scientists, decision-makers, and stakeholders who are interested in moderating the potential social and ecological impacts of this landscape.

**Eklblom-Bak, E., et al. (2013). "The importance of non-exercise physical activity for cardiovascular health and longevity." *British Journal of Sports Medicine*.**

Background Sedentary time is increasing in all societies and results in limited non-exercise physical activity (NEPA) of daily life. The importance of low NEPA for cardiovascular health and longevity is limited, especially in elderly. Aim to examine the association between NEPA and cardiovascular health at baseline as well as the risk of a first cardiovascular disease (CVD) event and total mortality after 12.5 years. Study design Cohort study. Material and methods Every third 60-year-old man and woman in Stockholm County was invited to a health screening study; 4232 individuals participated (78% response rate). At baseline, NEPA and exercise habits were assessed from a self-administrated questionnaire and cardiovascular health was established through physical examinations and laboratory tests. The participants were followed for an average of 12.5 years for the assessment of CVD events and mortality. Results at baseline, high NEPA was, regardless of regular exercise and compared with low NEPA, associated with more preferable waist circumference, high-density lipoprotein cholesterol and triglycerides in both sexes and with lower insulin, glucose and fibrinogen levels in men. Moreover, the occurrence of the metabolic syndrome was significantly lower in those with higher NEPA levels in non-exercising and regularly exercising individuals. Furthermore, reporting a high NEPA level, compared with low, was associated with a lower risk of a first CVD event (HR=0.73; 95% CI 0.57 to 0.94) and lower all-cause mortality (0.70; 0.53 to 0.98). Conclusions A generally active daily life was, regardless of exercising regularly or not, associated with cardiovascular health and longevity in older adults.

**Dinnie, E., et al. (2013). "Community, cooperation and conflict: Negotiating the social well-being benefits of urban greenspace experiences." *Landscape and Urban Planning* 112(0): 1-9.**

The positive benefits of urban greenspaces for human health and well-being are widely recognised. While much intellectual effort has gone into identifying and cataloguing the environmental characteristics of places, spaces and landscapes associated with particular health outcomes, less well understood are the social dimensions through which everyday engagements with such greenspaces are framed and put into practice, and interactions between these dimensions. This article reports on preliminary findings from ethnographic research in two areas of

Dundee, UK. We used mobile and participatory visual methods with greenspace users in order to investigate their everyday experiences and engagements with local greenspaces, and to understand how meanings associated with use translate (or not) into well-being benefits. The research found that experiences of greenspace – and thus any well-being benefits produced through engagement – are inescapably social and mediated through people's positioning in relation to particular social groups. Moreover there is not one social context or social order, but many, and hence meanings are contested. This prompts for more attention to be paid to how well-being from greenspace can be delivered in ways meaningful to different people and groups. We conclude that social relations and social health (as well as individual mental and physical health) need to be more thoroughly explored in relation to greenspace and its management practices.

**Bendt, P., et al. (2013). "Civic greening and environmental learning in public-access community gardens in Berlin." *Landscape and Urban Planning* 109(1): 18-30.**

We analyse environmental learning in public-access community gardens ('PAC-gardens') in Berlin, representing public green spaces that are collectively managed by civil society groups. Through extensive fieldwork, and drawing upon social theories of learning, we describe learning communities in four PAC-gardens and analyse factors that influence participation and boundary interaction, that is when experiences brought in from the outside encounter socially defined competences. Results show that these PAC-gardens have self-generated social and physical structures, which to different degrees inhibit or facilitate boundary interactions, whereas skills of individuals to put those to work, in combination with the quality of the surrounding neighbourhoods, can be ascribed for creating broader participation and greater diversity in the content of learning about local sustainability. Identified learning streams included learning about gardening and local ecological conditions; about urban politics, and about social entrepreneurship. We discuss results in relation to environmental learning that combats the generational amnesia in cities about our dependence on nature, where PAC-gardens clearly distinguish themselves from more closed forms of urban gardening such as allotment gardens and gated community gardens. We conclude that PAC-gardens that intertwine gardening with social, political and economic practices can create broader and more heterogeneous learning about social-ecological conditions, and help develop sense-of-place in degraded neighbourhoods.

**Wolfe, M. K. and J. Mennis (2012). "Does vegetation encourage or suppress urban crime? Evidence from Philadelphia, PA." *Landscape and Urban Planning* 108(2-4): 112-122.**

There is longstanding belief that vegetation encourages crime as it can conceal criminal activity. Other studies, however, have shown that urban residential areas with well-maintained vegetation experience lower rates of certain crime types due to increased surveillance in vegetated spaces as well as the therapeutic effects ascribed to vegetated landscapes. The present research analyzes the association of vegetation with crime in a case study of Philadelphia, Pennsylvania. We examine rates of assaults, robberies, burglaries, and thefts in relation to remotely sensed vegetation abundance at the Census tract level. We employ choropleth mapping, correlation, ordinary least squares regression, and spatial econometric modeling to examine the influence of vegetation on various crime types while controlling for tract-level socioeconomic indicators. Results indicate that vegetation abundance is significantly associated with lower rates of assault, robbery, and burglary, but not theft. This research has implications for urban planning policy, especially as cities are moving towards 'green' growth plans and must look to incorporate sustainable methods of crime prevention into city planning.

**Ward Thompson, C., et al. (2012). "More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns." *Landscape and Urban Planning* 105(3): 221-229.**

Green space has been associated with a wide range of health benefits, including stress reduction, but much pertinent evidence has relied on self-reported health indicators or experiments in artificially controlled environmental conditions. Little research has been reported using ecologically valid objective measures with participants in their everyday, residential settings. This paper describes the results of an exploratory study ( $n=25$ ) to establish whether salivary cortisol can act as a biomarker for variation in stress levels which may be associated with varying levels of exposure to green spaces, and whether recruitment and adherence to the required, unsupervised, salivary cortisol sampling protocol within the domestic setting could be achieved in a highly deprived urban population. Self-reported measures of stress and general wellbeing were also captured, allowing exploration of relationships between cortisol, wellbeing and exposure to green space close to home. Results indicate significant relationships between self-reported stress ( $P<0.01$ ), diurnal patterns of cortisol secretion ( $P<0.05$ ), and quantity of green space in the living environment. Regression analysis indicates percentage of green space in the living environment is a significant ( $P<0.05$ ) and independent predictor of the circadian cortisol cycle, in addition to self-reported physical activity ( $P<0.02$ ). Results also show that compliance with the study protocol was good. We conclude that salivary cortisol measurement offers considerable potential for exploring relationships between wellbeing and green space and discuss how this ecologically valid methodology can be developed to confirm and extend findings in deprived city areas to illuminate why provision of green space close to home might enhance health.

**Troy, A., et al. (2012). "The relationship between tree canopy and crime rates across an urban–rural gradient in the greater Baltimore region." *Landscape and Urban Planning* 106(3): 262-270.**

The extent to which urban tree cover influences crime is in debate in the literature. This research took advantage of geocoded crime point data and high resolution tree canopy data to address this question in Baltimore City and County, MD, an area that includes a significant urban–rural gradient. Using ordinary least squares and spatially adjusted regression and controlling for numerous potential confounders, we found that there is a strong inverse relationship between tree canopy and our index of robbery, burglary, theft and shooting. The more conservative spatially adjusted model indicated that a 10% increase in tree canopy was associated with a roughly 12% decrease in crime. When we broke down tree cover by public and private ownership for the spatial model, we found that the inverse relationship continued in both contexts, but the magnitude was 40% greater for public than for private lands. We also used geographically weighted regression to identify spatial non-stationarity in this relationship, which we found for trees in general and trees on private land, but not for trees on public land. Geographic plots of pseudo-t statistics indicated that while there was a negative relationship between crime and trees in the vast majority of block groups of the study area, there were a few patches where the opposite relationship was true, particularly in a part of Baltimore City where there is an extensive interface between industrial and residential properties. It is possible that in this area a significant proportion of trees is growing in abandoned lands between these two land uses.

**Mazumdar, S. and S. Mazumdar (2012). "Immigrant home gardens: Places of religion, culture, ecology, and family." *Landscape and Urban Planning* 105(3): 258-265.**

This paper focuses on the role of home gardens in the lives of immigrants. An ethnographic research was conducted which included observations of 16 home gardens and unstructured open-ended interviews with 28 immigrants from India, Vietnam; Indonesia, Philippines, Iran, China and Taiwan, to Southern California, USA. The lessons from this study are that for immigrants home gardens can be: (a) religious space enabling everyday practice of religion as well as meditation and socialization; (b) culture space through plants, fruits and flowers that enable cultural cuisine, ethnomedicine, and identity continuity; (c) ecological space that assists with environmental/ecological nostalgia, reconnecting people with landscapes left behind as well as forging new

connections to place; (d) family memorial space where gardens honor and memorialize family members and provide opportunities for intergenerational linkages. These enable immigrants to engage with, personalize, and experience their new environment in deeply meaningful ways.

**Hunter, M. C. R. and D. G. Brown (2012). "Spatial contagion: Gardening along the street in residential neighborhoods." *Landscape and Urban Planning* 105(4): 407-416.**

Urban nature, including residential gardens, can promote biodiversity and increase human wellbeing. Understanding factors that encourage the spread of gardening within cities may help planners facilitate healthier and more biodiverse urban communities. This study characterizes the spatial distribution and attributes of gardens found in easement areas of Ann Arbor, Michigan. Spatial analyses of these privately managed public spaces provide evidence of clustering for both presence of gardens and their esthetic quality. Data collected on the location and attributes of easements from 22,562 properties during summer of 2009, show that 11% of these properties held an easement garden. Results of multiple spatial analyses, each targeting a different aspect of garden distribution, show that (a) the most intense easement garden clustering occurs among neighbors with direct visual access to nearest neighbors' easement areas; (b) it is 2.4 times as likely that a property holds an easement garden if a property within 30m holds one; (c) although clustering is measurable for all neighborhood sizes up to 610m from home, peak clustering happens within 91m of home; and (d) clustering of easement gardens are clustered in terms of quality (appeal), and greatest clustering occurs between pairs of adjacent neighbors. While larger scale factors may play a role in where a garden cluster is initiated, the dominant occurrence of relatively small cluster sizes indicates that social contagion is in play. The potential value of social contagion is discussed as a mechanism for spread sustainable behaviors that support ecological resilience in urban areas.

**Freeman, C., et al. (2012). "'My garden is an expression of me': Exploring householders' relationships with their gardens." *Journal of Environmental Psychology* 32(2): 135-143.**

Domestic gardens offer immense potential as sites for native biodiversity conservation. In urban areas they often comprise the largest land use, thus presenting an accessible and immediate way for urban dwellers to connect with nature and to support and enhance native biodiversity. This paper presents findings from a study of 55 domestic gardens undertaken in Dunedin, New Zealand, which explores householders' relationships with their gardens. The study data was derived from two interviews with householders, two photo exercises (approximately a year apart), together with a number of biological studies of the gardens. Gardens proved to be very important for our householders; for physical and mental health, as an expression of ownership and identity, as sites for social relationships, for connecting with nature and as site of domestic produce production. Householders' connections with nature were idiosyncratic, multifaceted and exhibited in ways that are more complex and varied than those usually considered by those working in the natural sciences and indeed biophilia supporters. We emphasize the importance of the people side of nature in seeking to build and support positive ecological change in the urban environment and the value of combining natural and social science approaches.

**Franklin, D. (2012). Nature that nurtures: Hospital gardens turn out to have medical benefits. *Scientific American*: 24-25.**

**Donovan, G. H. and J. P. Prestemon (2012). "The effect of trees on crime in Portland, Oregon." *Environment and Behavior* 44(1): 3-30.**

The authors estimate the relationship between trees and three crime aggregates (all crime, violent crime, and property crime) and two individual crimes (burglary and vandalism) in Portland, Oregon. During the study period (2005-2007), 431 crimes were reported at the 2,813 single-family homes in our sample. In general, the authors find that trees in the public right of way are associated with lower crime rates. The relationship between crime and trees on a house's lot is mixed. Smaller, view-obstructing trees are associated with increased crime, whereas larger trees are associated with reduced crime. The authors speculate that trees may reduce crime by signaling to potential criminals that a house is better cared for and, therefore, subject to more effective authority than a comparable house with fewer trees. © SAGE Publications 2012.

**Zheng, B., et al. (2011). "Preference to home landscape: wildness or neatness?" *Landscape and Urban Planning* 99(1): 1-8.**

This study explores students' preferences toward natural and wild versus clean and neat residential landscapes using preference survey data. Based on the rating scores of four housing landscape designs, multinomial logit models were used to explore the potential influential factors on people's preferences, especially the wildness or neatness of the home landscape. The results suggest that students in agricultural economics, horticulture, and social sciences are more inclined to choose a neat, well-kept environment around their homes. In contrast, wildlife science students prefer more natural landscapes. This study also found that senior students and students from large cities also prefer well-maintained and artificial landscapes. Also, students who are members of an environmental group, and those whose parents have a better education, are more likely to choose a more natural landscape. The results would provide additional information for planners, developers, engineers, architects and foresters in building more livable communities which are aesthetically appealing but also ecologically sound.

**Ward Thompson, C. (2011). "Linking landscape and health: The recurring theme." *Landscape and Urban Planning* 99(3-4): 187-195.**

This paper traces evidence of the influence of the landscape on people's health, from ancient times to the present day, noting how access to nature and attractive green spaces has been a recurring theme in descriptions of therapeutic environments and associated healthy lifestyles. It describes how the theme of health in the picturesque debates of eighteenth century England (including such concepts as 'active curiosity' was taken up and developed in arguments for the nineteenth century urban park movement in England and North America. Recent theories on the mechanisms behind health benefits of nature and access to landscape are compared with claims made in the nineteenth century and earlier. The importance of access to the landscape appears to be as relevant as ever in the context of modern urban lifestyles but the need for better evidence and understanding remains.

**Thomsen, J. D., et al. (2011). "People-plant Relationships in an Office Workplace: Perceived Benefits for the Workplace and Employees." *HortScience* 46(5): 744-752.**

The study presented in this article represents an initial attempt to generate in-depth information about how ornamental plants in real-life office workplaces interact with workplace characteristics, thus influencing working environment and well-being of the employees. Using a qualitative, explorative, and inductive case-study design, the study provides an example of how a cross-disciplinary unit engaged in administrative office work at a Danish institution applied ornamental plants. The results document that ornamental plants are an integrated part of the workplace. The employees used ornamental plants in numerous ways to either actively manipulate different aspects of the surroundings or more passively cope with demands from the surroundings. Furthermore, the use of



the ornamental plants was structured by a number of factors: culture and traditions, provisional orders, organizational structures, practices, values and history, company policies, and characteristics of the indoor architectural environment. Ornamental plants were perceived as affecting many aspects of the working environment (e.g., the physical surroundings, the social climate, image of the workplace, etc.), the individual's well-being (e.g., mood, general well-being, emotions, self confidence, etc.), and to some degree the workplace's competitiveness. However, the actual effects were the results of a complex interaction among the way the ornamental plants were applied, characteristics of the present ornamental plants (e.g., size, species and condition), and characteristics of the individual employee (e.g., personal experiences, preferences, and values).

