

Healthy nature healthy people: 'contact with nature' as an upstream health promotion intervention for populations

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SUMMARY

Whilst urban-dwelling individuals who seek out parks and gardens appear to intuitively understand the personal health and well-being benefits arising from 'contact with nature', public health strategies are yet to maximize the untapped resource nature provides, including the benefits of nature contact as an upstream health promotion intervention for populations. This paper presents a summary of empirical, theoretical and anecdotal evidence drawn from a literature review of the human health benefits of contact with nature. Initial findings indicate that nature plays a vital role in human health and well-being, and that parks and nature reserves play a significant role by providing access to nature for individuals. Implications suggest contact with nature may provide an effective

population-wide strategy in prevention of mental ill health, with potential application for sub-populations, communities and individuals at higher risk of ill health. Recommendations include further investigation of 'contact with nature' in population health, and examination of the benefits of nature-based interventions. To maximize use of 'contact with nature' in the health promotion of populations, collaborative strategies between researchers and primary health, social services, urban planning and environmental management sectors are required. This approach offers not only an augmentation of existing health promotion and prevention activities, but provides the basis for a socio-ecological approach to public health that incorporates environmental sustainability.

Key words: nature; health promotion; mental health; ecological health

REMEMBER NATURE?

Humans have spent many thousands of years adapting to natural environments, yet have only inhabited urban ones for relatively few generations (Glendinning 1995; Roszak *et al.*, 1995; Suzuki 1997; Gullone 2000). Whilst modern 'westernization' has doubled our life expectancy, it has also created disparities between ancient and present ways of living that may have paved the way for the emergence of new serious diseases. 'As more people survive to older age, and as patterns of living, consuming and environmental exposures change, so non-communicable diseases such as coronary heart disease, diabetes and

cancer have come to dominate' [McMichael, 2001 (p. 2)]. Further, mental, behavioural and social health problems are seen to be an increasing health burden in all parts of the world (Desjarlais *et al.*, 1995).

According to the World Bank and the World Health Organization, mental health disorders currently constitute 10% of the global burden of disease (Victorian Health Promotion Foundation, 2005). In Australia, depression costs the economy AUD\$3.3 billion in lost productivity each year (Beyondblue, 2005). Estimates suggest by the year 2020 mental health disorders will rise

to 15% of the global burden of disease and depression alone will constitute one of the largest health problems worldwide (Murray and Lopez, 1996). More than ever, nations require effective and integrated strategies for promoting health in whole populations. In light of such trends, public health strategies need to closely investigate the social and physical habitats of urban populations, and examine 'ecological' solutions alongside specific behavioural, clinical and technological interventions (McMichael, 2001). This paper examines the potential use of human contact with nature as an effective and affordable health promotion intervention for populations. The evidence invites us to 'look outside' for solutions to this global contemporary health epidemic.

NATURAL CONNECTIONS WITH PUBLIC HEALTH

In the last few hundred years, there has been an extraordinary disengagement of humans from the natural environment (Axelrod and Suedfeld, 1995; Beck and Katcher, 1996; Katcher and Beck, 1987). This is mostly due to the enormous shift of people away from rural areas into cities (Katcher and Beck, 1987). In evolutionary terms, 'the urban environment is a spontaneous, changeable and historically unfamiliar habitat' [McMichael, 2001 (p. 252)]. Never in history have humans spent so little time in physical contact with animals and plants, and the consequences are unknown (Katcher and Beck, 1987). Already, some research has shown that too much artificial stimulation and an existence spent in purely human environments may cause exhaustion and produce a loss of vitality and health (Katcher and Beck, 1987; Stilgoe, 2001). Modern society, by its very essence, insulates people from outdoor environmental stimuli (Stilgoe, 2001) and regular contact with nature (Katcher and Beck, 1987). Some believe humans may not be fully adapted to an urban existence (Kellert and Wilson, 1993; Glendinning, 1995; Kellert, 1997; Burns, 1998; McMichael, 2001). With parks and public nature reserves often their only means of accessing nature, the majority of urban-dwelling individuals may have all but forgotten their connections with the natural world.

Whilst medical technology continues to improve the capacity of nations to combat the global infectious disease burden, public health

strategies struggle to cope with the rapid changes industrialization and urbanization have meant. Human, community and cultural well-being has suffered as a result. Traditional models of public health appear ill prepared for the new reality of health risks posed to populations. This has led to a reconsideration of the interdependence between people, their health, and their physical and social environments (Kickbusch, 1989a).

For the purposes of this paper, nature is defined as an organic environment where the majority of ecosystem processes are present (e.g. birth, death, reproduction, relationships between species). This includes the spectrum of habitats from wilderness areas to farms and gardens. Nature also refers to any single element of the natural environment (such as plants, animals, soil, water or air), and includes domestic and companion animals as well as cultivated pot plants. Nature can also refer collectively to the geological, evolutionary, biophysical and biochemical processes that have occurred throughout time to create the Earth as it is today. Parks are public natural environments, spaces reserved for their natural or cultural qualities, usually owned, managed and administered by public institutions. Parks are utilized for a range of purposes, including for conservation, recreation and education. In urban settings, parks are seen to provide the most ready access to nature for many individuals. This paper focuses on the benefits of contact with nature in park environments for urban-dwelling individuals, and explores the potential of contact with nature for the promotion of health for whole populations.

