

Healthy parks, healthy people

The health benefits of contact with nature in a park context

A review of relevant literature

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Foreword

Parks Victoria has adopted 'Healthy parks, healthy people' as its key message to the community of Victoria. Over recent years, other state-based park management bodies have adopted a similar message, and the Parks Forum (the peak body for park management agencies within Australia and New Zealand) has established as one of its Standing Committees a National Coordination Group for 'Healthy parks, healthy people'. The availability of up-to-date information is essential if these agencies are to increase their understanding of what the 'Healthy parks, healthy people' message means, and to have the capacity to communicate the importance of parks and nature for human health and wellbeing to governments and the community at large.

This project is the result of a joint initiative between Parks Victoria and the NiCHE (Nature in Community, Health and Environment) Research Group of Deakin University. This revised review updates research compiled and published in an earlier edition (completed in 2002 with funding provided by Parks Victoria and the International Park Strategic Partners Group) and aims to provide key information for park and open space managers, health professionals, researchers, and others with an interest in this area, while retaining its status as a platform for future research. The significance of the health and wellbeing benefits from interacting with nature, including in park settings, the implications for public health, and the need for collated up-to-date information on this topic cannot be over-estimated.

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Executive summary

In many disciplines, there have been concerted attempts to understand the human relationship with nature and how humans might benefit from nature in terms of health and wellbeing. Although still in the relatively early stages, research indicates that contrary to popular thinking, humans may be dependent on nature for psychological, emotional, and spiritual needs that are difficult to satisfy by other means. Findings so far demonstrate that access to nature plays a vital role in human health, wellbeing, and development that has not been fully recognised. This review is an examination of a broad cross-section of published literature that relates to the potential and actual health benefits of contact with nature, particularly but not only, in a park context.

City living involves an extraordinary disengagement of humans from the natural environment that is likely to be detrimental to health and wellbeing. Parks may be one of the only means of accessing nature for the majority of people in urban areas, yet most people are unaware of their full range of potential health benefits. Humans have forgotten how much the natural world means to them. Yet, signals abound that the loss of life's diversity endangers not just the body but also the spirit. It has been reported that modern people are experiencing a spiritual famine and that alcohol, food, and drug addictions are futile attempts to fill the spiritual emptiness that has arisen from loss of contact with nature.

In terms of health, parks and other natural environments have been viewed almost exclusively as venues for leisure and sport. Yet recent research shows that 'green nature', such as parks, can reduce crime, foster psychological wellbeing, reduce stress, boost immunity, enhance productivity, and promote healing. In fact, the positive effects on human health, particularly in urban environments, cannot be over-stated. As a result, urban planning should ensure that the communities have adequate access to nature.

Evidence in the literature shows that among other benefits viewing nature is positive for health in terms of recovering from stress, improving concentration and productivity, and improving psychological state, particularly of people in confined circumstances such as prisons and hospitals. Furthermore, wilderness and related studies clearly demonstrate that being in a natural environment affects people positively, particularly in terms of mental health. There are also multiple benefits from brief encounters with nature, or experiencing nature on a smaller scale, such as in urban parks. Surveys have shown that nature is important to people, and the numbers of people seeking nature-based recreation are increasing.

Other studies demonstrate that plants and nearby vegetation can have profound effects on individuals, small groups, or even entire neighbourhoods. Some health benefits of interacting with plants include facilitation of healing in the elderly and mentally disadvantaged, improving mental capacity and productivity of office workers, improving job and life satisfaction of residents, attracting consumers and tourists to shopping districts, and aiding community cohesion and identity.

While the relationship between social capital and health has been the subject of considerable research and reflection, the relationship between social capital and the biophysical environment is only now being explored. It seems likely, however, that human contact with nature through parks may have significant capacity for building social capital. As social and natural capital benefit one another, it could be worthwhile investigating the facilitative role parks play in linking one to the other.

A large body of research demonstrates that contact with companion animals has multiple positive physiological and psychological effects on human health including: decreasing blood pressure, heart rate, and cholesterol; reducing anxiety and stress and providing protection against stress-related diseases; provision of companionship and kinship; and the opportunity to nurture. All of these factors improve quality of life and enhance health and wellbeing. Parks and other natural environments such as beaches are important in providing a setting for pet-owners to interact both with their pet and with other pet-owners and parks users, which can positively influence the social aspects of health. In addition, parks are essential in the preservation of habitat for native wildlife, as well as providing people with the opportunity to observe or encounter animals in their natural environment.

Parks and other natural environments are a fundamental health resource, particularly in terms of disease prevention. The initial evidence documenting the positive effects of nature on blood pressure, cholesterol, outlook on life and stress-reduction is sufficient to warrant its incorporation into strategies for the Australian National Health Priority Areas of 'mental health' and 'cardiovascular disease'. These two disease categories place a considerable health and economic burden on Australians, and worldwide will be the two biggest contributors to disease by the year 2020. However, due to the positive effects of nature overall on human health and wellbeing, the health benefits of nature may have relevance to all Australian National Health Priority Areas (cancer control, injury prevention and control, cardiovascular health, diabetes mellitus, mental health, asthma, and arthritis and musculoskeletal conditions). The extent to which parks and other contact with nature can contribute to these areas, however, awaits investigation.

There is a clear message for park managers to join public health fora, as not only do parks protect the essential systems of life and biodiversity, but they also are a fundamental setting for health promotion and the creation of wellbeing, that to date has not been fully recognised.

Recommendations

Recommendations to government departments, planners, park management bodies, and health policy makers are:

1 Support further research

Research is required to:

- a collect further empirical evidence demonstrating the health and wellbeing benefits of contact with nature;
- b explore new opportunities for application of the health and wellbeing benefits of contact with nature by investigating nature-based interventions to address existing and emerging health problems;
- c explore opportunities for using the health and wellbeing benefits of contact with nature as a preventive 'upstream' health measure.

2 Encourage and facilitate the repositioning of parks

- a by communicating to governments and the wider community, the health and wellbeing benefits of nature as provided by parks;
- b by educating government departments, health professionals, and the wider community as to these benefits;
- c by facilitating the engagement of the community with nature in order to re-establish awareness of the importance of nature in people's lives, and cultivate a holistic, sustainable attitude towards life and health.

3 Develop ways of integrating parks and nature into public health

- a Cooperation through a partnerships approach is required between government departments, park management agencies, health service agencies, health professionals, and researchers to successfully integrate parks and nature in public health;
- b Health promotion agencies have already recognised the need for innovative, 'upstream' approaches to health and wellbeing, and are seeking potential alliances/opportunities to this end;
- c It may be beneficial to initiate this process by examining how contact with nature via parks could be used as a preventive measure, potentially contributing to, for example, the Australian National Health Priority Areas of Cardiovascular Disease and Mental Health;
- d The use of parks and nature to improve health and wellbeing is supported by the Jakarta Declaration (World Health Organization, 1997) and its predecessor, the Ottawa Charter for Health Promotion (World Health Organization, 1986), which call for creating supportive environments (both natural and social) and a reorientation of health services to be shared among individuals, community groups, health professionals, health service institutions, and governments.

Introduction

That the natural environment is a key determinant of health is unquestioned. A report published by the World Health Organization (Prüss-Üstün and Corvalán, 2006 p. 6) claims that 'approximately one-quarter of the global disease burden, and more than one-third of the burden among children, is due to modifiable environmental factors'. However, even in its attempt to quantify the environmental burden of disease, WHO has focused on *environmental degradation*: 'the amount of death and disease caused by factors such as unsafe drinking-water and sanitation, and indoor and outdoor air pollution' (Prüss-Üstün and Corvalán, 2006 p. 6), paying little if any attention to the impacts of *environmental deprivation*. The same focus is reflected more broadly within 'environmental health' as a discipline and a profession.

Despite the prevailing attitude in society that humans are separate from, outside of, or above nature (Martin, 1996; Suzuki, 1990), as human understanding of the natural environment has developed, and the massive destruction that human activities can have on natural systems has been observed, a more enlightened view has emerged. This view recognises that plants and animals (including humans) do not exist as independent entities as was once thought, but instead are parts of complex and interconnected ecosystems on which they are entirely dependent, and of which they are fundamentally a part (Driver et al., 1996). In the Foreword to its Millennium Ecosystem Assessment report 'Ecosystems and Human Well-being: Health Synthesis', the World Health Organisation (2005 p. iii) stated:

Nature's goods and services are the ultimate foundations of life and health, even though in modern societies this fundamental dependency may be indirect, displaced in space and time, and therefore poorly recognised.

The human relationship with the natural world is deeply intertwined with the human conscious and subconscious mind and is therefore not easy to access for analysis. Nonetheless, in recent years, there have been concerted attempts, particularly in the disciplines of ecology, biology, environmental psychology, and psychiatry, to empirically examine the human relationship with the natural world.

Many researchers have come to the conclusion that humans are dependent on nature not only for material needs (food, water, shelter, etc) but perhaps more importantly for psychological, emotional and spiritual needs (Wilson, 2001; Frumkin, 2001; Roszak et al., 1995; Friedmann and Thomas, 1995; Katcher and Beck, 1987; Wilson, 1984). Just how dependent on nature humans are, and exactly what benefits can be gained from interacting with nature are issues that have only just begun to be investigated. Findings so far, however, indicate that parks and other natural environments play a vital role

in human health and wellbeing through providing access to nature. This is likely to change the way parks and nature are currently viewed and managed by governments and the wider community.

The idea that contact with nature is good for human health and wellbeing is the subject of research in diverse disciplines such as environmental psychology, environmental health, psychiatry, biology, ecology, landscape preferences, horticulture, leisure and recreation, wilderness, and of course public health policy and medicine. Driving these divergent streams is the central notion that contact with nature is beneficial, perhaps even essential, to human health and wellbeing. While the strength of the evidence for this assertion varies, due in part to 'methodological limitations of [some of] the research', and the mechanisms by which nature influences health outcomes is generally unknown, nevertheless acceptance of the association of nature with human wellbeing is increasing (Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and Environment, 2005 p. 81).

In the last few hundred years, however, there has been an extraordinary disengagement of humans from the natural environment (Beck and Katcher, 1996; Axelrod and Suedfeld, 1995; Katcher and Beck, 1987). This is mostly due to the enormous shift of people away from rural areas into cities (Katcher and Beck, 1987). Here, contact with nature is often only available via parks. Never have humans spent so little time in physical contact with animals and plants and the consequences are unknown (Katcher and Beck, 1987). Further to this, modern society, by its very essence, insulates people from outdoor environmental stimuli (Stilgoe, 2001) and regular contact with nature (Katcher and Beck, 1987). Some researchers believe that too much artificial stimulation and an existence spent in purely human environments may cause exhaustion, or produce a loss of vitality and health (Stilgoe, 2001; Katcher and Beck, 1987)

A subject that has attracted some concern is the lack of opportunities for nurturing in urban environments. Nurturing living organisms, such as animals and plants, could be an essential part of human development that if denied could have adverse effects on the health, and perhaps even the long-term survival, of the human species (Kellert, 1997; Bustad, 1996; Wilson, 1993; Lewis, 1992; Katcher and Beck, 1987). Katcher and Beck (1987) state that there is a critical need for continued exploration of the emotional and health value of nurturing living things; they believe it will reveal a human health requirement equal in importance to exercise and touch (Katcher and Beck, 1987).

The idea that isolation from the natural world may be harmful to health is not limited to scientists and researchers but is also seen in the choices of everyday people. For example, it is estimated that 42% of the American public uses some form of complementary medicine (Clark, 2000) and worldwide the use of complementary medicine has doubled in recent decades (New Scientist, 2001). A recent Australian review of the literature on the use of complementary and alternative medicines, with a particular focus on their use in treating asthma, found that '20-30% of adults and 50-60% of children with asthma may be using CAM at any one time' (Slader et al. 2006 p. 386). The rise in popularity of complementary medicines may not only be due to disenchantment with modern techniques, but also the expression of a desire to take a more natural approach to health (Clark, 2000). In fact, many patients cite 'naturalness' as the appeal of complementary medicine, yet others are drawn by spiritualism or the emphasis on holism (New Scientist, 2001). Both of these qualities are often assigned to nature. Yet, there is still a lack of understanding in the general populace, governments and institutions about the significance of the human connectedness with nature, and its relevance to current social problems, particularly in terms of health.

The following is a review of the potential and actual health benefits of contact with nature, including but not restricted to nature in a park context. Contact with nature is defined as viewing natural scenes, being in natural environments, or observing, encountering or otherwise interacting with plants and animals. Although the primary

interest of this review concerns human contact with nature in a park context, we have examined the literature within the broader context of human health and nature. This has meant the inclusion of fields such as environmental psychology, psychology, psychiatry, medicine, environmental economics, biodiversity conservation, ecology, complementary and alternative medicine, landscape design and urban planning, recreation and leisure, environmental health, public health policy and health promotion, adventure and wilderness therapy, and religion and spirituality.

The emphasis on parks in this document is for the simple reason that they are the chief means of maintaining intact natural ecosystems and preserving biodiversity in a world that is becoming increasingly urbanised. Because of this, parks play an essential role in public health, as they are the most readily available (or sometimes the only) source of nature for the majority of people who live in urban areas. This review is the first step toward collating current knowledge on this topic with the aim of undertaking further empirical research in the near future.

The first part of the review comprises a discussion on public health and nature, as well as the current concerns of public health in Australia. This is followed by the connection between parks, nature and health, how parks can contribute to public health, and the need to reposition parks in terms of health. Next is a discussion on understanding the human-nature relationship that examines some current theories of the human place in nature, as well as in particular reference to some population groups. Evidence for the health benefits of contact with nature is presented in the following section, including the benefits arising from viewing nature, being in nature, contact with plants, and contact with animals. A brief discussion on some unique forms of nature-based therapy follows, which is then followed by a summary on the principal health outcomes of interacting with nature on an individual or personal level, and at a community level. Finally, a brief comment on policy outcomes and triple bottom line reporting, and some key recommendations are presented. There are also a number of assertions that can be made about current knowledge of the health and wellbeing benefits of the human relationship with nature. These are included in an Appendix.

Public health and nature

What is health and how is it determined?

Health is one of life's most valued assets. Practically all people have it in their 'top three' of important life factors. In the 5th Century B.C., a Greek statesman by the name of Pericles stated that 'Health is that state of moral, mental, and physical wellbeing that enables a person to face any crisis in life with the utmost grace and facility' (Burn, 1956). However, it is only through research carried out in the latter half of the 20th Century that society has discovered the factors that enhance health. Current theories of disease have become more complex and moved away from single cause explanations to ones in which multiple behavioural, environmental, biological and genetic factors combine over time, resulting in one or more of a number of different diseases (House et al., 1988).

The World Health Organization (WHO) states health is 'A state of complete physical, mental, and social wellbeing, and not merely the absence of disease or infirmity' (World Health Organization, 1946). The word 'health' is derived from the Greek word 'hal' or whole. It is this holistic perspective of health which has emerged in the last 50 years. Nevertheless, it is not possible in reality to achieve the WHO goal. Rene Dubos stated, 'The concept of perfect and positive health is a utopian creation of the human mind. It cannot become reality because man will never be so perfectly adapted to his environment...It is true that the modern ways of life are creating disease that either did not exist a few decades ago or are now more common than in the past...The utopia of positive health [however] constitutes a creative force because like other ideals, it sets goals and helps medical science to chart its course towards them' (Dubos, 1965 p. 346).

Dubos (1965) was one of the first to explore the interconnections of humans with their environment. Since that time, there has been a great deal of research and the development of models and frameworks about the different factors that shape human life and human health and wellbeing. The physical environment is one of these. Nevertheless, the reductionist approach which has characterised modern science is seen as undermining the capacity to adopt the holistic view which is required to understand and foster optimal outcomes both for humans and the planet.

The Canadian Government produced a major report in 1974, which examined 'The Health Field Concept' (Lalonde, 1974). It identified four key factors that shaped people's health: genetics; the environments in which they live; lifestyle behaviours; and the provision and accessibility of medical services (Lalonde, 1974). Since that time a major shift has occurred in how health is viewed. It is often called 'an ecological theory of public health' and has emanated from such writers as Kickbusch (Kickbusch, 1989a), Antonovsky (Antonovsky, 1984), WHO (World Health Organization, 1986), and recently, the World Bank (Murray and Lopez, 1996). Put simply, it is the recognition that health is influenced by many factors and most of them are interrelated.

Hancock and Perkins (1985) mapped this ecological perspective in their Mandala of Health. Their model shows that there are three core aspects of health, namely physical, mental, and spiritual, and the various factors that influence these (Figure 1).

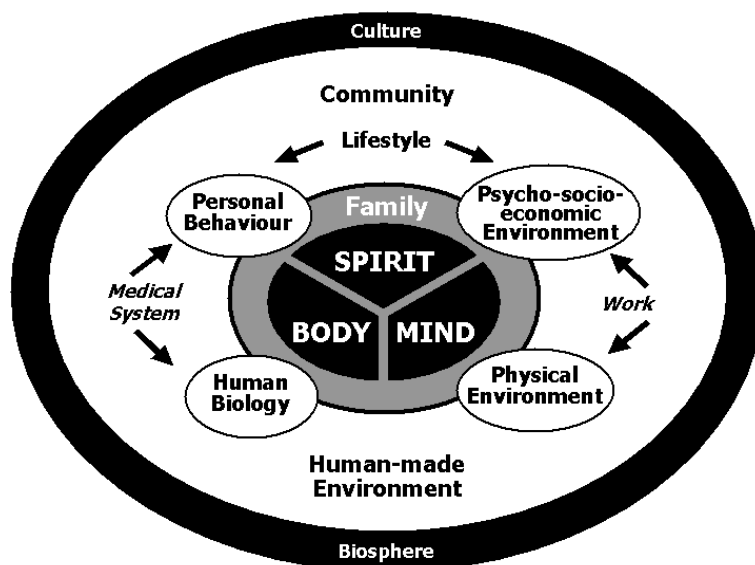


Figure 1: The Mandala of Health developed by Trevor Hancock and Fran Perkins (Hancock and Perkins, 1985)

In industrialised countries chronic disease has increasingly replaced acute infectious disease as the major cause of disability and death (House et al., 1988). These types of afflictions are often long-term and are potentially much more expensive in terms of health care requirements and cost to the community. Some of the health problems facing society include: disease patterns linked to social inequities and ways of life in industrial societies; health problems that are social rather than medical in nature; health problems that tend to be cumulative, long-term, chronic and not amenable to curative measures; and a general public that is changing its social perception of health risks and is expressing new expectations (Kickbusch, 1989b). In Australia, the Commonwealth and State Governments have been proactive in developing frameworks, strategies, priorities, and tactics to improve people's quality of life and their longevity. It is often referred to as 'adding years to life and life to years'.

The establishment of Health Promotion and Development Foundations has been just one example of government initiatives. There is now a greater emphasis on working 'upstream' (to prevent people 'falling into' ill health), than just supplying 'downstream' (rescue) services (e.g. medical treatment and rehabilitation). The work done in cardiovascular disease (CVD) prevention through encouraging

physical activity, healthy dietary practices, and tobacco reduction programs (e.g. QUIT) are examples of this approach. The 'upstream' (health promotion) approach is now happening in most areas of health and is certainly a cornerstone of addressing Australia's national health priorities (cancer control, injury prevention and control, cardiovascular health, diabetes mellitus, mental health, asthma, and arthritis and musculoskeletal conditions). The environment, however, plays a pivotal role in all of these. Better collection of data and accurate models of future health trends and issues means there can be careful planning for the next 20-30 years. The Victorian Burden of Disease Study (Vos and Begg, 1999) found a number of important changes occurring. This study used similar methods to the WHO/World Bank sponsored Global Burden of Disease study (Murray and Lopez, 1996).