**Raanaas, R. K., et al. (2011). "Benefits of indoor plants on attention capacity in an office setting." *Journal of Environmental Psychology* 31(1): 99-105.**

This research studied possible benefits of indoor plants on attention capacity in a controlled laboratory experiment. Participants were 34 students randomly assigned to one of two conditions: an office setting with four indoor plants, both flowering and foliage, or the same setting without plants. Attention capacity was assessed three times, i.e. immediately after entering the laboratory, after performing a demanding cognitive task, and after a five-minute break. Attention capacity was measured using a reading span test, a dual processing task known to tap the central executive function of attention. Participants in the plant condition improved their performance from time one to two, whereas this was not the case in the no-plant condition. Neither group improved performance from time two to three. The results are discussed in the context of Attention Restoration Theory and alternative explanations.

**Ling, C. and A. Dale (2011). "Nature, place and the creative class: Three Canadian case studies." *Landscape and Urban Planning* 99(3-4): 239-247.**

In the natural world, the transfer of resources between landscape features such as the corridors and patches that make up the mosaic of ecological niches is increased where those boundaries are more complex. This article explores this as an analogue for the relationship between natural landscapes and human communities and the possible link between those landscapes greater human diversity and innovation. Using Canadian case study research this article explores the potential link between landscape and human creativity. The case studies are all examples of human communities with higher than average populations of the creative class and with noted landscapes that have influenced the nature and direction of development. We explore the possibility that there is a link between landscape and creativity and consider how this may reflect the potential for cultural diversity and thus the sustainable community development.

**Branas, C. C., et al. (2011). "A Difference-in-Differences Analysis of Health, Safety, and Greening Vacant Urban Space." *American Journal of Epidemiology* 174(11): 1296-1306.**

Greening of vacant urban land may affect health and safety. The authors conducted a decade-long difference-in-differences analysis of the impact of a vacant lot greening program in Philadelphia, Pennsylvania, on health and safety outcomes. "Before" and "after" outcome differences among treated vacant lots were compared with matched groups of control vacant lots that were eligible but did not receive treatment. Control lots from 2 eligibility pools were randomly selected and matched to treated lots at a 3:1 ratio by city section. Random-effects regression models were fitted, along with alternative models and robustness checks. Across 4 sections of Philadelphia, 4,436 vacant lots totaling over 7.8 million square feet (about 725,000 m<sup>2</sup>) were greened from 1999 to 2008. Regression-adjusted estimates showed that vacant lot greening was associated with consistent reductions

in gun assaults across all 4 sections of the city ( $P < 0.001$ ) and consistent reductions in vandalism in 1 section of the city ( $P < 0.001$ ). Regression-adjusted estimates also showed that vacant lot greening was associated with residents' reporting less stress and more exercise in select sections of the city ( $P < 0.01$ ). Once greened, vacant lots may reduce certain crimes and promote some aspects of health. Limitations of the current study are discussed. Community-based trials are warranted to further test these findings.

**Yu, W.-W., et al. (2010). "Comparison of the Effects of Plant Parables on the Promotion of Spiritual Benefits in Students with Differing Horticultural Backgrounds." *HortTechnology* 20(3): 568-573.**

Research on the restorative benefits of nature primarily has focused on the spiritual benefits of wilderness areas, but other areas, such as cities, have not been studied. Horticultural activities have the potential to promote spiritual health, but most participants are not aware of this benefit. To improve this situation and to increase evidence of the benefits of therapeutic horticulture, this study suggests treating plant parables as trigger cues, which would allow an approach to interaction with plants through metaphysical imagination, resulting in an improvement in spiritual health from horticultural activities. The purpose of this study was to understand participants' beliefs of the spiritual benefits of horticultural activities, and to see if these beliefs were enhanced after reading plant parables. This study surveyed subjects with different horticultural backgrounds, and measured their opinions regarding belief in the spiritual benefits of horticultural activities, before and after reading the parables. The results indicated that before reading the plant parables, neither group of subjects with different horticultural backgrounds agreed with the spiritual benefits of horticultural activities; however, after reading the plant parables, the belief of participants with formal horticultural education backgrounds increased significantly ( $P < 0.001$ ). The increase was not significant in subjects without formal horticultural education backgrounds.

**Ryan, R. M., et al. (2010). "Vitalizing effects of being outdoors and in nature." *Journal of Environmental Psychology* 30(2): 159-168.**

Five studies utilizing survey, experimental, and diary methods assessed the effects of being outdoors on subjective vitality. In Study 1, we used a vignette method to examine whether being outdoors was associated with vitality, above and beyond the influences of physical activity and social interactions. Study 2 explored the effects of being outdoors on vitality through an experimental design contrasting indoor and outdoor walks. In Study 3, participants were exposed to photographic scenes of either nature or buildings. Results showed that only the nature scenes enhanced subjective vitality. Studies 4 and 5 used a diary methodology to examine within-person variations in subjective energy as a function of being outdoors, again controlling for physical and social activity. Being outdoors was associated with greater vitality, a relation that was mediated by the presence of natural elements. Limitations of these studies are discussed, as well as their implications for research on energy and vitalization.

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Five studies utilizing survey, experimental, and diary methods assessed the effects of being outdoors on subjective vitality. In Study 1, we used a vignette method to examine whether being outdoors was associated with vitality, above and beyond the influences of physical activity and social interactions. Study 2 explored the effects of being outdoors on vitality through an experimental design contrasting indoor and outdoor walks. In Study 3, participants were exposed to photographic scenes of either nature or buildings. Results showed that only the nature scenes enhanced subjective vitality. Studies 4 and 5 used a diary methodology to examine within-person variations in subjective energy as a function of being outdoors, again controlling for physical and social activity. Being outdoors was associated with greater vitality, a relation that was mediated by the presence of natural

elements. Limitations of these studies are discussed, as well as their implications for research on energy and vitalization. (C) 2009 Elsevier Ltd. All rights reserved.

**Raanaas, R. K., et al. (2010). "Effects of an Indoor Foliage Plant Intervention on Patient Well-being during a Residential Rehabilitation Program." *HortScience* 45(3): 387-392.**

Effects of an indoor plant intervention in a Norwegian rehabilitation center were assessed in a quasi-experiment. During a 2-year period, coronary and pulmonary patients (N = 282) completed self-report measures of health, subjective well-being, and emotion on arrival, after 2 weeks, and at the end of a 4-week program. The intervention involved the addition of indoor plants for the second year. On average, patient physical and mental health improved during the program, but the addition of plants did not increase the degree of improvement. Subjective well-being did, however, increase more in patients who went through their program after the addition of plants, although the effect was only apparent in the pulmonary patients. The patients reported more satisfaction with indoor plants and the interior generally after the intervention. Room for the intervention to affect outcomes may have been limited by the well-designed interior and the center's location in a scenic mountain area, but these favorable features of the context apparently did not negate the potential for indoor plants to contribute to patient well-being.

**Nurse, J., et al. (2010). "An ecological approach to promoting population mental health and well-being -- A response to the challenge of climate change." *Perspectives in Public Health* 130(1): 27-33.**

Climate change can be viewed as human-induced change to climate and depletion of natural systems. It potentially the biggest global health threat of the 21st century.<sup>1</sup> It is predicted to have wide-ranging impacts upon human mental health and well-being, through changes and challenges to people's environment, socioeconomic structures and physical security. Even the most conservative estimates of the health impacts are extremely alarming. Increasingly, the causes of poor human health and environmental damage are related. This implies that there are common solutions. For example, there are co-benefits to human health and biodiversity from mitigating and adapting to climate change (e.g. promoting active transport and reducing car use reduces CO<sub>2</sub> emissions, benefits our environment and reduces morbidity and mortality associated with a sedentary lifestyle). This article outlines how climate change impacts upon mental health and well-being. It introduces ecological concepts, applies these to public health and outlines their implications in transforming the way that we prioritize and deliver public health in order to promote both environmental and human health. Evidence, from psychology and neuroscience, suggests that the perception of being disconnected from our inner selves, from each other and from our environment has contributed to poor mental and physical health. We argue that we must transform the way we understand mental health and well-being and integrate it into action against climate change. We describe a Public Health Framework for Developing Well-Being, based on the principles of ecological public health.

**McFarland, A. L., et al. (2010). "Graduate Student Use of Campus Green Spaces and the Impact on Their Perceptions of Quality of Life." *HortTechnology* 20(1): 186-192.**

Students' perception of their overall academic experience and the campus environment is related to academic accomplishment, and research has found that the designed environment of the university can influence the degree of stress students may feel. Past research found that undergraduate student use of campus green spaces and perceptions of quality of life were related to each other. The main objective of this study was to investigate the relationship between graduate student use of campus green spaces and their perceptions of quality of life at a university in Texas. A total of 347 of 3279 (approx 10%) of the graduate student body received e-mails with information regarding the incentive for participation and instructions on accessing an on-line survey. The survey included questions that related to student use of campus green spaces, overall quality of life statements, an

instrument to measure the quality of life of university students, and demographic questions. A total of 79 (22.8% response rate) graduate student questionnaires were collected and analyzed to compare perceptions of quality of life of university students and the level of individual usage of campus green spaces. Descriptive statistics determined that, unlike undergraduates who were primarily "high users" of campus green spaces, graduate students were about equally split between being "low," "medium," and "high users" of campus green spaces. However, graduate students still ranked their quality of life highly. Finally, this study found that, unlike undergraduates, graduate students did not have a statistically significant relationship between green-user scores and perception of quality of life scores. It may be that graduate students have less time to spend in outdoor spaces, yet still meet their quality of life needs through other means such as academic achievements.

**Matsuoka, R. H. (2010). "Student performance and high school landscapes: Examining the links." *Landscape and Urban Planning In Press, Corrected Proof.***

High school students today are experiencing unprecedented levels of school-related stress. At the same time, a growing body of research has linked views of nature with restoration from mental fatigue and stress reduction. How important are such views for students while they are at school? This study investigated 101 public high schools in southeastern Michigan to examine the role played by the availability of nearby nature in student academic achievement and behavior. The analyses revealed consistent and systematically positive relationships between nature exposure and student performance. Specifically, views with greater quantities of trees and shrubs from cafeteria as well as classroom windows are positively associated with standardized test scores, graduation rates, percentages of students planning to attend a four-year college, and fewer occurrences of criminal behavior. In addition, large expanses of landscape lacking natural features are negatively related to these same test scores and college plans. These featureless landscapes included large areas of campus lawns, athletic fields, and parking lots. All analyses accounted for student socio-economic status and racial/ethnic makeup, building age, and size of school enrollment.

**Donovan, G. H. and J. P. Prestemon (2010). "The Effect of Trees on Crime in Portland, Oregon." *Environment and Behavior.***

The authors estimate the relationship between trees and three crime aggregates (all crime, violent crime, and property crime) and two individual crimes (burglary and vandalism) in Portland, Oregon. During the study period (2005-2007), 431 crimes were reported at the 2,813 single-family homes in our sample. In general, the authors find that trees in the public right of way are associated with lower crime rates. The relationship between crime and trees on a house's lot is mixed. Smaller, view-obstructing trees are associated with increased crime, whereas larger trees are associated with reduced crime. The authors speculate that trees may reduce crime by signaling to potential criminals that a house is better cared for and, therefore, subject to more effective authority than a comparable house with fewer trees.

**Andrews, M. and B. Gatersleben (2010). "Variations in perceptions of danger, fear and preference in a simulated natural environment." *Journal of Environmental Psychology In Press, Corrected Proof.***

Although natural environments can help promote health, they also contain a number of dangers. This study attempted to examine how variations in the physical structure of a simulated natural environment influenced perceptions of both overall and specific types of danger, fear and preference before exploring the relationships between these variables. Three simulated walks through a natural environment differing in levels of prospect-refuge were created for the study. Respondents were randomly assigned to one of the conditions and asked to imagine taking the walk for real. In support of the typology, the results found that the walks with higher levels of prospect-refuge (higher visibility, fewer hiding places and more accessibility) were perceived as less

dangerous and fearful and more preferred than walks with lower levels of prospect-refuge. However despite levels of prospect-refuge appearing to impact on the perceived likelihood of encountering a physical danger or becoming lost, they were not found to impact on the perception of encountering a social danger.

**Taylor, A. F. and F. E. Kuo (2009). "Children With Attention Deficits Concentrate Better After Walk in the Park." *Journal of Attention Disorders* 12(5): 402-409.**

Objective: In the general population, attention is reliably enhanced after exposure to certain physical environments, particularly natural environments. This study examined the impacts of environments on attention in children with ADHD. Method: In this within subjects design, each participant experienced each of three treatments (environments) in single blind controlled trials. Seventeen children 7 to 12 years old professionally diagnosed with ADHD experienced each of three environments—a city park and two other well-kept urban settings—via individually guided 20-minute walks. Environments were experienced 1 week apart, with randomized assignment to treatment order. After each walk, concentration was measured using Digit Span Backwards. Results: Children with ADHD concentrated better after the walk in the park than after the downtown walk ( $p = .0229$ ) or the neighborhood walk ( $p = .0072$ ). Effect sizes were substantial (Cohen's  $d = .52$  and  $.77$ , respectively) and comparable to those reported for recent formulations of methylphenidate. Conclusion: Twenty minutes in a park setting was sufficient to elevate attention performance relative to the same amount of time in other settings. These findings indicate that environments can enhance attention not only in the general population but also in ADHD populations. "Doses of nature" might serve as a safe, inexpensive, widely accessible new tool in the tool kit for managing ADHD symptoms. (*J. of Att. Dis.* 2009; 12(5) 402-409)

**Park, S.-H. and R. H. Mattson (2009). "Therapeutic Influences of Plants in Hospital Rooms on Surgical Recovery." *HortScience* 44(1): 102-105.**

Medical and psychological measurements of surgical patients were tested to determine the influence of plants and flowers within hospital rooms. Eighty female patients recovering from a thyroidectomy were randomly assigned to either control or plant rooms. Patients in the plant room viewed 12 foliage and flowering plants during their postoperative recovery periods. Data collected for each patient included length of hospitalization, analgesics used for postoperative pain control, vital signs, ratings of pain intensity, pain distress, anxiety and fatigue, the State-Trait Anxiety Inventory Form Y-1, the Environmental Assessment Scale, and the Patient's Room Satisfaction Questionnaire. Patients in hospital rooms with plants and flowers had significantly shorter hospitalizations, fewer intakes of analgesics, lower ratings of pain, anxiety, and fatigue, and more positive feelings and higher satisfaction about their rooms when compared with patients in the control group. Findings of this research suggest the therapeutic value of plants in the hospital environment as an effective complementary medicine for surgical patients.

**Park, S. and R. H. Mattson (2009). "Ornamental indoor plants in hospital rooms enhanced health outcomes of patients recovering from surgery." *Journal of Alternative & Complementary Medicine* 15(9): 975-980.**

Background: Clinical trials have not been reported concerning the health benefits of viewing indoor plants on stress and recovery of surgical patients within a hospital setting. Using various medical and psychologic measurements, this study performed a randomized clinical trial with surgical patients to evaluate whether plants in hospital rooms have therapeutic influences. Methods: Ninety (90) patients recovering from a hemorrhoidectomy were randomly assigned to either control or plant rooms. With half the patients, live plants were placed in their rooms during postoperative recovery periods. Data collected for each patient included length of hospitalization,

analgesics used for postoperative pain control, vital signs, ratings of pain intensity, pain distress, anxiety and fatigue, the State-Trait Anxiety Inventory Form Y-1, the Environmental Assessment Scale, and the Patient's Room Satisfaction Questionnaire. Results: Viewing plants during the recovery period had a positive influence linking directly to health outcomes of surgical patients. Patients in hospital rooms with plants and flowers had significantly more positive physiologic responses evidenced by lower systolic blood pressure, and lower ratings of pain, anxiety, and fatigue than patients in the control room. Patients with plants also felt more positively about their rooms and evaluated them with higher satisfaction when compared with patients in similar rooms without plants. Based on patients' comments, plants brightened up the room environment, reduced stress, and also conveyed positive impressions of hospital employees caring for patients. Conclusions: Findings of this study confirmed the therapeutic value of plants in the hospital environment as a noninvasive, inexpensive, and effective complementary medicine for surgical patients. Health care professionals and hospital administrators need to consider the use of plants and flowers to enhance healing environments for patients.