The Ottawa Charter for Health Promotion identified the importance of environments supportive of health, stating that the inextricable links between people and their environment are the basis for a socio-ecological approach to health (World Health Organization, 1986). The Charter advocates for protection of natural and built environments, and conservation of natural resources as essential in any health promotion strategy. The central theme was promotion of health by maximizing the health values of everyday settings. Everyday settings include, for example, where people learn, live, work, play, etc. (World Health Organization, 1986). An emerging question might be therefore whether the majority of urban-dwelling individuals currently utilize parks and nature reserves as 'everyday settings'.

Studies in disciplines of ecology, biology, psychology and psychiatry have attempted to

empirically examine the human relationship with the natural world, some concluding that as well as being totally dependent on nature for material needs (food, water, shelter, etc.) humans also need nature for psychological, emotional and spiritual needs (Wilson, 1984; Katcher and Beck, 1987; Friedmann and Thomas, 1995; Roszak *et al.*, 1995; Frumkin, 2001; Wilson, 2001). Yet how dependent humans are on nature for psychological and well-being needs, and what benefits can be gained from interacting with nature are just beginning to be investigated.

The Australian Institute of Health and Welfare identifies seven dimensions within holistic health and well-being, including: biological and mental well-being, social well-being, economic well-being, environmental well-being, life satisfaction, spiritual or existential well-being, and 'other characteristics valued by humans' (Australian Institute of Health and Welfare, 1998). Whilst a growing body of evidence has demonstrated the importance of social relationships (and social capital) for health, the relationship between environmental health and human health remains little understood. As Brown states, sustainable ecosystems in these dimensions of human health need greater attention and exploration, as well as inclusion and emphasis in the knowledge base of public health (Brown, 1996).

CONTACT WITH NATURE PROMOTES HEALTH AND WELL-BEING—THE EVIDENCE

'People with access to nearby natural settings have been found to be healthier overall than other individuals. The longer-term, indirect impacts (of 'nearby nature') also include increased levels of satisfaction with one's home, one's job and with life in general' [Kaplan and Kaplan, 1989 (p. 173)].

When parks were first designed in the nineteenth century, city officials had a strong belief in the possible health advantages that would result from open space (Hamilton-Smith and Mercer, 1991; Rohde and Kendle, 1997). It was hoped that parks would reduce disease, crime, and social unrest as well as providing 'green lungs' for the city, and areas for recreation (Rohde and Kendle, 1997). These assumptions were used as justification for providing parks and other natural areas in cities, and preserving wilderness areas outside of cities for public use (Parsons, 1991; Ulrich, 1993).

Contact with nature in an urban park environment may be experienced via various means, including viewing natural scenes, being in natural settings, encountering plants and animals, participating in recreational activities, undertaking environmental conservation work, and participating in nature-based therapy programmes, amongst others. Although the study upon which this paper is based included an examination of the human health benefits of observing plants and animals, this review focuses on 'everyday' interactions with nature in a park setting by urban populations including: (1) viewing natural scenes; and (2) being in natural environments. Also provided is a summary of current knowledge based on current anecdotal, theoretical and empirical evidence. Only those human relationships with animals and plants where no economic benefit is to be gained from the relationship are included.

Viewing natural scenes

The healing effects of a natural view are increasingly being understood in stressful environments such as hospitals, nursing homes, remote military sites, space ships and space stations (Lewis, 1996). In these environments particularly, as well as for people who work in windowless offices, studies show that seeing nature is important to people and is an effective means of relieving stress and improving well-being (Kaplan, 1992a; Lewis, 1996; Leather *et al.*, 1998).

A study examining recovery rates of patients who underwent gall bladder surgery found that those with a natural view recovered faster, spent less time in hospital, had better evaluation from nurses, required fewer painkillers and had less postoperative complications compared with those that viewed an urban scene (Ulrich, 1984). Similarly, Ulrich and colleagues studied the effects of different natural and urban scenes on subjects who had just watched a stressful film (horror genre) (Ulrich *et al.*, 1991b). Measuring a whole array of physiological measures [including heart rate, skin conductance, muscle tension and pulse transit time (a non-invasive measure that correlates with systolic blood pressure)] they found that recovery was faster and more complete when subjects were exposed to natural rather than urban scenes (Ulrich *et al.*, 1991b). The physiological data measured by this study suggests that natural settings elicit a response that includes a component of the parasympathetic

nervous system associated with the restoration of physical energy (Ulrich *et al.*, 1991a).

