

RESEARCH BRIEF | *February, 2014*

REFLECT & RESTORE

URBAN GREEN SPACE FOR MENTAL WELLNESS

KATHLEEN WOLF, PH.D.; ELIZABETH HOUSLEY, M.A.

A holistic, optimistic approach to health supports productive individuals, and livable communities where people can thrive. Health is not simply an absence of disease or infirmity, but is a state of complete physical, mental and social well-being. Wholesome living environments integrate the opportunities of built, social, natural, and (increasingly) online components to help people be at their best. One important aspect of health – mental function and wellness – is not only the outcome of personal and lifestyle situations, but is highly dependent on the natural and built environments that surround a person.

The World Health Organization¹ defines mental health as a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community. Each person's health, specifically mental health and wellness, is intricately integrated with the social and built environments around them. Achieving individual potential, managing stress, and living as a productive, contributing community member is a challenge when people must deal with the busyness of modern lifestyles, overwhelming time demands, and urban conditions. Mental health can be further compromised if one is stressed by conditions of low income, inadequate housing, and lack of career opportunity.



Nature Sacred
Helping communities heal from the outside.

Nature Sacred is a program of the TKF Foundation whose mission is to provide the opportunity for a deeper human experience by inspiring and supporting the creation of public greenspaces that offer temporary sanctuary, encourage reflection, provide solace and engender peace and well being.

Suggested Citation: Wolf, K.L., & E. Housley. 2014. *Reflect and Restore: Urban Green Space for Mental Wellness*. Annapolis, MD: The TKF Foundation.

The International Mental Health Research Organization claims that 1 in 5 people is afflicted by a mental health disorder, and that mental illness is the number one cause of adult disability worldwide. It is estimated that by the year 2020 mental health disorders will rise to 15% of the global burden of disease, and depression will constitute one of the largest health problems worldwide.² As the world's population grows and changes, everyday demands on individuals increases as each person seeks to obtain housing, quality food, education, a good job, and health care. These and other circumstances add up, and take their toll. One result is increased depression and stress rates of individuals, limiting their achievement of individual potential and community contributions.

The U.S. Census reports that about 80% of the U.S. population lives in cities and towns. More than 50 percent of the world's population now lives in cities, and further concentration in urban areas is forecast.³ Both the social and physical environments of one's life play a role in a person's mental response to challenges. As more people move into urban centers, they enter the places and the conditions that can compromise mental health. As a result, health officials now launch initiatives that target disease, and also promote supportive situations so that each and every person has the opportunity to experience positive mental health.



Providing places for respite and restoration, urban green spaces have the potential to improve mental wellness. Parks, trees, and open space have been appreciated for their aesthetic values for centuries. Exploring a deeper level of impact, scientists of multiple disciplines have been studying the contributions of nature experiences to human health, wellness, function, and therapy for about four decades. The earliest studies focused on the potential presence of toxins or reduced environmental quality (in air or water, for example) as sources of health risks.

The research now also addresses positive benefits. Regarding mental health, the evidence suggests that the experiences of city trees, parks, and gardens can aid with attention restoration and stress reduction, contribute to positive emotions, and can promote social engagement and social support (among neighbors, friends, family, and members of local organizations).

This briefing provides an overview of recent studies and conclusions. In this report 'green space' refers to urban landscapes, gardens, parks or any private or public spaces where natural elements (such as plants, soil, clean water or air, and even potted plants) are key components. Certain green spaces also provide opportunities for humans to interact with urban wildlife and companion animals, and with other people. The following research summaries describe the current research evidence about human encounters with nearby nature and mental benefit. Even the smallest bits of nature in the city are important.

Evidence of Nature Benefits for Mental Wellness

Every individual realizes his or her own potential.

Decades ago Abraham Maslow described the concept of a hierarchy of human needs. The major idea is that people have basic needs such as food, water, and shelter. Once these needs are satisfied, a person, through learning, work, constructive action, and relationships with other people, ascends a series of stages to self-actualization. This pursuit of one's potential is not necessarily step-wise. One can work toward having clean water, and at the same time pursue acts of creativity or social interactions that support one's self-esteem. Rarely considered on these terms, encounters with nature and involvement in stewardship within one's community may help a person to satisfy both basic and more abstract human needs, particularly those that involve mental wellness and function.