**Grinde, B. and G. G. Patil (2009). "Biophilia: Does Visual Contact with Nature Impact on Health and Well-Being?" International Journal of Environmental Research and Public Health 6(9): 2332-2343.**

It is concluded that an environment devoid of Nature may act as a "discord", i.e., have a negative effect. While the term mismatch is used for any difference between present living conditions and the environment of evolutionary adaptation, discords are mismatches with a potentially undesirable impact on health or quality of life. The problem is partly due to the visual absence of plants, and may be ameliorated by adding elements of Nature, e.g., by creating parks, by offering a view through windows, and by potted plants. The conclusion is based on an evaluation of some fifty relevant empirical studies.

**Gorham, M. R., et al. (2009). "The Impact of Community Gardens on Numbers of Property Crimes in Urban Houston." HortTechnology 19(2): 291-296.**

Research has suggested that city environments with more green space may have lower crime levels. For this pilot study, 11 established community gardens in Houston, TX, were selected and mapped using ArcGIS 9.1 software. The numbers of property crimes reported in the 2005 crime data from the Houston Police Department surrounding the community garden areas at a distance of 1/8 mile were then tallied and mapped for the areas. The numbers of crimes were evaluated alongside demographic data from the 2000 U.S. Census. Statistical comparisons were made between community garden areas and randomly selected city areas that were within a 1-mile area surrounding each garden. Initial results of paired t tests indicated no statistically significant differences between the mean number of crime occurrences in community garden areas and the mean number of crimes in randomly selected areas. Results from a linear regression analysis also indicated that the presence of a community garden was not a predictor of a lower crime rate for a neighborhood. Adjustments were then made by removing randomly selected areas that were demographically least like their respective community gardens. Results from further analysis indicated that there were no crime number differences between the community garden areas and the randomly selected areas. However, interviews conducted with community garden representatives showed that community gardens appeared to have a positive influence on neighborhoods, with residents reporting neighborhood revitalization, perceived immunity from crime, and neighbors emulating gardening practices they saw at the community gardens.

**Chon, J. H. and C. S. Shafer (2009). "Aesthetic Responses to Urban Greenway Trail Environments." Landscape Research 34(1): 83-104.**

The ways people perceive greenway trails in urban environments are not well studied. Trail layout and aspects of maintenance and design of trails in urban areas would benefit from better knowledge of how potential

users perceive these places and what might encourage or discourage their use. The purpose of this study was to examine the relative influence of aesthetic response dimensions on the likeability of greenway trail scenes in an urban environment. A web-based 'virtual tour' was used to elicit responses to scenes of urban greenway environments in downtown Houston and Austin, Texas, USA. The 211 subjects who participated in the study were selected from an undergraduate student population. Participants viewed the scenes and responded to the survey in a controlled computer laboratory. Perceptions of the greenways supported the aesthetic dimensions that Nasar has suggested for broader urban environments. Our analysis resulted in the identification of five dimensions of aesthetic response to the greenway scenes that were interpreted as: maintenance, distinctiveness, naturalness, pleasantness and arousal. These represented both cognitive and affective responses to the environment and all five dimensions were significant positive predictors of the likeability of greenway scenes. The dimension of pleasantness had the greatest influence on likeability and maintenance had the least. The implications of the findings for urban design related to greenway trails and future research are discussed.

**Bringslimark, T., et al. (2009). "The psychological benefits of indoor plants: A critical review of the experimental literature." *Journal of Environmental Psychology* 29(4): 422-433.**

People have been bringing plants into residential and other indoor settings for centuries, but little is known about their psychological effects. In the present article, we critically review the experimental literature on the psychological benefits of indoor plants. We focus on benefits gained through passive interactions with indoor plants rather than on the effects of guided interactions with plants in horticultural therapy or the indirect effect of indoor plants as air purifiers or humidifiers. The reviewed experiments addressed a variety of outcomes, including emotional states, pain perception, creativity, task-performance, and indices of autonomic arousal. Some findings recur, such as enhanced pain management with plants present, but in general the results appear to be quite mixed. Sources of this heterogeneity include diversity in experimental manipulations, settings, samples, exposure durations, and measures. After addressing some overarching theoretical issues, we close with recommendations for further research with regard to experimental design, measurement, analysis, and reporting.

**Arbogast, K. L., et al. (2009). "Vegetation and outdoor recess time at elementary schools: What are the connections?" *Journal of Environmental Psychology* 29(4): 450-456.**

Empirical and anecdotal evidence suggests that landscapes with more vegetation have a positive impact on children's focus, attention, and cognitive development. In school, children are able to regain focus, suppress impulses, and pay attention in class longer after exposure to natural settings. Because children spend much of their time in school, the amount and types of vegetation on school grounds may influence their development. Public elementary schools in the Commonwealth of Virginia (N = 988) were surveyed to examine correlations between school ground vegetation and outside recess. The number of trees on school grounds, the size of the school grounds, and the presence of sports fields were modestly correlated with greater outside recess time. These correlations support common sense because sports fields facilitate supervised play and larger school grounds provide space for sports fields and playgrounds and additional opportunities for free play. More trees on school grounds provide a welcoming environment for students and teachers, and encourage outside play. These results may help school personnel design and maintain school grounds that increase outdoor recess time.

**Richard, M. and P. Frank (2008). "Effect of exposure to natural environment on health inequalities: an observational population study." *Lancet* 372(9650): 1655-1660.**

Studies have shown that exposure to the natural environment, or so-called green space, has an independent effect on health and health-related behaviours. We postulated that income-related inequality in health would be less pronounced in populations with greater exposure to green space, since access to such areas

can modify pathways through which low socioeconomic position can lead to disease. We classified the population of England at younger than retirement age ( $n=40\,813\,236$ ) into groups on the basis of income deprivation and exposure to green space. We obtained individual mortality records ( $n=366\,348$ ) to establish whether the association between income deprivation, all-cause mortality, and cause-specific mortality (circulatory disease, lung cancer, and intentional self-harm) in 2001–05, varied by exposure to green space measured in 2001, with control for potential confounding factors. We used stratified models to identify the nature of this variation. The association between income deprivation and mortality differed significantly across the groups of exposure to green space for mortality from all causes ( $p<0.0001$ ) and circulatory disease ( $p=0.0212$ ), but not from lung cancer or intentional self-harm. Health inequalities related to income deprivation in all-cause mortality and mortality from circulatory diseases were lower in populations living in the greenest areas. The incidence rate ratio (IRR) for all-cause mortality for the most income deprived quartile compared with the least deprived was 1.93 (95% CI 1.86–2.01) in the least green areas, whereas it was 1.43 (1.34–1.53) in the most green. For circulatory diseases, the IRR was 2.19 (2.04–2.34) in the least green areas and 1.54 (1.38–1.73) in the most green. There was no effect for causes of death unlikely to be affected by green space, such as lung cancer and intentional self-harm. Populations that are exposed to the greenest environments also have lowest levels of health inequality related to income deprivation. Physical environments that promote good health might be important to reduce socioeconomic health inequalities. None.

**Park, S.-H. and R. H. Mattson (2008). "Effects of Flowering and Foliage Plants in Hospital Rooms on Patients Recovering from Abdominal Surgery." *HortTechnology* 18(4): 563-568.**

Using various medical and psychological measurements, this study performed a randomized clinical trial with surgical patients to evaluate if plants in hospital rooms have therapeutic influences. Ninety patients recovering from an appendectomy were randomly assigned to hospital rooms with or without plants. Patients in the plant treatment room viewed eight species of foliage and flowering plants during their postoperative recovery periods. Data collected for each patient included length of hospitalization, analgesics used for postoperative pain control, vital signs, ratings of pain intensity, pain distress, anxiety, and fatigue, the State-Trait Anxiety Inventory Form Y-1, the Environmental Assessment Scale, and the Patient's Room Satisfaction Questionnaire. Patients in hospital rooms with plants and flowers had significantly fewer intakes of postoperative analgesics, more positive physiological responses evidenced by lower systolic blood pressure and heart rate, lower ratings of pain, anxiety, and fatigue, and more positive feelings and higher satisfaction about their rooms when compared with patients in the control group. Findings of this research suggested that plants in a hospital environment could be noninvasive, inexpensive, and an effective complementary medicine for patients recovering from abdominal surgery.

**Mitchell, R. and F. Popham (2008). "Effect of exposure to natural environment on health inequalities: an observational population study." *The Lancet* 372(9650): 1655-1660.**

Studies have shown that exposure to the natural environment, or so-called green space, has an independent effect on health and health-related behaviours. We postulated that income-related inequality in health would be less pronounced in populations with greater exposure to green space, since access to such areas can modify pathways through which low socioeconomic position can lead to disease. We classified the population of England at younger than retirement age ( $n=40\,813\,236$ ) into groups on the basis of income deprivation and exposure to green space. We obtained individual mortality records ( $n=366\,348$ ) to establish whether the association between income deprivation, all-cause mortality, and cause-specific mortality (circulatory disease, lung cancer, and intentional self-harm) in 2001–05, varied by exposure to green space measured in 2001, with control for potential confounding factors. We used stratified models to identify the nature of this variation. The association between income deprivation and mortality differed significantly across the groups of exposure to green



space for mortality from all causes ( $p < 0.0001$ ) and circulatory disease ( $p = 0.0212$ ), but not from lung cancer or intentional self-harm. Health inequalities related to income deprivation in all-cause mortality and mortality from circulatory diseases were lower in populations living in the greenest areas. The incidence rate ratio (IRR) for all-cause mortality for the most income deprived quartile compared with the least deprived was 1.93 (95% CI 1.86–2.01) in the least green areas, whereas it was 1.43 (1.34–1.53) in the most green. For circulatory diseases, the IRR was 2.19 (2.04–2.34) in the least green areas and 1.54 (1.38–1.73) in the most green. There was no effect for causes of death unlikely to be affected by green space, such as lung cancer and intentional self-harm. Populations that are exposed to the greenest environments also have lowest levels of health inequality related to income deprivation. Physical environments that promote good health might be important to reduce socioeconomic health inequalities.

**McFarland, A. L., et al. (2008). "The Relationship Between Student Use of Campus Green Spaces and Perceptions of Quality of Life." *HortTechnology* 18(2): 232-238.**

Researchers have found that students' perception of their overall academic experience and the campus environment is related to academic accomplishment. Additionally, studies have found that the designed environment of the university can influence the degree of stress students may feel. The main objective of this study was to investigate the relationship between undergraduate university student use of campus green spaces and their perceptions of quality of life at a university in Texas. A total of 2334 students or 10% of the undergraduate student body received e-mails with information regarding the incentive for participation and instructions on accessing an online survey. The survey included questions that related to student use of campus green spaces, overall quality of life statements, an instrument to measure the quality of life of university students, and demographic questions. A total of 373 surveys was collected and analyzed to compare levels of quality of life of university students and the level of usage of campus green spaces. Demographic information collected allowed controlling for student grade classification, gender, and ethnicity. Frequency statistics determined that, on average, more than half the students were ranked as "high-users" of the campus green spaces, and very few students were considered "low-users." Frequency statistics also determined that most students rated their overall quality of life and quality of life of university students positively. Additionally, this study found that undergraduate student use of campus green spaces and perceptions of quality of life were related to each other.

**Kweon, B. S., et al. (2008). "Anger and stress - The role of landscape posters in an office setting." *Environment and Behavior* 40(3): 355-381.**

Anger and stress management have become important issues in the modern workplace. One out of four American workers report themselves to be chronically angry, which has been linked to negative outcomes such as retaliatory behavior, revenge, interpersonal aggression, poor work performance, absenteeism, and increased turnover. We hypothesized that people who work in office environments decorated with aesthetically engaging art posters would experience less stress and anger in response to task-related frustration. Two hundred and ten college students were randomly assigned to different office conditions where abstract and nature paintings were hung on the walls. Participants performed four mild anger-provoking computer tasks and then reported their levels of state anger and stress. Results indicate that different office conditions had a significant influence on state anger and stress for males but not for females. Males experienced less state anger and stress when art posters were present. Through mediation analysis, we found that increased proportions of nature paintings decreased state anger because of decreased levels of stress.

**Fried, G. G. and M. J. Wichrowski (2008). "Horticultural Therapy : A Psychosocial Treatment Option at the Stephen D. Hassenfeld Children's Center for Cancer and Blood Disorders." 15(7): 5.**

Quality psychosocial care for patients undergoing treatment for hematology/oncology disorders and their families serves to reduce the inevitable disruptions in life experienced during treatment. Horticultural therapy, a process through which plants and gardening activities are used as vehicles in professionally conducted programs of therapy is a program option that can address the psychosocial needs of patients in numerous medical situations. The horticultural therapy program at the Stephen D. Hassenfeld Children's Center for Cancer and Blood Disorders of New York University Langone Medical Center is designed to stimulate sensory, cognitive, and communication skills as well as increase knowledge and awareness of nature while providing a stress-reducing diversion during treatment. This program provides a range of benefits that complement other treatment options and serves to help minimize potential challenges in the quality of life for patients and their families.

**Dravigne, A., et al. (2008). "The Effect of Live Plants and Window Views of Green Spaces on Employee Perceptions of Job Satisfaction." HortScience 43(1): 183-187.**

A job satisfaction survey was posted on the Internet and administered to office workers in Texas and the Midwest. The survey included questions regarding job satisfaction, physical work environments, the presence or absence of live interior plants and windows, environmental preferences of the office workers, and demographic information. Approximately 450 completed responses were included in the final sample. Data were analyzed to compare levels of job satisfaction of employees who worked in office spaces with live interior plants or window views of exterior green spaces and employees who worked in office environments without live plants or windows. Statistically significant differences ( $P < 0.05$ ) were found regarding perceptions of overall life quality, overall perceptions of job satisfaction, and in the job satisfaction subcategories of "nature of work," "supervision," and "coworkers" among employees who worked in office spaces with live interior plants or window views and those employees who worked in office environments without live plants or windows. Findings indicated that individuals who worked in offices with plants and windows reported that they felt better about their job and the work they performed. This study also provided evidence that those employees who worked in offices that had plants or windows reported higher overall quality-of-life scores. Multivariate analysis of variance comparisons indicated that there were no statistically significant differences among the categories of "age," "ethnicity," "salary," "education levels," and "position" among employees who worked in offices with or without plants or window views. However, there were gender differences in comparisons of males in that male participants in offices with plants rated job satisfaction statements higher when compared with males working in offices with no plants. No differences were found in comparisons of female respondents.