Research conducted in prison environments suggests that cell window views of nature are associated with a lower frequency of stress symptoms in inmates, including digestive illnesses and headaches, and with fewer sick calls overall by prisoners (Moore, 1981). Tennessen and Cimprich gave university students a test and compared scores of students who had natural views to those that had did not (Tennessen and Cimprich, 1995). They found that those with a view of nature scored better on the test than those with non-natural views.

Research suggests access to nature in the workplace is related to lower levels of perceived job stress and higher levels of job satisfaction (Kaplan and Kaplan, 1989). Workers with a view of trees and flowers felt that their jobs were less stressful and they were more satisfied with their jobs than others who could only see built environments from their window. In addition, employees with views of nature reported fewer illnesses and headaches (Kaplan and Kaplan, 1989). A similar study found that a view of natural elements (trees and other vegetation) buffered the negative impact of job stress on intention to quit (Leather *et al.*, 1998).

Parsons *et al.*, reviewed the literature on commuter stress in car drivers and the mitigating effects of roadside environments (Parsons *et al.*, 1998). Driving is known to be a stressful activity, and causes several physiological changes in the body, including: activation of the sympathetic nervous system, increased blood pressure, increased heart rate and an increase in heart rate variability (Parsons *et al.*, 1998). Stress recovery and immunization were measured in subjects exposed to one of four simulated drives (drives with forest/rural scenery, drives along the outside of golf courses, drives through urban scenes and drives through mixed roadside scenery), immediately following and preceding mildly stressful events. Findings demonstrated that participants who viewed nature-dominated drives experienced quicker recovery from stress and greater immunization to subsequent stress than participants who viewed artifact-dominated drives (Parsons *et al.*, 1998).

Ulrich examined the effects of viewing nature on psychological state, particularly on mood affect, and found that participants who viewed slides of unspectacular scenes of nature had an increase in positive mood affect, while those

who viewed scenes of urban areas experienced a decline in positive mood affect (Ulrich, 1979; Ulrich, 1982; cited in Rohde and Kendle, 1994). In this and a later study, Ulrich concluded that scenes of nature, particularly those depicting water, had a beneficial influence on the psychological state of participants (Ulrich, 1982; cited in Rohde and Kendle, 1994).

In a review of the literature, Rohde and Kendle found that the psychological response to nature involves feelings of pleasure, sustained attention or interest, 'relaxed wakefulness', and diminution of negative emotions, such as anger and anxiety (Rohde and Kendle, 1994). Evidence presented here has demonstrated that just by viewing nature many aspects of human health and development can be markedly improved. Evidence also exists for the therapeutic benefits to be gained from *being in nature*.

Being in natural environments

Early research found that in the act of contemplating nature, the brain is relieved of 'excess' circulation (or activity) and nervous system activity is reduced (Yogendra, 1958). Furnass found an experience of nature can help strengthen the activities of the right hemisphere of the brain, and restore harmony to the functions of the brain as a whole (Furnass, 1979). This is a technical explanation of the process that occurs when people 'clear their head' by going for a walk in a natural setting.

Kaplan and Kaplan described 'restorative environments' as those settings that foster recovery from mental fatigue (Kaplan and Kaplan, 1981). According to theirs and other studies, restorative environments require four elements: fascination (an involuntary form of attention requiring effortless interest, or curiosity); a sense of being away (temporary escape from one's usual setting or situation); extent or scope (a sense of being part of a larger whole); and compatibility with an individual's inclinations (opportunities provided by the setting and whether they satisfy the individual's purposes) (Kaplan and Kaplan, 1989; Hartig *et al.*, 1991). Parks are ideal for restorative experiences due to their ability to satisfy the four elements described above (Kaplan and Kaplan, 1989; Kaplan and Kaplan, 1990; Kaplan, 1992a; Kaplan 1992b; Kaplan 1995). For example, when comparing a walk in a natural setting, a walk in an urban setting, and relaxing in a

comfortable chair, Hartig *et al.* found that mental fatigue was most successfully relieved by a walk in a park (Hartig *et al.*, 1991). Nature may well constitute a 'restorative environment'

Whilst outside the emphasis of this paper, the community benefits of social contact within nature in parks and gardens is worthy of examination. Community gardens for example provide opportunities for socializing with and learning from fellow gardeners and residents that may normally be unavailable. This aids community cohesion by dissolving prejudices about race, and economic or educational status (Lewis, 1990; Lewis, 1996). At an annual gardening competition in a public housing area of New York, research found an increase in community cohesion, a reduction in graffiti and violence, and an increase in positive attitudes about themselves and their neighbourhood for residents, resulting in personal and neighbourhood transformation (Lewis, 1990; Lewis, 1992; Lewis 1996). Civic volunteering in natural environments, such as through 'Friends of Parks' groups, may be another example of enhanced health and well-being made possible not only through contact with nature, but through the social connection that arises from working on a common community task in a local natural area.