- Urban nature, when incorporated into community planning and building design, provides calming and inspiring environments and can encourage learning, inquisitiveness, and alertness.^{4, 5}
- Using national data for 10,000 people in the UK, a recent study found that, on average, individuals have both lower mental distress and higher well-being when living in urban areas with more green space.⁶
- Those people who relocated to homes in greener areas had significantly better mental health for all of the 3 years of monitoring following the move. Moving to greener urban areas was associated with sustained mental health improvements in a study group of more than 500 people.⁷
- EEG recordings showed evidence of lower frustration and higher meditation when in green space, versus when moving within retail and commercial areas having no trees.⁸ Happiness, or the presence of a positive emotional mindset, broadens how a person thinks about and acts in the daily flow of life's efforts, creating positive intellectual and psychological resources.
- Findings in medical research support the benefits of mindfulness activities.⁹ During relaxing activities such as light walking, tai-chi, yoga, meditation, and exercise, even prayer and belief, the brain shifts from releasing stress hormones to the production of endorphins



* The placebo effect is itself a powerful drug. It is not a trick found in research methods. It is the act of placing one's mind and body in such a state that the brain is triggered to enact healing pathways. As much as 30-50% of healing in research studies is attributed to the placebo effect⁹⁾.

and dopamine. When a person engages in such activities and within environments that she believes contribute to health and wellbeing, the placebo effect* supports mental wellness.

- A study compared meditative and athletic walking, in both forest and indoor settings.¹⁰ Meditative walking had greater effectiveness on positive psychological effects than athletic walking did in the same environment. Also, walking in the forest increased happiness to a greater degree than walking in the gymnasium at the same pace. Meditative walking in the forest was the most effective at increasing happiness.
- There is interest in the developmental benefits of nature experiences for children. Contact with nature may help children to develop cognitive, emotional, and behavioral connections to their nearby social and biophysical environments. Nature experiences can potentially encourage imagination and creativity, support feelings of self-worth, aid cognitive and intellectual development, enhance ability to concentrate and exercise self-discipline, and encourage positive social relationships.¹¹

12, 13, 14, 15, 16, 17



Every individual can cope with the normal stresses of life.

Stress response is triggered by the physical elements of our surroundings, by unpleasant social interactions, or by a perception of something threatening or fearful. When stressed one's body releases hormones, such as cortisol, that trigger an inner 'fight or flight' response. Frequent stress response can fatigue the immune system, and negatively affect other health responses. Researchers typically describe stress in two ways: acute and chronic stress. Acute stress plays an evolutionary and survival role, occurs less often, and is in response to an alarming or traumatic event (such as loss of a job or death of a loved one). Chronic stress occurs when one experiences an ongoing stressor (such as daily freeway commuting, or work demands), leading to a heightened and nearly constant physiological response. Chronic stress is now more often studied because it is the type of stress most likely experienced by urban dwellers, and is an alarming public health threat. One can reduce or eliminate stressors, avoid situations that are triggers, or develop the mindfulness to cope with challenge. Studies suggest that nearby nature experiences in cities can be a helpful buffer.

- The experience of nature appears to be an antidote to the stress effects of urban living. In a key experiment people who viewed a video of a natural setting, after viewing a visual stressor, displayed faster and more complete physiological recovery than those seeing built environments.^{18, 19}