**Criley, R. A. (2008). "Ornamentals - More than just beautiful." Proceedings of the International Workshop on Ornamental Plants 788: 23-28.**

The myriad of cultures around the world differ from continent to continent and within continents, regions, and even cities themselves. The cultural expectations are often aesthetics-based, but there are more reasons than just beauty for the popularity of ornamental plants. Growers and garden centers feature the new, the different, the plant breeder introductions, and the tried-and-true heritage varieties, but keeping up with change is difficult. Across America, and to a certain extent, Europe, the traditional customers are retiring and the next generation of customers is not willing to spend the time gardening that their parents did. In both the USA and Europe, increasing attention is paid to marketing and how to attract the 25- to 45-year-old customer. The market is changing from "Do It Yourself" to "Do It For Me," as the new generation, brought up on instantaneous gratification, wants it Now. In addition to the appeal of something new, the markets are promoting and sharing the

knowledge of how valuable plants are in a home or workplace as stress relievers, air purifiers, environmental modifiers, health benefits, and symbols of feelings, friendship, and comfort. The support behind the commercial ornamental industries includes plant breeders and university and government researchers, but also industry organizations, marketplace gurus, psychologists, and social scientists. As cities reinvent their aging downtowns, the green industries play a huge role in enhancing the quality of life the urban dwellers experiences. Different strategies are needed for different target groups, but basic themes include "providing solutions," and contributing easy and instant applications. Growers must be able to choose among the many new plants introduced each year to produce enough plants for the demand, but they must also be ready to switch to new products when that demand weakens. Keys to this include knowing the customer better and keeping up with the trends that influence plant selection and use.

**Collins, C. C. and A. M. O'Callaghan (2008). "The Impact of Horticultural Responsibility on Health Indicators and Quality of Life in Assisted Living." HortTechnology 18(4): 611-618.**

This study used quantitative and qualitative methods to investigate the impact of indoor gardening on elderly residents of a low-income assisted living facility over a 4-week period. Mastery, self-rated health, and self-rated happiness were pre-, post-, and post-post measured to evaluate whether a short-term introduction of indoor gardening that involved individual plant-care responsibility would improve these measures that are predictive of health and quality of life. Eighteen residents participated in four 2-hour interactive horticulture classes taught by a social horticulturist and a sociologist. Class members showed a significant increase in mastery, self-rated health, and self-rated happiness. The results of this study indicate that a basic horticultural activity, as simple as learning how to maintain a houseplant and taking individual responsibility for one, can have a short-term positive impact on the quality of life and on primary indicators of future health outcomes of older adults residing in assisted living facilities.

**Acar, C. and C. Sakici (2008). "Assessing landscape perception of urban rocky habitats." Building and Environment 43(6): 1153-1170.**

By environmental literature conducted recently, it has been evidently comprehended that urban life quality for mankind and others can be improved by serving these systems with green and living elements. This study is to investigate urban rocky habitats that have special natural characteristics and that can be implicated for urban green areas. But these habitats have been considered as nature splits withstanding against the urban pressures by means of the unplanned build-up activities foremost, and road construction, poor quality or neglected remnants. Therefore, this study presents the environmental perception and preferences of urban rocky habitats which are threatening within excessive urbanization and human use of natural areas in the context of the city of Trabzon, Turkey. So, a total of 20 habitats selected from urban and surroundings were surveyed by using a questionnaire and landscape assessment approach. With surveying performed on 204 participants, visual preferences, landscape attributes and proposed management options for urban nature conservation were determined. The chi(2)-test results revealed clearly that the demographic and expertise status of the participants were correlated with the preferences for types of rocky habitat scene and management options. The scenes with natural elements and less human disturbance obtained higher scores on visual preferences than any of the urban rocky scenes lacking these characteristics. Also, in the quantitative phase, factor analysis based on principal component structure revealed the 'visual and spatial effects', the 'usage and arrangement', the 'naturalness and ecological value', and the 'functionality' components of the scenes. Consequently, some implications for the effective and efficient planning and development of urban nature conservation by assisting the letter understanding of the various patterns of landscape preference, choice and satisfaction in habitats under the present study were suggested. (C) 2007 Elsevier Ltd. All rights reserved.

**(2008). "Ecosystems and Human Well-being: Biodiversity Synthesis." Encyclopedia of Earth. from [http://www.eoearth.org/article/Ecosystems\\_and\\_Human\\_Well-being:\\_Biodiversity\\_Synthesis\\_full\\_report](http://www.eoearth.org/article/Ecosystems_and_Human_Well-being:_Biodiversity_Synthesis_full_report).**

\* Biodiversity benefits people through more than just its contribution to material welfare and livelihoods. Biodiversity contributes to security, resiliency, social relations, health, and freedom of choices and actions.

\* Changes in biodiversity due to human activities were more rapid in the past 50 years than at any time in human history, and the drivers of change that cause biodiversity loss and lead to changes in ecosystem services are either steady, show no evidence of declining over time, or are increasing in intensity. Under the four plausible future scenarios developed by the MA, these rates of change in biodiversity are projected to continue, or to accelerate.

\* Many people have benefited over the last century from the conversion of natural ecosystems to human-dominated ecosystems and from the exploitation of biodiversity. At the same time, however, these gains have been achieved at growing costs in the form of losses in biodiversity, degradation of many ecosystem services, and the exacerbation of poverty for other groups of people.

\* The most important direct drivers of biodiversity loss and ecosystem service changes are habitat change (such as and use changes, physical modification of rivers or water withdrawal from rivers, loss of coral reefs, and damage to sea floors due to trawling), climate change, invasive alien species, overexploitation, and pollution.

\* Improved valuation techniques and information on ecosystem services demonstrate that although many individuals benefit from biodiversity loss and ecosystem change, the costs borne by society of such changes are often higher. Even in instances where knowledge of benefits and costs is incomplete, the use of the precautionary approach may be warranted when the costs associated with ecosystem changes may be high or the changes irreversible.

\* To achieve greater progress toward biodiversity conservation to improve human well-being and reduce poverty, it will be necessary to strengthen response options that are designed with the conservation and sustainable use of biodiversity and ecosystem services as the primary goal. These responses will not be sufficient, however, unless the indirect and direct drivers of change are addressed and the enabling conditions for implementation of the full suite of responses are established.

\* Trade-offs between achieving the 2015 targets of the Millennium Development Goals and the 2010 target of reducing the rate of biodiversity loss are likely, although there are also many potential synergies between the various internationally agreed targets relating to biodiversity, environmental sustainability, and development. Coordinated implementation of these goals and targets would facilitate the consideration of trade-offs and synergies.

\* An unprecedented effort would be needed to achieve by 2010 a significant reduction in the rate of biodiversity loss at all levels.

\* Short-term goals and targets are not sufficient for the conservation and sustainable use of biodiversity and ecosystems. Given the characteristic response times for political, socioeconomic, and ecological systems, longer-term goals and targets (such as for 2050) are needed to guide policy and actions.

\* Improved capability to predict the consequences of changes in drivers for biodiversity, ecosystem functioning, and ecosystem services, together with improved measures of biodiversity, would aid decision-making at all levels.

\* Science can help ensure that decisions are made with the best available information, but ultimately the future of biodiversity will be determined by society.

**Tzoulas, K., et al. (2007). "Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review." *Landscape and Urban Planning* 81(3): 167-178.**

Europe is a highly urbanised continent. The consequent loss and degradation of urban and peri-urban green space could adversely affect ecosystems as well as human health and well-being. The aim of this paper is to formulate a conceptual framework of associations between urban green space, and ecosystem and human health. Through an interdisciplinary literature review the concepts of Green Infrastructure, ecosystem health, and human health and well-being are discussed. The possible contributions of urban and peri-urban green space systems, or Green Infrastructure, on both ecosystem and human health are critically reviewed. Finally, based on a synthesis of the literature a conceptual framework is presented. The proposed conceptual framework highlights many dynamic factors, and their complex interactions, affecting ecosystem health and human health in urban areas. This framework forms the context into which extant and new research can be placed. In this way it forms the basis for a new interdisciplinary research agenda.

**Bringslimark, T., et al. (2007). "Psychological Benefits of Indoor Plants in Workplaces: Putting Experimental Results into Context." *HortScience* 42(3): 581-587.**

Laboratory experiments and quasi-experimental field studies have documented beneficial effects of indoor plants on outcomes such as psychophysiological stress, task performance, and symptoms of ill health. Such studies have taken an interest in the value of indoor plants in work settings, but they typically have not considered how the effects of plants might compare with effects of other workplace characteristics. The present study makes an initial attempt to situate the potential benefits of indoor plants in a broader workplace context. With cross-sectional survey data from 385 Norwegian office workers, we used hierarchical regression analyses to estimate the associations that plants and several often-studied workplace factors have with perceived stress, sick leave, and productivity. Other variables included in our models were gender, age, physical workplace factors (e.g., noise, temperature, lighting, air quality), and psychosocial workplace factors (demands, control, social support). After controlling for these variables, the number of indoor plants proximal to a worker's desk had small but statistically reliable associations with sick leave and productivity. Although small, such associations can have substantial practical significance given aggregation over the large number of office workers over time.

**Brethour, C., et al. (2007). Literature review of documented health and environmental benefits derived from ornamental horticulture products, *Agriculture and Agri-Food Canada Markets and Trade*, Ottawa, ON.**

A review of the literature demonstrated that ornamental horticulture has a wider suite of benefits than expected. Plants can provide multiple benefits in terms of the economy, environment and human lifestyles. Many of these benefits, however, are not well known or understood within the general population. As a result, there is a considerable opportunity for the ornamental horticulture industry to sell more products based on the benefits identified throughout this literature review.

**Wilson, P., et al. (2006). "Floral odor prompts positive emotional searches." *Chemical Senses* 31(5): A142-A142.**

Flowers preferred by humans increase Duchenne smiling and social behavior and decrease negative mood reports. Would a floral odor also affect emotional behavior? 123 participants (66 females) rated their own emotional state, rated the emotional response to short fear/anger videos and reported a recent memory in either a gardenia, peppermint or Etoh condition. There is no effect of odor on ratings of pleasantness or intensity (both

odors are different from Etoh only). Condition did not effect self-rating of mood. There is an effect of emotional response to the fear/anger videos for positive emotion ( $P < 0.002$ ) and negative emotion ( $P < 0.02$ ); both gardenia and peppermint prompt higher positive emotion than Etoh but peppermint also prompts more negative emotion than Etoh. There is an effect of odor on social reference words in the memory narrative ( $P < 0.02$ ); gardenia prompts more than Etoh. These results support the hypothesis that floral odor specializes in searches for positive emotion and social reference.

**Rishbeth, C. and N. Finney (2006). "Novelty and nostalgia in urban greenspace: Refugee perspectives." *Tijdschrift Voor Economische En Sociale Geografie* 97(3): 281-295.**

This paper investigates migrants' perceptions and experiences of urban greenspaces. The research used innovative participatory and visual (photography) methods and the 12 week programme included visits to 10 greenspaces in Sheffield. The participants were all asylum seekers and refugees from Asia and Africa. This paper discusses how and why the participants engaged or disengaged with local greenspace in the short and medium term. In particular, the importance of memory and nostalgia in participants' experiences; the significance of plants; the novelty of visiting British 'parks'; and the role of greenspace in enhancing the quality of life of immigrants are explored. The paper concludes that a positive impression of the local environment and meaning-ful participation in it can be a useful component of integration into a new society. Furthermore, recognition of landscape elements or characteristics can provide a conceptual link between former and new homes. However, for this refugee group many physical and psychological barriers must be overcome if the full benefits of urban public open space are to be realised.

**Mok, J. H., et al. (2006). "Landscape improvement impacts on roadside safety in Texas." *Landscape and Urban Planning* 78(3): 263-274.**

Environmental psychologists suggest that appropriately landscaped roadside scenes may have a reducing influence on travel-related stress or may improve attention, yet there is very little data available that establishes the nature of the relationship between roadside landscaping and driver safety. Traditional transportation researchers suggest that aesthetic enhancements are a problematic component of the roadside landscape because of the severity of vehicle/tree collisions and a perception that roadside aesthetics can distract the driver causing safety risk. Costly planning processes arise as members of the local communities debate with public utility and transportation management staff on the subject of appropriate roadside landscaping.

To test the effect of landscape improvements on driver performance, this study used a comparison of before-and-after crashes as a quantitative measure of roadside greening. Researchers examined 61 road sections in Texas that were landscape designed as either urban arterials or state highways. The hypothesis tested was to determine whether landscape-improved sections of the roadway were safer compared to the same road section before landscape improvements at 10 sites were very well controlled as study sites. The findings of this study show a significant decrease in crash rate after landscape improvements were implemented at the 95% confidence level on 10 urban arterial or highway sites in Texas. The contribution of this study is to further investigate the effect that landscape features are having on driver behavior which appear to be associated with positive changes in safety result from design. However, these findings need further research to verify a relationship between driver's visual perception according to travelway corridor landscape treatments. (c) 2005 Elsevier B.V. All rights reserved.

**Elings, M. (2006). "People-plant interaction - The physiological, psychological and sociological effects of plants on people." *Farming for Health: Green-Care Farming Across Europe and the United States of America* 13: 43-55.**

This paper reports the results of a literature study into the effects of plants on human wellbeing. Different studies from various countries show that there are many different settings in which humans interact with plants. Some of these settings have a therapeutic aim, others do not. This paper demonstrates that various target groups can benefit from working with plants. Little is known, however, about the mechanisms behind horticultural therapy while the evidence is weak due to the methodological limitations of the studies.

**Sherman, S. A., et al. (2005). "Post-occupancy evaluation of healing gardens in a pediatric cancer center." *Landscape and Urban Planning* 73(2-3): 167-183.**

This study evaluates three healing gardens surrounding a pediatric cancer center. All gardens contained seating, flowers and plants, but varied in size, features, and in user groups' access to them. A post-occupancy evaluation (POE) yielded a dataset of 1400 garden-users for whom demographic information, activities, and length-of-stay were recorded. Results indicate differential usage patterns across gardens, user category (patient, visitor, or staff), and age (adults and children). The largest garden with most direct patient access was the most used. Staff mostly used the gardens to walk-through or to sit and eat, rarely interacting with features intended for active engagement. Despite patient and child-friendly designs, the overwhelming majority of visitors were adults who mostly engaged in sedentary activities. Children who did use the gardens interacted with garden features significantly more than adults. Although patient rooms are situated at ground-level around the gardens to promote window views of the gardens, the findings suggest an inverse relationship between patient window use and the number of people in the gardens. Finally, preliminary data suggest that emotional distress and pain are lower for all groups when in the gardens than when inside the hospital. Provisional design implications of these findings are discussed. (c) 2004 Elsevier B.V. All rights reserved.

**Rivel, D. (2005, 08/06/2010). "How cities use parks for arts and cultural programs." from <http://www.planning.org/cityparks/briefingpapers/index.htm>.**

Urban parks have always been an important setting for arts and cultural programs. During the late 19th century, parks commonly hosted musical events. By the beginning of the 20th century, dance, theatre, and even the new medium of film began to be represented in parks programming. Today, there is a tremendous flowering of artistic and cultural activity in urban parks, from large-scale performing arts festivals to long-term residencies with arts organizations. Parks and the arts have become mutually beneficial: the arts can play an essential role in revitalizing a park, and parks in turn can help solve problems faced by artists and arts organizations. Since parks are the democratic spaces of a city, where communities can come together to express their identities, the marriage of parks and the arts makes perfect sense. Parks can be a vital place for the cultural expression of a community and a city.

**Lohr, V. I. and C. H. Pearson-Mims (2005). "Children's Active and Passive Interactions with Plants Influence Their Attitudes and Actions toward Trees and Gardening as Adults." *HortTechnology* 15(3): 472-476.**

A nationwide phone survey of attitudes toward urban trees, participation in civic or educational activities, and memories of childhood experiences with gardening and nature was conducted with 2004 adults in large urban areas. We analyzed the influence of 11 childhood experiences and five adult demographic characteristics on three items: "Trees in cities help people feel calmer," "Do trees have a particular personal, symbolic, or spiritual meaning to you?" and "During the past year, have you participated in a class or program about gardening?" Growing up next to natural elements such as flower beds, visiting parks, taking environmental classes, and gardening during childhood were associated with stronger adult attitudes and more actions. Growing up next to urban elements,

such as large buildings, had a small, but opposite, influence. Demographics played a role in adult attitudes and actions. While both passive and active interactions with plants during childhood were associated with positive adult values about trees, the strongest influence came from active gardening, such as picking flowers or planting trees. These results indicate that horticultural programs for children raised in urban surroundings with few or no plants can be effective in fostering an appreciation for gardening in adults.