Wong examined the benefits of contact with nature for migrants (Wong, 1997; cited in Rohde and Kendle, 1997). Benefits included: increased sense of identity and ownership of the country they live in; sense of integration rather than isolation; a reunion with nature (i.e. particularly important for first generation immigrants who have rural backgrounds); the reawakening of a sense of possibility; restoration and a relief from daily struggles; empowerment, skill development and the enabling of opportunity to participate in caring for the environment. Further, Rohde and Kendle found being in natural environments invokes a sense of 'oneness' with nature and the universe, and that being in nature can lead to transcendental experiences (Rohde and Kendle, 1994).

It has been stated that the major determinants of health may have little to do with the health care system (Hancock, 1999) and that public health needs to focus on the environmental and social aspects of health (Chu and Simpson, 1994). Public owned natural spaces are an ideal resource to support these and other aspects of human health and well-being.

Empirical, theoretical and anecdotal evidence demonstrates contact with nature positively impacts blood pressure, cholesterol, outlook on life and stress-reduction (Moore, 1981; Kaplan and Kaplan, 1989; Hartig *et al.*, 1991; Ulrich *et al.*, 1991a; Ulrich *et al.*, 1991b; Kaplan, 1992a; Rohde and Kendle, 1994; Lewis, 1996; Leather *et al.*, 1998; Parsons, *et al.*, 1998). These outcomes have particular relevance in areas of mental health and cardiovascular disease, categories that are set to be the two biggest contributors to disease worldwide by the year 2020 (Murray and Lopez, 1996). Whilst the extent to which contact with nature can contribute to human health and well-being is in need of further investigation, the strength of this evidence alone is sufficient to warrant inclusion of 'contact with nature' within population health strategies, and for parks to be considered a fundamental health resource in disease prevention for urban populations worldwide. Table 1 presents a summary of knowledge based on current anecdotal, theoretical and empirical evidence.

HUMAN HEALTH NATURALLY

As our understanding of the natural environment has developed, and the massive destruction human activities can have on natural systems has been observed, a more enlightened view has emerged. This view recognizes that plants and animals (including humans) do not exist as independent entities as was once thought, but instead are part of complex and interconnected ecosystems on which they are entirely dependent, and fundamentally a part of (Driver *et al.*, 1996). As Suzuki states, the ecosystem is the fundamental capital on which all life is dependent (Suzuki, 1990). It is clear that nature and natural environments relate to human health and well-being. To seek human health and sustainability without considering the importance of environmental sustainability is to invite potentially devastating consequences for the health and well-being of whole populations.

What is needed is a focus on social equity, social investment and social innovation in health and environment policy (Kickbusch, 1989b). Natural environments are an ideal setting for the integration of environment, society and health by promoting a socio-ecological approach

Table 1: A summary of evidence supporting the assertion that contact with nature promotes health and well-being

What the Research Demonstrates With Certainty				
Assertion	Evidence			Key reference/s
	A	T	E	
There are some known beneficial physiological effects that occur when humans encounter, observe or otherwise positively interact with animals, plants, landscapes or wilderness	✓	✓	✓	(Friedmann <i>et al.</i> , 1983a; Friedmann <i>et al.</i> , 1983b; Parsons, 1991; Ulrich, <i>et al.</i> , 1991b; Rohde and Kendle, 1994; Beck and Katcher, 1996; Frumkin, 2001)
Natural environments foster recovery from mental fatigue and are restorative	✓	✓	✓	(Furnass, 1979; Kaplan and Kaplan, 1989; Kaplan and Kaplan, 1990; Hartig <i>et al.</i> , 1991; Kaplan, 1995)
There are established methods of nature-based therapy (including wilderness, horticultural and animal-assisted therapy among others) that have success healing patients who previously had not responded to treatment	✓	✓	✓	(Levinson, 1969; Katcher and Beck, 1983; Beck <i>et al.</i> , 1986; Lewis, 1996; Crisp and O'Donnell, 1998; Russell <i>et al.</i> , 1999; Fawcett and Gullone, 2001; Pryor, 2003)
When given a choice people prefer natural environments (particularly those with water features, large old trees, intact vegetation or minimal human influence) to urban ones, regardless of nationality or culture		✓	✓	(Parsons, 1991; Newell, 1997; Herzog <i>et al.</i> , 2000)
The majority of places that people consider favourite or restorative are natural places, and being in these places is recuperative	✓	✓	✓	(Kaplan and Kaplan, 1989; Rohde and Kendle, 1994; Korpela and Hartig, 1996; Herzog <i>et al.</i> , 1997; Newell, 1997; Herzog <i>et al.</i> , 2000)
People have a more positive outlook on life and higher life satisfaction when in proximity to nature (particularly in urban areas)	✓	✓	✓	(Kaplan and Kaplan, 1989; Kaplan, 1992a; Lewis, 1996; Leather <i>et al.</i> , 1998; Kuo, 2001; Kuo and Sullivan, 2001)
Exposure to natural environments enhances the ability to cope with and recover from stress, cope with subsequent stress and recover from illness and injury	✓	✓	✓	(Ulrich, 1984; Parsons, 1991; Ulrich <i>et al.</i> , 1991b)
Observing nature can restore concentration and improve productivity	✓	✓	✓	(Tennessen and Cimprich, 1995; Leather <i>et al.</i> , 1998; Taylor <i>et al.</i> , 2001)
Having nature in close proximity, or just knowing it exists, is important to people regardless of whether they are regular 'users' of it	✓	✓	✓	(Kaplan and Kaplan 1989; Cordell <i>et al.</i> , 1998)

A, anecdotal; T, theoretical; E, empirical.

to human health and well-being based on human contact with nature.