- Exposure to nature in the form of trees, grass, and flowers can effectively reduce stress²⁰ particularly if initial stress levels are high.^{21, 22}
- Physiological measures of stress are restored to desirable, more healthful levels when study participants have either been placed within or view green spaces. Stress indicators include heart rate, muscle tension, systolic and diastolic blood pressure, brain electrical activity, skin conductance (sweating), as well as self-reports of perceived stress (a summary is provided by an article in the *Journal of Environmental Psychology*).²³
- A study found that even short-term visits (of about half an hour) to urban nature environments have positive effects on perceived stress relief compared to built-up environments. In addition to more positive mood, salivary cortisol levels decreased.²³
- A study of 11,000 adults from Denmark showed that living more than 1 km away from green space (forests, parks, beaches, lakes) were 42 percent more likely to report high stress and had the worst scores on evaluations of general health, vitality, mental health and bodily pain.²⁴
- Comparing household medical records and natural amenities, those residents with only 10% green space within about half a mile had a 25% greater risk of depression and a 30% greater risk of anxiety disorders vs. those with the highest degree of green space near the home.²⁵
- Studies examined the effects of exposure to nature on positive affect and ability to reflect on a life problem.²⁶ Participants spent 15 min walking in a natural setting, a built setting, or watching videos of natural and built settings. Exposure to nature was found to increase connectedness to nature, ability to direct attention, positive emotions, and ability to reflect on a life problem. The effects were stronger for actual nature than for virtual nature.
- Research found that experiencing nature had a powerful influence on the rehabilitation potential of people greatly affected by a crisis.²⁷ Individuals who have many experiences of nature were less affected by their crisis than are those who have few such experiences. The rehabilitative effect of nature is tied to its function as an enriched environment. During stays in natural settings an interaction takes place between sensory stimulation, emotions and logical thought—an interaction that leads to a new orientation and new ways of seeing one's self and one's resources.





- In a Korean study involving patients with moderate to severe depression, participants were assigned to cognitive-behavioral therapy in either a hospital setting or a forest setting (arboretum), while a third group acted as a control and were treated using standard outpatient care in the community.²⁸ Overall depressive symptoms were reduced most significantly in the forest group, and the odds of complete remission were relatively high - 20-30% higher than that typically observed from medication alone. Moreover, the forest therapy group had more pronounced reductions in physiological markers of stress, including lower levels of the stress hormone cortisol and improvements in heart rate variability, a marker of adequate circulatory system response to stress. It appears that the settings where psychotherapy is conducted can actually become part of the therapy.
- Based on decades of research we now have guidelines for supportive outdoor spaces.^{9, 29} A restorative environment should be visually stimulating; it should include the nuanced complexity and opportunity to access information about one's surroundings that is experienced in well-designed gardens and parks. An environment that readily supports one's movements and intentions is also more likely to move your body from a stress state to a relaxed state, thus a lower stress level. A restorative green space should have slower movement in the visual field and smells that one associates with pleasant memories. Notably, when we go to a place that we believe heals us we actually do send the human body on a path towards healing.

Every individual can work productively and fruitfully.

Early city beautification programs focused on quality of life and generating a harmonious social order within crowded industrial cities. Today, incorporating nature into everyday places is seen as important for an

additional reason—the effects on quality of life and human productivity. Cities with amenities are more desirable, and people who are healthy and are generally satisfied with life may also be better able to work toward both individual and community goals. New urban greening initiatives help create a “sense of place” for a city or town, generating a sense of pride for ones’ community. In addition, high-quality human habitat can be the places where students, workers, and community leaders restore their minds and bodies, enabling them to continue the important work that helps to keep a local community competitive.³⁰

- Mental restoration is gained from spending time in an urban green space, and increased length of stay (up to 1.5 hours) increases the restorative effect.³¹
- Focusing on tasks that require a lot of concentration in work or school leads to cognitive fatigue. With greater fatigue we are unable to work as well, become irritable, and may feel a general tiredness. Short breaks in nature help to restore the mind from this mental fatigue, perhaps contributing to improved work performance and satisfaction.^{32, 33}
- Depression can impact a person’s motivation to work and learn. Symptoms of major depressive disorder (MDD) include impaired working memory, and persistent negative mood. In one study MDD patients were set up to take 50 minute walks in either a natural or highly built setting.³⁴ Participants exhibited significant increases in memory span after the nature walk relative to the urban walk, and showed increases in mood. The effect sizes were nearly five times as large for MDD individuals compared to healthy individuals (in another study). Interacting with nature may be useful clinically as a supplement to existing treatments for MDD.
- Workplace managers are increasingly providing opportunities for employee physical activity, for better health and reduced care costs. There may be synergy between the psychological benefits of physical activity, and the restorative effects of contact with natural environments. One study concluded that physical activity in natural environments is associated with reduced risk of poor mental health to a greater extent than physical activity in other environments.³⁵
- Over 2 million children in the U.S. have been diagnosed with attention-deficit/hyperactivity disorders (ADHD). Such a child has reduced attention capacity, which can have detrimental effects on social and psychological growth, affecting school performance. In one study, parents judged that attention deficit symptoms were more manageable after their child did activities in green settings than after activities in other settings. Also, the greener a child’s play area, the less severe his or her attention deficit symptoms; children who played in