**Kuo, F. E. and A. F. Taylor (2005). "Mother nature as treatment for ADHD: Overstating the benefits of green - Response." *American Journal of Public Health* 95(3): 371-372.**

**Haviland-Jones, J., et al. (2005). "An environmental approach to positive emotion: Flowers." *Evolutionary Psychology* 3: 104-132.**

For more than 5000 years, people have cultivated flowers although there is no known reward for this costly behavior. In three different studies we show that flowers are a powerful positive emotion "inducer". In Study 1, flowers, upon presentation to women, always elicited the Duchenne or true smile. Women who received flowers reported more positive moods 3 days later. In Study 2, a flower given to men or women in an elevator elicited more positive social behavior than other stimuli. In Study 3, flowers presented to elderly participants (55+ age) elicited positive mood reports and improved episodic memory. Flowers have immediate and long-term effects on emotional reactions, mood, social behaviors and even memory for both males and females. There is little existing theory in any discipline that explains these findings. We suggest that cultivated flowers are rewarding because they have evolved to rapidly induce positive emotion in humans, just as other plants have evolved to induce varying behavioral responses in a wide variety of species leading to the dispersal or propagation of the plants.

**Brascamp, W. (2005). "A Quantitative Approach to Human Issues in Horticulture: Conjoint Analysis." *HortTechnology* 15(3): 546-550.**

Research on human issues in horticulture focuses on the human dimension of horticulture in an effort to maximize the benefits of plants and nature in general, for human well-being. A key issue is the need for scientific evidence of such benefits and for rigorous research methods to reveal the mechanics of the interaction between people and plants. Conjoint analysis, a methodology with obvious potential for successful application in the area of human issues in horticulture, is widely used in consumer research to estimate the structure of people's reactions to multi-attribute objects or services. This paper discusses the steps involved in implementing conjoint analysis and describes how it can be applied to people-plant research.

**Sullivan, W. C., et al. (2004). "The fruit of urban nature - Vital neighborhood spaces." *Environment and Behavior* 36(5): 678-700.**

What makes a neighborhood space vital? This article explores the possibility that the presence of trees and grass may be one of the key components of vital neighborhood spaces. We report on 758 observations of individuals in 59 outdoor common spaces in a residential development. Twenty-seven of the neighborhood common spaces were relatively green, whereas 32 were relatively barren. Results indicate that the presence of trees and grass is related to the use of outdoor spaces, the amount of social activity that takes place within them,



and the proportion of social to nonsocial activities they support. The findings improve and broaden our understanding of the physical characteristics that influence social contact among neighbors and provide evidence that nature plays an important role in creating vital neighborhood spaces.

**Shibata, S. and N. Suzuki (2004). "Effects of an indoor plant on creative task performance and mood." *Scandinavian Journal Of Psychology* 45(5): 373-381.**

In this study, we investigated the effect of an indoor plant on task performance and on mood. Three room arrangements were used as independent variables: a room with (1) a plant, or (2) a magazine rack with magazines placed in front of the participants, or (3) a room with neither of these objects. Undergraduate students ( $M = 35$ ,  $F = 55$ ) performed a task of associating up to 30 words with each of 20 specified words in a room with one of the three room arrangements. Task performance scores showed that female participants performed better in view of the plant in comparison to the magazine rack ( $p < 0.05$ ). Moreover, mood was better with the plant or the magazine rack in the room compared to the no object condition ( $p < 0.05$ ). However, the difference in task performance was highly influenced by the evaluation about the plant or the magazine rack. It is suggested that the compatibility between task demand and the environment is an important factor in facilitating task performances.

**Kuo, F. E. and A. F. Taylor (2004). "A potential natural treatment for attention-deficit/hyperactivity disorder: Evidence from a national study." *American Journal of Public Health* 94(9): 1580-1586.**

**Objectives.** We examined the impact of relatively "green" or natural settings on attention-deficit/hyperactivity disorder (ADHD) symptoms across diverse sub-populations of children.

**Methods.** Parents nationwide rated the aftereffects of 49 common after-school and weekend activities on children's symptoms. Aftereffects were compared for activities conducted in green outdoor settings versus those conducted in both built outdoor and indoor settings.

**Results.** In this national, nonprobability sample, green outdoor activities reduced symptoms significantly more than did activities conducted in other settings, even when activities were matched across settings. Findings were consistent across age, gender, and income groups; community types; geographic regions; and diagnoses.

**Conclusions.** Green outdoor settings appear to reduce ADHD symptoms in children across a wide range of individual, residential, and case characteristics.

**Kuo, F. E. (2004). "Horticulture, well-being, and mental health: From intuitions to evidence." *Expanding Roles for Horticulture in Improving Human Well-Being and Life Quality* (639): 27-34.**

Can horticulture contribute significantly to human well-being and mental health? Increasing evidence suggests it can. These findings come from scientific studies with diverse populations, including residents of poor inner city neighborhoods, ecological restoration volunteers, and children with Attention Deficit/Hyperactivity Disorder. Moreover, the findings come from studies of diverse outcomes, including lower rates of violent and property crime, lower incidence of aggression, greater ability to cope with poverty, better life functioning, greater life satisfaction, reduced attention deficit symptoms, greater strength of community, and others. This presentation gives an overview of the evidence for horticultural contributions to human mental health and well-being, with a particular focus on its implications for children, the poor, and other vulnerable populations.

**Kuo, F. E. (2004). "Enhanced self-control: A new impact of restorative environments." *International Journal of Psychology* 39(5-6): 14-14.**

**Anna, C. (2004). "The role of urban parks for the sustainable city." *Landscape and Urban Planning* 68(1): 129-138.**

International efforts to preserve the natural environment are mainly concerned with large, bio-diverse and relatively untouched ecosystems or with individual animal or vegetal species, either endangered or threatened with extinction. Much less attention is being paid to that type of nature close to where people live and work, to small-scale green areas in cities and to their benefits to people. Increasing empirical evidence, however, indicates that the presence of natural areas contributes to the quality of life in many ways. Besides many environmental and ecological services, urban nature provides important social and psychological benefits to human societies, which enrich human life with meanings and emotions. The main concern of this paper is to address the importance of urban nature for citizens' well being and for the sustainability of the city they inhabit. Some results of a survey conducted among visitors of an urban park in Amsterdam (The Netherlands) are presented and discussed. The issues investigated concern people's motives for urban nature, the emotional dimension involved in the experience of nature and its importance for people's general well being. Results confirm that the experience of nature in urban environment is source of positive feelings and beneficial services, which fulfill important immaterial and non-consumptive human needs. Implications for the sustainability of the city will be analyzed and discussed.

**Warber, S. L., et al. (2003). "Environmental ethics: Finding a moral compass for human-plant interaction (Reprinted from *Creating a sustainable future: Living in harmony with the Earth, 2001*)." *Alternative Therapies in Health and Medicine* 9(2): 100-105.**

With the increasing demand for plant products as medicine, we need a set of principles to guide our actions. Medical ethics, which until now has focused only on human concerns, must expand to include notions about the relationship of humans and plants. This paper presents an overview of 3 major environmental ethical models: anthropocentric, pragmatic, and ecocentric. The conflicts and inadequacies of these models are examined. We present for the first time the ethical principles for gathering plants as taught by an indigenous Native North American healer, Keewaydinoquay Peschel (Anishinaabe). Her principles are applied to 2 well-known medicinal plant cases: goldenseal, an endangered species, and the Pacific yew, the source of paclitaxel, a novel anticancer treatment. The actions of individuals, corporations, and government are examined in light of indigenous gathering ethics. Suggestions are made for incorporating these ethics into the practice of complementary, alternative, and integrative medicine.

**Ulrich, R. S., et al. (2003). "Effects of environmental simulations and television on blood donor stress." *Journal of Architectural and Planning Research* 20(1): 38-47.**

This study used an experimental design and multiple measures to ascertain whether stress in healthcare consumers undergoing a procedure known to be stressful - blood donation - would be affected by modest changes in a clinic environment. Four different environmental conditions were presented to 872 blood donors (68% males; 32% females; mean age = 40.4 years) using wall-mounted television monitors: a videotape of nature settings (Nature); a tape of urban environments (Urban); daytime television (Television); or a blank monitor (No Television). Findings from physiological measures (blood pressure, pulse rate) provided a pattern of evidence that the environmental conditions had significantly different effects on donor stress. Consistent with arousal/stimulation theory, the blood-pressure and pulse-rate findings converged to indicate that stress was lower during No Television than Television, and during Low Stimulation (No Television + Nature) than High Stimulation (Television + Urban). In line with evolutionary theory, pulse rates were markedly lower during Nature than Urban.

An important clinical implication of the findings is that the common practice of playing uncontrollable daytime television in healthcare waiting areas where stress is a problem may actually have stressful, not stress-reducing, influences on many patients/consumers. Healthcare environments should tend to be more restorative and supportive for stressed outpatients when Nature is prominently present, and environmental stimulation levels are low rather than high and intrusive.

**Moore, R. (2003) How cities use parks to help children learn.**

Childhood is a holistic process, different for each individual child. Many children do not learn effectively exclusively within a classroom. They need alternative, hands-on learning environments to match their varied learning styles. Test-driven education mandates often do not emphasize children's emotional and social needs and opportunities for creativity. This limits the development of unique talents and the fulfillment of individual lives, and deprives society of practical, problem-solving intelligence. City parks, greenways, and naturalized school grounds can be a crucial antidote to these unhealthy trends. They can motivate young people to learn through the natural environment (which includes learning about the natural environment), bringing environmental education into the mainstream of state-mandated instructional programs. The informal learning, non-formal programs, and formal instruction associated with parks can reinforce each other, enhancing academic achievement.

**Laboratory, U. o. I. H.-E. R. (2003, 08/06/2010). "How cities use parks to create safer neighborhoods." from <http://www.planning.org/cityparks/briefingpapers/index.htm>.**

For those concerned that green spaces may foster crime and illegal activity, evidence now exists that the opposite may be true. When adjacent to residential areas, green spaces have been shown to create neighborhoods with fewer violent and property crimes and where neighbors tend to support and protect one another. These are the findings of scientists at the Human-Environment Research Laboratory of the University of Illinois at Urbana-Champaign who studied green space alongside public housing in Chicago. Other researchers who are conducting similar studies across the country are finding similar results. The factors that explain these findings emphasize the importance of greenery in community and personal wellness. Time spent in natural surroundings relieves mental fatigue, which in turn relieves inattentiveness, irritability, and impulsivity, recognized by psychologists as precursors to violence. Green spaces also support frequent, casual contact among neighbors. This leads to the formation of neighborhood social ties, the building blocks of strong, secure neighborhoods where people tend to support, care about, and protect one another.

**Kuo, F. E. (2003). "The role of arboriculture in a healthy social ecology." *Journal of Arboriculture* 29(3): 148-155.**

In urban communities, arboriculture clearly contributes to the health of the biological ecosystem; does it contribute to the health of the social ecosystem as well? Evidence from studies in inner-city Chicago suggests so. In a series of studies involving over 1,300 person-space observations, 400 interviews, housing authority records, and 2 years of police crime reports, tree and grass cover were systematically linked to a wide range of social ecosystem indicators. These indicators included stronger ties among neighbors, greater sense of safety and adjustment, more supervision of children in outdoor spaces, healthier patterns of children's play, more use of neighborhood common spaces, fewer incivilities, fewer property crimes, and fewer violent crimes. The link between arboriculture and a healthier social ecosystem turns out to be surprisingly simple to explain. In residential areas, barren, treeless spaces often become "no man's lands," which discourage resident interaction and invite crime. The presence of trees and well-maintained grass can transform these no man's lands into pleasant, welcoming, well-used spaces. Vital, well used neighborhood common spaces serve to both strengthen ties among residents and deter crime, thereby creating healthier, safer neighborhoods.

**Iles, J. K. (2003). "The science and practice of stress reduction in managed landscapes." *Environmental Stress and Horticulture Crops* (618): 117-124.**

Managed landscapes are an intricate blend of woody and herbaceous ornamentals, turfgrass, organic and mineral groundcovers, and a vast array of manufactured elements, generically referred to as "hardscape." When properly designed, installed, and maintained, "built landscapes" provide countless economic and quality-of-life benefits for people in rural, suburban, and urban areas. But the journey from drafting table to finished landscape often is poorly defined and fraught with challenges, frustrations, and misconceptions. Functional and sustainable landscapes are created when attention is paid to minimizing or alleviating abiotic and biotic stress along the continuum from plant production and selection, to installation, and finally maintenance of established plants. Topics for discussion include selection and use of superior taxa for managed landscapes, nursery crop production techniques for enhanced transplant success, installation and post-plant maintenance protocols to minimize stress, and intervention/rescue treatments for established plants with compromised root systems.

**Frumkin, H. and M. E. Eysenbach (2003, 08/06/2010). "How cities use parks to improve public health." from <http://www.planning.org/cityparks/briefingpapers/index.htm>.**

People value the time they spend in city parks, whether walking a dog, playing basketball, or having a picnic. Along with these expected leisure amenities, parks can also provide measurable health benefits, from providing direct contact with nature and a cleaner environment, to opportunities for physical activity and social interaction. A telephone survey conducted for the American Public Health Association found that 75 percent of adults believe parks and recreation must play an important role in addressing America's obesity crisis. Because of the different ways people experience parks, cities need to provide all types, from neighborhood facilities to large natural areas. In fact, many of the health benefits described below can be best achieved through small-scale, readily accessible sites. A full reckoning of the benefits of parks will better inform public policy about parks and provide a useful public health tool.

**Barnicle, T. and K. S. Midden (2003). "The Effects of a Horticulture Activity Program on the Psychological Well-being of Older People in a Long-term Care Facility." *HortTechnology* 13(1): 81-85.**

This study investigated the effects of indoor horticulture activities on the current psychological well-being of older people in two long-term care facilities over a 7-week period. Thirty-one participants at one facility served as the control group. Thirty-one participants at another facility served as the horticulture group. Participants in both facilities continued with their normal daily routine and activities over the 7-week period; however, the horticulture group participated in a 1-hour horticulture activity session once a week over the 7-week period and the control group did not. The control group and horticulture group did not differ significantly in psychological well-being prior to the start of the study. After the 7-week program, the horticulture group had a significant increase in psychological well-being, whereas the control group had a slight decrease in psychological well-being. The results of this study indicate that horticulture activities may have a beneficial effect on the current psychological well-being of older people in a long-term care facility.

**Taylor, A. F., et al. (2002). "Views of nature and self-discipline: Evidence from inner city children." *Journal of Environmental Psychology* 22(1-2): 49-63.**

Children growing up in the inner city are at risk of academic underachievement, juvenile delinquency, teenage pregnancy, and other important negative outcomes. Avoiding these outcomes requires self-discipline. Self-discipline, in turn, may draw on directed attention, a limited resource that can be renewed through contact with nature. This study examined the relationship between near-home nature and three forms of self-discipline in

169 inner city girls and boys randomly assigned to 12 architecturally identical high-rise buildings with varying levels of nearby nature. Parent ratings of the naturalness of the view from home were used to predict childrens performance on tests of concentration, impulse inhibition, and delay of gratification. Regressions indicated that, on average, the more natural a girls view from home, the better her performance at each of these forms of self-discipline. For girls, view accounted for 20% of the variance in scores on the combined self-discipline index. For boys, who typically spend less time playing in and around their homes, view from home showed no relationship to performance on any measure. These findings suggest that, for girls, green space immediately outside the home can help them lead more effective, self-disciplined lives. For boys, perhaps more distant green spaces are equally important. (C) 2002 Elsevier Science Ltd.