Some key findings were:

Men have a life expectancy six years shorter than women but the gap is narrowing;

- The gap between the LGA (Local Government Area) with the lowest and highest life expectancy is seven years in men and four in women. Socio-economic disadvantage is an important predictor of lower life expectancy;
- The life expectancy of Aboriginal men may be between eight and 18 years shorter than the state average. In women, the gap is estimated to be as large as nine to 18 years;
- Rural residence, especially in the least populated parts of Victoria, is the most important predictor of premature mortality from injuries. Traffic accidents, suicide, machinery accidents, and drowning are the main types of injury responsible for this difference;
- Favourable trends in life expectancy and mortality from many causes have been witnessed in the last two decades. The most favourable trends are observed in deaths from cardiovascular disease and injuries, with a mean annual decline of five percent. Tobacco-related illness in young women, diabetes in older men, drug overdose and suicide in young men show unfavourable trends (Vos and Begg, 1999).

Recent figures show little change in those findings.

The WHO/World Bank report identified cardiovascular disease (CVD) and poor mental health as likely to be the two biggest contributors to disease by the year 2020 (Murray and Lopez, 1996). CVD is currently number one, and will remain so, but poor mental health will rise from position number eight to position number two. The environment has a major influence on both of these areas. Evidence cited in this report shows that parks and nature can be a significant contributor to reducing premature death and disease in these two fields. Promising evidence is also emerging that positive influences from park environments, and associated flora and fauna, enhance wellbeing in relation to other health issues.

Parks are one of our most vital health resources. The following sections provide an evidence-based case to support this claim, and suggest that both the health and parks/environment sectors need to act more proactively in collaboration to enrich the role that parks play in improving and sustaining the nation's (indeed, the world's) health.

Ecological theory of public health

In response to these changes in the way health is being conceptualised and managed, researchers and health care professionals are adopting a more holistic approach. Although not always referred to as such, this approach is based on an ecological theory of public health. As mentioned, the concept of an ecological public health has emerged recently in response to a new range of health issues and problems (Chu and Simpson, 1994; Kickbusch, 1989a). Traditional modes of public health seem ill prepared for this new reality and the health risks posed to populations, which has led to a reconsideration of the interdependence between people, their health, and their physical and social environments (Kickbusch, 1989a). It is now known that human health cannot be considered in isolation from physical or social environments (Chu and Simpson, 1994; Wilkinson and Marmot, 2003). In fact, some authors state that the separation of the health of the environment and the health of humans is done at the peril of the human species (Brown, 1996).

In recognition of this, the Ottawa Charter for Health Promotion was developed at an international conference sponsored by the WHO in 1986 (World Health Organization, 1986). The Charter 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). It advocated the protection of natural and built environments as well as the conservation of natural resources as essential in any health promotion strategy. The central theme of the conference, however, was the promotion of health through the maximisation of the health values of everyday settings. Settings are places or social contexts where people engage in daily activities in which environmental and personal factors interact to affect health and wellbeing (Chu and Simpson, 1994). This includes where people learn, live, work, play etc. The consequence for public health policy is to strengthen the health potential of the settings of everyday life, starting where health is created (Kickbusch, 1989b). Parks are settings that may be health creating (perhaps more so than many other settings) yet their health potential currently often remains unacknowledged and under-utilised.

Apart from the identification of the health value of everyday settings, the Australian Institute of Health and Welfare (AIHW) (1998) identifies holistic wellbeing as a crucial concept for understanding health. AIHW nominates seven dimensions of health: biological and mental wellbeing, social wellbeing, economic wellbeing, environmental wellbeing, life satisfaction, spiritual or existential wellbeing, and 'other characteristics valued by humans' (Australian Institute of Health and Welfare, 1998). Although our understanding of these dimensions is slowly increasing, the majority of health statistics still measure illness or the absence of health. Despite this, much data is accumulating for the positive effects of social relationships on health. It has been demonstrated that social relationships provide a buffer for potentially harmful health effects arising from psychological stress in particular (House et al, 1988). However, the significance of sustainable ecosystems for the dimensions of human health needs greater exploration, as well as inclusion and emphasis in the knowledge base of public health (Brown, 1996). Butler and Friel (2006) highlight a paradox: that the emergence of evidence linking ecological and environmental factors to health outcomes has occurred at the same time as a declining acknowledgement by health promoters of the importance of these factors.

An ecological theory of public health recognises that not only is health itself holistic and multidisciplinary, but also 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). Our objective for the future should be healthy people in a healthy environment, with healthy relations to that environment (Birch, 1993). In terms of parks, not only do they preserve and protect the environment; they also encourage and enable people to relate to the natural world. For these reasons they have a key role in an ecological approach to health.

Social capital, health and the natural environment

The term 'social capital' has become increasingly common in the social science literature over recent years. Though there are variations in the way it is defined, the term generally refers to social structures such as networks, trust, and norms which facilitate co-operation and cohesion in communities, and which result in benefits for community members (Kawachi et al., 1997; Putnam et al., 1993; Coleman, 1988; Bourdieu, 1986). There are, therefore, at least two aspects to social capital: the sources or relational aspects of the capital (i.e. the structures and mechanisms by which it is established and maintained), and the consequences or material aspects of the capital (i.e. the flow-on effects or benefits to community members which result from their membership) (Hawe and Shiell, 2000; Portes, 1998; Wilkinson, 1999)

Recent research suggests that differences in social capital may explain differences in morbidity and mortality within and between different population groups (Kawachi et al., 1997; Putnam, 1995; Runyan et al., 1998; Baum, 1999; Leeder and Dominello, 1999; Lynch and Kaplan, 1997). However, there are differing explanations for the ways in which health is influenced by social capital. Hawe and Shiell (2000) point out that while Kawachi et al. (1997) focus on the relational aspects of social capital, arguing that a large gap between rich and poor people leads to higher mortality through the breakdown of social cohesion, Lynch and Kaplan (1997) offer an explanation based on the material aspects of social capital where income inequality may be a marker for a set of other concrete societal characteristics and policies that influence health. This difference in explanations highlights the fact that the relationships between variables may be complex and multi-directional. Nevertheless, whatever the mechanism by which social capital influences health, there is clear evidence that it does have an effect. At a population health level, Baum (1999) highlights the association between 'the quality and extent of social interaction and relationships' and the health of populations. This view is supported by Wilkinson and Marmot (2003 p. 22) who state: 'Social support and good social relations make an important contribution to health'. However, Wilkinson and Marmot (p. 22) go on to point out that there are two aspects to social support—personal and structural. 'People who get less social and emotional support from others are more likely to experience less well-being, more depression, a greater risk of pregnancy complications and higher levels of disability from chronic diseases. ...The amount of emotional and practical social support people get varies by social and economic status. Poverty can contribute to social exclusion and isolation'. Wilkinson (1999) highlights research by Berkman (1995, in Wilkinson, 1999) and House et al. (1988) which 'reported death rates two or three times as high among people with low levels of social integration compared to people with high levels'. At an individual level, Baum (1999) reports on a US study by Kawachi et al. (1996, in Baum, 1999) which found that, by comparison with 'people who had many social ties, those who were socially isolated were 6.59 times less likely to survive a stroke, 3.22 times more likely to commit suicide and 1.59 times less likely to survive coronary heart disease'.

While the relationship between social capital and health has been the subject of considerable research and reflection, the relationship between social capital and the biophysical environment is only now beginning to be explored. Howe and Shiell (2000) highlight the lack of exploration of place-level effects within the literature on social capital, but even they do not specifically refer to the effects of place in terms of biophysical environments. More recently, the role of parks and open spaces in building social capital through recreational activities has been highlighted. For example, DeGraaf and Jordan (2003) draw attention to the opportunity available to professionals working in park management and in recreation and leisure services to promote development of social capital.

Where the link between social capital and the biophysical environment has been explored (Cavaye, 1999; Pretty and Ward, 2001; Pretty and Smith, 2003) the work has largely focused on the impacts of varying levels and types of social capital on environmental management, rather than on the contribution of biophysical environments to social capital. One strand of work linking social capital and the environment has been the work of the Civic Practices Network on 'civic environmentalism'. However, like the previous example, this also links social capital and the environment in a unidirectional 'social capital environmental improvement' model.

Anecdotal evidence, however, suggests that engagement in civic environmentalism (through groups such as Friends of Parks) has spin-off social capital benefits in addition to the benefits that such groups were originally designed to achieve. One of the key elements of social capital is 'civic engagement'. Putnam (1995) states that dense networks of interaction probably broaden participants' sense of self, developing the 'I' into the 'we'. Yet, Putnam (1995) observes, America (like many other nations) is experiencing a decline in civic engagement and social connectedness. One of the factors associated with this decline has been 'the technological transformation of leisure' (Putnam, 1995). If we consider the anecdotal evidence, and Putnam's (1995) observations, in the light of Frumkin's (2001) evidence of the effects of wilderness experience in increasing capacity for cooperation and trust, it seems likely that human interactions with nature through parks may have significant capacity for building social capital.

Emerging empirical evidence confirms the potential for spin-off social capital benefits of civic environmentalism indicated by anecdotal evidence (Townsend, 2006; Moore, Townsend and Oldroyd, 2007). Research by Selman (2001), however, exploring the potential for environmental management projects to contribute to the growth of social capital, suggests that although this potential exists, it may be compromised by the pressures of life in modern society. A study of a local 'friends of parks' group in Melbourne found, like Selman, that relatively few young families are involved in such groups (Townsend and Maller, 2003). However, where young families were involved, significant social benefits were found to flow from that involvement, including the widening of their social networks and 'the increase in confidence in ... children as a result of interaction with other people in the community' (Townsend 2006 p. 116). In another Australian study which compared volunteer members of land management groups associated with the Trust for Nature and matched controls, it was found that members of the groups both experienced and contributed to higher levels of social capital than the controls (Moore, Townsend and Oldroyd 2007). It is interesting to note the 'symbiotic' relationship between social and natural capital. As one benefits the other it could be worthwhile to investigate the facilitative role that parks could play in linking one to the other. This area needs exploration.

Current Australian public health priorities

A collaborative effort involving the Australian Government as well as State and Territory governments has identified the following Australian National Health Priority Areas: Cancer Control, Injury Prevention and Control, Cardiovascular Health, Diabetes mellitus, Mental Health, Asthma, Arthritis and Musculoskeletal Conditions (Australian Institute of Health and Welfare, 2005). Most relevant to parks and nature are Cardiovascular Health and Mental Health. There is, however, considerable overlap between all of the Priority Areas in terms of risk factors and barriers to better prevention. Hence, initiatives targeting risk factors and barriers will bring benefits across all Priority Areas (Commonwealth Department of Health and Aged Care and Australian Institute of Health and Welfare, 1999).

Cardiovascular health

Cardiovascular disease is a major health and economic burden for Australia, and is the country's greatest health problem (Australian Institute of Health and Welfare, 2000). Recent estimates of annual costs to the health system were at AUD\$3.7 billion, accounting for approximately 40% of deaths in 1998 (Australian Institute of Health and Welfare, 2000). Risks of developing the disease are associated with factors including high blood cholesterol, high blood pressure, physical inactivity, obesity, excess alcohol, and smoking (Australian Institute of Health and Welfare, 1998).

Aside from family history, lifestyle greatly influences cardiovascular health. Through adequate education and health promotion, the burden of this disease to individuals and the community could be dramatically reduced. Although campaigns addressing smoking, physical activity, cholesterol, and alcohol consumption are already in place, they could be supplemented by the promotion of the health and wellbeing benefits arising from exposure to nature through visiting a park, interacting with pets, gardening, habitat restoration, or simply contemplating a natural view.

As a result of public awareness, walking for recreation or exercise has increased with 44.9% of men and 53.3% of women reporting walking in 1995, compared with 41% and 49% respectively in 1989-90 (Australian Institute of Health and Welfare, 2000). Through raising public awareness (i.e. via health education and promotion) the same sort of result is possible for the health benefits of contact with nature. There is a synergy between these two outcomes, as recent research has indicated that the availability of parks and high quality public open spaces is associated with increased levels of walking (Giles-Corti and Donovan 2002; Giles-Corti et al. 2005; Mowen et al. 2007).

In fact, if promoted successfully, the health benefits of nature combined with the health benefits of physical activity could be brought together in a joint public campaign. There has been little recent improvement in physical activity levels despite a decline in coronary heart disease, and an increasing percentage of population is becoming overweight (especially children) (Australian Institute of Health and Welfare, 2000). This highlights the pressing nature of this health issue.

Mental health

The Mental Health Priority Area focuses primarily on depression. This is due, firstly, to predictions that depressive disorders will constitute the largest share of the burden of disease in the developing world and the second largest worldwide by 2020, and secondly because it imposes such high social and financial costs on society (Commonwealth Department of Health and Aged Care and Australian Institute of Health and Welfare, 1999). For example, 8.3% of total annual health system expenditure in Australia in 1993-94 was on mental disorders (AUD\$2.58 billion) (Australian Institute of Health and Welfare, 2000). The World Bank and the World Health Organization, however, have predicted that by the year 2020 the health burden worldwide attributed to neuropsychiatric disorders could increase by about 50%, from 10.5% of the total burden to almost 15% in the year 2020 (Commonwealth Department of Health and Aged Care and Australian Institute of Health and Welfare, 1999). In an earlier report, Desjarlais et al. (1995) state that mental, behavioural and social health problems are becoming an increasing part of the health burden in all parts of the world. One of the reasons for this is the increase in average life expectancy and the occurrence of an ageing population in developed nations (Desjarlais et al., 1995). But, mental illnesses are also becoming more prevalent in young people and at younger ages (Raphael and Martinek, 1996). This is related to a number of social, ecological and technological processes, including: the polarities of high levels of urbanisation, crowding and social isolation; globalisation of economies, communication and information; human, social, and economic epidemics related to depression, substance abuse and violence (Raphael and Martinek, 1996); the break-up of families; and perhaps an almost complete disconnection from the natural world (Roszak et al., 1995).

As many depressive symptoms and disorders are treatable as well as preventable, improvements in mental health promotion activities, prevention, and early intervention are likely to have a major impact on the level of depressive symptoms and disorders prevalent in the Australian community (Commonwealth Department of Health and Aged Care and Australian Institute of Health and Welfare, 1999). Furthermore, depressive symptoms and disorders are related to other disorders both mental and physical, including cardiovascular disease (Commonwealth Department of Health and Aged Care and Australian Institute of Health and Welfare, 1999; Hippisley-Fox et al., 1998), potentially magnifying human suffering and adding further costs to the health care system. Hence, effective prevention and treatment targeted at depression is likely to have a much wider impact on individual and community health. It is imperative, however, that action is taken now.

The Commonwealth Department of Health and Aged Care and the Australian Institute of Health and Welfare (1999) state that interventions to impact upon depression are possible across the entire continuum of health care, from promotion, prevention and early intervention, through to treatment and maintenance care. While the effectiveness of many promotion and prevention activities is yet to be demonstrated, interventions that improve people's mental health literacy, optimistic outlook, resilience to life stress, and social support appear to be helpful (Commonwealth Department of Health and Aged Care and Australian Institute of Health and Welfare, 1999). It is here that parks and contact with nature could have the most impact, particularly in terms of facilitating a more optimistic or positive attitude, enhancing social support (via improvements in social capital), reducing stress and tension, and by providing opportunities for physical exercise.

Physical activity has recently been proved to be equally effective as medication in the treatment of depression in elderly people (Blumenthal et al., 1999). Blumenthal et al. (1999) compared the occurrence of depression in people undertaking indoor aerobic exercise, being treated with antidepressants, or a

combination of both. At the end of a four month trial, approximately 65% of patients in all groups had experienced such a reduction in clinical symptoms that they were no longer classified as clinically depressed (Blumenthal et al., 1999). Recent research has investigated the effects on depression and overall mental health of exercising outside in a nature-based setting, such as a park—termed ‘green exercise’. Pretty et al. (2005), reporting on a study involving simulated green exercise (exercise on a treadmill while exposed to photographs of green spaces compared with other spaces), found that green exercise appears to have benefits both for cardiovascular health and mental health. A subsequent study by Peacock, Hine and Pretty (2007) compared exercising outdoors (in a ‘Country Park’) and exercising indoors (in a shopping centre). In comparison to the indoor exercise, the outdoor exercise was found to have more positive outcomes in terms of mood, and to be associated with an increase in the level of vigour or energy.

The term ‘ecotherapy’ has been used to describe the intentional use of nature in a therapeutic way. It involves not simply a two-way relationship between individual and nature (which is often the case in ‘green exercise’), but a three-way relationship between individual, therapist and nature, in which nature plays an active rather than passive role (Burls 2007). Both mental and physical health benefits have been found to flow from this relationship.

Mental health is much more than the absence of mental illness: it is the realisation of one’s potential and the capacity of individuals and groups to interact with one another and the environment in ways that promote wellbeing, and optimise development (Commonwealth Department of Health and Aged Care and Australian Institute of Health and Welfare, 1999). The positive influence that parks could have in terms of mental health presents many exciting opportunities for dovetailing the agendas of local and state governments in terms of health promotion and the use of parks. A recent project undertaken in Australia, involving people experiencing depression, anxiety and/or social isolation taking part in hands-on environmental activities in a park environment, demonstrated positive benefits in terms of mood (Townsend and Ebdon 2006). Further work, however, is required to determine the risk factors (environmental, social, biological and psychological) associated with mental illness as well as factors that act in a protective manner (e.g. social support, optimism). Additionally, environments such as parks that enhance mental health need to be investigated further in residential, educational, workplace, community and social settings (Commonwealth Department of Health and Aged Care and Australian Institute of Health and Welfare, 1999).

The future of public health

An ecological (or holistic) approach to health encompasses the health of the whole individual and their environment, and in fact, the whole community. This approach is a logical way of managing health as it accounts for the interplay between all of the elements of health (i.e. mental, physical, environmental, spiritual, social), which can impact either negatively or positively on one another. Yet, more research is required to understand these interrelationships.

As stated by the Australian Institute of Health and Welfare (1998; 2000), national health information is needed by consumers and providers of health services, the health industry, governments, and the community to enable informed decision-making and ensure effectiveness of treatments and interventions. National health information is any information that has national relevance and relates to the

health of the whole population, the determinants of population health, health programs or services, and the relationship among these elements (Australian Institute of Health and Welfare, 1998). According to these criteria, the health benefits of contact with nature should be regarded as national health information and be thoroughly investigated. In particular, the health benefits of parks should have priority as parks constitute public-owned nature, and therefore have more significance nationally.

The initial evidence documenting the positive effects of nature on blood pressure, cholesterol, outlook on life and stress-reduction is sufficient to warrant incorporation into strategies for the National Health Priority Areas of Mental Health, and Cardiovascular Disease in particular. These two disease categories place a considerable health and economic burden on Australians. However, due to the positive effects of nature on overall health and wellbeing, the health benefits of contact with nature have relevance to all National Health Priority Areas. The extent to which parks can contribute to these areas awaits investigation.

Parks, nature and health: What is the connection?

The context: parks and people

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 (Rohde and Kendle, 1997; Hamilton-Smith and Mercer, 1991). 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). At this time, it was also believed that exposure to nature fostered psychological wellbeing, reduced the stresses associated with urban living and promoted physical health (Ulrich, 1993). 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 (Ulrich, 1993; Parsons, 1991).

Although parks have not entirely lost their connection with health, the modern emphasis is almost exclusively on their use as a venue for leisure and sport (Rohde and Kendle, 1997). The importance of physical activity for health is well known, yet physical inactivity contributes significantly to the burden of disease and is on the rise in developed countries (Duncan, Spence and Mummery 2005). A wealth of literature exists, linking parks with varying levels and types of physical activity. For example, Wendel-Vos et al. (2004) used GIS databases to objectively measure the amount of green and recreational space in neighbourhoods, and found that there was an association between greater amounts of parks and sports grounds in an area and increased levels of cycling. Similarly, a study by Zlot and Schmid (2005) found that there was a significant correlation between parkland acreage and walking and cycling for transportation. However, other research has shown that it is not only the size but the quality of parkland and public open space (eg. Giles-Corti et al. 2005), as well as its physical and economic accessibility (eg. Bengoechea, Spence and McGannon 2005), that influences people's use of such areas). As Lee et al. (2005) note: 'merely building a park in a deprived area may be insufficient for insuring its intended use ... It is critical to provide ongoing support for maintenance and civic improvements'. Exploring the role of personal, social and environmental attributes as mediating factors in socioeconomic variations in women's walking behaviours, Ball et al. (2006) found that while all three elements play a part, access to environments conducive to walking is a key factor which needs to be taken into account. Two aspects of parks and open spaces which influence their use are perceptions of safety and aesthetic appeal (Evenson et al. 2006).