windowless indoor settings had significantly more severe symptoms than those who played in grassy, outdoor spaces (with or without trees).³⁶ In a follow up study green outdoor activities reduced symptoms significantly more than did either built outdoor activities or indoor activities.³⁷ A third study found that children with ADHD concentrated better after a walk in the park than after a downtown walk or a neighborhood walk.³⁸

Every individual is able to make a contribution to her or his community.

Behavior studies in business and economics have established that social cohesion contributes to economic development.³⁰ A socially stable community where there are strong networks, a sense of trust, and comfort in relationships can be a favorable environment for commerce.³⁹ People who have a general sense of well-being and confidence that interactions with other people will be positive are more likely to commit to community-wide improvements and redevelopment programs. It has even been suggested that more social cities breed more creativity as a rapid exchange of ideas flows from both dense interactions and loose connections among residents.⁴⁰

At the neighborhood level, having nearby public green spaces facilitates informal social interactions. Residential common spaces with more trees and vegetation are associated with more use of common spaces and stronger neighborhood social ties. Urban parks and greening projects can help create the environments that facilitate social contacts and community attachment.

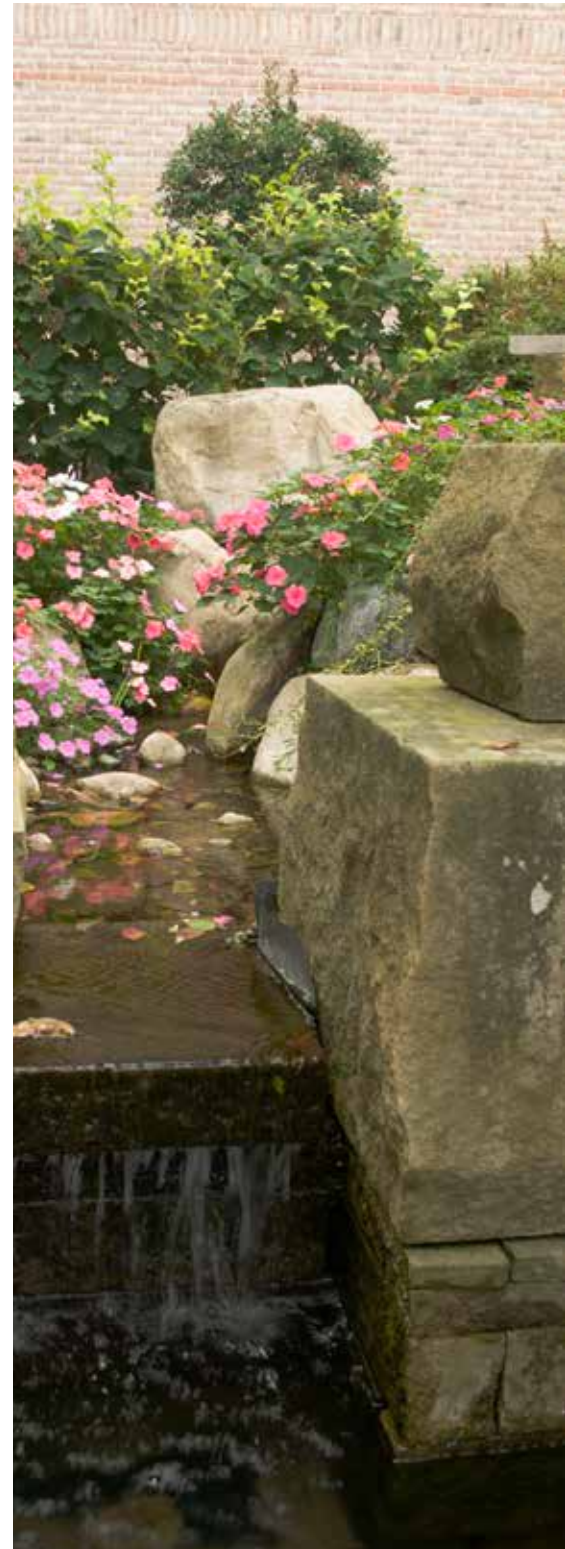
- Easy access to nature, opportunities to visit natural areas, having a view of nature from one's home, and plentiful tree cover are all associated with higher levels of neighborhood satisfaction. In contrast, negative perceptions of the nearby physical environment, including lack of green space, are associated with expectations of higher crime rates and reduced mental health.^{41, 42}
- More social activities were observed in public housing common spaces that had trees compared to treeless spaces of the same size.⁴³
- Older adults who have more exposure to green common spaces report a stronger sense of unity among residents within their local neighborhood, and experience a stronger sense of belonging to the neighborhood.⁴⁴
- Moreover, urban green areas (parks, playgrounds, and forests) have been found to encourage children and adolescents in making cross-cultural contacts and friendships.⁴⁵