**Shibata, S. and N. Suzuki (2002). "Effects of the foliage plant on task performance and mood." *Journal of Environmental Psychology* 22(3): 265-272.**

In this study we investigate the effect of leafy plants on subjects' task performance and mood. As independent variables, two types of tasks and several room arrangements were used. There was an association or a sorting task and the room was arranged either with the plant placed in front of the subjects, to the side of the subjects, or with no plant placed in the room. Gender was also considered as a variable for analysis. Undergraduate students (F = 63, M = 83) performed either the association task or the sorting task under one of the three room arrangements. The association task was to create no more than 30 words for 20 different items. The sorting task was to sort 180 index cards into Japanese syllabary order.

As for the task performance, Room x Gender interaction was significant in the scores of the association task ( $p < 0.05$ ). Male subjects working without plants performed worse than female subjects under the same conditions ( $p < 0.01$ ). Moreover, the task performances of the male subjects using the front arrangement were higher than that of the male subjects working without plants ( $p < 0.10$ ). It was concluded that the presence of the plants affected the association task more than the sorting task, and male subjects more than female subjects. It was also suggested that the presence of the leafy plants might affect creative work positively. (C) 2002 Elsevier Science Ltd. All rights reserved.

**Kwack, H. R. and P. D. Relf (2002). "Current Status of Human Issues in Horticulture in Korea." *HortTechnology* 12(3): 415-419.**

As the level of urbanization has increased, many people in Korea have begun to recognize the beneficial effects of plants in our immediate surroundings and involvement in horticultural activities. Today, an increasing number of Koreans attempt to improve the quality of life and enhance educational effectiveness through horticultural activities. Kindergarten, elementary, middle, and high schools have initiated garden-based programs. Some universities include courses focusing on horticulture applications to human well-being in their regular graduate programs or in their social education curricula. A few general hospitals, psychiatric hospitals, and rehabilitation centers have begun applying horticulture as a means of treatment. Most of the research articles in Korea on various aspects of human issues in horticulture have been published since the foundation of two academic societies, the Korean Horticultural Therapy Association and the Korean Society for Plants, People, and Environment. These articles are primarily focused on the areas of school gardening, healing gardens, and psychological or physiological effects of horticultural activities. For the future development of human issues in horticulture in Korea, several areas need to be enhanced including: interdisciplinary studies of horticulture and social education; development of different skills, techniques, and scales to validate the effects of horticultural therapy, healing gardens, and gardening as a teaching tool in public education; and an organization empowered to certify horticultural therapists.

**Kohleppel, T., et al. (2002). "A Walk through the Garden: Can a Visit to a Botanic Garden Reduce Stress?" HortTechnology 12(3): 489-492.**

Stress has been characterized as an epidemic and has been found to play an important role in causing many diseases. In contrast, people often seek out nature and green spaces to help cope with life stress. Botanic gardens provide opportunities for people to immerse in nature, explore their horticultural interests, and experience recreation and leisure. The literature suggests that all of these activities are effective coping strategies against life stress. This study explored the effectiveness of botanic garden visits as a coping strategy. The findings of this study suggest that botanic gardens could be a place for coping with the effects of stress. Botanic garden visitation, along with gender, stressful life events, perceived health, and self esteem, was found to be important in explaining reported levels of depression. Data also showed that visitors who received the most benefit of stress reduction were those most needing a coping strategy.

**Jarrott, S. E., et al. (2002). "An Observational Assessment of a Dementia-specific Horticultural Therapy Program." HortTechnology 12(3): 403-410.**

Horticultural therapy (HT) is used across the lifespan with individuals with a wide range of physical, social, and cognitive abilities. Older adults make up a large group of participants in horticultural activities. As the population of older adults grows, more adults face the risk of experiencing a dementing illness. Many families turn to institutional care programs, such as nursing homes and adult day service (ADS) programs, for assistance with the care of their relative with dementia. HT may be an appropriate activity to incorporate into dementia care activity programs, but formal evaluations of such programs are limited. The current study evaluated a 10-week HT program conducted with adults with dementia at an ADS program. Observations indicated that participants engaged in the horticultural activities for greater periods of time than the non-horticultural activities. Participant affect during the horticultural and non-horticultural activities was comparable. HT is appropriate for dementia care programs serving adults with a wide range of cognitive, physical, and social needs, and it should be considered as a viable alternative to more typical dementia care program activities.

**Austin, M. E. (2002). "Partnership opportunities in neighbourhood tree-planting initiatives: Building from local knowledge." Journal of Arboriculture 28(4): 178-186.**

This study explored resident involvement in tree planting and maintenance projects on vacant lots in Detroit, Michigan, U.S. Thirty-eight individuals involved in follow-up care of tree planting sites were interviewed and surveyed to understand their motivations for involvement and their perception of these local neighborhood greening projects. "Tending to local residents, as well as the trees, in neighborhoods can have positive impacts on tree survivorship, community development, and improved relationships between foresters and the public. This study explored resident involvement in tree planting and maintenance projects on vacant lots in Detroit, Michigan, U.S. Thirty-eight individuals involved in follow-up care of tree planting sites were interviewed and surveyed to understand their motivations for involvement and their perception of these local neighborhood greening projects. Underlying motivations include an enjoyment from working with nature as well a strong social motivation. Recommendations are offered for forestry professionals seeking improved interactions with local constituents."

**Wolf, K. L. (2001). "Human dimensions of the urban forest in small city business settings." Proceedings of the Society of American Foresters, 2001 National Convention: 303-309.**

Small city central business districts undergoing revitalization must carefully weigh their choices for improvements, given limited resources. One option, an urban forest and streetscape program, should include planning for both tree and human factors. This qualitative research specifies the human dynamics of successful

programs. Forest professionals assisting communities should consider civic process as well as arboricultural choices and practices. Planning, implementation and ongoing maintenance strategies often involve public and private partnerships. Each program contributor has different capacities for tree installation and care. Appropriate technical choices must be accompanied by personal commitment. Finally, implementation of the tree program must acknowledge the needs of all interests in the district.

**Taylor, A. F., et al. (2001). "Coping with add - The surprising connection to green play settings." *Environment and Behavior* 33(1): 54-77.**

Attention Restoration Theory suggests that contact with nature supports attentional functioning, and a number of studies have found contact with everyday nature to be related to attention in adults. Is contact with everyday nature also related to the attentional functioning of children? This question was addressed through a study focusing on children with Attention Deficit Disorder (ADD). This study examined the relationship between children's nature exposure through leisure activities and their attentional functioning using both within- and between-subjects comparisons. Parents were surveyed regarding their child's attentional functioning after activities in several settings. Results indicate that children function better than usual after activities in green settings and that the "greener" a child's play area, the less severe his or her attention deficit symptoms. Thus, contact with nature may support attentional functioning in a population of children who desperately need attentional support.

**Shibata, S. and N. Suzuki (2001). "Effects of Indoor Foliage Plants on Subjects' Recovery from Mental Fatigue." *North American Journal of Psychology* 3(3): 385-396.**

We investigated the effects of foliage plants on participants' task performance, fatigue, and mood. Two room conditions (one in which plants were arranged in the room and the other without plants) were created. Undergraduate students (M=33, F=37) performed 2 sessions of a key response task under one of the two room conditions. As for task performance, Plant Session interaction was significant ( $p < .05$ ). The task scores in the first session did not show any significant difference between plant and no plant conditions. Although it was not significant, the scores in the second session showed higher scores under the plant condition than in the no-plant condition. The plant condition and the no-plant condition did not show any differential effects on the deterioration of task scores in each session. Though the plants affected task scores, they did not show any effects on subjects' moods or fatigue. It was concluded that the presence of the plant might have influenced recovery from mental fatigue.

**Rappe, E. and A.-M. Evers (2001). "The Meaning of Growing Plants: Contributions to the Elderly Living in Sheltered Housing." *HortTechnology* 11(2): 268-272.**

In this qualitative research conducted in Finland, 12 residents in sheltered housing for aged people were interviewed to explore the meanings they associate with the growing of plants. Growing plants had both individual and social meanings for the interviewees. The individual meanings were categorized into three groups: one's own growing skills, the continuity of time, and creating experiences. The category "one's own growing skills" was coded into three subcategories: individual settings and growing methods, interpretation of the plants' needs and responses, and adaptation to current situation. The social meanings identified in the data were also divided into three categories: significant acts undertaken for other people, indications about the gardener, and the feeling of togetherness. The results of the research suggest that growing plants may have an effect on the well-being of the elderly who have a rural background and are living in institutional settings, especially for those aspects threatened by institutional environments: autonomy, a sense of control, identity, and the opportunity to form social relationships.

**McGuinn, C. and P. D. Relf (2001). "A Profile of Juvenile Offenders in a Vocational Horticulture Curriculum." HortTechnology 11(3): 427-433.**

This study provides a profile of six juvenile offenders' responses to a vocational horticulture curriculum. The results indicate that vocational horticulture curricula may be a tool to strengthen a delinquent individual's bonds with society and, subsequently, evoke changes in attitudes about personal success and perceptions of personal job preparedness. The youths in this study increased their social bonds in all six categories addressed by the pretest and posttests, and were motivated to think more practically about their careers. Due to the limitations on size and scope of the study, it is exploratory in nature and provides ideas for future research and possible assessment methods for further research.

**Kuo, F. E. and W. C. Sullivan (2001). "Aggression and violence in the inner city - Effects of environment via mental fatigue." Environment and Behavior 33(4): 543-571.**

S. Kaplan suggested that one outcome of mental fatigue may be an increased propensity for outbursts of anger and even violence. If so, contact with nature, which appears to mitigate mental fatigue, may reduce aggression and violence. This study investigated that possibility in a setting and population with relatively high rates of aggression: inner-city urban public housing residents. Levels of aggression were compared for 145 urban public housing residents randomly assigned to buildings with varying levels of nearby nature (trees and grass). Attentional functioning was assessed as an index of mental fatigue. Residents living in relatively barren buildings reported more aggression and violence than did their counterparts in greener buildings. Moreover, levels of mental fatigue were higher in barren buildings, and aggression accompanied mental fatigue. Tests for the proposed mechanism and for alternative mechanisms indicated that the relationship between nearby nature and aggression was fully mediated through attentional functioning.

**Kuo, F. E. and W. C. Sullivan (2001). "Environment and crime in the inner city - Does vegetation reduce crime?" Environment and Behavior 33(3): 343-367.**

Although vegetation has been positively linked to fear of crime and crime in a number of settings, recent findings in urban residential areas have hinted at a possible negative relationship: Residents living in "greener" surroundings report lower levels of fear, fewer incivilities, and less aggressive and violent behavior. This study used police crime reports to examine the relationship between vegetation and crime in an inner-city neighborhood. Crime rates for 98 apartment buildings with varying levels of nearby vegetation were compared. Results indicate that although residents were randomly assigned to different levels of nearby vegetation, the greener a building's surroundings were, the fewer crimes reported. Furthermore, this pattern held for both property crimes and violent crimes. The relationship of vegetation to crime held after the number of apartments per building, building height, vacancy rate, and number of occupied units per building were accounted for.

**Kuo, F. E. (2001). "Coping with poverty - Impacts of environment and attention in the inner city." Environment and Behavior 33(1): 5-34.**

Considerable evidence suggests that exposure to "green" environments can enhance human effectiveness and make life's demands seem manageable. Does this phenomenon extend to poor inner cities, where green space is minimal and life's demands may be overwhelming? In 145 urban public housing residents randomly assigned to buildings with and without nearby nature, attentional functioning and effectiveness in managing major life issues were compared. Residents living in buildings without nearby trees and grass reported more procrastination in facing their major issues and assessed their issues as more severe, less soluble, and more long-standing than did their counterparts living in greener surroundings. Mediation tests and extensive tests for possible confounds



supported the attention restoration hypothesis-that green space enhances residents' effectiveness by reducing mental fatigue. These findings suggest that urban public housing environments could be configured to enhance residents' psychological resources for coping with poverty.

**Hamilton, S. L. and K. DeMarrais (2001). "Visits to Public Gardens: Their Meaning for Avid Gardeners." HortTechnology 11(2): 209-215.**

This study examined how avid gardeners experience a public garden. Phenomenological interviewing was used to collect data from six avid gardeners who frequently visited a public garden. Data about the gardeners' beliefs and actions regarding gardening history, gardening practices, and involvement with public gardens were gathered. From inductive analysis, a model of a gardener's world composed of four conceptual themes: 1) personal history, 2) social connections, 3) human well-being, and 4) learning experiences was delineated. The conceptual themes of a gardener's world are the personal learning constructs through which gardeners experience the plant world. Each of the four conceptual themes influenced how participants in this study experienced a public garden. Participants used a public garden to socially interact with others, enhance their human well-being, strengthen their gardening background, and extend their gardening knowledge and skill. Several subthemes emerged within the four conceptual themes of an avid gardener's world to inform us how gardening plays an integral role in gardeners' lives.

**Waliczek, T. M., et al. (2000). "Using a Web-based Survey to Research the Benefits of Children Gardening." HortTechnology 10(1): 71-76.**

A survey, targeting adults working with youth in garden situations, was designed for delivery on the KinderGARDEN World Wide Web site. The goal of this survey was to investigate adults who are actively involved in gardening with children in school, community or home gardens on their perceptions of the benefits of children participating in gardening. Three hundred-twenty completed surveys were returned via e-mail during a period of 9 months. Fourteen questions were included on the survey requesting information concerning what types of gardening situations in which children were participants and the demographics of the children involved in gardening. Results of the study cover 128,836 children (youth under 18 years old) involved in gardening, primarily with teachers in school gardens. The children involved were generally 12 years of age or under and were growing food crops. Adults gardening with children reported benefits to children's self-esteem and reduction in stress levels. Adults were also interested in learning more about the psychological, nutritional and physical benefits of gardening. Comparisons between those adults involved in gardening found that parents' and teachers' ideas differed concerning the most important aspects of the gardening experience. Parents viewed food production as most important while teachers thought socializing and learning about plants were most important.

**Sim, W.-K. (2000). "The First Symposium of the Korean Society for Plants, People and Environment." HortTechnology 10(1): 38-39.**

The Korean Society for Plants, People and Environment held its first International Symposium on Plant and People Interactions in Human Health and Quality of Life in May 1998. Three speakers, invited from abroad, were among those who made presentations. A summary is presented.