Public health has a key role to play in environmental conservation, and environment administration has a key role to play in human health and well-being. On this basis, potential exists for parks and natural reserves to gain an expanded role, scope and influence in urban-based societies. A collaborative socio-ecological approach between health and environmental management sectors is required to ensure that contact with nature is integral to sustainable development strategies for local and global urban communities.

As Keating and Hertzman state, high exposure to economic and social inequality is a powerful

determinant of health and well-being in populations (Keating and Hertzman, 1999; cited in Commonwealth Department of Health and Aged Care and AIHW, 1999). With further investigation, perhaps ecological inequality, or a lack of opportunity to experience contact with nature may come to be recognized as a third powerful determinant of health and well-being in populations. In such a case, along with access to primary health care, accessibility to nature would be seen as a social justice issue. According to these criteria, the health benefits of contact with nature, in particular publicly-owned nature, which would be regarded as a national health resource, should be thoroughly investigated.

Although most people are aware of the health benefits of sport and recreation, the health and well-being benefits arising from contact with nature are little understood. Further empirical research is required to remedy gaps in current knowledge, to further knowledge in this area, to facilitate decision-making and policy formulation, and to foster interdisciplinary approaches. Findings summarized in this paper warrant a repositioning of natural spaces in the minds of both the community and government.

HEALTHY NATURE HEALTHY PEOPLE—A SEARCH FOR SUSTAINABILITY

Socio-ecological theory is essentially triple bottom line reporting in practice. This approach promotes enhancement of individual and community health, well-being, and welfare by following a path of economic development that does not impair the welfare of future generations; provides for equity between and within generations; and protects biodiversity maintaining essential ecological processes and life support systems (Brown, 1996).

Not only do natural spaces and public parks protect the essential systems of life and biodiversity, but they also provide a fundamental setting for health promotion and the creation of well-being for urban populations that to date has lacked due recognition. Whilst experience and intuition, along with opportunity and access, may guide some urban-dwelling individuals to seek out gardens, parks and public natural areas for improved health and sense of well-being, significant evidence exists for contact with nature to be considered in the promotion of health and well-being for individuals and communities, and potentially be incorporated within public health strategies for whole populations.

A socio-ecological approach to public health recognises that not only is health itself holistic and multidisciplinary, but that a holistic or multidisciplinary approach is needed to promote and manage health successfully. This requires inventive new efforts in the collaboration between environmental scientists and biomedical researchers on one hand, and between health and environmental policy makers on the other (Wilson, 2001).

As Birch stated, our objective for the future should be healthy people in a healthy

Table 2: Recommendations for a development of contact with nature in upstream health promotion for populations

Strategies	Recommendations
Further research	<p>Determine the potential health and well-being benefits arising from contact with nature for a range of population groups.</p> <p>Explore how contact with nature via parks could contribute to population health priority areas (especially in cardiovascular disease and mental health).</p> <p>Determine the importance of natural spaces for community health, and the actual health benefits people derive from parks.</p> <p>Examine the health benefits of volunteering in park settings, including volunteering for park conservation.</p> <p>Evaluate the health and well-being benefits of contact with nature as a potential preventive ‘upstream’ health intervention.</p> <p>Examine whether the destruction of the natural environment directly affects human health and well-being and/or is linked to the prevalence of mental ill-health in modern society.</p> <p>Examine whether human health in a range of population groups is affected by lack of opportunities to experience nature.</p>
Health promotion	<p>Partnerships: form partnerships between health and environment sectors, at national and local levels, towards a sustainable socio-ecological approach to health promotion.</p> <p>Education: promote understanding of the health and well-being benefits of viewing and being in nature through media and community projects that raise public awareness; promote contact with nature in schools, for example through curriculum development; encourage workplaces, schools and housing developments to provide access to nature.</p> <p>Training: train teachers, health workers and administrators of public natural spaces (including parks staff) to facilitate nature encounters.</p>

environment, with healthy relations to that environment (Birch, 1993). Natural spaces and public-owned parks not only preserve and protect the environment; they also encourage and enable people to relate to the natural world, hence they have a key role to play in a socio-ecological approach to health.

Health promotion agencies have already recognized the need for innovative, 'upstream' approaches to health and well-being, and are seeking potential alliances/opportunities to this end. Collaboration with the environmental management sector, and the use of public natural spaces in population health promotion is a clear potential strategy. As demonstrated through this review, the individual and community benefits arising from contact with nature include biological, mental, social, environmental and economic outcomes. Nature can be seen therefore as an under-utilized public resource in terms of human health and well-being, with the use of parks and natural areas offering a potential gold mine for population health promotion.