Aside from this recent focus on parks as venues for physical activity, parks tend to be viewed as optional amenities rather than as necessary components of urban (as well as rural) infrastructure (Kaplan and Kaplan, 1989). Moreover, there is a prevailing lack of awareness about opportunities for enhancing health provided by larger, wilderness parks such as National Parks. Why the benefits of parks understood by early landscape designers and park engineers have been overlooked is a mystery. Yet, research on the benefits of nature carried out over the last two decades is indicating that in fact, they may have been right. Amongst other evidence, data so far has shown that 'green nature' can reduce crime (Kuo, 2001), foster psychological wellbeing (Kaplan and Kaplan, 1989; Kaplan, 1992a), reduce stress (Ulrich et al., 1991b; Parsons, 1991), boost immunity (Rohde and Kendle, 1994; Parsons et al., 1998) enhance productivity (Tennessen and Cimprich, 1995) promote healing in psychiatric and other patients (Beck et al., 1986; Katcher and Beck, 1983), and is most likely essential for human development and long-term health and wellbeing (Driver et al., 1996).

Despite the prevailing emphasis on sport and leisure, park management agencies have recently focused on the social and environmental values of parks. For example, the Canadian Parks/Recreation Association recently published 'The Benefits Catalogue' (1997) documenting the health and wellbeing benefits of all aspects of recreation, including that carried out in parks. In Australia, the recent repositioning of Parks Victoria's key message to 'Healthy parks, healthy people' acknowledges the symbiotic relationship between parks and people (de Kievit, 2001). However, although the government and much of the community are aware of how people can benefit parks (e.g. by legislation, activism, or Friends of Parks groups), the benefits that parks can bestow on people (in terms of health and wellbeing) through contact with nature have, until recently, gone largely unrecognised.

As summarised in this review, the evidence from recent research demonstrates clearly that there are many and varied health effects to be derived from contact with nature, and that, in urban environments in particular, experiencing nature through parks may in fact be a vital component of human health that for too long has been ignored.

Parks, public health and wellbeing

The ecosystem is the fundamental capital on which all life is dependent (Suzuki 1990). Because our water quality, air quality, economic vitality, and personal wellbeing are as dependent on natural resources as they are on transportation, communications, and public safety systems, parks, by providing access to nature and protecting ecosystems, are an essential part of the infrastructure of our cities and communities (Gutowski, 1994 in Lewis, 1996). The threat of climate change has heightened awareness of the ecosystem services provided by parks and other green spaces. Yet, despite a growth in conservation activities over recent years, there still appears to be a lack of acknowledgement and acceptance on the part of planners, decision-makers and developers of the need for 'a healthy and diverse natural environment in the modern city' (Kellert 2004 p. 9).

In addition to their contribution to public health and wellbeing through ecosystem services, parks also contribute to health and wellbeing through the provision of settings for community engagement. Baum (1999) states that healthy communities should provide varied opportunities for their citizens to meet and interact in both formal and informal settings. Recent research has shown that

parks make a key contribution to meeting this requirement (eg. Krenichyn 2005). However, it has been asserted that, if not well maintained and used, parks which form boundaries between neighbourhoods of different cultural, ethnic and socio-economic characteristics may become 'green walls' dividing communities, rather than places of community interaction (Solecki and Welch 1995).

In the urban environment, the best access that people have to nature (apart from that available in their homes and gardens) is via parkland. Parks vary in size, shape, quality, and character and hence satisfy the whole spectrum of opportunities for contact with the natural world at various levels. Yet, Wilson's (1984) biophilia hypothesis (see section titled 'Understanding the Human-Nature Relationship') has prompted many researchers to re-evaluate their understanding that plants and engineered ecosystems, such as parks, please people only on cultural (Stilgoe, 2001) or superficial level (Driver et al., 1996). From an evolutionary perspective, parks are ideal environments in which to reap some of the positive contributions to personal health that are inseparable from our evolutionary history, but which are virtually impossible to obtain in modern society (Furnass, 1979). These contributions include the physiological and psychological benefits derived from physical activity over varied terrain, the dramatic change in sensory input, and the spiritual values which can accrue from direct contact with the natural world (Furnass, 1979). A common conclusion in the literature is that humans may not be fully adapted to an urban existence (Burns, 1998; Kellert, 1997; Kellert and Wilson, 1993; Glendinning, 1995). Hence, they live in an environment so different to that from which they evolved that natural selection has not had time to revise human bodies for coping with many aspects of modern life, including fatty diets, vehicles, drugs, artificial lights, and central heating (Nesse and Williams, 1996 in Burns, 1998). The reasoning for this argument is that humans have spent many thousands of years adapting to natural environments, yet have only inhabited urban ones for relatively few generations (Suzuki, 1997; Roszak et al., 1995; Glendinning, 1995; Gullone, 2000). Moreover, although humans may have all of their physical needs well satisfied by the urban environment of large cities, our internal psyche is profoundly disturbed (Suzuki, 1997; Gullone, 2000).

Frederick Law Olmstead, a famous 19th century American landscape architect, believed in the restorative quality of green nature that 'operates by unconscious processes to relax and relieve tensions created by the artificial surroundings of urban life' (Lewis, 1992). Olmstead (1870 in Lewis, 1996) also believed that parks improved health and vigour and extended the life expectancy of citizens. These ideas are now being confirmed by research in psychology and geography, as well as in many other fields. Examples of how parks and nature can contribute to some of the components of health are displayed in Table 1. Although the physical, mental, and social components of health have been identified by health authorities, such as the Victorian Health Promotion Foundation (VicHealth, 1999), this review advocates an ecological definition of health by also including the spiritual and environmental components.

Table 1: A Summary of the Contribution of Parks to Human Health and Wellbeing

Component of health	Contribution of parks
Physical	Provide a variety of settings and infrastructure for various levels of formal and informal sport and recreation, for all skill levels and abilities e.g. picnicking, walking, dog training, running, cycling, ball games, sailing, surfing, photography, birdwatching, bushwalking, rock climbing, camping
Mental	Make nature available for restoration from mental fatigue; solitude and quiet; artistic inspiration and expression; educational development (e.g. natural and cultural history)
Spiritual	Preserve the natural environment for contemplation, reflection and inspiration; invoke a sense of place; facilitate feeling a connection to something beyond human concerns
Social	Provide settings for people to enhance their social networks and personal relationships from couples and families, to social clubs and organisations of all sizes, from casual picnicking to events days and festivals
Environmental	Preserve ecosystems and biodiversity, provide clean air and water, maintain ecosystem function, and foster human involvement in the natural environment (Friends of Parks groups, etc.)

Parks and nature have enormous untapped health potential as they provide an opportunity for people to re-establish and maintain their health in a holistic manner. Recent developments in public health and health promotion have recognised the benefits of a holistic approach. For example, it has been stated that the major determinants of health 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). Parks are in an ideal position to address both these, and other aspects, of human health and wellbeing.

Repositioning parks

Parks and nature are currently undervalued as a means of improving and maintaining health. Although most people are aware of the health benefits of sport and recreation, the range of other health and wellbeing benefits arising from contact with nature are virtually unknown. Although further research is required, the findings summarised in this report are sufficient to warrant the repositioning of parks in the minds of both the community and government as a positive health resource. Parks need recognition for the essential role they play in preserving, maintaining, and promoting the health of the humans, as well as that of their environment.

Parks, in fact, are an ideal catalyst for the integration of environment, society, and health (which have been demonstrated to be inextricably linked) by promoting an ecological approach to human health and wellbeing based on contact with nature. The potential exists for parks to gain an expanded role, scope, and influence in society, especially in terms of public health, as well as changing the way park management bodies relate to other organisations and agencies (by advocating an integrated approach to government). This would also bring together several disciplines and/or agencies already moving in this direction as well as value-add to the status of parks in the community.

In order to reposition parks, it is necessary for park management agencies to:

1 Communicate to governments and the wider community that:

- a growing body of evidence shows that access to, and interaction with, nature is essential to human health and wellbeing;
- through providing access to nature, parks improve and maintain human health and wellbeing (both at an individual and community level);
- by improving and maintaining human health and wellbeing, parks have the potential to reduce the burden on the health care system;
- parks facilitate an holistic/ecological approach to health and wellbeing that is beneficial (and essential) to individuals, society, and the environment;
- through providing a holistic/ecological approach to health, parks reinstate people with a sense of empowerment and control over their own health and wellbeing.

2 Educate governments and the wider community:

- as to how the above can be applied for improved health and wellbeing;
- about how to incorporate this knowledge into public health policy and health promotion;
- about how to collaborate in the pursuit of common goals;
- about the need for broadening the knowledge base in this area (via further research) for future dissemination.

3 Facilitate the engagement of the community with nature in order to re-establish the importance of nature in people's lives and the cultivation of a holistic and sustainable attitude towards life and health:

- by the communication and education as outlined above;
- by continued exploration of the benefits to individuals and communities to be gained from contact with, and preservation of, nature;
- by fostering park management practices which support community engagement with nature.

To accomplish the above will require the cooperation of multiple government departments and/or other agencies (i.e. those whose portfolios/core business relate to any aspect of society, health or the environment). This in itself would be groundbreaking since traditionally (as is commonly known) government departments (and other similar entities such as university faculties, or research institutes) tend to work in isolation, despite opportunities that may exist for mutual benefit. An interdisciplinary approach would reflect a recent insight in health promotion that modern health issues are usually multi-faceted and complex, arising from social and environmental conditions of the individual or community concerned (e.g. socio-economic status, access to basic health and educational services, family issues, social cohesion, and un-polluted environment).

Mowen (2003) offers seven hints for park professionals in attempting to align with health agencies, including: 1. Infant health partnerships require baby steps; 2. Know the lingo of the health profession; 3. Integrate health benefits into all communications; 4. Use solid evidence to justify the link between park use and health; 5. Don't reinvent the health promotion wheel; 6. Create partnerships that provide an incentive for physical activity, and; 7. Attempt collaboration not competition.

To reposition parks in this way will mirror other international attempts, such as those in Canada. The Canadian Parks/Recreation Association state in their Benefits Catalogue (1997) that in the future parks will be: recognised as champions of personal and community wellbeing, central to the quest for human potential, builders of social foundations, catalysts for Canada's green movement, and be a cornerstone for economic renewal. This is possible for parks everywhere.

Understanding the human-nature relationship

Introduction

To realise the potential benefits to human health and wellbeing to be gained from interacting with nature, it is important to understand how and why humans relate to nature. The simplest explanation is that humans *are part of* nature, but more often than not, modern thinking views human beings as separate from, or even above nature, despite our obvious animal status. Although the concept of nature as a human construct is subject to debate and often leads to philosophical, ‘chicken and egg’ type arguments, these are not applicable here.

Generated from numerous disciplines exploring the human relationship with nature (including religion) are a number of theories to explain: why humans interact with nature the way they do; the effect nature has on the human psyche, spirit, and wellbeing; the effect that humans have on the biosphere (both positive and negative); and how this in turn effects human society (particularly human health and wellbeing). This section briefly examines some of these theories and reviews their application in research undertaken on some different population groups.

Biophilia

The Biophilia Hypothesis was developed by Harvard biologist Edward O. Wilson (Wilson, 1984) and has been expanded and debated by Wilson and numerous others (e.g. Gullone, 2000; Fawcett and Gullone, 2001; Takacs, 1996; Kellert, 1993; Kellert and Wilson, 1993; Wilson, 1993; Wilson, 1984). The Hypothesis is based on the assertion that early in human history there was an evolutionary advantage in knowing about the natural world, particularly information concerning plants and animals, and that this knowledge contributed to survival (Kellert, 1997). The essential aspect of biophilia, however, is that apart from knowledge, attraction and respect for nature also contributed to survival (Kellert, 1997). Kellert (1997) believes that an affiliation for nature addresses innate psychological needs such as intellectual capacity, emotional bonding, aesthetic attraction, creativity

and imagination that are a product of our evolution and otherwise not easy to satisfy (Kellert, 1997). It is believed by some that these innate psychological and neurological needs are mismatched with the results of technological progress (Suzuki, 1997; Glendinning, 1995; Lewis, 1996; Gullone, 2000). This notion is not new, and has been expressed by authors as early as 4,600 years ago (Benson, 1976).

Advocates of biophilia believe that humans evolved in the company of other living organisms and in a matrix of conditions making human existence possible, and that we continue to rely intellectually, emotionally, physically, and spiritually on our affiliations with nature (Kellert, 1997; Suzuki, 1997; Gullone, 2000; Kellert, 1993). According to the theory therefore, biophilia is: inherent; part of the human species' evolutionary heritage; associated with increased chances of survival via genetic fitness; likely to increase the possibility for achieving meaning in life and personal fulfilment; and a self-interested basis for the care and conservation of nature (especially biodiversity) (Kellert and Wilson, 1993).

Although still in the process of being explored, the biophilia hypothesis is not a romanticised idealisation of nature (Kellert and Wilson, 1993). In fact, multidisciplinary teams of researchers have formed over the past decade or two to support and explore this notion further (Takacs, 1996) and it is now gaining wider acceptance in the scientific community. Suzuki (1997) states that biophilia provides us with a conceptual framework through which human behaviour can be examined, and that it appears to be scientifically verifiable that human beings have a profound need for an intimate bond with the natural world. Evidence for biophilia is slowly building, as shown in some of research findings included in this review.

Wilson (1984) and others (Gullone, 2000; Kellert, 1997) believe that modern city-dwelling humans still possess this innate tendency to associate with nature (although, they admit, it is more evident in some people than others) and that in modern times it has the potential to give meaning to human life and development, and result in greater health and wellbeing. As Wilson (1993) states, human history began hundreds of thousands or millions of years ago with the evolution of the genus *Homo* and for more than 99 percent of our history we have lived totally involved with other organisms. Only in the very recent part of human history has the delusion arisen that people can flourish apart from the rest of the living world (Kellert, 1997; Wilson, 1992). Unfortunately, this could prove to be to our detriment. Satisfying our affinity with the natural world, however, may be an effective way to reverse this trend and enhance health (as well as being cheaper and freer of side effects than medication) (Frumkin, 2001). If so, then medicine and other professions will need to articulate a broad vision of environmental health, one that encompasses many disciplines (Frumkin, 2001) and adopts a holistic or ecological approach to health.

The modern environmental crisis has been viewed as symptomatic of a fundamental rupture of the human emotional and spiritual relationship with the natural world (Kellert and Wilson, 1993). Biophilia urges researchers to address the question of what will happen to the human psyche when the natural environment, such a defining part of human evolutionary experience, diminishes or disappears.

The fact that there may be a biophilic basis for the adaptive responses humans have for certain natural stimuli is being used to explain both positive/approach (biophilic) responses and negative/avoidance (biophobic) responses that people have to nature (Ulrich, 1993). It is likely that a predisposition in early humans for biophilic or biophobic responses to certain natural elements and settings contributed to chance of survival (genetic fitness) (Ulrich, 1993). Examples of this include the virtually universal attraction humans have for the round faces and large eyes of infant animals (including humans), and the widespread fear of snakes and spiders (Kellert and Wilson, 1993; Ulrich, 1993).

In animals, choice of habitat exerts a powerful influence on survival and reproductive success, so behavioural mechanisms involved in habitat selection in humans would have been under strong selection pressure for millennia (Orians, 1986). In all organisms habitat selection presumably involves emotional responses to key features of the environment that produce 'positive' or 'negative' feelings leading to settling or rejection in a particular place (Orians, 1986). Parsons (1991) suggests that the process of habitat selection is also associated with triggering certain physiological processes that influence the immune system and affect physical wellbeing. These physiological responses are concerned with the release of hormones, which can impair or enhance immunity and cardiovascular function (Parsons, 1991). A positive response to an environmental feature presumably also has a positive effect on physiological state, and a negative response has a negative effect. If this is so, the ability of a habitat to evoke such emotional states should be positively associated with survival and reproductive success of an organism in that habitat (Orians, 1986).

Modern urban environments differ considerably from the natural habitats that have been the home of humans for thousands of years. As humans have lived in cities for relatively few generations it is most likely that adaptation to this environment has not yet occurred, and humans are still dictated by habitat preferences formed by their ancestry (Kellert, 1997; Kellert and Wilson, 1993; Heerwagen and Orians, 1993).

Parsons (1991) considers the stress associated with urban living a direct result of the unsuitability of urban environments as optimum habitat for humans. The features of urban living known to induce stress include crowding, noise, air pollution, and traffic. As mentioned, some authors believe that time spent solely in urban environments is detrimental to human health and wellbeing (Stilgoe, 2001). Although they may not elicit a full-blown stress response once acclimatised to, these features could produce slight elevations in stress hormones which compromise immunocompetence and cardiovascular functioning, resulting in deleterious health effects over time (Rohde and Kendle, 1994; Parsons, 1991).

Biohistory

Stephen Boyden has merged human culture with natural history (or the study of nature, society, and history) in the field of 'biohistory', which reflects the broad sequence of events in the history of the biosphere and of human civilisation, from the beginning of life to the present day (Boyden, 1999; Boyden, 1992). Among other aspects of evolution and human history, biohistory pays particular attention to the changing patterns of interplay between cultural and biophysical systems, or the interplay between culture and nature (Boyden, 1992). Biohistory considers human culture as an ecological force, due to its ability to shape the natural world

and alter ecological processes. Boyden (1999) asserts that it is impossible to overstate the ecological and health potential of human beliefs, knowledge, and ideas.

Biohistory aims to improve understanding of the human situation and the human place in the natural world by examining interactions between biological and cultural processes (Boyden, 1992). Three important aspects identified by Boyden (1992) are:

- Humans are totally dependent for sustenance, health and wellbeing, and enjoyment of life on the biosphere, and all products of culture are negligible if biologically determined health requirements of the biosphere and of human bodies are not met;
- Every human situation from individuals to societies involves continual interplay between biological and cultural elements, the effects of which influence human health and wellbeing, and/or the health of ecosystems on which humans depend;
- Human culture has influenced biological processes on which humans depend, and of which they are a part, and although some of these influences are beneficial, others are detrimental and threaten the survival of the human species.

Aspects of culture that have detrimental effects on the environment and/or on human health and wellbeing are referred to as 'cultural maladaptations' (Boyden, 1999; 2001). Some of the central assumptions of Western culture that result in cultural arrangements and human activities that are ecologically unsustainable are examples of cultural maladaptations. A more specific example is the current pattern of unsustainable resource/energy use and waste generation and its detrimental effects on the environment and human health. Although cultural maladaptations have been present throughout the history of human culture and civilisation, an essential difference between the past and the present is in the scale of the consequences (Boyden, 1999). The consequences of current cultural maladaptations for the biosphere and human health will potentially be catastrophic due to the degree and extent that humans now dominate the environment. Boyden (1999) believes that in order to divert catastrophe, significant cultural reform in the dominant cultures of global society is required: nature once again should be placed at the centre of human culture. In order to achieve this reform, Boyden (1992) states that biohistory should become part of the educational curriculum, and should be used as a framework for integrative research on human situations (particularly health and wellbeing) to achieve wise policy formulation and decision-making. But as well as including biohistory in formal education, Boyden (2001 p. 113) also highlighted the need for broader community education, through 'places for people who share enthusiasm and respect for the *natural* ...and who care about the health and well-being of human-kind and of the rest of the living world' to gather. Such 'biocentres' will, according to Boyden (2001 p. 114) 'provide a new framework for constructive collaboration between community groups, scientific bodies, businesses, schools and other organizations'. In Boyden's view, 'the attainment of a truly sustainable, healthy, equitable and peaceful society' is only achievable if a biohistorical perspective becomes a central feature of cultures (Boyden, 2001 p. 115).