- Strong community relationships may result in individuals being more likely to work together to achieve common goals (e.g., cleaner and safer public spaces), to exchange information, and to maintain informal social controls (e.g., discouraging crime or other undesirable behaviors).^{46, 47, 48}
- Communities where residents express high mutual trust and reciprocity have been linked with lower homicide rates. Neighborhoods lacking social cohesion and community wellness conversely, have been related to higher rates of social disorder, anxiety, and depression.⁴⁹

Theories About Green Spaces and Mental Well-being⁵⁰

In the early 1960s, researchers began to ask questions about what we consider beautiful and how we perceive our surroundings. A lot has been learned since then, and it is remarkable how fundamentally different people's responses are to natural versus man-made materials,²⁰ and how stable and consistent this response is across cultures.⁵ Once it was established that people "prefer" natural scenes compared to man-made settings, researchers began to investigate the physiological and cognitive mechanisms that govern people's reactions to nature. Two theoretical frameworks have emerged to explain the restorative effect of nature. Stress Reduction Theory (SRT) and Attention Restoration Theory (ART) are each supported by dozens of studies, and a summary is provided here.

Based on the work of Dr. Roger Ulrich,¹⁸ SRT proposes that natural landscapes improve well-being through physiological stress reduction. In this theory, a person experiences an instantaneous, preconscious emotional reaction to elements in nature (a bright pink flower, a flowing stream) and this reaction interacts with her current physiological state. This interaction in turn effects and is modified by her conscious consideration of the situation, generating a new level of stress or relaxation. Researchers in this school of thought use physiological measures as indicators of stress and health changes.





Another explanation, proposed by Drs. Stephen and Rachel Kaplan, is Attention Restoration Theory (ART).⁵ The concept is that nature has the potential to restore a person when a taxing cognitive activity has exhausted a mind's finite ability to focus and concentrate. When focused on a task a person is able to suppress mental distractions and impulses, allowing us to study and work, but this ability (directed attention) can become exhausted over time. The Kaplans identify characteristics of green spaces that are rich in qualities that allow directed attention to recover. The inherent characteristics found in green spaces provide stimulation but place little demand on a person's ability to maintain concentration. More recent research based on this theoretical standpoint shows that benefits of nature do appear to be mediated by the effect of nature on attention abilities.^{51, 52, 53}

Both of these theoretical frameworks provide insights as to how the natural environment benefits human health. ART is concerned with how green spaces improve attention but SRT emphasizes the emotional and stress physiology outcomes of time spent in nature. However, health research is leading us to understand that stress and cognitive abilities are interrelated phenomena; researchers today are beginning to pull apart the complex mechanisms at work.