In this light, natural areas can be seen as one of our most vital health resources. In the context of the growing worldwide mental illness burden of disease, contact with nature may offer an affordable, accessible and equitable choice in tackling the imminent epidemic, within both preventative and restorative public health strategies.

Table 2 lists recommendations for research and strategies to incorporate nature contact in the promotion of health for whole populations.

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REFERENCES

- Australian Institute of Health and Welfare (1998) Australia's Health 1998: The Sixth Biennial Health Report of the Australian Institute of Health and Welfare. Canberra: Australian Institute of Health and Welfare.
- Axelrod, L. J. and Suedfeld, P. (1995) Technology, capitalism, and christianity: are they really the three horsemen of the eco-collapse? *Journal of Environmental Psychology*, **15**, 183–195.
- Beck, A. and Katcher, A. (1996) *Between Pets and People: The Importance of Animal Companionship*. Purdue University Press, West Lafayette, Indiana.
- Beck, A., Seraydarian, L. and Hunter, F. (1986) Use of animals in the rehabilitation of psychiatric inpatients. *Psychological Reports*, **58**, 63–66.
- Beyondblue (2005) Website: <http://www.beyondblue.org.au> (last accessed 04 July 2005). National Depression Initiative, Australia.
- Birch, C. (1993) *Regaining Compassion for Humanity and Nature*. New South Wales University Press, Kensington.
- Brown, V. A. (1996) Double or nothing: the changing relationship between the health of the biosphere and the health of the people. In Furnass, B., Whyte, J., Harris, J. and Baker, A. (eds) *Survival, Health and Wellbeing into the Twenty First Century—Proceedings of a Conference Held at The Australian National University, November 30—December 1, 1995*. Nature and Society Forum, Canberra, pp. 59–67.
- Burns, G. W. (1998) *Nature-Guided Therapy—Brief Integrative Strategies for Health and Well-being*. Brunner/Mazel, Philadelphia.
- Chu, C. and Simpson, R. (1994) *Ecological Public Health: From Vision to Practice*. Nathan: Institute of Applied Environmental Research, Griffith University, Queensland, Australia and Centre for Health Promotion, University of Toronto, Canada.
- Commonwealth Department of Health and Aged Care and Australian Institute of Health and Welfare. (1999) National Health Priority Areas Report: Mental Health 1998—A Report Focusing on Depression. Commonwealth Department of Health and Aged Care, Canberra.
- Cordell, K. H., Tarrant, M. A., McDonald, B. L. and Bergstrom, J. C. (1998) How the public views wilderness: more results from the USA survey on recreation and the environment. *International Journal of Wilderness*, **4**, 28–31.
- Crisp, S. and O'Donnell, M. (1998) Wilderness-adventure therapy in adolescent mental health. *Australian Journal of Outdoor Education*, **3**, 47–57.
- Desjarlais, R., Eisenberg, L., Good, B. and Kleinman, A. (1995) *World Mental Health: Problems and Priorities in Low-income Countries*. Oxford University Press, New York.
- Driver, B. L., Dustin, D., Baltic, T., Elsner, G. and Peterson, G. L. (1996) *Nature and the Human Spirit: Toward an Expanded Land Management Ethic*. Venture Publishing, Inc., State College, PA.
- Fawcett, N. R. and Gullone, E. (2001) Cute and cuddly and a whole lot more? A call for empirical investigation into the therapeutic benefits of human-animal interaction for children. *Behaviour Change*, **18**, 124–133.
- Friedmann, E., Katcher, A. and Meislich, D. (1983a) When pet owners are hospitalized: significance of companion