A symposium held in 1990 titled 'Spirit and Nature: Religion, Ethics and the Environmental Crisis' brought together speakers from Buddhist, Christian, Islamic, Jewish, Native American, and liberal democratic traditions to discuss why the environmental crisis is fundamentally a moral and religious problem (Rockefeller and Elder, 1992). Its purpose was to foster ways of living that promote sustainable development, and to join scientific understanding with life-affirming, and world-affirming moral and religious values (Rockefeller and Elder, 1992). In the introduction to the published proceedings, Rockefeller and Elder (1992) state that the great issue for the 1990s and the twenty-first century is to channel the freedom and power modern humanity has acquired into new creative directions by spiritual awareness and a moral commitment that transcends, among other things, the dualism between human culture and nature.

Conversely, the original teachings of most world religions including Judaism, Christianity, Islam, and Hinduism are based on a deep reverence for nature, and a profound understanding of the relationship between humans and the natural world around them (Suzuki, 1997). For example, in classical Islamic thought, the Koran (or Quran) does not regard humans and nature, or the natural and the supernatural, as separate from one another but as an integral part of the same universe, 'sharing in its earthly life and also in its ultimate destiny' (Nasr, 1992). Malinski (2004 p. 92) puts it this way:

Experiencing wholeness and unity with all living beings and the natural environment, finding meaning and purpose in living and dying, transforming, and transcending, such are the hallmarks of spirituality. Spirituality is a unitive experience, without boundaries or divisions.

Suzuki (1997) claims, however, that most religions have changed their beliefs over time to consider the individual as an entity separate from family, clan, and nature. As a result, people are increasingly finding themselves alienated from their cultural and natural surroundings.

Every worldview of indigenous humans describes a universe in which everything is connected with everything else: stars, clouds, forests, oceans, and human beings are interconnected components of a single system in which nothing can exist in isolation (Suzuki, 1997). Indigenous cultures around the world regard nature as the realm of the spirit and the sacred; the natural world is seen as inherently spiritual, and humans are seen as an integral part of it (Metzner, 1995). From this perspective follows an attitude of respect, and an instinctive understanding of the need to consider future generations and the future health of our ecosystem; in other words, a sustainable approach to life and health (Metzner, 1995).

A study on health promotion and illness prevention in Chinese elders revealed that the elders believed conformity with nature was the key to health and wellness (Yeou-Lan, 1996). This comes from the teachings of Taoism, Confucianism, and Buddhism, which emphasise harmony with nature, simplicity, and love as the way to achieve 'ultimate wellbeing' (Yeou-Lan, 1996). The study by Yeou-Lan (1996) defined nature as all things and events that surround an individual, such as air, mountains, plants, animals, people, society, and belief in a higher force, identified as 'Supreme Nature'. To conform with nature, Chinese spirituality requires three interrelating categories: harmonising with the environment, following bliss, and 'listening to heaven' (Yeou-Lan, 1996). Harmonising with the environment is the process of allowing oneself to gain access to experience of, interact with, and be aware of nature. In agreement with recent findings (e.g. by Parsons et al., 1998; Ulrich et al., 1991b; Kaplan and Kaplan, 1989), the Chinese elders believed that exposure to natural scenes gave them peace of mind, and promoted health and wellbeing (Yeou-Lan, 1996).

The 14th Dalai Lama refers to the Buddhist understanding of interdependence in order to understand the human relationship with nature (Gyatso, 1992). This principle essentially implies the interdependence of all life, matter, and consciousness, as well as the interdependence between causes and conditions (Gyatso, 1992). This is practised also by the Australian Aborigines, who believe that each person is not only the offspring of their physical parents, but also that they are in some essential way a spirit of the land with an eternal and intimate connection with it (Kingsley, 1995 in Suzuki, 1997). This connectedness of people to country and kin (both present relatives and ancestors), to that which is outside of time, is integral to the Aboriginal sense of wellbeing (Anderson, 1996), and it implies that when harm is done to the land or to people, the other is adversely affected. Leal (2004 p. 93), reflecting on the Australian Indigenous belief in a 'creator Spirit ...located not in a remote heaven above but deep in the earth', states that 'such a conception immediately confers on the earth and its contents a value inaccessible to the dualistic thinking of the Western mind. It spiritualises the earth and serves to explain why access to land is of such overriding importance to the Aboriginal people'. It is this concept of a creator Spirit which is expressed in the totems and creation stories that typify Australian Indigenous culture (Isaacs, 2005; Indigenous Law Research, Reconciliation and Social Justice Library, n.d.).

Traditionally, Hindu theology reflects similar attitudes to those expressed within 'traditional Chinese and Aboriginal views and practices' (Coward, 1997 p. 50). The Hindu belief in non-violence reflects the belief that 'humans, along with everything else in nature, are but a part' of God's creation (Coward p. 50). This philosophy underpins the ecological orientation of Hinduism, which is set out in a key Hindu scripture, the Bhagavad Gita (Coward p.56). Reflecting on the tsunami of December 2004, Vandana Shiva reminds us of this traditional Hindu belief, stating: 'The tsunami reminds us we are not mere consumers in a marketplace driven by profits: we are fragile, interconnected beings inhabiting a fragile planet. The tsunami reminds us that we are all interconnected through the earth' (Shiva, 2005 p. 24).

In a similar vein, Wilson (1992) observes that humans have forgotten how much the natural world means to them. Yet, as Wilson (1992) states, signals abound that the loss of life's diversity endangers not just the body but also the spirit. If that much is true, the changes occurring now will visit harm on all generations to come (Wilson 1992). It has been reported that modern people are experiencing a spiritual famine. Alcohol, food, and drug addictions are futile attempts to fill the spiritual emptiness that has arisen from loss of contact with nature (Nasr, 1968; Glendinning, 1995; Canadian Parks/Recreation Association, 1997). Along a similar line of thought, Metzner (1995) states that human beings have forgotten how to empathise and identify with non-human life, have lost respect for the mysterious, and lack humility in the relationship to the infinite complexities of the natural world (Metzner, 1995). Shiva (2005 p. 24) concurs, stating: 'Above all, it [the tsunami] brings a message of humility: that in the face of nature's fury, we are powerless. The tsunami calls on us to give up arrogance and to recognise our fragility'. The evidence irrefutably demonstrates that both the cultural and natural history of the human species is entirely based upon an intimate relationship with, understanding of, and respect for the natural world. Recognising and respecting worldviews and spiritual practices that are based on oneness with nature, and searching for similarities in the dominant religions is, according to Metzner (1995) perhaps the best antidote to 'the West's fixation on the life-destroying disassociation between spirit and nature'. Similarly, Nasr (1992) states that to rediscover the spirit in oneself and then see its reflection in nature is essential to reverse the humanity's current destructive attitude towards the natural environment.

A small study conducted on a random sample of residents in New York also demonstrates the spiritual effect that nature can have on people. The study by Mausner (1996) revealed that respondents viewed themselves as separate from nature, but felt 'compelled to re-insert themselves'. The author interpreted this yearning for reintegration with nature as a reaction to the separation from the natural world deeply ingrained in Western culture (Mausner, 1996). When the respondents were in natural environments, they claimed to be more perceptive of their surroundings, to have an increased awareness of themselves, to feel at one with the world, and simultaneously detached from the people in their everyday lives (Mausner, 1996). Mausner (1996) concluded that the experience of being in nature appeared to give people the opportunity to transcend the fundamental dualism of people vs. nature. To understand the human relationship with nature by looking to traditions of spirituality and religion confirms that by harming nature, humans harm themselves.

There is no doubt that nature can evoke powerful responses in people, and can sometimes be responsible for life-changing experiences. Katcher and Beck (1987) describe one such response: '...[it] generated a feeling of being intact, complete, as if the solid distinct otherness of that natural world had acted as a mirror reflecting myself back to myself. That sense of being intact and comfortable in myself crystallized precisely at the moment when the sense of being a separate self was lost in contemplation' (page 175). A second example concerns the Stein Valley Festival held in Lytton, British Columbia, which celebrates the physical and spiritual values of the Stein Valley. When two young American Indian men were asked independently describe what the Stein meant to them they both described the valley in terms of a church or a cathedral where they could go to find spiritual sustenance and restoration (Suzuki 1990).

Although not always formally 'religious', many manifestations of modern environmentalism and the 'eco-protest lifestyle' (Letcher, 2002 p. 81) reflect aspects of spirituality and/or religion. Taylor (2001 p. 175) observes that 'although participants in countercultural movements often eschew the label religion, these are religious movements, in which these persons find ultimate meaning and transformative power in nature'. Lecher (p. 81), reflecting on the British anti-road protests of the 1990s, comments 'whilst the actions, and direct-action, of protesters may not always appear outwardly to be religious, many protesters are motivated by their religious convictions such as the paramount belief in the sanctity of nature'. Lecher refers to this religious belief as 'Eco-Paganism'.

Ethnicity and nature

According to the theory of biophilia, when given a choice people of all cultures should prefer natural environments to urban ones. Newell (1997) studied the favourite places of subjects from Senegal, Ireland, and the United States for cross-cultural comparison of environmental preferences. Participants were asked to identify their favourite place and give the reason it was chosen, the aim being to test whether people from different cultures shared a preference for certain environments or features, including both built and natural environments. Sixty-one percent of participants identified a part of the natural environment as their favourite place, and across all countries the reasons given were 'relaxation' or 'to recharge', 'safety', or ecological reasons (Newell, 1997). This indicates that across the human population there is a preference for natural environments, regardless of nationality or culture. This clearly supports the hypothesis of biophilia (Newell, 1997).

Another good example of cross-cultural preferences for nature is the universal attraction humans have for water bodies (Wilson, 1984; Ulrich, 1993; Kellert, 1997; Williams, 1999). Ulrich (1993) proposes that this attraction for water has a genetic component tied closely to human evolution, as it signalled the presence or likelihood of finding two survival necessities: water and food. Also, Williams (1999) believes that the general attraction Western cultures have for water is because of a healing or therapeutic meaning assigned to it, dating back to classical Greek and Roman times where water bodies were renowned for their healing powers. Evidence for this in modern times can be seen in the popularity (and real estate value) of houses built overlooking water. Evidence for the international appeal of water bodies can also be seen in the high volume of tourists and pilgrims who travel each year to rivers, lakes, and beaches at various significant sites around the globe.

However, there are of course different cultural interpretations of what 'nature' is, and different ethnic groups relate to nature and natural environments in different ways. In commenting about how people of varying characteristics, including ethnicity, relate to parks and natural environments, Brun (2001, p.20) states that '... different groups relate to the same place with different meanings, uses and values. These are differences that may give rise to various tensions and conflicts over the use of places.' Ewert and Kessler (1996 p. 273) highlight the example of indigenous communities which (because they 'participate in a natural ecosystem as part of their daily lives') may relate to the natural environment in quite a different way when compared with people who only 'visit' a natural environment. Ewert and Kessler (p. 273-4) go on to say: 'The ecosystem is more than a physical setting for these communities; it is the support system that sustains people physically, culturally, and spiritually.'

Viriden and Walker (1999) studied how ethnicity and gender are related to affective meanings attached to the natural environment and how they might influence preferences for environmental settings in outdoor recreation by surveying African-American, Hispanic and White university students in the United States (for the discussion on gender refer to the section entitled 'Gender, Nature and Health' below). Their findings showed that White participants considered a forest environment more pleasing and safer than did African-American or Hispanic participants (Viriden and Walker, 1999). African-American participants viewed the forest as more 'annoying', and both African-American and Hispanic participants considered the forest as 'threatening'. The authors discuss a number of explanations for these findings, including that African-American and Hispanic participants had lesser amounts of outdoor childhood experience than Whites, which may have influenced their perceptions of nature and natural environments (Viriden and Walker, 1999). Drawing on the literature, Viriden and Walker (1999) also discuss the possibility that African-Americans and Hispanics are apprehensive about forest environments because of their perception of experiencing unpleasant encounters with other humans. However, their findings may not be applicable to the broader population because the sample was limited to university students (Ho et al., 2005). Nonetheless, they contribute some interesting data to the exploration of ethnicity and nature, an aspect of human-nature relationship that is understudied.

Culturally, due to their early European ancestry (influenced by Judeo-Christian tradition), American Whites are predisposed to perceive forests or wilderness areas as symbolising freedom, as places of refuge, or as places to test oneself (Nash, 1982 in Viriden and Walker, 1999). This indicates there is a strong sense of ownership of these environments in those from a White ethnic background. Conversely, due to the historical suppression of, and discrimination against, those from ethnic backgrounds other than White (Ho et al., 2005; Shinew et al., 2004), forests may be considered by non-Whites as environments that are controlled by Whites and are therefore perceived to be potentially unsafe. Viriden and Walker (1999) explain

that the perceived freedom of wilderness areas may actually imply a lack of social structure, and therefore it is not surprising that members of African-American and Hispanic ethnic groups may find forest environments to be more threatening than their White counterparts. Martin (2004) however, investigated the concept of a racialised outdoor leisure identity in magazine advertisements. He found that the 'great outdoors' is socially constructed as a White space, and that African-American models rarely appeared in advertisements for wilderness leisure experiences and are instead confined to urban and suburban environments. Martin (2004) discusses three consequences of this, including: the stereotype that African-American Americans do not participate in wilderness recreation may become a self-fulfilling prophecy; if wilderness areas are perceived as a 'White space' some African-Americans may not participate to avoid a perceived or real increase in the likelihood of discrimination; and lastly, that some African-Americans may internalise the notion that wilderness recreation is White leisure and therefore avoid participation because of a conflict with their own racial identity and/or they may fear ostracism by other Blacks.

Shinew et al. (2004) tested whether community gardens in urban settings could be perceived as spaces in which people of different ethnicities, in this case those from either an African-American or a White background, can successfully relate. Although further investigation is warranted, their findings showed that majority of African-American and White gardeners felt connected to their community garden and believed that community gardening brought people of different ethnicities, who would not normally socialise, together (Shinew et al., 2004). Compared to the negative connotations of forest and wilderness environments described above, community gardens may be perceived by ethnic groups other than White (particularly African-Americans) as unbiased (Shinew et al., 2004), making them ideal environments for fostering positive interactions among people of varying ethnicities as well as a means to build community in urban/suburban environments.

Community gardening is also a means of building community and enhancing the individual wellbeing of newly arrived migrants. Wong (1997, in Rohde and Kendle, 1997) described the outcomes of a community garden for migrants as: 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; and empowerment, skill development and the enabling of opportunity to participate in caring for the environment.

Ravenscroft and Markwell (2000) highlight the potential of parks and open spaces to bring together people of varying social, cultural and ethnic backgrounds. They refer to Carr et al. (1992, p. 10) who note that '... successful multicultural spaces add to the richness of the city as a learning environment and give hope to the ... dream of cultural integration, or at the very least, cultural understanding.' Hence, by bringing people in contact with one another, natural environments could be used as means of breaking down racial barriers, or facilitating cooperation and communication between different groups.

In terms of preferences for, and perceptions of, parks and other natural environments by people from varied ethnicities, Ho et al. (2005) studied people from African-American, Hispanic, Chinese-American, Japanese-American, and Korean-American backgrounds and their use of urban parklands. Although some differences were found in relation to preferences about facilities (refer to Ho et al., 2005 for explanation), there was widespread agreement amongst participants that urban parks and open spaces provided important benefits including

improving overall health, increasing social and spiritual wellbeing, and enhancing environmental quality.

In general there is still more research needed on how people of different ethnicities perceive nature and natural environments, how these perceptions influence their use of these areas, and lastly, their perceptions of the potential benefits and outcomes of contact with nature. On this note, Driver et al. (1996) comment that managers of parks and other open spaces must work towards a fuller understanding of the needs and values of an increasingly 'multicultural citizenry'.

Gender and nature

Although much has been published in philosophy and sociology linking the concepts of gender and nature, this is not the focus of the discussion here (e.g. Wilson, 2005; Norgaard, 2000). Although some reference is made to the philosophical literature, this review is concerned more with human perceptions of day-to-day contact with nature and how it can influence health and wellbeing. Yet research in this area on gender remains undeveloped, and what little is published relates mostly to women.

The Ecofeminist literature offers some interesting insights into conceptualisations of gender and nature. Norgaard (2000) provides numerous historical examples of the assignment of 'male' and 'female' genders to certain aspects of nature. For example, she attempts to explain gender-nature relationships by examining symbolic references from history, where Gaia, Eve and Isis were considered 'female nature', and Pan, Neptune and Thor were considered 'male nature' (Norgaard, 2000). Filemyr (1997) argues that nature as 'the outdoors' is gendered as a male space, racialised as a white space (see section entitled 'Ethnicity and Nature' above), and sexualised as a heterosexual space. Although a personal account, her article raises some important issues that could be tackled in future research.

In their study on gender, ethnicity, and urban park preferences, Ho et al. (2005) review some of the available literature on gender and nature. They cite the work of Hutchison (1994 in Ho et al., 2005) who found that in parks women were more likely than men to engage in stationary activities (i.e. associated with child care or as a member of a mixed gender social group), whereas men were more likely to participate in mobile activities such as sport, and to do so as individuals or with peers. Furthermore, new immigrant women have been found to be less likely than Western women to engage in activities outdoors, including the use of urban parks (Eyler et al., 2002 in Ho et al., 2005), let alone other 'less tamed' natural environments such as wilderness areas.

The work by Virden and Walker (1999) on forest environments also found that women perceived forests as more threatening than men. Virden and Walker (1999) explain that this is most likely due to women's fear of their own species, particularly men, rather than fear of other animals. Indeed, the work by Wesley and Gardner (2004) seems to confirm this. They studied women partaking in a wilderness adventure program in the United States, who despite feeling empowered by their wilderness experience, still considered themselves vulnerable to violence in outdoor environments, particularly from men (Wesely and Gardner, 2004). Conversely, work by Pohl et al. (2000) found that rather than simply feeling empowered, women's wilderness recreation resulted in feelings of increased self-confidence, assertiveness, problem-solving skills, self-trust, and self-worth—outcomes which were transferred to their daily life and which enabled them to

challenge norms and the restrictive worldviews of those around them. For their own findings on women, fear, and forest environments, Virden and Walker (2004) offer an alternative explanation by describing the possibility of a distinct, but not necessarily exclusive, feminine view of forested environments that perceives forests as threatening, but also as more mysterious and awe-inspiring than men do, where nature is considered an entity or organism in its own right (Virden and Walker, 1999).

Interestingly, in an early study by Kellert and Berry (1984) which investigated gender variations in human relationships to animals and nature, female participants scored higher on the humanistic and moralistic attitude scales than men, which Kellert and Berry (1984) reported was indicative of greater emotional attachment to individual animals and more concern for their ethical treatment. Along similar lines, Kruse (1999) studied gender, perceptions of nature and support for animal rights. He too found that women displayed greater support for animal rights than men. However, Kalof (2003) cites work by Peek et al. (1997) which showed that women's devotion to animal rights is not explained by an ethic of care, but is instead explained by women's subordination in the social hierarchy whereby an experience of oppression results in empathy for other oppressed groups, including animals. In terms of men, Kellert and Berry's (1984) findings suggested, as did Virden and Walker's (1999) research, that men demonstrated a greater interest in wildlife and direct contact with the outdoors, and showed substantially less fear and indifference to wild animals (Kellert and Berry, 1984).

Bhatti and Church (2000) explore gendered meanings of contemporary gardens. In reviewing the literature, they conclude that for much of the twentieth century, the garden, particularly in working class households, was portrayed as the man's domain and as a masculine source of leisure (Bhatti and Church, 2000). Yet their own work suggests that although men expressed a desire to control the garden by imposing their own personal order, for women the garden was a creative outlet, more so than inside the house (Bhatti and Church, 2000). Their findings show that for both genders gardening is a major leisure activity and that gardens have multiple meanings, including: as a private retreat; a social place for sharing; a connection to personal history; a reflection of one's identity; and a status symbol (Bhatti and Church, 2000). Bhatti and Church (2000 p. 195) conclude '... that the garden often reveals hidden (or not so hidden) social relations and can be seen as a negotiated realm that highlights deeper gender relations.' It is clear that the gender-nature relationship is complex, and that more work is needed to unravel this fascinating aspect of the human-nature relationship.