Investing in Green for Mental Health and Wellness

When comparing the foundational theories of nature and well-being, the physiological and attentional restoration processes may complement one another, though expressed in different kinds of outcomes that emerge at different rates and persist to differing degrees.⁵⁴ Nonetheless, the key message, confirmed by literally hundreds of studies, is that across all age groups, and in diverse cultural groups, there is a recurring positive response to small scale, often unremarkable, natural settings in cities. Some responses, such as mood change or a sense of relaxation may be personally felt, while other reactions, such as reduced blood pressure or cortisol levels, are happening at the subconscious level.



With global environmental concerns, rapid urban expansion, and mental health disorders at crisis levels, the pattern of diminished nature contact in people's lives is an important issue. The research evidence points to many reasons why an investment in urban nearby nature is a low cost way to encourage mental health and wellness for urban inhabitants. Scientific findings support the long-held intuitions about the healing power of the nature-based environment - green space, gardens, forests, and parks - particularly as it extends into the realm of mental health and vitality.⁵⁵

References

- 1 World Health Organization's Mental Health Action Plan 2013-2020. http://apps.who.int/iris/bitstream/10665/89966/1/9789241506021_eng.pdf
- 2 Murray, C.J.L. & A.D. Lopez (eds). 1996. The global burden of disease: A comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020. *Global Burden of Disease and Injury Series, Vol. 1*. Harvard University Press, Cambridge MA.
- 3 United Nations Population Fund, State of the World's Population 2007: Unleashing the Potential of Urban Growth; www.unfpa.org/swp/2007/presskit/pdf/sowp2007_eng.pdf.
- 4 Beatley, T. 2010. *Biophilic Cities: Integrating Nature Into Urban Design and Planning*. Washington DC, Island Press.
- 5 Kaplan, R., & S. Kaplan. 1989. *The Experience of Nature: A Psychological Perspective*. Cambridge University Press, New York.
- 6 White, M.P., I. Alcock, B.W. Wheeler, & M.H. Depledge. 2013. Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. *Psychological Science* 24, 6: 920-28.
- 7 Alcock, I., M.P. White, B.W. Wheeler, L.E. Fleming, & M.H. Depledge. 2014. Longitudinal effects on mental health of moving to greener and less green urban areas. *Environmental Science & Technology* 48, 2: 1247-255.
- 8 Aspinall, P., P. Mavros, R. Coyne, and J. Roe. 2013 (online). The urban brain: Analysing outdoor physical activity with mobile EEG. *British Journal of Sports Medicine*.
- 9 Sternberg, E.M. 2009. *Healing Spaces: The Science of Place and Well-being*. Belknap Press, Cambridge MA.
- 10 Shin, Y.K., K. Jung-Choi, Y.J. Son, J.W. Koo, J.A. Min, & J.H. Chae. 2013. Differences of psychological effects between meditative and athletic walking in a forest and gymnasium. *Scandinavian Journal of Forest Research* 28, 1: 64-72.
- 11 Heerwagen, J.H., & G.H. Orians. 2002. The ecological world of children. In: P.H.J. Kahn, & S.R. Kellert (eds.), *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations*. MIT Press, Cambridge MA, pp. 29-64.
- 12 Kahn Jr., P.H., & S.R. Kellert. 2002. *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations*. MIT Press, Cambridge MA.
- 13 Kirkby, M. 1989. Nature as refuge in children's environments. *Children's Environments Quarterly* 6: 7-12.
- 14 Taylor, A.F., F.E. Kuo, & W.C. Sullivan. 2002. Views of nature and self-discipline: Evidence from inner city children. *Journal of Environmental Psychology* 22, 1-2: 49-63.