**Shibata, S. and N. Suzuki (2000). "Effects of foliage plant on mood and task performances." International Journal of Psychology 35(3-4): 82-82.**

**Predny, M. L. and D. Relf (2000). "Interactions between Elderly Adults and Preschool Children in a Horticultural Therapy Research Program." HortTechnology 10(1): 64-70.**

This report examines the behavior of elderly adults and preschool children during horticultural therapy (HT) activities to determine if combining intergenerational groups would complement or detract from the HT goals for each group separately. During a 10-week observation period, data were collected on video documenting attendance, participation time and pattern during separate age group and intergenerational activities. These data were used to determine if interactions changed over time or in response to different activities. Participation appeared to be affected by activity design, difficulty level, individual ability, and availability of assistance from volunteers. Children's participation during separate age group activities appeared to be affected mainly by the difficulty level and activity design. Elderly adults' participation during separate age group activities appeared to be affected by individual ability limitation and availability of assistance. Children's intergenerational participation scores appeared to show an increase in the category of "working with direct assistance", while elderly adults' intergenerational scores appeared to show an increase in the categories of "no participation" and "independent participation". In part, the change in intergenerational participation appeared to be due to a decrease in assistance available from volunteers for each individual. For some individuals, the introduction of intergenerational groups appeared to detract from personal participation in horticulture activities. If the goal of the HT is directly related to the individual's activity in horticulture (i.e., increased self-esteem from successfully designing and building a terrarium), the intergenerational element appears to reduce the potential for that benefit. The percentage of total social interaction time between the generations during activities increased over time. The intergenerational activities involving plant-based activities seemed to be more successful at increasing intergenerational exchange than the craft-type activities. Therefore, horticulture may be a useful activity for programs with a goal of increased intergenerational interaction.

**Lohr, V. I. and P. D. Relf (2000). "An Overview of the Current State of Human Issues in Horticulture in the United States." HortTechnology 10(1): 27-33.**

Throughout history, plants have been used to benefit people. In the United States, formal research to document the impacts of plants on people was not published until the 1970s, when papers from social and medical scientists began to appear. In the 1990s, symposia, including the first on "The Role of Horticulture in Human Well-being and Social Development," brought people together from around the world to share and expand their knowledge in this emerging field. Symposium participants have included researchers in the social sciences and plant sciences, practitioners in horticultural therapy, teachers in colleges and public gardens, industry representatives applying the knowledge, and more. This has formed the basis for current activities in research, teaching, and practice throughout the United States. Examples from research that now documents a variety of beneficial impacts of plants on people are discussed.

**Lohr, V. I. and C. H. Pearson-Mims (2000). "Physical Discomfort May Be Reduced in the Presence of Interior Plants." HortTechnology 10(1): 53-58.**

A well-known research report showed that being in a hospital room with a view of trees rather than a view of a building was linked to the use of fewer pain-reducing medications by patients recovering from surgery. The experiment reported here was designed to further examine the role of plants in pain perception. We found that more subjects were willing to keep a hand submerged in ice water for 5 min if they were in a room with plants

present than if they were in a room without plants. This was found to be true even when the room without plants had other colorful objects that might help the subject focus on something other than the discomfort. Results from a room assessment survey confirmed that the room with colorful, nonplant objects was as interesting and colorful as the room with plants present, but the presence of plants was perceived as making the air in the room fresher.

**Fjeld, T. (2000). "The Effect of Interior Planting on Health and Discomfort among Workers and School Children." HortTechnology 10(1): 46-52.**

Plants are widely used in building environments; however, studies reporting the health and discomfort symptoms of people in response to indoor foliage plants are few. The objective of the presented studies was to assess the effect of foliage plants or a combination of foliage plants and full-spectrum fluorescent lamps on self-reported health and discomfort complaints in three different work environments: an office building, an X-ray department in a Norwegian hospital, and a junior high school. Health and discomfort symptoms were found to be 21% to 25% lower during the period when subjects had plants or plants and full-spectrum lighting present compared to a period without plants. Neuropsychological symptoms, such as fatigue and headache, and mucous membrane symptoms, such as dry and hoarse throat, seemed to be more affected by the treatments than skin symptoms, such as itching skin.

**Evers, A.-M., et al. (2000). "A Review of Human Issues in Horticulture in Finland: Urbanization Motivates a Renewed Appreciation for Plants and Nature." HortTechnology 10(1): 24-26.**

Approaches using human issues in horticulture (HIH) offer new possibilities to develop nearby nature in cities, especially during a period of rapid urbanization in Finland. New initiatives have been developed in school gardening, environmental education, gardening in training programs for disabled people, therapeutic environments in hospitals and institutions, and in the University of Helsinki horticultural education and research programs. At the University of Helsinki, two contact teaching courses and national seminars were organized in 1996 and 1998. Initial studies in the HIH approach have three main themes: 1) gardening as a tool for better quality of life in homes for the elderly, 2) ecology, native plants and extensive maintenance in parks, and 3) the use of horticulture in environment and science education at the lower level of the comprehensive school.

**Dunnett, N. and M. Qasim (2000). "Perceived Benefits to Human Well-being of Urban Gardens." HortTechnology 10(1): 40-45.**

Private gardens occupy a significant proportion of the total surface area of a British city. For many people, the garden represents their only contact with nature and their chance to express themselves creatively. Yet relatively little research has been carried out on the role and value of such gardens to human well-being. We report in this paper on a major survey on the role of private, urban gardens in human well-being, conducted with a wide cross-section of randomly selected garden owners from the city of Sheffield, England, over the summer of 1995. In particular, we discuss the perceived value that gardens have to the well-being of people, both individually through the enjoyment of their own gardens and collectively through the contribution of city gardens to environmental enhancement. We relate these values to age, gender and social demographics.

**Burchett, M. (2000). "Report of the International People-Plant Symposium in Sydney, Australia, July 1998." HortTechnology 10(1): 36-37.**

Participants from eight countries met in Australia in July 1998 for the International People-Plant Symposium titled "Towards a New Millennium in People-Plant Relationships." There were about 75 presentations arranged under three general headings: 1) plants, cultural diversity, and environmental quality, 2) plants for

human health and well-being, and 3) plant and horticultural education--community and schools. The symposium represented another step in the dissemination of information and awareness on people-plant relationships.

**Aldous, D. E. (2000). "Perspectives on Horticultural Therapy in Australia." *HortTechnology* 10(1): 18-23.**

Human awareness of plants in Australia goes back 50,000 years when the aboriginal first began using plants to treat, clothe and feed themselves. The European influence came in 1778 with the First Fleet landing in New South Wales. Australia's earliest records of using horticulture for therapy and rehabilitation were in institutions for people with intellectual disabilities or who were incarcerated. Eventually, legislation created greater awareness in the government and community for the needs of persons with disabilities, and many worthwhile projects, programs and organizations were established or gained greater recognition. Horticultural therapy programs may be found in nursing homes, rehabilitation centers, adult training support services, hospitals, day centers, community centers and gardens, educational institutions, supported employment, and the prisons system. This article reviews the history and development of Australian horticulture as a therapy in the treatment of disabilities and social disadvantaged groups, and includes an overview of programs offered for special populations and of Australia's horticultural therapy associations. It also discusses opportunities for research, teaching and extension for horticultural therapy in Australia.

**Adachi, M., et al. (2000). "Effects of floral and foliage displays on human emotions." *HortTechnology* 10(1): 59-63.**

Changes in human emotions were investigated during exposure to three different indoor conditions: floral display present, foliage display present, and no display present. There were 20 subjects (10 males and 10 females) in each condition. The subjects were shown a video that introduced the University of Reading and included scenes of landscapes. It was shown that a floral display had positive effects on human emotions, such as composition and confidence, however, some evidence of a significant increase in annoyance was also found for this treatment. The foliage display had a somewhat negative effect by slightly increasing bad temper, and the foliage display tended to have a positive effect on clearheadedness. Investigations of psychological responses to nature are complex, and many opportunities for more work exist.

**DeMarco, L. W., et al. (1999). "Integrating Gardening into the Elementary School Curriculum." *HortTechnology* 9(2): 276-281.**

Gardening is increasing in use as the focus of interdisciplinary teaching units in the elementary school curriculum and as a stratagem for student therapeutic, recreational, and social experiences. Elementary school teachers, identified as experienced in using gardening as a teaching tool, were surveyed and interviewed to determine successful strategies for integration of gardening into elementary school curricula. The most important factors determined by these teachers for the successful use of gardening in the curriculum were 1) student and faculty ownership or commitment to integrating gardening in their curriculum, 2) availability of physical resources, and 3) faculty knowledge and skill in the application of gardening to enhance an interdisciplinary curriculum. Educators who incorporate school gardening into their curriculum report that school gardening is a somewhat successful (35.2%) or very successful (60.6%) teaching tool that enhances the learning of their students. Most (92%) teachers surveyed requested additional school gardening education for themselves.

**Waliczek, T. M., et al. (1998). "Studying Children's Perceptions of Garden Benefits Using the Internet." *HortScience* 33(3): 504-c-.**

A survey was designed to investigate children's perceptions of the benefits of gardening and is posted on the KinderGARDEN Web page within the Aggie Horticulture network. The KinderGARDEN Web page was developed as a resource for parents and teachers to help them incorporate the garden into the home and school lives of children. The Web site additionally attracts young visitors with a "Fun Page." The "Fun Page" has descriptions of garden activities that children can experiment with at home or school, garden literature for children and garden Web links. The survey is included on this page. Children respond to the survey via e-mail. The survey requests information about the type of gardening situations in which each respondent participates, the number of children with whom they generally garden, what they feel they learn from gardening and what benefits they feel they gain from gardening. Children responded positively on the value of the garden to their recreation, while also mentioning educational, environmental, aesthetic, social and economic benefits in the survey. Results showed that 81% of children felt they were learning about the environment by working in the garden. Fifty-four percent of children mentioned that the garden taught them about plants and plant-related concepts. Other benefits children mentioned as important to them included recreation and/or "having fun" (31%) and socialization with friends and family (15%).

**Taylor, A. F., et al. (1998). "Growing up in the inner city - Green spaces as places to grow." *Environment and Behavior* 30(1): 3-27.**

Children growing up in the inner city are at risk for a range of negative developmental outcomes. Do barren, inner-city neighborhood spaces compromise the everyday activities and experiences necessary for healthy development? Sixty-four urban public housing outdoor spaces (27 low vegetation, 37 high vegetation) were observed on four separate occasions. Overall, inner-city children's everyday activities and access to adults appeared remarkably healthy; of the 262 children observed, most (73%) were involved in some type of play, and most groups of children (87%) were supervised to some degree. In relatively barren spaces, however, the picture was considerably less optimistic: Levels of play and access to adults were approximately half as much as those found in spaces with more trees and grass, and the incidence of creative play was significantly lower in barren spaces than in relatively green spaces.

**Parsons, R., et al. (1998). "The view from the road: Implications for stress recovery and immunization." *Journal of Environmental Psychology* 18(2): 113-140.**

A considerable body of folklore and scientific research alludes to the efficacy of the vernacular environment to influence both aesthetic experience and general well-being. To examine explicitly whether stress recovery and/or immunization varies as a function of the roadside environment, 160 college-age participants, both male and female, viewed one of four different video-taped simulated drives through outdoor environments immediately following and preceding mildly stressful events. Overall, it was anticipated that participants who viewed artifact-dominated drives, relative to participants who viewed nature-dominated drives, would show greater autonomic activity indicative of stress (e.g. elevated blood pressure and electrodermal activity), as well as show altered somatic activity indicative of greater negative affect (e.g. elevated electromyographic (EMG) activity over the brow region and decreased activity over the cheek region). In addition, it was expected that participants who viewed nature-dominated drives would experience quicker recovery from stress and greater immunization to subsequent stress than participants who viewed artifact-dominated drives. The overall pattern of results is consistent with both hypotheses and the findings are interpreted to support postulating a sympathetic-specific mechanism that underlies the effect of nature on stress recovery and immunization. (C) 1998 Academic Press.

**McDaniel, A. and D. Relf (1998). "Master Gardener Judges in State and National Horticulture Career Development Events." *HortTechnology* 8(1): 71-74.**

Master Gardeners (MGs) have proven to be effective judges for vocational horticulture student demonstrations of industry skills in 1996 Virginia and National FFA competitions. In a survey, the MG judges indicated a wide variety of backgrounds, with many being first-year MGs having no prior experience in judging or youth programs. Overall, they rated the student performance as better than expected and their own judging standard as neither lenient nor rigorous. Training is a critical part of their effectiveness as judges, and it was found that multiple formats are needed. Overall, most rated judging the FFA events as a very appropriate match to the MG educational goals, and there was a 100% affirmative response to the questions would they accept an invitation to judge again and would they encourage other MGs to volunteer as judges for FFA horticulture events.

**Kuo, F. E., et al. (1998). "Transforming inner-city landscapes - Trees, sense of safety, and preference." *Environment and Behavior* 30(1): 28-59.**

How would inner-city residents respond to the incorporation of trees and grass in their neighborhoods? Law enforcement officials have argued that, in these settings, trees and other forms of vegetation increase fear. Tree density, tree placement, and levels of grass maintenance were manipulated in photo simulations of neighborhood outdoor space. One hundred residents of Chicago's Robert Taylor Homes living adjacent to the space rated the images with respect to preference and sense of safety. Although tree placement (subspaces created by trees, formality of arrangement) had little effect on sense of safety and no effect on preference, both tree density and grass maintenance had strong effects on preference and sense of safety ( $\eta^2$ s from .49 to .89). Surprisingly, tree density and grass maintenance increased both preference and sense of safety. Results suggest that-contrary to some views-trees and grass maintenance can increase sense of safety in inner-city neighborhoods.

**Dobbs, K., et al. (1998). "Survey on the Needs of Elementary Education Teachers to Enhance the Use of Horticulture or Gardening in the Classroom." *HortTechnology* 8(3): 370-373.**

To determine if and how plant materials were used in Virginia elementary school curricula, a survey was conducted on horticulture or gardening in elementary [Kindergarten-sixth grade (K-6)] education. To do this, 10 questionnaires and cover letters were sent to each of 100 randomly chosen elementary schools throughout Virginia. Based on a 34% response rate from a self-selected group of K-6 teachers, there was a relatively high level of interest (88%) regarding using horticulture or gardening in the classroom. A major goal of this survey was to determine what would encourage or facilitate incorporating horticulture or gardening into the curriculum.

**Day, S. D., et al. (1997). "Advanced Master Gardener-Tree Steward: Training to Enhance Community Volunteerism." *HortTechnology* 7(4): 363-367.**

The Virginia Cooperative Extension (VCE) Advanced Master Gardener-Tree Steward (AMGTS) program provides advanced training in leadership development and arboriculture to MG volunteer educators so they may expand the influence of extension through leadership in community forestry. A statewide survey of agents, MGs, and foresters served as the basis for developing the training package, which was funded in part by the Virginia Department of Forestry. According to a statewide survey, 70% of VCE MGs and extension agents with MG programs would like to be involved in community tree programming, while only 26% was currently involved. Typically, agents cited limited staff and volunteer resources as the primary factors in restricting program expansion. Furthermore, 90% of municipal foresters indicated they would like to work with trained volunteers. The AMGTS program simultaneously answers the desire of MGs to expand their role in the community landscape and the need of VCE to expand its outreach with increasingly limited resources. AMGTS training, guided by a 10-unit resource book, integrates technical and program management expertise to foster volunteer pride and self-sufficiency. This allows MG tree stewards to coordinate much of their own training and recruit and manage non-MG volunteers to whom they can provide limited training for specific projects, thus allowing program expansion

without additional staff. The training is designed for delivery by knowledgeable professionals in the local community, such as arborists, horticulturists, college professors, extension specialists, MGs, and others who can provide quality training following the program guidelines.

**Coley, R. L., et al. (1997). "Where does community grow? The social context created by nature in urban public housing." *Environment and Behavior* 29(4): 468-494.**

This study examines how the availability of nature influences the use of outdoor public spaces in two Chicago public housing developments. Ninety-six observations were collected of the presence and location of trees and the presence and location of youth and adults in semiprivate spaces at one high-rise and one low-rise public housing development. Results consistently indicated that natural landscaping encourages greater use of outdoor areas by residents. Spaces with trees attracted larger groups of people, as well as more mixed groups of youth and adults, than did spaces devoid of nature. In addition, more dense groupings of trees and trees that are located close to public housing buildings attracted larger groups of people. These findings suggest that natural elements such as trees promote increased opportunities for social interactions, monitoring of outdoor areas, and supervision of children in impoverished urban neighborhoods.