- animals during hospitalization. In Katcher, A. and Beck, A. (eds) *New Perspectives on Our Lives with Companion Animals*. University of Pennsylvania Press, Philadelphia, pp. 346–350.
- Friedmann, E., Katcher, A., Thomas, S. A., Lynch, J. J. and Messent, P. R. (1983b) Social interaction and blood pressure: influence of animal companions. *The Journal of Nervous and Mental Disease*, **171**, 461–465.
- Friedmann, E. and Thomas, S. A. (1995) Pet ownership, social support, and one-year survival after acute myocardial infarction in the Cardiac Arrhythmia Suppression Trial (CAST). *American Journal of Cardiology*, **76**, 1213–1217.
- Frumkin, H. (2001) Beyond toxicity human health and the natural environment. *American Journal of Preventative Medicine*, **20**, 234–240.
- Furnass, B. (1979) Health values. In: Messer, J. and Mosley, J. G. (eds) *The Value of National Parks to the Community: Values and Ways of Improving the Contribution of Australian National Parks to the Community*. University of Sydney, Australian Conservation Foundation, pp. 60–69.
- Glendinning, C. (1995) Technology, trauma and the wild. In Roszak, T., Gomes, M. E. and Kanner, A. D. (eds) *Ecopsychology: Restoring the Earth, Healing the Mind*. Sierra Club Books, San Francisco.
- Gullone, E. (2000) The biophilia hypothesis and life in the 21st century: increasing mental health or increasing pathology? *Journal of Happiness Studies*, **1**, 293–321.
- Hamilton-Smith, E. and Mercer, D. (1991) *Urban Parks and Their Visitors*. The Parks Division, Melbourne and Metropolitan Board of Works, Melbourne, pp. 1–79.
- Hancock, T. (1999) Healthy and Sustainable Communities—Creating Community Capital. In: *4th European IUHPE Conference on Effectiveness and Quality of Health Promotion*. IUHPE, Estonia.
- Hartig, T., Mang, M. and Evans, G. W. (1991) Restorative effects of natural environment experiences. *Environment and Behavior*, **23**, 3–26.
- Herzog, T. R., Black, A. M., Fountaine, K. A. and Knotts, D. J. (1997) Reflection and attentional recovery as distinctive benefits of restorative environments. *Journal of Environmental Psychology*, **17**, 165–170.
- Herzog, T. R., Herbert, E. J., Kaplan, R and Crooks, C. L. (2000) Cultural and developmental comparisons of landscape perceptions and preferences. *Environment and Behaviour*, **32**, 323–337.
- Kaplan, R. (1992a) The psychological benefits of nearby nature. In Relf, D. (ed.) *Role of Horticulture in Human Well-being and Social Development: A National Symposium*. Timber Press, Arlington, Virginia, pp. 125–133.
- Kaplan, S. (1992b) The restorative environment: nature and human experience. In Relf, D. (ed.) *Role of Horticulture in Human Well-being and Social Development: A National Symposium*. Timber Press, Arlington, Virginia, pp. 134–142.
- Kaplan, S. (1995) The restorative benefits of nature: toward and integrative framework. *Journal of Environmental Psychology*, **15**, 169–182.
- Kaplan, R. and Kaplan, S. (1989) *The Experience of Nature: A Psychological Perspective*. Cambridge University Press, Cambridge, New York.
- Kaplan, R. and Kaplan, S. (1990) Restorative experience: the healing power of nearby nature. In Francis, M. and Hester, R. T., Jr (eds) *The Meaning of Gardens: Idea, Place and Action*. The MIT Press, Cambridge, pp. 238–243.
- Katcher, A. and Beck, A. (1987) Health and caring for living things. *Anthrozoos*, **1**, 175–183.
- Katcher, A., Friedmann, E., Beck, A. and Lynch, J. J. (1983) Looking, talking, and blood pressure: the physiological consequences of interaction with the living environment. In Katcher, A., and Beck, A. (eds) *New Perspectives on Our Lives with Companion Animals*. University of Pennsylvania Press, Philadelphia, pp. 351–360.
- Katcher, A. H. and Beck, A. M. (1983) *New Perspectives on Our Lives with Companion Animals*. University of Pennsylvania Press, Philadelphia.
- Kellert, S. R. (1997) *Kinship to Mastery: Biophilia in Human Evolution and Development*. Island Press, Washington, D.C.
- Kellert, S. R. and Wilson, E. O. (1993) *The Biophilia Hypothesis*. Shearwater Books/Island Press, Washington, D.C.
- Kickbusch, I. (1989a) Approaches to an ecological base for public health. *Health Promotion*, **4**, 265–268.
- Kickbusch, I. (1989b) Good planets are hard to find: approaches to an ecological base for public health. In La Trobe University and Commission for the Future (ed.) *2020: A Sustainable Healthy Future, Towards an Ecology of Health*. La Trobe University and Commission for the Future, Melbourne, pp. 7–30.
- Korpela, K. and Hartig, T. (1996) Restorative qualities of favourite places. *Journal of Environmental Psychology*, **16**, 221–233.
- Kuo, F. E. 2001. Coping With Poverty: Impacts of Environment and Attention in the Inner City. *Environment and Behavior*, **33**, 5–34.
- Kuo, F. E. and Sullivan, W. C. (2001) Environment and crime in the inner city: does vegetation reduce crime? *Environment and Behavior*, **33**, 343–367.
- Leather, P., Pyrgas, M., Beale, D. and Lawrence, C. (1998) Windows in the workplace. *Environment and Behavior*, **30**, 739–763.
- Levinson, B. M. (1969) *Pet-Oriented Child Psychotherapy*. Charles C Thomas, Springfield, IL.
- Lewis, C. A. (1990) Gardening as a healing process. In Francis, M. and Hester, R. T., Jr (eds) *The Meaning of Gardens: Idea, Place and Action*. The MIT Press, Cambridge, pp. 244–251.
- Lewis, C. A. (1992) Effects of plants and gardening in creating interpersonal and community well-being. In Relf, D. (ed.) *Role of Horticulture in Human Well-being and Social Development: A National Symposium*. Timber Press, Arlington, Virginia, pp. 55–65.
- Lewis, C. A. (1996) *Green Nature/Human Nature: The Meaning of Plants in our Lives*. University of Illinois Press, Urbana, Chicago.
- McMichael, T. (2001) *Human frontiers, environments and disease. Past patterns, uncertain futures*. UK University Press, The Syndicate of the University of Cambridge, Cambridge.
- Moore, E. O. (1981) A prison environment's effect on health care service demands. *Journal of Environmental Systems*, **11**, 17–34.
- Murray, C. J. L. and Lopez, A. D. (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—summary. World Health Organization, Geneva, the World Bank, and the Harvard School of Public Health.