- 15 Wells, N.M., & G.W. Evans. 2003. Nearby nature: A buffer of life stress among rural children. *Environment and Behavior* 35, 3: 311-330.
- 16 Wells, N.M. 2000. At home with nature: Effects of "greenness" on children's cognitive functioning. *Environment and Behavior* 32, 6: 775-795.
- 17 Coley, R.L., W.C. Sullivan, & F.E. Kuo. 1997. Where does community grow? *Environment and Behavior* 29: 468.
- 18 Ulrich, R.S., R.F. Simons, B.D. Losito, E. Fiorito, M.A. Miles, & M. Zelson. 1991. Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology* 11, 3: 201-230.
- 19 Ulrich, R.S., & R. Parsons. 1992. Influences of passive experiences with plants on individual well-being and health. In: D. Relf (ed), *The Role of Horticulture in Human Well-Being and Social Development: A National Symposium*. Timber Press, Arlington VA, pp. 93-103.
- 20 Ulrich, R.S. 1986. Human responses to vegetation and landscapes. *Landscape and Urban Planning* 13: 29-44.
- 21 Ulrich, R.S., & D.L. Addoms. 1981. Psychological and recreational benefits of a residential park. *Journal of Leisure Research* 13, 1: 43-65.
- 22 Ulrich, R.S., U. Dimberg, & B.L. Driver. 1991. Psychophysiological indicators of leisure benefits. In: B.L. Driver, L.R. Brown, & G.L. Peterson (eds), *Benefits of Leisure*. Venture Publishing, State College PA, pp. 73-89.
- 23 Tyrväinen, L., A. Ojala, K. Korpela, T. Lanki, Y. Tsunetsugu, & T. Kagawa. 2014. The influence of urban green environments on stress relief measures: A field experiment. *Journal of Environmental Psychology* 38: 1-9.
- 24 Stigsdottir, U.K., O. Ekholm, J. Schipperijn, M. Toftager, F. Kamper-Jørgensen, & T.B. Randrup. 2010. Health promoting outdoor environments - associations between green space, and health, health-related quality of life and stress based on a Danish national representative survey. *Scandinavian Journal of Public Health* 38, 4: 411-17.
- 25 Maas, J., R.A. Verheij, S. de Vries, P. Spreeuwenberg, F.G. Schellevis, & P.P. Groenewegen. 2009. Morbidity is related to a green living environment. *Journal of Epidemiology and Community Health* 63, 12: 967-973.
- 26 Mayer, F.S., C.M.P. Frantz, E. Bruehlman-Senechal & K. Dolliver. 2009. Why is nature beneficial? *Environment and Behavior* 41, 5: 607-643.
- 27 Ottosson, J., & P. Grahn. 2008. The role of natural settings in crisis rehabilitation: How does the level of crisis influence the response to experiences of nature with regard to measures of rehabilitation? *Landscape Research* 33, 1: 51-70.
- 28 Kim, W., S.K. Lim, E.J. Chung, & J.M. Woo 2009. The effect of cognitive behavior therapy-based psychotherapy applied in a forest environment on psychological changes and remission of major depression. *Psychiatry Investigation* 6: 245-254.
- 29 Marcus, C.C., & N.A. Sachs. 2013. *Therapeutic Landscapes: An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces*. John Wiley & Sons, Hoboken NJ.
- 30 Wolf, K.L. 2014. Greening the city for health. *Communities & Banking* 25, 1: 10-12.
- 31 Korpela, K.M., M. Ylén, L. Tyrväinen, & H. Silvennoinen. 2008. Determinants of restorative experiences in everyday favorite places. *Health & Place* 14, 4: 636-652.
- 32 Kaplan, R. 1993. The role of nature in the context of the workplace. *Landscape and Urban Planning* 26, 1-4: 193-201.
- 33 Kaplan, S. 1995. The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology* 15, 3: 169-182.
- 34 Berman, M.G., E. Kross, K.M. Krpan, M.K. Askren, A. Burson, P.J. Deldin, S. Kaplan, L. Sherdell, I.H. Gotlib, & J. Jonides. 2012. Interacting with nature improves cognition and affect for individuals with depression. *Journal of Affective Disorders* 140, 3: 300-05.