**Lewis, C. A. (1996). *Green Nature/Human Nature: The Meaning of Plants in Our Lives, Urbana and Chicago: University of Illinois Press.***

In *Green Nature/Human Nature* Charles A. Lewis describes the psychological, sociological, and physiological responses of people to vegetation in cities and forests, as well as in horticultural therapy programs in hospitals, geriatric institutions, physical rehabilitation centers, drug rehabilitation programs, and correctional institutions. He presents an evolutionary basis for the human attraction to plants. People-plant interactions are presented from two perspectives: participatory, in which the individual is involved in planting and maintaining the vegetation, and observational, in which the individual bears no responsibility for establishing or maintaining the vegetation. In what amounts to a straightforward catalog of well-documented and tangible benefits, Lewis brings the latest and best research into plant/human interaction to bear on questions of how green nature is intertwined with the human psyche and how that interaction can lead to enhanced well-being and an appreciation of the human dimension in environmental concerns.

**Stoneham, J. A., et al. (1995). "Horticultural therapy: Horticulture's contribution to the quality of life of disabled people." *Horticulture in Human Life, Culture, and Environment*(391): 65-75.**

Traditionally, the term horticultural therapy has been associated with plant cultivation as a tool of occupational therapy. Today, a broader range of definitions are recognized, ranging from plant cultivation to the appreciation of landscape. The level of interest in the subject is illustrated by a diversity of concerned professions from architects to providers of care and support for people with disabilities.

Research at the University of Bath ranged from techniques of plant cultivation to landscape designs suitable for a wide range of people, including those with learning difficulties, physical disabilities, and the frail and the elderly. The underlying aim was to encourage active and/or passive involvement with plants, to produce systems successful enough to give therapists confidence in using horticulture as a therapeutic tool or to provide settings where people are able to develop their own interests and improve their quality of life.

Demographic trends in Britain have resulted in an increase in the proportion of elderly people in the population and most significantly in the very old. In later years the research at Bath focused on the design and modification of landscape and gardens for older people. Current research at the Research Institute for Care of the Elderly is

progressing this work by exploring older people's attitudes to, and preferences for, the outdoor environment. Work at Reading University is also exploring the influences of contact with nature on human psychological well-being, and the role urban landscapes can play in promoting environmental care and enabling sustainable development.

There is increasing interest in the benefits of landscapes and plants to children, both as part of the education curriculum and as an agent for improved social, psychological and physical development. Current research at Learning through Landscapes is looking at the design, use and management of school grounds for children with special needs.

**Relf, P. D. (1995). "The significance of horticulture-human interaction to the horticulture industry and researchers." *Horticulture in Human Life, Culture, and Environment*(391): 89-100.**

Research to understand the interaction between people and plants will have a direct influence on the development of environmentally sound and humanly healthful urban landscapes; the understanding of the role of greenspace in interior as well as exterior settings; the involvement of school children in gardening; and the use of cut flowers, pot plants, and food crops to improve human life quality. This increased understanding of what people expect from plants and the garden can directly influence horticultural products and techniques.

Coupled with communications to make the public aware of the findings, this research will increase the appreciation and use of plants, thus the benefits that people gain from plants. Research results will serve as a powerful marketing tool to increase the demand for horticultural products and services, leading to an increase in the number of jobs in the industry and, ultimately, the demand and funding for traditional horticultural research and education.

**Nassauer, J. I. (1995). "Culture and Changing Landscape Structure." *Landscape Ecology* 10(4): 229-237.**

Culture changes landscapes and culture is embodied by landscapes. Both aspects of this dynamic are encompassed by landscape ecology, but neither has been examined sufficiently to produce cultural theory within the field. This paper describes four broad cultural principles for landscape ecology, under which more precise principles might be organized. A central underlying premise is that culture and landscape interact in a feed-back loop in which culture structures landscapes and landscapes inculcate culture. The following broad principles are proposed:

1. Human landscape perception, cognition, and values directly affect the landscape and are affected by the landscape.
2. Cultural conventions powerfully influence landscape pattern in both inhabited and apparently natural landscapes.
3. Cultural concepts of nature are different from scientific concepts of ecological function.
4. The appearance of landscapes communicates cultural values.

Both the study of landscapes at a human scale and experimentation with possible landscapes, landscape patterns invented to accommodate ecological function, are recommended as means of achieving more precise cultural principles.



**Dobbs, G. S. and D. Relf (1995). "Enclave Employment at Virginia Colleges and Universities." HortTechnology 5(2): 131-133.**

Surveys taken in 1991 and 1992 in Virginia suggest that the enclave model of employment may be a more successful and long-term method of employing individuals with mental disabilities (IMDs) within Virginia college grounds departments. Individual, competitive placement of IMDs seems to be less successful, resulting in increased level of temporary and short-term employment. Additional research is needed to document the methods and benefits of employment used by other grounds departments, including colleges outside Virginia in the employment of IMDs.

**Zuckerman, M., et al. (1993). "Sensation Seeking and Reactions to Nature Paintings." Personality and Individual Differences 15(5): 563-576.**

Two studies were done comparing the preferences of high and low sensation seekers for nature paintings representing different styles. The paintings had been previously rated for qualities of complexity and tension. Factor analyses established five stylistic categories among the paintings. In both studies high sensation seekers had a relatively greater liking for high tension paintings whereas the lows had a relatively greater liking for low tension paintings. In both studies high sensation seekers had a relatively greater liking for expressionist style paintings, and in the second study the lows had a greater preference for the realistic, low tension pastoral scenes than the high sensation seekers. Men liked complex, high tension, realistic paintings more than women did. Complexity did not interact with personality, but was subordinate to other qualities of the paintings. High sensation seekers like tension evoking paintings and are more tolerant of ambiguity in style than low sensation seekers.

**Lohr, V. and D. Relf (1993). "Human Issues in Horticulture: Research Priorities." HortTechnology 3(1): 106-107.**

**Zampini, J. W. (1992). "Down to Earth Benefits of People-Plant Interactions in Our Community." HortTechnology 2(2): 177-179.**

This past year, Lake County Nursery (LCN) committed itself to shaping the future of our world through beautification. In September LCN, the Ohio Dept. of Natural Resources, the Cleveland Electric Illuminating Co., and CLEAN-LAND, OHIO cohosted a Beautification Stewards Conference at Lake Erie College. The conference's theme was "How to Increase Tax Revenues and Lessen Crime by the Proper Planting of Trees and Flowering Plants." A group of nationally known speakers made presentations to attendees from across the United States. The following will retrace how we became a catalyst for people-plant interactions through beautification in our community in the past decade.

**Shoemaker, C. A., et al. (1992). "Relationships between Plants, Behavior, and Attitudes in an Office Environment." HortTechnology 2(2): 205-206.**

The effects of plants in the workplace on the opinions and attitudes of workers was assessed. Attitudes of employees regarding plants were favorable, and most surveyed agreed that plants in the office made it a more desirable place to work. Office workers were aware of the benefits, such as improving air quality, that plants provide. No behavioral changes in response to the addition of plants to the office environment were demonstrated. There were no significant differences between gender, position in the corporation, and age regarding perceptions of plants in the office environment.

**Relf, D., et al. (1992). "Attitudes toward Plants and Gardening." HortTechnology 2(2): 201-204.**

Recently there has been an increased interest in the role of plants in human well-being and in the general public's perception of the value of plants. Knowing the nature and extent of the value of plants to people can affect the way plants are used in public and private landscapes, the amount of money invested in the establishment and maintenance of plants, and the satisfaction derived from the plantings. In conjunction with the annual National Gardening Association consumer market study, a question was asked to determine if observations from previous, limited studies were applicable to a wide range of American households.

**Relf, D. (1992). "Human Issues in Horticulture." *HortTechnology* 2(2): 159-171.**

**Hull, R. B. and R. S. Ulrich (1992). "Health Benefits and Costs of Urban Trees." *Proceedings of the Fifth National Urban Forest Conference*: 69-72.**

**Flagler, J. S. (1992). "Master Gardeners and Horticultural Therapy." *HortTechnology* 2(2): 249-250.**

Horticultural therapy programs can benefit from the services of Master Gardeners. Trained through the U.S. Cooperative Extension Service, Master Gardeners are skilled in practical plant sciences and committed to volunteerism. A nationwide survey has determined that 374 Master Gardeners in 21 states are helping to bring structured horticultural activities to individuals in nursing homes, hospitals, rehabilitation centers, prisons, and other special service facilities.

**Ulrich, R. S., et al. (1991). "Stress Recovery during Exposure to Natural and Urban Environments." *Journal of Environmental Psychology* 11(3): 201-230.**

Different conceptual perspectives converge to predict that if individuals are stressed, an encounter with most unthreatening natural environments will have a stress reducing or restorative influence, whereas many urban environments will hamper recuperation. Hypotheses regarding emotional, attentional and physiological aspects of stress reducing influences of nature are derived from a psycho-evolutionary theory. To investigate these hypotheses, 120 subjects first viewed a stressful movie, and then were exposed to color/sound videotapes of one of six different natural and urban settings. Data concerning stress recovery during the environmental presentations were obtained from self-ratings of affective states and a battery of physiological measures: heart period, muscle tension, skin conductance and pulse transit time, a non-invasive measure that correlates with systolic blood pressure. Findings from the physiological and verbal measures converged to indicate that recovery was faster and more complete when subjects were exposed to natural rather than urban environments. The pattern of physiological findings raised the possibility that responses to nature had a salient parasympathetic nervous system component; however, there was no evidence of pronounced parasympathetic involvement in responses to the urban settings. There were directional differences in cardiac responses to the natural vs urban settings, suggesting that attention/intake was higher during the natural exposures. However, both the stressor film and the nature settings elicited high levels of involuntary or automatic attention, which contradicts the notion that restorative influences of nature stem from involuntary attention or fascination. Findings were consistent with the predictions of the psycho-evolutionary theory that restorative influences of nature involve a shift towards a more positively-toned emotional state, positive changes in physiological activity levels, and that these changes are accompanied by

sustained attention/intake. Content differences in terms of natural vs human-made properties appeared decisive in accounting for the differences in recuperation and perceptual intake.

**Hartig, T., et al. (1991). "Restorative Effects of Natural Environment Experiences." *Environment and Behavior* 23(1): 3-26.**

The utility of different theoretical models of restorative experience was explored in a quasi-experimental field study and a true experiment. The former included wilderness backpacking and nonwilderness vacation conditions, as well as a control condition in which participants continued with their daily routines. The latter had urban environment, natural environment, and passive relaxation conditions. Multimethod assessments of restoration consisted of self-reports of affective states, cognitive performance, and, in the latter study, physiological measures. Convergent self-report and performance results obtained in both studies offer evidence of greater restorative effects arising from experiences in nature. Implications for theory, methodology, and design are discussed.

**Ulrich, R. S. (1990). "The Role of Trees in Human Well-Being and Health." *Proceedings of the Fourth Urban Forestry Conference*: 25-30.**

**Kaplan, R. and S. Kaplan (1989). *The experience of nature : a psychological perspective*. Cambridge ; New York, Cambridge University Press.**

A study of the natural environment, people, and the relationship between them. The authors offer a research-based analysis of the vital psychological role that nature plays. They try to understand how people perceive nature and what kinds of natural environments they prefer.

**Ulrich, R. S. (1986). "Human Responses to Vegetation and Landscapes." *Landscape and Urban Planning* 13(1): 29-44.**

The rapidly expanding research record concerning aesthetic, emotional and physiological response to visual landscapes is summarized, with emphasis on aesthetic preferences for views containing trees and other vegetation. The survey is set within a conceptual perspective suggesting that affective responses such as aesthetic preference are central to a landscape observer's thoughts, conscious experience and behavior. Substantial progress has been made in developing models that relate aesthetic responses to specific visual properties of environments. When aesthetic preferences are compared for urban and unspectacular natural views, American and European adult groups evidence a strong tendency to prefer nature. However, liking for urban scenes usually increases when trees and other vegetation are present. Views of nature, compared to most urban scenes lacking natural elements such as trees, appear to have more positive influences on emotional and physiological states. The benefits of visual encounters with vegetation may be greatest for individuals experiencing stress or anxiety. Recent research demonstrates that responses to trees and other vegetation can be linked directly to health, and in turn related to economic benefits of visual quality.

**Ulrich, R. S. (1984). "View through a Window May Influence Recovery from Surgery." *Science* 224(4647): 420-421.**

Records on recovery after cholecystectomy of patients in a suburban Pennsylvania hospital between 1972 and 1981 were examined to determine whether assignment to a room with a window view of a natural setting might have restorative influences. Twenty-three surgical patients assigned to rooms with windows looking out on a natural scene had shorter postoperative hospital stays, received fewer negative evaluative comments in nurses' notes, and took fewer potent analgesics than 23 matched patients in similar rooms with windows facing a brick building wall.

**Kaplan, R. (1984). "Impact of urban nature: A theoretical analysis." *Urban Ecology* 8(3): 189-197.**

The stresses and strains of the urban environment are widely acknowledged. The means for recovery, for recuperation, are perhaps less evident. In particular, the role of environmental configurations in this process is often neglected in the measurement of quality of life. The urban natural environment can provide the setting for such restorative experiences, both physically and conceptually. A theoretical analysis is presented that focuses on the importance of fascination and coherence as essential processes in the powerful effects of the nature context. When these are both afforded by the setting, many of the benefits available in more remote natural settings may be available in the nearby urban context as well. The bits and pieces of urban nature are significant not only in terms of active recreational encounters. The view of trees and birds, the thought of spring to come, and the plans for summer's window box can all help in the restorative experience.

**Ulrich, R. S. and D. L. Addoms (1981). "Psychological and Recreational Benefits of a Residential Park." *Journal of Leisure Research* 13(1): 43-65.**

**Ulrich, R. S. (1981). "Natural Versus Urban Scenes - Some Psychophysiological Effects." *Environment and Behavior* 13(5): 523-556.**

**Lewis, C. A. (1976). "People-Plant Interaction - Human Perspectives in Horticulture." *HortScience* 11(1): 4-5.**

**Lachowycz, K. and A. P. Jones "Towards a better understanding of the relationship between greenspace and health: Development of a theoretical framework." *Landscape and Urban Planning*(0).**

A growing body of evidence investigates whether access to greenspace, such as parks and woodland, is beneficial to well-being. Potential health benefits of greenspace exposure include opportunity for activities within the space and psychological benefits of viewing and interacting with nature. However, empirical research evidence on the effects of greenspace exposure shows mixed findings. Hence we suggest that the key questions of "if, why and how?" greenspace influences health remain largely unanswered. We argue that researchers have inadequately considered the causal pathways which drive the relationship. In particular, an improved understanding is needed of potential mediators and moderators. In this paper we draw on social-ecological theories and a review of the literature to develop a novel theoretical framework which summarises current knowledge about hypothetical causal pathways between access to greenspace and health outcomes. The framework highlights how mediators – such as use of greenspace and perceptions of the living environment – drive associations between access and both physical and psychological health outcomes. We propose key moderators based on evidence that associations between greenspace and health differ by demographic factors such as gender, ethnicity and socio-economic status, living context, greenspace type and climate. We discuss the evidence for how and why these factors act as

moderators and consider the implications which arise from this improved understanding of the relationship between greenspace and health. In conclusion, we discuss how the framework can be used to inform planning of research studies, and how it may be developed in the future as more evidence emerges.