- Newell, P. B. (1997) A cross cultural examination of favourite places. *Environment and Behavior*, **29**, 495–515.
- Parsons, R. (1991) The potential influences of environmental perception on human health. *Journal of Environmental Psychology*, **11**, 1–23.
- Parsons, R., Tassinary, L. G., Ulrich, R. S., Hebl, M. R. and Grossman-Alexander, M. (1998) The view from the road: implications for stress recovery and immunization. *Journal of Environmental Psychology*, **18**, 113–140.
- Pryor, A. (2003) The outdoor experience program: wilderness journeys for improved relationships with self, others, and healthy adventure. In Richards, K. and Smith, B. (eds) *Proceedings of the 2nd International Adventure Therapy Conference: Therapy within Adventure*. University of Augsburg, Zeil.
- Rohde, C. L. E. and Kendle, A. D. (1994) *Report to English Nature—Human Well-being, Natural Landscapes and Wildlife in Urban Areas: A Review*. Department of Horticulture and Landscape and the Research Institute for the Care of the Elderly, University of Reading, Bath.
- Rohde, C. L. E. and Kendle, A. D. (1997) Nature for people. In Kendle, A. D. and Forbes, S. (eds) *Urban Nature Conservation—Landscape Management in the Urban Countryside*. E. and F. N. Spon, London, pp. 319–335.
- Rozsak, T., Gomes, M. E. and Kanner, A. D. (1995) *Ecopsychology: Restoring the Earth, Healing the Mind*. Sierra Club Books, San Francisco.
- Russell, K. C., Hendee, J. C. and Phillips-Miller, D. (1999) How wilderness therapy works: an examination of the wilderness therapy process to treat adolescents with behavioural problems and addictions. In Cole, D. N. and McCool, S. F. (eds) *Wilderness Science in a Time of Change*. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Odgen, UT.
- Stilgoe, J. R. (2001) Gone barefoot lately? *American Journal of Preventative Medicine*, **20**, 243–244.
- Suzuki, D. (1990) *Inventing the Future*. Allen and Unwin, Sydney.
- Suzuki, D. (1997) *The Sacred Balance: Rediscovering Our Place in Nature*. Allen and Unwin, St Leonards.
- Takacs, D. (1996) *The Idea of Biodiversity: Philosophies of Paradise*. Johns Hopkins University Press, Baltimore.
- Taylor, A. F., Kuo, F. E. and Sullivan, W. C. (2001) Coping with ADD: the surprising connection to green play settings. *Environment and Behavior*, **33**, 54–77.
- Tennessen, C. M. and Cimprich, B. (1995) Views to nature: effects on attention. *Journal of Environmental Psychology*, **15**, 77–85.
- Ulrich, R. S. (1984) View through a window may influence recovery from surgery. *Science*, **224**, 420–421.
- Ulrich, R. S. (1993) Biophilia, biophobia, and natural landscapes. In Kellert, S. R. and Wilson, E. O. (eds) *The Biophilia Hypothesis*. Shearwater Books/Island Press, Washington D.C., pp. 73–137.
- Ulrich, R. S., Dimberg, U. and Driver, B. L. (1991a) Psychophysiological indicators of leisure benefits. In Driver, B. L., Brown, L. R. and Peterson, G. L. (eds) *Benefits of Leisure*. Venture Publishing, State College, Pennsylvania, pp. 73–89.
- Ulrich, R. S. and Parsons, R. (1992) Influences of passive experiences with plants on individual well-being and health. In Relf, D. (ed.) *Role of Horticulture in Human Well-being and Social Development: A National Symposium*. Timber Press, Arlington, Virginia, pp. 93–103.
- Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A. and Zelson, M. (1991b) Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, **11**, 231–248.
- Victorian Health Promotion Foundation (2005) Website: <http://www.vichealth.gov.au> (last accessed 04 July 2005). Victoria, Australia.
- Wilson, E. O. (1984) *Biophilia*. Harvard University Press, Cambridge, MA.
- Wilson, E. O. (2001) The ecological footprint. *Vital Speeches*, **67**, 274–281.
- World Health Organization (1986) Ottawa Charter for Health Promotion. In: *International Conference on Health Promotion: The Move Towards a New Public Health*. World Health Organization, Health and Welfare Canada, Canadian Public Health Association, Ottawa.
- Yogendra, S. (1958) *Hatha Yoga Simplified*. The Yoga Institute, Santa Cruz, Bombay.