- 35 Mitchell, R. 2013. Is physical activity in natural environments better for mental health than physical activity in other environments? *Social Science & Medicine* 91: 130-134.
- 36 Taylor, A. F., F.E. Kuo, & W.C. Sullivan. 2001. Coping with ADD: The surprising connection to green play settings. *Environment and Behavior*, 33:54-77.
- 37 Kuo, F. E., & A.F. Taylor. 2004. A potential natural treatment for attention-deficit/hyperactivity disorder: Evidence from a national study. *American Journal of Public Health* 94: 1580.
- 38 Taylor, A.F., & F.E. Kuo. 2009. Children with attention deficits concentrate better after walk in the park. *Journal of Attention Disorders* 12, 5: 402-09.
- 39 Matsuoka, R., & W.C. Sullivan. 2011. Urban nature: Human psychological and community health. In: I. Douglas et al. (eds.), *Handbook of Urban Ecology*. Routledge, New York.
- 40 Florida, R. 2011 (October). Where the skills are. *Atlantic*.
- 41 Kaplan, R. 2001. The Nature of the view from home: Psychological benefits. *Environment and Behavior* 33, 4: 507-542.
- 42 Kearney, A.R. 2006. Residential development patterns and neighborhood satisfaction: Impacts of density and nearby nature. *Environment and Behavior* 38, 1: 112-139.
- 43 Taylor, A.F., A. Wiley, F.E. Kuo, & W.C. Sullivan. 1998. Growing up in the inner city. *Environment and Behavior* 30, 1: 3-27.
- 44 Kweon, B.S., W.C. Sullivan, & R. Angel. 1998. Green common spaces and the social integration of inner-city older adults. *Environment and Behavior* 30, 6: 832-858.
- 45 Seeland, K., S. Dübendorfer, & R. Hansmann. 2009. Making friends in Zurich's urban forests and parks: The role of public green space for social inclusion of youths from different cultures. *Forest Policy and Economics* 11, 1: 10-17.
- 46 Kuo, F.E., W.C. Sullivan, R.L. Coley, & L. Brunson. 1998. Fertile ground for community: Inner-city neighborhood common spaces. *American Journal of Community Psychology* 26, 6: 823-851.
- 47 Sampson, R., J. Morenoff, & T. Gannon-Rowley. 2002. Assessing "neighborhood effects": Social processes and new directions in research. *Annual Review of Sociology* 28: 443-478.
- 48 Sullivan, W.C., F.E. Kuo, & S. DePooter. 2004. The fruit of urban nature: Vital neighborhood spaces. *Environment and Behavior* 36, 5: 678-700.
- 49 Cubbin, C., S. Egerter, P. Braveman, & V. Pedregon. 2008. Where We Live Matters for Our Health: Neighborhoods and Health. *Issue Brief 3 of the Robert Wood Johnson Foundation, Commission to Build a Healthier America*, 11 pages.
- 50 This article provides a full review of this theory: Bratman, G.N., J.P. Hamilton, & G.C. Daily. 2012. The impacts of nature experience on human cognitive function and mental health. *Annals of the New York Academy of Sciences* 1249: 118-136.
- 51 Tennessen, C.M. & B. Cimprich. 1995. Views to nature: Effects on attention. *Journal of Environmental Psychology* 15: 77-85.
- 52 Kuo, F.E. 2001. Coping with poverty: Impacts of environment and attention in the inner city. *Environment and Behavior* 33, 1: 5-34.
- 53 Berman, M.G., J. Jonides & S. Kaplan. 2008. The cognitive benefits of interacting with nature. *Psychological Science* 19: 1207- 1212.
- 54 Hartig, T., G. Evans, L. Jamner, et al. 2003. Tracking restoration in natural and urban field settings. *Journal of Environmental Psychology* 23: 109-123.
- 55 Logan, A.C., & E.M. Selhub. 2012. Vis Medicatrix Naturae: Does nature "minister to the mind"? *BioPsychoSocial Medicine* 6: 11

This research brief was prepared by the TKF Foundation through its NatureSacred Awards Program

TKF FOUNDATION

410 Severn Avenue,
Suite 216
Annapolis, MD

Tel: 410.268.1376

www.NatureSacred.org



Nature Sacred
Helping communities heal from the outside.