Children and nature

Humans' perception of the natural world and the meanings they attach to nature are shaped by the influence of learning, culture and experience, despite their presumed biological origins (Kellert 2002). Kellert (2002) observes that there is a paucity of available literature on the role played by childhood contact with natural systems in character and personality formation. He comments that the literature that does exist almost exclusively employs the terms 'ecology' and 'environment' in considering family relationships, human social contexts, and the built rather than the natural environment (e.g. Bronfenbrenner, 1979; Kellert, 2002). Hence, the underlying assumption in the existing literature is that these are the predominant settings of modern childhood, or alternatively the more defining settings (i.e. more important). This assumption excludes the natural environment

and its influence on human development entirely. As Kellert (2002, p.118) states, '...the relative absence of published material on this subject may be indicative of a society so estranged from its natural origins it has failed to recognise our species' basic dependence on nature as a condition of growth and development.'

So how does the natural environment affect children's health and wellbeing? Tuan (1978) states that posed in this way the question is largely meaningless—children's health depends more on the quality of parental care, nutrition, access to medical services, and the socioeconomic environment than on whether they live surrounded by the built or the natural environment. As Tuan (1978) argues, in romanticising nature it is easy to forget that infant mortality is higher in many indigenous cultures that have close contact with the natural world than in developed countries where children live in almost entirely in urban environments. Nevertheless, this is most likely due to differences in culture, socioeconomic factors, access to and level of education, and access to health care services between richer and poorer nations. Any positive effects on the health and wellbeing of indigenous peoples obtained from contact with nature are likely to be ineffectual due to the dominance of these other factors. Yet, according to the research presented in this review, the natural environment can and does have a positive impact on human health and wellbeing. Perhaps surprisingly however, there is not an expansive amount of scientific literature on children and youth and their relationships with the natural world. Despite this, there are some interesting publications that adopt an ecological or evolutionary approach.

Heerwagen and Orians (2002) explore the ecological world of children. Their aim was to show how conditions experienced in ancestral environments still exert considerable pressure on humans today. Adopting an ecological-evolutionary perspective they predicted age-related patterns of behavioural responses to the environment or environmental stimuli. For example, as children develop physical skills and are able to gain some independence from the primary caregiver they begin to explore their environment (Heerwagen and Orians, 2002). In doing so, they should be motivated to seek out spaces that afford safety and protection, as children's play at this age is highly focused on their activities and not on the surrounding environment (Heerwagen and Orians, 2002). But this type of play can leave them vulnerable to hostile people, animals, or other dangers (Heerwagen and Orians, 2002). As examples of natural refuges, Heerwagen and Orians (2002) describe a tree with a wide canopy, or a shrub open enough for a child to sit and play within it, while offering a view of the nearby surroundings. Heerwagen and Orians (2002) predict that young children, particularly of preschool age will seek out naturally occurring shelters in the environment and that older children (i.e. those old enough to attend school) will actively shape or construct shelters.

In fact, when playing outside research has shown that children do seek 'refuge' in certain elements found in the natural environment (Kirkby, 1989). Kirkby (1989) also predicted that children would engage in more dramatic and imaginative play in a natural refuge as opposed to a built refuge in school playgrounds. Her reasoning was that natural refuges offer a greater sense of enclosure and more opportunities to manipulate objects (Kirkby, 1989). She found that dramatic play ranged from 42% of the total play content in the built refuge to 68% in the natural refuge settings (Kirkby, 1989). Similarly, Heerwagen and Orians' (2002) analysis of young children's attraction to natural refuges in playgrounds showed that play behaviours in natural refuges differed significantly from play behaviours in built refuge or traditional playground equipment ((Heerwagen and Orians, 2002). They cite evidence that natural refuges and natural materials (such as flowers, sticks and stones) facilitated long bouts of imaginary play, a behaviour known to have high social and cognitive benefits (Heerwagen and Orians, 2002).

In their overview of the literature, Heerwagen and Orians (2002) state that the design of day-care centres, playgrounds, schools, homes, and hospitals could benefit from a better understanding of children's natural play behaviours. They state 'Even a cursory investigation of schools and playgrounds shows that little has changed over the past 50 years. Children still sit in desks facing a teacher or sometimes in clusters of desks. And they still play in environments dominated by swings and slides or other fixed play equipment that does little to capture their imagination' (Heerwagen and Orians, 2002 p.52). Disconnection from the natural environment has prompted some researchers to implore policy and other decision makers to remember their own youth (e.g. Nabhan and Trimble, 1994) and Louv (2005) has coined the phrase 'nature-deficit disorder' to capture 'modern' children's lack of contact with nature.

In terms of children's contact with nature, Kellert (2002) has described three types of experiences—*direct*, *indirect*, and *vicarious* experiences. Kellert (2002) defines *direct* experiences with nature as actual physical contact with natural settings and nonhuman species (i.e. animals and plants). However, he restricts these direct encounters to creatures and environments occurring mostly outside and independent of the human built environment, where plants, animals, and ecosystems function without continuous human intervention and control. Kellert (2002 p.119) states 'The child's direct experience of nature is viewed as largely unplanned rather than formally organised into structured programs and activities...' Examples of direct experience of nature are spontaneous play or activity in one's backyard, in a nearby forest, creek, neighbourhood park, or vacant lot (Kellert, 2002) where the child is likely to encounter mostly native, wild species of plants, animals, and insects.

Kellert (2002) defines a child's *indirect* experience of nature as involving actual physical contact but in more restricted, programmed, and managed contexts. Included here are examples of nature that are usually the product of deliberate and extensive human mastery and manipulation, such as animals, plants, and habitats encountered in zoos, aquariums, and botanical gardens (Kellert, 2002). Indirect experiences of nature also include domesticated species and habitats such as farm and companion animals (pets), vegetable gardens, and cultivated crops. As Kellert (2002) asserts these are all habitats and creatures dependent on (or the result of) extensive human intervention and control.

The final type of experience with nature described by Kellert (2002) is *vicarious* or symbolic experience. This is defined as '...representations or depicted scenes of nature that sometimes are realistic but that also, depending on circumstance, can be highly symbolic, metaphorical, or stylised characterisations' (Kellert, 2002 p.119). This type of experience of nature has become more predominant in modern living through various technologies (such as books and other print media, radio, television, film, and computers) (Kellert, 2002). Yet, the depiction of the natural world through symbols is something that the human species has explored throughout our history, as supported by extensive archaeological and palaeontological evidence. Kellert (2002) argues that because humans have symbolically experienced nature since ancient times this counters any inclination to treat vicarious experiences of nature as specific to modern humans. What has changed, however, is the proliferation of these images via technology and the mass media (Kellert, 2002). Furthermore, and perhaps more disconcerting is '... the concurrent decline in children's direct experience with healthy and abundant natural systems' (Kellert, 2002 p.120).

Some important research has been conducted on the potential effects of contact with nature on children's health and wellbeing in a variety of contexts including the home and school environments. Wells and Evans (2003) examine the notion

that nature might buffer or moderate the effects of stress or adversity in children living in rural upstate New York. Their research is part of a growing number of studies investigating children's relationship with the natural environment and the potential for nature to positively influence child health. As Wells and Evans (2003) state, although some research has investigated the direct effects of nature on children's functioning or wellbeing (e.g. Taylor, Kuo, and Sullivan, 2001; 2002; Wells, 2001; Taylor et al., 1998) very little work has investigated the potential for nature to buffer the effects of stress. Despite this, several studies have demonstrated the positive effects of contact with nature on stress reduction and resilience to stress in adults (e.g. Parsons et al., 1998; Ulrich et al., 1991b).

Wells and Evans (2003) highlighted a number of studies demonstrating that children have a preference for green natural settings. Included was a study by Moore (1986), who reported that 96% of urban children illustrated outdoor places when asked to make a map or drawing of all their favourite places. From this and other evidence, Wells and Evans (2003) state that it is reasonable to expect that green natural settings preferred by children would also have a beneficial effect on children's wellbeing. In fact research in children has shown that children function better cognitively and emotionally in 'green environments' (i.e. those with higher amounts of vegetation) than those without (Taylor et al., 2001; Wells, 2000); have more creative play in 'green areas' (Taylor et al., 1998); and develop better interpersonal relationships and a more positive attitude to school (Crisp and Aunger, 1998). Furthermore, other research has demonstrated that children have an abiding affiliation with nature, even in economically impoverished urban communities and across cultures (Kellert, 2002; Taylor et al., 1998; Kahn, 1997). Related work using companion animals and/or wilderness experiences to treat children and adolescents suffering from behavioural and/or psychological disorders has also indicated positive outcomes (Fawcett and Gullone, 2001; Ross, 1999; Crisp and Aunger, 1998; Beck and Katcher, 1996; Levinson, 1969).

Wells and Evans (2003) report however, that the majority of work investigating the beneficial effects of nature on children has been conducted since the mid-1990s, and nearly all of this has been on children living in urban environments. Although this work is in the early stages there is significant incentive to explore the relationship that children have with the natural environment, and to look for ways this relationship can be used to maximise health and wellbeing. As Kellert (2002) writes, direct experience of nature plays a significant, vital, and perhaps irreplaceable role in affective, cognitive, and evaluative development but further study is needed.

Conclusion

As discussed above there are many ways of examining the human-nature relationship, yet knowledge about our relationship with nature is still incomplete. Despite this, the importance of the natural environment is apparent across cultures and varying population groups. Overall, there is a strengthening perception that contact with nature is beneficial to adults and children alike, and is perhaps an antidote to health and wellbeing problems associated with an increasingly urbanised modern lifestyle. Some of the evidence is discussed in the following section titled 'Health Benefits of Contact with Nature: The Evidence.'

Health benefits of nature: The evidence

Introduction

The belief that contact with nature fosters psychological wellbeing and reduces the stress of urban living seems to be as old as urbanisation itself (Ulrich and Parsons, 1992; Ulrich, 1993), and as mentioned, was the guiding principle behind the first parks. There are many ways that humans come into contact with nature, including viewing natural scenes, being in natural settings, or encountering plants and animals. Some of these occurrences are ‘everyday’ interactions, and others are more specific and affect people at a deeper level. This section briefly examines everyday human-nature interactions, as well as those interactions with landscapes, wilderness, plants and animals (Frumkin, 2001).

Note: We have included here only those human relationships with animals and plants where no economic benefit is to be gained from the relationship (so the interactions between farmers and their stock and/or crops are not included, nor are other commercial nature-based industries). This is not to say that the same benefits as described here may not also arise from these relationships. However, there have been virtually no studies examining the potential health benefits of people working with nature in these industries and as the majority are now large-scale operations; whatever benefits to be gained in terms of health are likely to be overshadowed by the impersonal nature of any interactions that may occur.

Viewing nature

In recent decades, landscape researchers have conducted studies to investigate individuals’ preferences for natural scenery (eg. Kaplan and Talbot, 1988; Talbot, 1988; Talbot, Bardwell, and Kaplan, 1987; Talbot and Kaplan, 1984; 1986; 1991). Since the early work of Talbot and Kaplan (1984) through to more recent work by Kaplan (2001), studies generally indicate that people prefer viewing natural landscapes rather than the built environment. Furthermore, there is now considerable empirical and theoretical evidence for the positive effects that simply viewing natural scenes can have on human health.

The healing effects of a natural view (such as those provided by parks) 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 wellbeing (Leather et al., 1998; Lewis, 1996; Kaplan, 1992a). Research such as this could have important implications for the placement and planning of parks in urban areas.

One famous 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 to those that viewed an urban scene (Ulrich, 1984). Similarly, Ulrich and colleagues (1991b) studied the effects of different natural and urban scenes on subjects who had just watched a stressful film (horror genre). 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).

Similar 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). Natural views can also result in better performance in attention demanding tasks (Tennessee and Cimprich, 1995). Tennessee and Cimprich (1995) gave university students a test and compared scores of students who had natural views to those that did not. They found that those with a view of nature scored better on the test than those with non-natural views. Furthermore, a study by Heerwagen and Orians (1986, in Lewis, 1996) compared the preferences of office workers for visual décor (i.e. photographs or posters) in windowed and window-less offices. Findings showed that people who worked in offices without windows were four times more likely to choose photographs or posters of outdoor/natural scenes than those who worked in offices with windows; more than 75% of scenes represented in window-less offices contained no buildings or human-made artefacts at all (Heerwagen and Orians, 1986 in Lewis, 1996).

Further evidence shows that 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. (1998) reviewed the literature on commuter stress in car drivers and the mitigating effects of roadside environments. 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 immunisation 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 immunisation to subsequent stress than participants who viewed artifact-dominated drives (Parsons et al., 1998).

Kaplan (2001) found that apartment residents had enhanced wellbeing and greater neighbourhood satisfaction when they could look out onto more natural rather than more built settings. However, satisfaction was far greater when residents could see even a few trees than when their view was of large open spaces (Kaplan, 2001). Similarly, results from a study by Kaplan (1985) suggested that urban residents who could see gardens found their neighbours to be friendlier and felt their housing development had a stronger sense of community, thus contributing to their neighbourhood satisfaction. Furthermore, Kearney (2006) found that having a view of natural environments (particularly forests and landscaping) increased residents' neighbourhood satisfaction and suggested that higher density living, such as highrise living, could be more acceptable if residents have a natural view.

The beneficial effects of viewing nature on psychological state, and in particular mood affect were examined by Ulrich (1979, 1982, in Rohde and Kendle, 1994). Ulrich (1979 in Rohde and Kendle, 1994) 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. In this and a later study, Ulrich (1982, in Rohde and Kendle, 1994) concluded that scenes of nature, particularly those depicting water, had a beneficial influence on the psychological state of humans. In their review of the literature, Rohde and Kendle (1994) state that the positive psychological response to nature involves feelings of pleasure, sustained attention or interest, 'relaxed wakefulness', and diminution of negative emotions, such as anger and anxiety.

Kaplan and Kaplan (1989) point out that observing or viewing nature is an important form of involvement with it. Much of the pleasure that people derive out of nature comes from opportunities to observe, and much of this observation occurs, not when people are in nature itself, but when they are looking out a window (Kaplan and Kaplan, 1989). This type of observation lets the mind wander and provides an opportunity for reflection. It can also aid recovery from mental fatigue. 'Mental fatigue' is a term coined by Stephen Kaplan (1987b in Kaplan and Kaplan, 1989) and arises from an intense period of concentration or directed attention (whether pleasant or unpleasant) that eventually results in a worn-out mental state with symptoms including irritability and a lack of concentration. It has been shown that natural environments are ideal environments to foster recovery from this state (see below). The reason for this is that the act of viewing or observing nature does not require directed or focussed attention, but instead requires undirected or effortless attention, which is non-taxing and can restore mental capabilities.

Evidence presented here has demonstrated that just by viewing nature many aspects of human health and development can be markedly improved. Some of these benefits in a park context are summarised in Table 2. Although the benefits are mostly psychological, flow-on effects to physical health have also been documented in the literature. Viewing nature is positive for health, particularly in terms of recovering from stress, improving concentration and productivity, and improving psychological state, particularly of people in confined circumstances such as prisons, hospitals and high-rise apartments/high density living. From these findings, it is clear that visual access to nature in urban settings should be taken into account and given appropriate priority when planning urban areas. As well as viewing landscapes, however, many therapeutic effects can be gained from *being* in nature.

Being in natural environments, whether hiking in a World Heritage area or sitting in a local urban park, has many psychophysiological beneficial effects on health (i.e. positive psychological effects that translate into positive physiological effects). Although there is much anecdotal evidence documenting the benefits of 'being in nature', the exact effects (for example by using psychophysiological measures) on the human mind, body, and spirit are still largely unknown. It has been suggested that some of the benefits from being in natural settings arise from a mood state of pleasant arousal and relaxation, resulting from returning to a more cyclical, and slower sense of time (Nettleton, 1992; Furnass, 1979).

Nettleton (1992) reviewed some of the literature describing positive emotional states arising out of time spent in natural settings. A study by Russell and Pratt (1980 in Nettleton, 1992) found that parks and gardens were perceived as relaxing and peaceful and were associated with a positive mood state, while supermarkets were perceived as distressing and associated with a negative mood state. A later study conducted at one of the train stations in the Melbourne underground railway system (Parliament Station) found that when asked about what they liked about the station, commuters mentioned a small park (MacArthur Gardens) located just outside the exit of the station that they walked through on their way to the train, whereas the station itself was viewed as sterile, daunting, and stark (Joske et al., 1989 in Nettleton, 1992).

City life is dominated by mechanical time (punctuality, deadlines, etc) yet our bodies and minds are dominated by biological time. Conflicts between mechanical and biological time can result in a variety of unpleasant psychosomatic symptoms including irritability, restlessness, depression, insomnia, tension and headaches, and indigestion (Furnass, 1979). If unaddressed, these problems have the potential to eventuate into illnesses that are more serious. The experience of nature in a neurological sense 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 perhaps a technical explanation of the process that occurs when people 'clear their head' by going for a walk in a park and emphasises the importance of parks in providing communities with access to nature. Furthermore, in the act of contemplating nature, researchers have found that the brain is relieved of 'excess' circulation (or activity), and nervous system activity is also reduced (Yogendra, 1958).

Nature does have great importance to people. In a survey of 1,900 adults in the US, Cordell et al. (1998) found that approximately 45% of respondents rated wilderness as 'very important' or 'extremely important' for spiritual inspiration, and a further 56% stated that just knowing it exists was 'very important' or 'extremely important'. This confirms the conceptual importance of nature to people described by Kaplan and Kaplan (1989).

Being in natural environments invokes a sense of 'oneness' with nature and the universe, and can lead to transcendental experiences (Rohde and Kendle, 1994). This is more likely to occur in wilderness settings, although as it relates to subjective experience it is probable that nature in urban environments could produce the same effect.

In order to encourage people to be in nature, the accessibility of urban green spaces should be considered. With current trends in Australia and other Western countries towards an ageing demographic, it is important to make urban green space accessible to all. Furthermore, urban green spaces should be created as beautiful places in cities - places that are socially cohesive and promote social solidarity (Ward Thompson, 2002).

Restorative settings

The increasing complexity of both technological tasks and the built environment is generally a source of many negative stress response patterns for the majority of people (West, 1986 in Lewis, 1996). In contrast, the natural environment has been found to have a restorative quality, particularly for people who live in urban environments. Natural places such as parks offer an opportunity to become revitalised and refreshed. Living in urban areas often means dealing with environmental demands such as crowds, noise, pollution, and primarily uniformed structures. It has been demonstrated that these factors can cause mental fatigue and exhaustion (Furnass, 1979; Rohde and Kendle, 1994), whereas exposure to nature has been demonstrated to have the opposite effect. Symptoms of mental fatigue include: decreased ability to concentrate and solve problems, heightened irritability, and a greater susceptibility to make mistakes or cause accidents (Herzog et al., 1997).

The Kaplans (Kaplan and Kaplan, 1989; Kaplan and Kaplan, 1990; Kaplan, 1992a; Kaplan, 1992b; Kaplan, 1995) have developed the notion of 'restorative environments' that foster recovery from this state of mental fatigue. 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). For a more detailed discussion, see Hartig et al. (1991) or Kaplan and Kaplan (1989). 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). When comparing a walk in a natural setting (a park), a walk in an urban setting, and relaxing in a comfortable chair, Hartig et al. (1991) found that mental fatigue was most successfully relieved by a walk in a park.

Furthermore, Kaplan et al. (1998) suggest that the implications for design and management of natural environments to be restorative are vast and vital. They suggested that the natural setting may be beneficial to not only its immediate users but also to those who view it from afar. In addition, Kaplan et al. (1998, p.77) stated that 'if treated as the opportunity for increasing the sanity and welfare of those who can see it, it becomes every bit as important as hallways and lighting'. Herzog, Chen and Primeau (2002 p. 295), reporting on a study of undergraduate students in the USA, concluded that 'the restorative potential of natural settings is probably underappreciated'. This is supported by results of research by Hartig et al. (2003), also involving university students, in which the restorative effects of natural settings were accentuated by the negative effects associated with the urban surroundings and windowless room that acted as 'controls'.

In recent years, Frances Kuo and her colleagues (2001; 2002) have conducted research to examine the effectiveness of the Attention Restoration Theory in the inner city context. Their work has focussed on high-rise residents and the effects of nearby nature on a range of factors including: the ability to cope with major life issues, Attention Deficit Disorder and children's self-discipline. For example, a study conducted by Taylor, Kuo and Sullivan (2002) examined the relationship between nearby views of 'green' nature and children's ability to concentrate, inhibit impulses and delay gratification. They found that the more 'green' a girl's view from her high-rise window was, the better able to concentrate and the more self-disciplined she was.

Similarly, Kuo (2001) examined whether nearby nature effects high-rise residents' ability to cope with poverty and life issues. She found that residents with 'green' surroundings were able to pay attention more effectively and found their major life issues to be less difficult to deal with than their counterparts with 'barren' surroundings. Furthermore, Taylor, Kuo and Sullivan (2001) tested whether the Attention Restoration Theory could be applied to children and their capacity to deal with Attention Deficit Disorder (ADD). Through the use of parental surveys, children were tested for their attentional functioning in a range of play settings, and green settings were found to be most effective in enhancing attention. The authors concluded that the 'greener' a child's play setting, the less severe her ADD symptoms appeared (Taylor et al., 2001).

Leisure and recreation

Although many benefits arise from the act of recreation itself, whether it be a hobby or playing a team sport, the concern here is with the types of recreation that occur in natural or semi-natural settings and the particular benefits that may arise from carrying out the activity in those settings.

Leisure and recreation experiences in natural environments probably reduce stress through a number of mechanisms, including a sense of control through active coping or escape, and the therapeutic effects of exposure to natural environments that most likely have learned as well as biological origins (Ulrich et al., 1991a). For example, many people each year flock to parks and wilderness areas for their annual holiday to 'experience' the wilderness, and the number of people seeking these experiences is increasing (Freimund and Cole, 2001). Associated with this is a rise in the number of people pursuing non-consumptive nature-related recreational activities, such as birdwatching. This is often referred to as 'wildlife-watching' or 'watchable-wildlife' and includes observing, feeding, or photographing wildlife (U.S. Department of the Interior et al., 1996). Much work has been carried out on this topic in the United States and although similar trends are likely in Australia, there is almost no data on wildlife watching by Australians or visitors to Australia (D. Jones personal communication).

Recreation in the natural settings provided by parks is becoming increasingly important as our lives become dominated by indoor activities. Some authors anticipate that allowing people to interact with nature (such as spending time in parks during the working week) to reduce tension and increase competence and productivity, will eventually become socially accepted and actively encouraged (S. Kaplan in Lewis, 1996). Pursuing recreation in a park setting enables people to develop a clearer understanding of their relatedness to nature, which can influence their everyday lives and preferences (Martin, 1996). This can have quite a powerful effect as a form of intervention treatment, for example as used in wilderness therapy (see section titled 'Health Benefits of Nature in Practice').

Wilderness and related studies clearly demonstrate that being in a natural environment affects people positively, although the exact benefits are still largely unknown. There are also multiple benefits from brief encounters with nature or experiencing nature on a smaller scale, such as in urban parks. As outlined by Woolley (2003), the most obvious benefits and opportunities that urban green spaces may provide for inner city living are social benefits - that is opportunities for people to participate in events and activities. Similarly, the Sydney Urban Parks Education Research (SUPER) Group (2001), stated that urban green space, in

particular parks and gardens, may generate a range of social and economic values for the Australian community. These benefits may include:

- opportunities for activity for older people;
- supervised child-care;
- health improvement and fitness motivation;
- education in sport, environment and other endeavours; and
- individual personal development.

Survey work has shown that nature is important to people, and numbers of people seeking nature-related recreation overseas is increasing. Similarly, research indicates that in Sydney, Australia, inner city residents have the highest visitation rate to urban parks, no doubt due to small or non-existent personal gardens or backyards (Veal, 2001). Some of the benefits of being in nature in a park context are presented in Table 2.

Contact with plants

Gardens and gardening

Gardening and gardens are central features of societies throughout the world. It is claimed by some researchers that, across the world, gardening is the most common nature-based activity (Lewis 1996; Kaplan and Kaplan 1989). The American College of Sports Medicine (2004) goes further, suggesting that gardening is among the most popular leisure pursuits (not just among pursuits which are nature-based). Moreover, research indicates that gardening is good for human health and wellbeing in many ways. For example, gardening allows people to interact with the natural environment, which has psychological, physiological and social benefits (Frumkin 2003; Pretty et al. 2007).

As well as the leisure aspects of gardening noted above, gardening provides opportunities for beneficial physical activity (Nieman 2003), can be used therapeutically in drug rehabilitation centres, prisons and hospitals (Frumkin 2001; Lewis 1996; Relf 1992), fosters recovery from the stresses and strains of everyday living (Kaplan and Kaplan 1990), and can enhance community cohesion and transform neighbourhood relationships (Lewis 1990, 1992, 1996).

The physiological benefits of gardening are fairly obvious, but the benefits have also been verified by research (including research on gardening and diabetes by Armstrong 2000, and research on gardening and general health maintenance by Galloway and Jokl 2000). Other more recent claims of physical health benefits of gardening include Rotherth (2007 p. 26) who states that 'the lifting and reaching motions of gardening can strengthen weak muscles and increase limited joint flexibility ranges. Physical stamina and skills such as balance and coordination can be improved'. Gardening has also been cited as a means of prevention for osteoporosis. According to Kovach (2006 p.56), researchers at the University of Arkansas 'found that women 50 and older, who gardened at least once a week, showed higher bone density readings than those who engaged in other types of exercise including jogging, swimming, walking and aerobics'. Gardening has also been found to be beneficial in reducing another age-related condition—dementia. A recent Australian study of nursing home admissions to identify risk factors for dementia (Simons et al. 2006) found a 36% reduction in risk associated with daily gardening. A garden has been likened to a gymnasium: 'Turning compost is

essentially lifting weights, raking is like using a rowing machine' says Dan Hickey (2004) of the (US) National Gardening Association.

One of the most passionate advocates for the psychological health benefits of plants is Charles Lewis. Lewis (Lewis, 1990; 1992; 1996) believes that vegetation, whether part of a garden, park or wilderness setting has great potential for healing. According to Lewis (1990), when humans first view it, a park or garden is a visual experience. However, the image is then transmitted from the eye to the brain where it is decoded, recognised, and can be transferred to a deeper level of being (Lewis, 1990).

A recent article in a newsletter from the Nursery and Garden Industry Australia Limited (2006 p. 1), citing the 9th annual Ipsos Mackay 'Mind and Mood' report, highlights the importance of the restorative and community building aspects of gardening, saying: 'Australians consistently report higher levels of anxiety, irritability, grumpiness—all associated with what is assumed to be a rising level of tension in the community. ... Gardens and gardening may offer one of the few antidotes to a community so frenzied.'

Lewis (1990) also points out that the benefits of gardening are not dependent on age or on physical strength, but are available to the young and the old alike, to those who can be actively involved and those who can only observe or even interact with gardens only through their sense of smell. According to Lewis (1990), plants heal via two modes: *observational* mode and *participatory* mode. Observational mode occurs when viewing vegetation in a garden or wilderness, but the observer has no responsibility for its care (e.g. in a park or wilderness area). Participatory mode occurs when an individual is responsible for nurturing a plant or garden (or even wilderness), and it is through their efforts that the plant/s thrive. Lewis (1990) has stated that the act of nurturing and being responsible for plants at a more intimate level is a more intense experience than that gained through observation alone, however, both observation and participation produce wellbeing (Lewis, 1990). Interestingly, a questionnaire sent to members of the American Horticultural Society and readers of an organic gardening magazine found that the most beneficial aspects of gardening cited by respondents were peacefulness and tranquillity, rather than the tangible benefits of food or flower production (Kaplan and Kaplan, 1989).

The Kaplans' notion of restorative experiences was an idea that emerged from their work in wilderness research, but they found that it is also relevant to the experience of gardening (Kaplan and Kaplan, 1990). As noted previously, restorative experiences are based on the fact that mental effort, stress, and the demand of everyday living cause fatigue and affect one's capacity to concentrate, or direct attention to one particular task (Kaplan and Kaplan, 1990). A restorative environment fosters recovery from this state. It requires four elements: fascination, a sense of being away, extent or scope, and compatibility with an individual's inclinations (Kaplan and Kaplan, 1989). These four factors are found in natural places such as parks and gardens, or in the act of gardening itself.

The importance of the health benefits of gardening in relation to parks and nature is apparent when considering environment groups like 'Friends of Parks'. These groups regularly volunteer their time to restore and rehabilitate parks (i.e. public gardens) by planting, watering, and weeding, among other activities. Although the health of people who have private gardens has been investigated somewhat, there was until recently little known about the potential health benefits from membership and participation in a 'public gardening' group. In many urban areas, particularly with recent increases in high density housing, contact with nature and natural environments, typically gained through the 'Australian birthright of owning a free-standing bungalow on a quarter-acre block surrounded by leafy gardens' (Mayne-Wilson 2005 p. 3) is available only via public parks.

Research by Bhatti and Church (2000) suggests that gardening may be experienced differently by males and females. Other research suggests that socio-economic status influences the amount of time spent in gardens (Armstrong 2000). For children, school gardens have been found to enrich teaching and learning experiences, increase scientific knowledge and environmental awareness, and foster positive relationships between children, adults and the local community (Maller and Townsend 2006).

For older people, especially those living in retirement communities, the availability of a garden not only enables residents to actively garden but also encourages and supports informal activities 'such as walking and talking with friends' (Browne 1992 p. 78). Sifton (2004 p. 89) tells the story of John Angus:

John Angus had worked all of his life with the land and plants; for John Angus, growing things was more than a way to earn a living, it was his life. ... Tragically, when I met John Angus, independently tending a garden or plants was out of the question due to the symptoms of advanced Alzheimer's disease. His language skills were quite well preserved, but he was particularly troubled by motor co-ordination and movement difficulties. He had so little command or sense of his body that he required full assistance to get dressed or even to sit in a chair. And distress with his losses often led to behavioural symptoms such as agitation.

John Angus had been living in various institutions for several months when I suggested that he come with me to help with some potting up. The very suggestion brightened him up immensely. As I guided his hands to the potting soil, tears began to run down his smiling cheeks.

With hands immersed in his beloved soil, John Angus said: 'This is just heaven, just heaven, and I had no idea that it was so handy to home'.

For asylum seekers and refugees, the opportunity to participate in gardening has been shown to assist in dealing with the traumas they have experienced prior to resettlement (Hodge 2003).

Because of the diverse and widely applicable benefits they offer, gardens are increasingly being used for therapeutic reasons (see discussion on Horticultural Therapy below).

Community gardens

The positive effects of gardening can be observed in the transformation of whole neighbourhoods that occurs with the simple act of establishing a community garden. An annual gardening competition in a public housing area of New York, along with many other urban community garden schemes in impoverished neighbourhoods, have been found to increase community cohesion, reduce graffiti and violence, and give residents a more positive attitude about themselves and their neighbourhood, resulting in personal and neighbourhood transformation (Lewis, 1990; Lewis, 1992; Lewis, 1996). Community gardens provide opportunities for socialising 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).

A strengthening of community and social capital may be derived from participation in community gardening (Schukoske, 2000). Bartolomei et al. (2003) state that there is an increasing interest in the role of community gardens as a mechanism to strengthen social infrastructure, particularly in inner city public high-rise housing estates, which are often characterised by high levels of unemployment and a high proportion of low-income elderly and single-parent families.

A study conducted by Blair, Giesecke and Sherman (1991) in America, comparing gardeners of an inner city community garden versus non-gardeners, found that the 'gardeners' believed their neighbours were friendly and felt more satisfied with their life. In addition, the authors concluded that the results of their study suggested that community gardening appeared to facilitate community self-help as gardeners were more likely to be active in community projects.

Similarly, results of studies conducted by Armstrong (2000) and Francis (1987) indicated that participation in community gardens facilitates social networks and friendships. Furthermore, in their report on the benefits of community gardens as a vehicle to promote neighbourhood renewal in public high-rise housing estates in inner Sydney, Bartolomei et al. (2003) found that the gardens created a great sense of belonging, friendship and generosity amongst the gardeners and a sense of community on the estates. They were also found to break down cultural barriers as well as promote physical activity and good nutrition principles (Bartolomei et al., 2003).

While the social benefits noted above were also identified in reports of community gardening projects in the UK (Milligan, Gattrell and Bingley, 2004) and in Canada (Wakefield et al., 2007), these papers also highlighted some other health and wellbeing benefits of community gardens (known as 'allotment gardens' in the UK). For instance, Milligan et al. (p. 1790) highlighted the benefits of allotment gardening for older people's 'ontological security'—a sense of personal identity resulting in improved mental health and wellbeing. Other equally important benefits were highlighted by Wakefield et al. (p. 97): 'better nutrition and increased exercise'; 'better access to fresh wholesome food'; 'being able to grow and eat culturally appropriate foods'; 'the opportunity to interact with nature [which was] relaxing and calming'; and 'an impetus for broader community improvement and mobilization'. The theme of nutritional benefits was also highlighted in an article by Flanigan and Varma (2006) on community gardening in New Mexico, USA.

Many similar benefits may result from membership of Friends of Parks or other environment groups where members actively restore the natural environment by weeding, replanting, rubbish removal, and interpretation. Such groups may be seen as another form of community gardening. It is likely that members gain a sense of ownership of their local environment (or park) and are provided with the opportunity to learn from, and socialise with, other members of the community. In fact, Friends groups have much potential to satisfy the components of wellbeing described by Furnass (1996). These components include: satisfactory human relationships, meaningful occupation, opportunities for contact with nature, creative expression, and making a positive contribution to human society (Furnass, 1996). Membership of Friends groups can also enhance social capital. As mentioned, however, a limited amount of work has been carried out in this area. Some preliminary research by Townsend and Maller (2003) indicated that members of such groups are likely to receive a number of benefits from working with the natural environment, including: a sense of achievement and ownership; the opportunity to learn from, and socialise with, other members of the community (enhancing social capital); multiple physical health benefits; and the opportunity to work with plants and animals. A recent paper (Townsend, 2006) reported on a series of small-scale projects undertaken in Australia, which explored the perceived benefits of 'civic environmentalism' (or membership of 'friends' groups). The studies, which included studies of a largely qualitative nature, as well as some using mixed methods, identified three main types of benefits: physical health benefits, including improved 'cardio-vascular health and weight control' (p. 114); mental health benefits, including relaxation, diminished symptoms of depression, and a sense of having a support base to cope in times of trouble; and social health benefits, including expanded

friendship networks, 'opportunities for fun, and an increased sense of belonging to the local community' (p. 115). A later paper (Moore, Townsend and Oldroyd, 2007), reporting on a study of volunteers involved in groups managing land for conservation in Victoria, Australia, reported statistically significant positive differences between volunteers and matched controls in terms of: perceived general health; number of visits to the general practitioner; use of prescription drugs; sense of safety in the local community; opportunities to use skills developed over their lifetime; and experience of pain and discomfort.

Incidental exposure to plants

What effect does simply having plants, parks and gardens in close proximity have on human health? Street trees and other people's gardens, fields and unused lots, courtyards and landscaped areas that are encountered in one's daily travels (as separate from parks or designated recreational areas) constitute important opportunities for experiencing nature (Kaplan and Kaplan, 1989). In a study of apartment dwellers in the USA, Kaplan (2001) found that views of trees, gardens and grassy areas were important for participants' wellbeing and were factors in neighbourhood satisfaction. Kaplan suggests (p.540) suggests that 'incidental' exposure to plants via window views may be far from 'incidental'—that it may, in fact, provide 'micro-restorative opportunities' that may accumulate to 'provide long-term contact with the natural environment'. Similarly, in a study of low income children in USA, Wells (2000) found that the 'greenness' of their home environment (predominantly related to views from various windows) impacted on their cognitive functioning, with greater levels of 'greenness' associated with higher cognitive functioning. Kearney (2006), reporting on a study of residential density and neighbourhood satisfaction, found that density per se was less important than 'opportunities to visit nearby shared space and having views of nature from the home' (p. 112).

Even the knowledge that there is nature nearby (e.g. parks) has proven to have important effects on residents' satisfaction with their neighbourhood, despite the fact that they may not make use of it regularly (Kaplan and Kaplan, 1989). Kaplan and Kaplan (1989) refer to this as 'conceptual' involvement in nature. Its benefits stem from the fact that nature is important to people and they value its presence, even though they may not experience it on a daily basis. Another study found higher neighbourhood and life satisfaction among individuals who more regularly pursued gardening and other nature-related activities (such as birdwatching) than among those who did not have such interests (Frey, 1981 in Kaplan and Kaplan, 1989). People with access to nearby natural settings or parks have been found to be healthier overall than other individuals, and the long-term, indirect impacts of 'nearby nature' can include increased levels of satisfaction with one's home, job, and with life in general (Kaplan and Kaplan, 1989). A study by Wells and Evans (2003) of nearby nature as a buffer against stress among rural children found that 'the impact of life stress was lower among children with high levels of nearby nature than among those with little nearby nature' (p. 311).

Indoor plants are known to improve office air quality, and have been found to improve productivity and enhance the overall mood in the office environment (Larsen et al., 1998; Randall et al., 1992). Along similar lines, Kuo and Sullivan (2001) examined the effect of nearby trees and grassy areas on residents of public housing. By comparing neighbourhoods with vegetation close by to those without vegetation, they found that residents living in greener areas experienced lower levels of fear, fewer incivilities, less aggressive and violent behaviour, and lower crime rates (Kuo and Sullivan, 2001).

At the University of Washington in the US, researchers have been studying the attitudes of consumers and retailers to urban trees and the effects they have on consumer behaviour. They found streetscapes that make plants and trees a feature have a positive effect on consumer behaviour and actually attract consumers and tourists (Wolf, 1998a; Wolf, 1998b; Wolf, 1998c; Wolf, 1999). Trees seem to promote a perception of quality, and increase the appeal of a district. For example, consumers claimed they would be willing to pay more for parking in a well-landscaped business district (Wolf, 1998c). Tree-lined sidewalks had higher ratings of amenity and comfort compared to non-shaded streets, and shops in these areas were seen to have better quality products than those in streets barren of vegetation (Wolf, 1998c).

The observational mode of experiencing plants mentioned previously can occur wherever and whenever people encounter plants (Lewis, 1990). Whether in parks or buildings, they are islands of green that provide opportunities for people to become refreshed by experiencing nature. Research has demonstrated that even brief encounters with nature can improve one's capacity to concentrate and remedy mental fatigue (Kaplan, 1992b; Kaplan, 1995; Kaplan and Kaplan, 1990).

Failure to recognise, and to maximise, the benefits available from nearby plants, parks, and other natural settings could have serious consequences (Kaplan and Kaplan, 1989). Considering the positive psychological effects that vegetation has on all sectors of the community, it seems unwise not to use this knowledge to improve productivity and quality of life. Too often parks and landscaping are considered as optional 'amenities' rather than as essential components of urban design (Kaplan and Kaplan, 1989).

Plants and nearby vegetation can have profound effects on individuals, small groups, or even entire neighbourhoods. As noted above, some of the health benefits of interacting with plants include the ability to facilitate healing in the elderly and mentally disadvantaged, improving mental capacity and productivity of people working in offices, improving job and life satisfaction of residents, attracting consumers and tourists to shopping districts, and aiding community cohesion and identity. For example, Guite, Clark and Ackrill (2006), in a large study of urban residents in the UK, found that dissatisfaction with green spaces was associated with low scores on the mental health scale. Given the inter-relationship between physical and mental health, it is also likely that via their effects on mental health, plants and nearby vegetation can indirectly improve physical health. This requires further investigation.

Contact with animals

Companion animals

Although pets are common in hunter-gatherer societies, pet-keeping as a phenomenon has grown exponentially with the increasing urbanisation of Western society (National Institutes of Health, 1987). In Australia, 64% of households own a pet (Chaseling 2001), with similar figures reported in the US (APPMA 2003). Although overlooked by the scientific community for many years, people's relationship with companion animals has generated much research, particularly in the last two or three decades. Research has included studies focusing on the motivations for pet ownership (eg. Endenburg, Hart and Bouw 1994), factors (including ethnicity and gender) influencing people's relationships

with companion animals (eg. Risley-Curtiss, Holley and Wolf 2006; Risley-Curtiss et al., 2006), and the benefits of owning companion animals (eg. McColgan and Schofield 2007; Cutt et al. 2007).

The motivations for acquiring a pet reflect people's perceptions of the benefits gained from having a pet. Chaseling (2001) observed that pets 'offer companionship, a vector for meeting people, an exercise stimulus, they teach our children responsibility, they give pleasure, love and are loved in return'. Participants in a qualitative study in the Netherlands undertaken by Endenburg, Hart and Bouw (1994) highlighted all of these factors as reasons for their acquisition of a pet. The relationship between humans and their companion animals goes deeper than simply humans caring for animals. Sarmicanic (2004 p. 47) argues that 'companion animals shape human self-perception'.

Although there is debate about the mechanisms by which pets confer human health benefits, there is a growing body of evidence to support the claim that people who own pets experience better health than those who do not own pets (Headey 2003). According to Headey (p. 460), a longitudinal study of 10,000 people in Germany in 1996 and 2001 'found that people who continuously owned a pet reported the fewest doctor visits ...and those who had acquired a pet during the 5-year period reported the next fewest number of visits. Both these groups went to the doctor about 10% less often than people who did not have a pet at either time, or who had ceased to have a pet'. Australian longitudinal research is reported to have found similar outcomes. However, some studies (eg. Parslow and Jorm 2003; Parslow et al. 2005; Koivusilta and Ojanlatva 2006) have produced data which appears to contradict the findings of other studies which claim human health benefits of pet ownership, and suggest that further rigorous research is required. McNicholas et al. (2005) suggest that the failure of recent research to support earlier findings of specific health benefits of pet ownership may relate more to the way those studies define health than to any lack of benefit.

Nevertheless, numerous health benefits from keeping pets have been identified, especially when a broad definition of health including physical and mental dimensions of wellbeing and the notion of social integration, is adopted (McNicholas et al. 2005). The following is a discussion of some of the main studies investigating the health benefits of companion animals.

One of the key benefits of companion animals appears to be in addressing loneliness. Dr. James Lynch, in his book 'A Cry Unheard: New Insights into the Medical Consequences of Loneliness', recounts the story of Margaret, one of his patients who was suffering from cancer, as well as extreme loneliness and depression (Lynch 2000 pp. 93-94). When Lynch asked Margaret if there were particular times of extreme vulnerability and depression, she replied:

It's 11 o'clock at night ... and there is no-one there to hold you—not yesterday, not today, and not tomorrow. ... It's an unbearable and terrifying feeling ... Tomorrow, I am getting a puppy, and then I will get a cat and some fish and even some plants. My house has been silent and empty long enough. I need to let life back in.

Baun and McCabe (2003) draw attention to the potential benefits of companion animals in facilities for people experiencing dementia of the Alzheimer's type (DAT). In keeping with the views expressed by Thomas (1994, 1996) about the benefits of animals in nursing homes, Baun and McCabe suggest that residents gain 'unconditional positive regard' (p. 44) and suffer less from mood swings and agitation. At the same time, the stresses of caring for DAT sufferers (whether by family members or staff in an institution) are also reduced by the presence of a companion animal (Baun and McCabe).

Homeless young people constitute another group for whom companion animals have been helpful in addressing issues of loneliness. Rew (2000) found that having a pet dog was a key coping strategy for a high proportion (41%) of the homeless young people she interviewed. Not only were the dogs seen as providing companionship, safety and affection, but their need for care provided 'a reason to keep going' (p. 128) and a motivation for maintaining health. Similar views were expressed by residents in supported housing for people experiencing psychiatric disorders, with social connectedness, responsibility and emotional stability identified as key benefits of pet ownership (Hunt and Stein 2007). For children suffering chronic illness, anecdotal evidence suggests that companion animals may help to alleviate stress and to foster coping skills (Spence and Kaiser 2002).

Particularly in the elderly whose social groups often slowly breakdown as age increases, companion animals have been found to be beneficial. A recent small qualitative study conducted by McColgan and Schofield (2007) in the UK identified that older people who own dogs gain support and companionship from their animals. They say (p. 23): 'The dogs act as social catalysts, a reason to go out walking, and a means of comfort when emotional support was needed'. Similarly, McNicholas et al. (2005 p. 1253) highlight the benefits of pet ownership in terms of promoting increased social interactions especially for people 'at risk of social isolation, such as elderly people or people with physical disabilities'. Other benefits of pet ownership for older people include maintenance of mobility (Thorpe et al. 2006) and the buffering of stress (Motooka et al. 2006).

The findings about physical activity and mobility among the elderly who own pets seem to be paralleled by research within the populous at large. Cutt et al. (2007 p. 267) cite a wide range of studies indicating that 'dog owners are more physically active ... than non-owners', although Bauman et al. (2001) and Ham and Epping (2006), while acknowledging the potential of dog ownership to promote physical activity, found the evidence was not conclusive.

Social interaction benefits of pet ownership which were identified by McColgan and Schofield (2007) and McNicholas et al. (2005) (see above) were also noted by Wood, Giles-Corti and Bulsara (2005) who reported on a random survey of 339 adults in Perth, Western Australia. However, the Perth study found that, in addition to pet-induced individual social interactions, pet ownership was associated with enhanced sense of community and social capital. The study found that as well as experiencing higher levels of social engagement, pet owners scored higher than non-pet owners on measures of reciprocity, trust and civic engagement. A later paper (Wood et al. 2007 pp. 51-52), which drew on the Perth survey data as well as qualitative data collected in 12 focus groups, identified a ripple effect in which the social interaction benefits of pet ownership extend beyond pet owners to 'the broader community and to many non-pet owners'. Given the links between social capital and health (see above), these findings support the claim that pets are health promoting.

It has been suggested also that companion animals satisfy the need for intimacy, nurturance, and contact with nature that is excluded by urban living (Bustad, 1996; National Institutes of Health, 1987; Katcher and Beck, 1987; Beck, 1983). An important aspect of pet keeping is that it provides people with an opportunity to nurture, something that is becoming rare in human society. In fact, at no time during history have humans been so devoid of healthy interaction with each other, and with their environment (Katcher and Beck, 1987; Bustad, 1996). Some authors believe that this has serious, and perhaps unknown, effects on health (Katcher and Beck, 1987; Bustad, 1996). Bustad (1996) states that deprivation of nurturing opportunities has resulted in increased stress, depression, loneliness, as well as serious overall challenges to health and wellbeing. It is probable that there are

distinct physiological and emotional changes that occur in the act of nurturing that have a positive effect on health (Katcher and Beck, 1987). To date, however, there is very little information on nurturing and the possible benefits to human health and wellbeing.

Apart from owning or caring for a pet, studies have demonstrated that the sight of a pet alone can lower stress (Friedmann et al., 1983b; Katcher et al., 1983). Research using aquariums has shown that watching fish significantly lowered blood pressure and heart rate, and produced a greater state of relaxation (in groups of subjects with normal and high blood pressure) than watching an empty tank, or staring at a blank wall (Katcher et al., 1983). Watching the fish also increased the subjects' ability to cope with subsequent stress. Looking at or stroking a pet can also lower blood pressure and make people feel more relaxed (Friedmann et al., 1983b). Friedmann et al (1983b?) examined the effect of an unknown, but friendly dog on children's blood pressure and heart rate while resting compared to the same measures taken while the children were reading aloud (a measure used to elevate stress levels). They hypothesised that the presence of the animal could make the situation and/or the experimenter appear less threatening thereby reducing physiological responses. During the experiment, the dog was present in the room but not interacting with the children. Their findings showed the presence of a pet was associated with lower blood pressure and heart rate both while the children were resting and while reading aloud (Friedmann et al., 1983b).

The role of pets in cardiovascular health has also been explored. Research by Allen, Blascovich and Mendes (2002) studied cardiovascular reactivity in 240 married couples of which half were pet owners. The study found that, in comparison with their non-pet owning counterparts, pet owners had 'significantly lower heart rate and blood pressure levels during a resting baseline, significantly smaller increases (i.e. reactivity) from baseline levels during ... [the intervention activities], and faster recovery' (p. 727). Friedmann et al. (2003) also found that pet ownership had a positive influence on autonomic control of heart rate in people who had suffered myocardial infarcts, and was therefore a factor in their long term survival.

Serpell (1991) studied the health of new pet owners over ten months. He found that pet owners reported a highly significant reduction in minor health problems during the first month following pet acquisition and this effect was sustained in dog owners for the ten months of the study. The reduction of minor health problems in dog owners indicates that the health benefits of pets may be long-term, although this has yet to be investigated (Serpell, 1991). The reason for the extended health benefits observed in dog owners is most likely due to the greater level of companionship dogs provide compared to other types of pet (Serpell, 1990; Serpell, 1991).

The companionship provided by pets may partly explain the finding that pet owners have an increased likelihood of survival after surgery (Friedmann et al., 1980; Friedmann and Thomas, 1995). Friedmann and Thomas (1995) found that both pet ownership and social support are significant predictors of survival, independent of the effect of other psychosocial factors and physiologic status, one year after acute myocardial infarction (coronary artery disease). They found that the beneficial effects of pet ownership on survival were independent of marital status or living situation. Interestingly, again dog owners had a higher survival rate than owners of other types of pet (Friedmann and Thomas, 1995).

As mentioned, one of the main reasons for increased survival rate of post-operative elderly patients who have pets is the companionship provided by their animals (Friedmann and Thomas, 1995). Elderly people, whether recovering from surgery or not, often become isolated as their social relationships and activity

levels breakdown, resulting in depression. Depression is a complex state that can affect recovery rates as well as survival (Friedmann et al., 1980). Companionship and social affiliation, however, have been shown to have positive health effects and are reliable predictors of survival after coronary surgery (Friedmann et al., 1980; Friedmann and Thomas, 1995).

Anderson et al. (1992) examined the risk factors for cardiovascular disease, and compared pet owners to non-owners at the Baker Institute, part of the Alfred Hospital in Melbourne. They looked at blood pressure, plasma cholesterol, and triglyceride values in approximately 5000 patients. They found that pet owners had significantly lower systolic blood pressure, plasma cholesterol and plasma triglycerides than non-owners; that is, pet owners had lower levels of accepted risk factors for cardiovascular disease (Anderson et al., 1992). These findings could not be explained by lifestyle and health factors such as cigarette smoking, diet, body mass index, or socio-economic status (Anderson et al., 1992).

Against the background of the fast pace of modern living, pets offer protection against stress and change by their constant nature and the positive feelings and actions they evoke in people (Beck and Katcher, 1996; Katcher and Beck, 1983). Human relationships with animals complement other human relationships (as they do many other aspects of people's lives), and are not a substitute for them, as has been suggested in the past (Manning, 1983; Katcher and Beck, 1987). In fact, most pet owners have been found to live in intact families containing both children and pets, and are not single and childless as once assumed (Katcher and Beck, 1987; Beck, 1983; Beck and Katcher, 1996).

It is now widely recognised that healing influences exist in the relationships of humans to their pets (Birch, 1993) and that people who own pets have better mental health and wellbeing than non-pet owners (Rowan and Beck, 1994; Straede and Gates, 1993). On the strength of this evidence, Rowan and Beck (1994) and others (Bustad, 1996; Katcher and Beck, 1987; Frumkin, 2001; National Institutes of Health, 1987; Fawcett and Gullone, 2001) believe that there is a pressing need for detailed and serious research of human-animal interactions in large study populations. Some authors believe that because pet ownership cannot be patented and sold as a drug, however, there has been less than satisfactory research interest and funding into the health benefits of pet keeping for individuals (Rowan and Beck, 1994). A similar scenario exists for the effect of companion animals on societal health, and here too there is enough evidence to indicate that there are many benefits to be gained (Rowan and Beck, 1994).

In terms of companion animals, parks provide an important outlet for people to interact with their pet (mostly applicable to dog-owners), both formally (e.g. training) and informally (e.g. play). An added benefit is the opportunity to also interact socially with other pet owners and park users, expanding or enhancing social networks. It is also important to emphasise the opportunity that parks provide for observing or encountering wildlife, particularly in those protected area parks that preserve the habitat of native fauna.

Wildlife

Apart from interactions with pets and other domesticated animals, humans also interact in various ways with wildlife. In the US and Canada more people visit zoos and aquariums each year than attend all professional sports events combined (Wilson, 1993). Since its opening in the year 2000, the Melbourne Aquarium boasts an annual visitation rate of one million (Oceanis Australia, 2002). In zoos and aquariums, visitors can safely view, interact with, and learn about animals that they would rarely encounter (or that are too dangerous to encounter) in the wild.

There are also increasing numbers of people seeking contact with animals in their natural environment, particularly marine mammals, such as dolphins and whales. In Port Phillip Bay in Victoria up to 15,000 visitors each summer book organised tours to view and swim with dolphins. Increasing visitor pressure from tourists is so great in fact, that concerns are mounting for the welfare (and long-term survival) of the animals (Linnell, 2002; Dolphin Research Institute Inc., n.d.).

Furthermore, in a national US survey on recreational interests (the National Survey on Recreation and the Environment conducted in 1995) birdwatching was found to be the fastest growing recreational activity (Cordell et al., 1999). Other specific wildlife watching pursuits are also emerging, such as butterfly watching and whale watching (Youth, 2000). Whale watching in particular has gained immense popularity over the last couple of decades, and is the backbone of the tourist industry in towns like Hervey Bay, Queensland. The enormous increase in wildlife-based ecotourism is indicative of the desire humans have to interact with nature, particularly animals. In fact, Lonely Planet Publications (publishers of popular international travel guides) have just published a series of guidebooks specifically for watching wildlife in a number of countries, including Australia (Lonely Planet, 2000).

A recent phenomenon of urbanisation is the number of people who go to sometimes-extraordinary lengths to feed urban wildlife in their neighbourhood. Although there is limited research on this topic to date, preliminary studies suggest that people engage in wildlife feeding not only to benefit the animals involved, but also because they themselves derive considerable benefit from the interaction. One small investigative study by Howard and Jones (2000) found that the primary reasons respondents fed wildlife were to make up for human damage to the environment, that they wanted to be near nature, and that the animals improved their quality of life. Some unpublished data also suggests that up to 38% of households in Brisbane (Queensland) feed wildlife (Thomas and Jones, 1998 in Howard and Jones, 2000), and an Australia-wide survey ('Wildwatch Australia' by the ABC's Natural History Unit, Melbourne, conducted in October 2004) found that more than 40 per cent of households feed local wildlife in their backyard at least once per week.

Wildlife carers have contact with wildlife on a daily basis. These people rescue, rehabilitate, and relocate native fauna, which is probably the most intimate, intensive, and expensive interaction that the majority of people could have with wildlife (Tribe and Brown, 2000). Although wildlife rescue often encounters controversy (in that many rehabilitated wildlife released back into the wild do not survive (Tribe and Brown, 2000)), some recent work has begun investigating the potential benefits carers may gain from their experiences with wild animals (P. Brown personal communication.). It suggests that even though carers are aware that by attempting to care for native animals they may actually do more harm than good, many feel that they themselves benefit greatly from the interaction and it significantly enhances their quality of life.

Interacting with animals has multiple positive physiological and psychological effects on human health including: decreasing blood pressure, heart rate, and cholesterol; reducing anxiety and stress, and providing protection against stress-related diseases; provision of companionship and kinship; and offering the opportunity to nurture. All of these factors improve the quality of life and health. Parks are important in providing a setting for pet-owners to interact both with their pet and with other pet-owners and park users, which can positively influence the social aspects of health. Parks also preserve the habitat of native wildlife, providing people with the opportunity to observe or encounter animals in their natural environment. Some of the main benefits with specific relevance to parks are presented in Table 2.

The human affiliation for living nature is most obvious through people's relationships with animals, particularly pets. Whether it is a close relationship experienced through pet ownership, or a profound encounter with an animal in the wild, there is little doubt that animals can positively influence human health and wellbeing.

Conclusion

Modern life is becoming more stressful each decade, reflected in the increasing rates of stress-related illnesses (e.g. depression, chronic fatigue), violence, and aggression. Many authors believe that this is partly because humans have severed connections with nature, in particular, those connections to other life forms. It begs the question, how much will human health, wellbeing, and quality of life deteriorate before current attitudes and lifestyles change?

Contact with the natural world (through active interaction or even passive contemplation) has the ability to affect human health and wellbeing in countless positive ways. As the evidence clearly demonstrates, there are immediate and long-term favourable, emotional, and physiological changes proceeding from contact with nature through animals, gardens, natural landscapes, and wilderness. Much of this contact is made accessible through parks. Knowledge of the potential benefits is not complete, however, and this is coupled with a lack of awareness in governments and the general community in governments and the general community about the health and wellbeing benefits arising from contact with nature. Yet, some authors anticipate that allowing people to interact with nature (such as spending time in parks during working hours), to reduce tension as well as increasing competence and productivity, will eventually become socially accepted and actively encouraged as an effective way of promoting health and wellbeing, and a means of enhancing quality of life.

Table 2: Some Known Health Benefits of Contact with Nature in a Park Context

Health benefit	Key references	Park example
Viewing Nature		
Improves concentration, remedies mental fatigue, improves psychological health (particularly emotional and cognitive aspects), and positively affects mood state	(Kaplan, 1995; Rohde and Kendle, 1994; Ulrich et al., 1991b; Kaplan and Kaplan, 1989)	Parks, such as Tarra Bulga National Park or Sugarloaf Reservoir, are ideal spots for picnicking as a way to view the natural environment to renew body and mind
Reduces stress and tension and improves self-reports of wellbeing (positively influencing the immune system by reducing production of stress hormones such as cortisol and corticosterone)	(Leather et al., 1998; Lewis, 1996; Rohde and Kendle, 1994; Kaplan, 1992a)	Apart from active exploration, many parks can be experienced from within a vehicle, particularly those with scenic drives such as Macedon Regional Park or Angahook-Lorne State Park
When exposed to scenes of natural environments subjects recover faster and are more resistant to subsequent stress, which also is likely to boost immunity	(Parsons et al., 1998)	All parks provide ready views of nature and parks like Albert Park and Yarra Bend Park are especially important in urban areas for stress release and wellbeing
Recovery from a stressful event is faster and more complete when subjects are exposed to natural rather than urban scenes, and heart rate and muscle tension decreases (yet it increases when viewing urban scenes)	(Ulrich et al., 1991b)	Parks near places of high stress such as prisons, hospitals, and nursing homes most likely provide many more benefits beyond purely aesthetic ones
Viewing nature improves performance in attention demanding tasks	(Tennessen and Cimprich, 1995)	Natural views are provided in urban areas courtesy of local, neighbourhood, and regional parks (many of which are managed by local as well as State government)
Viewing nature aids recovery from mental fatigue (attention restoration) and encourages reflection by requiring involuntary attention	(Herzog et al., 1997; Kaplan, 1995; 1992b; Hartig et al., 1991; Kaplan and Kaplan, 1989; Furnass, 1979)	Some parks can provide close up views of nature to aid in attention restoration, while others like Port Campbell provide views of wide, open spaces encouraging a fresh perspective on life
Views of flowers and trees in the workplace reduce perceived job stress, improve job satisfaction, and reduce the incidence of reported illness and headaches of office workers	(Kaplan and Kaplan, 1989)	As well as providing a natural view, parks in urban areas are used by office workers to take a break from being indoors, to breath fresh air, view nature, and absorb sunshine
Trees nearby: decrease levels of fear, incivilities, and violence amongst residents; decrease crime rates in public housing; and improve the life satisfaction of residents	(Kuo and Sullivan, 2001; Kuo, 2001)	The positive effects of vegetation on communities could have an impact on future park planning and park placement. Parks preserve and maintain essential habitat and ecosystems, (including trees and other vegetation)

Health benefit	Key references	Park example
Being in Nature		
Natural play settings reduce the severity of symptoms of children diagnosed with Attention Deficit Disorder (ADD) and improve concentration	(Taylor et al., 2001)	Parks within urban areas such as Yarra Bend Park or Wattle Park are easily accessible to educational groups such as schools and family or community organisations
Viewing nature enhances residents' satisfaction and makes higher density living more acceptable	(Kaplan, 2001; Rodiek and Fried, 2005; Kearney, 2006)	Parks near residential developments may provide a range of social and emotional benefits to residents
Natural surroundings assist cognitive functioning in children	(Wells, 2000)	Parks have special significance to schools, kindergartens, and childcare centres with limited green space
Wilderness areas provide spiritual inspiration, enable people to gain a fresh perspective on life, and provide an opportunity to 'get away'.	(Ward Thompson et al, 2005; Cumes, 1998; Cordell et al., 1998; Martin, 1996; Kaplan and Kaplan, 1989)	Parks of intact wilderness, such as Grampians National Park or Bay of Islands Coastal Park, can provide spiritual inspiration for local, interstate, and international visitors
Therapy in a wilderness setting heals emotional and psychological conditions and can aid those recovering from substance abuse and violence	(Russell et al., 1999; Crisp and O'Donnell, 1998; Crisp and Aunger, 1998; Bennett et al., 1997; Byers, 1979)	Large, rugged National Parks such as Wilson's Promontory are ideal for wilderness therapy excursions and Outward Bound programs where there can be many physical and mental challenges to overcome, as well as much to inspire
Outward Bound and similar programs use wilderness challenges to boost self-confidence and self-esteem	(Cumes, 1998; Furnass, 1979)	Many National Parks have minimal visitor infrastructure which is ideal for wilderness challenges or for those seeking adventure
Observing Plants and Gardens, or Gardening		
Community gardens increase community cohesion, reduce graffiti and violence and enhance self-image of residents	(Lewis, 1996; Reuter and Reuter, 1992; Lewis, 1992; 1990; Bartolomei, Corkery, Judd, and Thompson, 2003; Glover, Shinew and Parry, 2004; Parry and Shinew, 2005; Glover, Shinew and Parry, 2005.)	The most significant aspect of community gardens is the sense of ownership residents' gain. This could also apply to Friends of Parks groups who care for their local park
Gardening and gardens help people to feel tranquil and at peace	(Butterfield and Relf, 1992)	Sculptured gardens such as the National Rhododendron Gardens enable people of any mobility or ability access to plants and flowers

Health benefit	Key references	Park example
In habitat restoration people see a metaphor for their own personal transformation and growth, enhancing psychological wellbeing	(Shapiro, 1995)	Many of the Friends of Parks groups regularly carry out habitat restoration via planting and weeding workshops
Gardens improve psychological wellbeing, provide environmental stimulation, a means of self-expression, physical exercise, and social interaction for residents of retirement communities	(Browne, 1992)	Retirement communities without gardens can readily access urban parks and gardens whether highly manicured (e.g. National Rhododendron Gardens) or more natural parks (e.g. Yarra Bend Park)
Residents who have nature nearby or regularly pursue nature-related activities (e.g. gardening, birdwatching) have greater neighbourhood satisfaction, overall health and life satisfaction than residents who do not	(Frey, 1981 in Kaplan and Kaplan, 1989; Kaplan and Kaplan, 1989; (Kaplan, 2001; Kearney, 2006)	Many residents in urban areas are in close proximity to a park, yet as housing density increases, increased pressure will be placed on existing parklands
Observing/Encountering animals (pets and wildlife)		
Pets provide companionship, and an opportunity to nurture and express intimacy, as well as facilitating social networks	(Newby, 1997; Bustad, 1996; Cusack, 1988; Katcher and Beck, 1987; Cusack and Smith, 1984; Messent, 1983; Bustad and Hines, 1983; Wood et al., 2005)	Parks that permit dogs such as Albert Park and Jells Park enable dog owners to interact with their pet (on and off the leash) and to socialise with people from all age groups (including owners and non-owners)
The sight of, or touching a pet can reduce stress, decrease blood pressure and heart rate	(Katcher et al., 1983; Friedmann et al., 1983b)	Even watching or patting a pet that does not belong to you, such as may be encountered in parks, can have beneficial effects on health
Pet owners report fewer minor health problems and have better mental health than non-owners (regardless of overall health, socio-economic status and physical exercise)	(Straede and Gates, 1993; Serpell, 1991)	Parks are one of the few places outside the home that owners can freely interact with their pet and socialise with other pet owners
Owning a pet can reduce the risk factors for cardiovascular disease (systolic blood pressure, plasma cholesterol, plasma triglycerides) independent of lifestyle and other health factors	(Anderson et al., 1992)	The health of an ageing population is a pressing problem. Pet ownership may be responsible for motivating people to visit parks where they can reap many other health benefits and alleviate isolation
Observing native animals, having them nearby, or interacting with them improves quality of life	(Tribe and Brown, 2000; Howard and Jones, 2000)	Native animals are found in all parks, from urban ones like St Kilda Pier (Little Penguins and Native Water Rats), to wilderness parks like Mount Buffalo National Park (Swamp Wallabies, Gang Gang Cockatoos, etc.).

Health benefits of nature: In practice

Introduction

Further evidence for the positive effects on health and wellbeing from contact with nature is found in some unique forms of therapy based on the human relationship with nature. These forms of treatment, discussed in the preceding pages, have proven to be successful where conventional treatments have often had limited success.

Ecopsychology or nature-guided therapy

Ecopsychology or nature-guided therapy considers every aspect of the human-nature relationship. It is primarily concerned with the fundamental alienation of humans from nature and the effects on human health (Scull, 2001; Burns, 1998; Gullone, 2000). The person-environment relationship is both the unit of analysis and the basis of treatment (Burns, 1998). Although only relatively recently adopted in modern western society, ecopsychology is essentially modern interpretation of ancient views of humans and nature held by many indigenous peoples. In essence, most native cultures view humans as part of the rest of nature by believing that human beings are intricately linked to all life forms and life-like processes, and that by harming nature we harm ourselves (Burns, 1998; Martin, 1996; Knudtson and Suzuki, 1994; Suzuki, 1990; Rockefeller and Elder, 1992; Orr, 1993) (refer to earlier section on Spirituality ,Religion and Nature).

As echoed by researchers in other fields, ecopsychologists believe that disconnection from nature has a heavy cost in impaired health and increased stress (Scull, 2001; Burns, 1998; Glendinning, 1995; Katcher and Beck, 1987; Gullone, 2000). Clinical ecopsychology operates on the premise that many psychological and physical afflictions can be due to withdrawal from the healing forces of the natural world (Scull, 2001; Roszak et al., 1995; Levinson, 1969). No longer able to identify with nature and its representatives, humans find themselves in a psychological void (Nasr, 1968). However, people may be able to regain some emotional harmony by re-establishing a bond with the animate and inanimate world (Levinson, 1969; 1983).

Many western psychologists are now readily adopting ecopsychology as a form of treatment or are subscribing to its views (Burns, 1998; Durning, 1995; Hillman, 1995; Roszak et al., 1995). In fact, the field of mainstream psychology is undergoing a paradigm shift as a result of new problems brought about by urban existence and the destruction of the natural environment that are proving difficult to treat (Hillman, 1995). Australian psychologist George Burns (1998) reviewed a selection of nature-based interventions. The work cited by Burns (1998) included the following beneficial effects from contact with nature: enhancement of positive affect; stress reduction; improvement in parasympathetic nervous system functioning; and enhancement of self-concept, self-esteem, and self-confidence.

Although ecopsychological treatment usually involves excursions into wilderness, it is now recognised that any exposure to nature, such as spending time with plants and animals, or going to a park, can have positive benefits (Scull, 2001; Cohen, 2000). Burns (1998) has documented his success treating patients with simple nature-based assignments. These assignments use natural objects or natural processes that have in the past, or are likely to in the future, assist the patient with achieving a therapeutic goal. Burns (1998) has successfully treated patients suffering from a variety of negative psychological states associated with severe trauma, cancer, depression and anxiety, using nature as the basis for treatment.

Although there is a lack of scientific research in this area, in a similar way that wilderness therapy and outdoor adventure therapy also lack research evidence of their efficacy, anecdotal evidence suggests that ecopsychology is particularly successful in treating stress-related illness. However, unlike wilderness therapy and outdoor education from which the benefits may be short-term, ecopsychological treatment is believed to have more lasting positive benefits than ordinary outdoor recreation (Scull, 2001).

Stainbrook (1973, in Lewis, 1996) states that an over-urbanised, dirty environment, and a lack of natural surroundings confirms the negative self-appraisal a person may have developed through other negative contacts with society. Since self-esteem is the keystone to emotional wellbeing, a poor self-appraisal, among other factors, determines how one treats his/her surroundings and how destructive he or she will be towards themselves and others (Stainbrook, 1973 in Lewis, 1996). If the self were expanded to include the natural world, behaviour leading to destruction of natural systems would be interpreted as self-destruction (Roszak, 1995).

Hence, to suggest with the full weight of professional psychological authority that people are bonded emotionally to the earth gives a powerful new meaning into our understanding of the term 'sanity' (Roszak, 1995; Orr, 1993). Furthermore, as Levinson (1969; 1983) states, humans must remain in contact with nature throughout life if they are to maintain good mental health, not too mention their humanity. It has been proposed that the modern life as prescribed by Western Society results in adverse outcomes on the human psyche (Gullone, 2000), the full impacts of which are yet to be realised.

Attention restoration

Attention restoration theory suggests that contact with nature improves the ability to concentrate and aids recovery from mental fatigue. Mental fatigue, as mentioned earlier, can arise from extended periods of directed attention on a particular task, while shutting out distractions (Herzog et al., 1997). Symptoms include a lack of concentration, increased irritability, and a proneness to mistakes or accidents. The effect of nature on children's capacity for concentration was

studied by Taylor et al. (2001) who tested the ability of nature to improve the concentration of children diagnosed with Attention Deficit Disorder (ADD). They found that children functioned better after activities were carried out in natural play settings, and that the 'greener' a play setting the less severe were the attention deficit symptoms (Taylor et al., 2001). ADD affects many children and can have a detrimental effect on most aspects of life (including school, interpersonal relationships, personal growth etc.) (Taylor et al., 2001). It is not an easy disorder to treat, but natural settings could be used to improve children's concentration, thereby somewhat alleviating the need for drugs (that have serious side effects and do not aid children's long-term health or development) (Taylor et al., 2001). This research highlights the importance of 'green' playgrounds and the availability and access to parks and nature for childcare centres, kindergartens, and schools.

However, attention restoration is not just relevant for children, but has increasing relevance for adults in the current social and economic environment in which people are working longer hours and spending long periods of time looking at computer screens. While Hartig et al. (2003) demonstrated that natural environments have both stress reducing and attention restoration benefits for young adults (university students), a study by Herzog et al. (2002), also involving university students in the USA, found that recognition of the restorative effects of natural environments was limited. Herzog et al. (2002) suggest that strategies to address this lack of awareness should include communication of the benefits through images and narratives, and urban design which brings people closer to nature.

Wilderness experience and wilderness therapy

As well as being restorative in terms of attention enhancement and stress reduction, natural environments can also be used educationally and therapeutically for other purposes. The terminology for such activities varies, and includes 'outdoor education', 'outdoor adventure', 'wilderness experience', 'wilderness therapy', 'wilderness adventure therapy' and 'bush adventure therapy'. Whatever the terminology, participation in such activities is typically undertaken for physical, emotional and/or psychological health reasons (Mitten, 2004). However, its potential as a population-wide health promotion tool has only recently been recognised (Pryor, Carpenter and Townsend, 2005).

Challenges presented by wilderness are used in wilderness experience programs such as Outward Bound and other wilderness therapy programs to boost the self-confidence and self-esteem of participants. These programs encourage leadership ability, social cohesiveness, and facilitate an increased awareness of, and respect for, nature (Furnass, 1979). Although these benefits can be substantial and have a long-term effect on individuals, it has been claimed that they are somewhat superficial compared to the psychological and spiritual benefits that can arise from contact with wilderness itself (Cumes, 1998).

At least one wilderness program, however, draws on this aspect, namely the Wilderness Vision Quest Program, run in the United States (Easley, 1991). This program, founded in 1976, emphasises the spiritual dimensions of contact with the natural world and focuses on fostering conscious efforts to heal, enrich, and expand the human spirit (Brown, 1984 in Easley, 1991). Deeper experiences with wilderness are used in the emotional and psychological treatment of patients suffering from any number of conditions, including psychosis, substance abuse

(Bennett et al., 1997) or violence, and injury (Beringer, 1999; Crisp and O'Donnell, 1998). The combination of physical activity and social connection in the context of the natural environment has been found to be effective in preventing both the onset and the escalation of depression (Crisp and Hinch, 2004). However, the multifaceted nature of the outcomes of such programs (particularly their broader social and environmental wellbeing outcomes) is often forgotten in the intense focus on the outcomes for individual participants. 'When small groups of people adventure together in natural environments, the health and wellbeing of humans, communities and the natural environment are enhanced' (Pryor, Carpenter and Townsend, 2005 p. 11).

This area is only just beginning to be understood and no appropriate terms exist for the powerful effect of nature on the human psyche, although the term 'wilderness rapture' has recently been suggested by Cumes (1998). More thorough research on wilderness therapy programs is required, particularly to determine whether beneficial effects on participant's lives are long-term. One commonly reported outcome of wilderness therapy is that self perceptions and perceptions about the one's relationship to the natural world change (Kaplan and Kaplan, 1989). This can assist people in finding meaning or higher purpose in life.

Some of the most important wilderness areas worldwide are contained in parks. Those parks that have minimum facilities or infrastructure are ideal settings for wilderness therapy or wilderness adventure. For example, many National Parks and all of the Wilderness parks in Victoria (like Big Desert and Wabba Wilderness Park) although designed for conservation, are also ideal for self-reliant recreation and the use of wilderness for therapeutic purposes.

Horticultural therapy

Historically, plants are associated with healing (Lewis, 1996) and the medicinal properties of plants used by ancient societies are still employed in the present day (e.g. traditional Chinese medicine, naturopathy). However, the use of plants in mental health therapy has now also been well established by the field of horticultural therapy (Frumkin, 2001; Relf, 1992; Lewis, 1996). The restorative and therapeutic aspects of gardening are being used in a wide range of settings including hospitals where they are often referred to as 'healing gardens' (Hartig and Cooper-Marcus 2006 p. 536), geriatric centres, drug rehabilitation centres, prisons, and schools for the developmentally disabled (Lewis, 1990).

In a study conducted in retirement communities, residents had a strong preference for natural landscapes and in fact, 'pleasantly landscaped grounds' were a determining factor in their choice of retirement home (Browne, 1992). The same study described how contact with plants (and nature) affected wellbeing. Five benefits were identified: psychological wellbeing, environmental stimulation, self-expression and personalisation, motivators for physical exercise, social interaction and networking (Browne, 1992). Similarly, the use of horticultural therapy within a residential facility for people experiencing ongoing mental health problems, has provided benefits in terms of encouraging social interaction, providing opportunities for creativity and self-expression, and increasing self-esteem and confidence (Parker 2004).

According to Reid (2006), holistic design is being recognised increasingly as an essential feature of healthcare facilities. Johnson (2007 p. 40) quotes CEO of Samaritan Lebanon Community Hospital in Oregon, USA, Becky Pape: 'We now know that exposure to nature is not just a nice thing—it's essential ... We'll never

build anything the way we did it before when it was all about technology'. Those involved in hospital design are experiencing an increase in demand for designs incorporating nature (Johnson p. 40). The increasing popularity of therapeutic gardens within hospitals is supported by a study which found that visiting the garden associated with a children's hospital was a restorative experience (Whitehouse et al. 2001). Pilot data collected in a later study of the same facility (Sherman et al. 2005 p.181) revealed positive benefits in terms of 'anxiety, sadness, anger, worry, fatigue, and pain' when comparing those inside the gardens with others inside the hospital building. Some healing gardens are reported to serve a dual purpose: as a place of prayer for those of faith, and as a place of nurture for others. In one facility for Alzheimer's patients, a 'wandering garden' featuring a secure area for walking through a garden of non-toxic plants helps to evoke memories and to reconnect patients with the world (Rauma 2003). Similar 'wander gardens' have been used elsewhere with patients undergoing post-stroke rehabilitation, and have been shown to be beneficial for stimulating both mental and physical functions (Detweiler and Warf 2005).

There is also evidence of benefits from therapeutic gardens/gardening in detention facilities. One study undertaken at a prison found that inmates regularly damaged buildings and/or were aggressive towards prison staff, but never destroyed plants that they themselves had grown (Lewis, 1990; Lewis, 1996). Lewis (1996; 1990) reports that the plants seemed to have a calming effect on even the most hardened inmates, and were used for therapy, rehabilitation and job training. Kaplan and Kaplan (1989) noted that working with plants gave inmates responsibility, and they experienced a sense of accomplishment that notably enhanced self-esteem (Kaplan and Kaplan, 1989). A review of therapeutic gardening at a juvenile detention facility in Texas (Sandel 2004) found benefits in terms of improved social skills, increased self-esteem, anxiety reduction, increased patience and an improved capacity for delaying gratification. It is also believed to have benefits for staff as a result of a reduction in aggression in inmates and a corresponding reduction in stress for staff.

Horticultural therapy is based on our emotional responses to nature, in this case to plants. Sensory gardens used in horticultural therapy provide people with a range of ways to respond to the plants and the setting, using the five senses (Lynch 2005). Plants, like animals, are non-judgmental, non-threatening, and non-discriminating, and can be an effective means of reaching someone who is not responding to conventional treatment (Lewis, 1996). The growth of plants has a universal attraction in that it presents opportunities for interaction at a number of levels of intelligence, skill, and maturity (Lewis, 1996). Of course, different people have different responses to nature, and what works for some may not work for others. Despite this, advocates for horticultural therapy rely on the innate connection that human beings have with living nature and the positive feelings that plants evoke within people (Lewis, 1996). Horticultural therapy has been found to be highly beneficial, particularly to people with disabilities and to the elderly (eg. Pachanal, McWha and Arathoon 2003; Heliker, Chadwick and O'Connell 2000). Such therapy has the capacity to be adapted to meet the cultural needs of participants. For example, Hoban (2004 p. 53) reported that an aged care facility for Asian residents in Seattle had incorporated 'Asian vegetables and herbs that later are used in a cooking activity'.

However, although there appear to be health benefits to be bestowed on all age and ability groups in the act of gardening, further empirical research is warranted (Relf 2005; Söderback, Söderström and Schäländer 2004). It is likely that many of the benefits of horticultural therapy are experienced also by members of Friends of Parks and other environment groups, although, as mentioned, the health of these groups has not yet been investigated.

Animal Assisted Therapy (AAT) can be defined as a 'tool' that utilizes the human-animal bond in goal-directed activities that are part of the therapeutic process. AAT is viewed as one of the most recent additions to holistic medicine, although it is not a new phenomenon (Beck and Katcher, 1996; National Institutes of Health, 1987). For example, animals were used as treatment in Ancient Greek times, and more recently in 1792 at the York Retreat in London, where they were used to 'enhance the humanity of the emotionally ill' (Beck and Katcher, 1996) and to reduce the use of drugs and restraints (National Institutes of Health, 1987). However, the use of AAT as part of the standard medical treatment of patients is quite limited, perhaps because of a perceived lack of theoretical basis and evidence of 'scientifically measured physiological parameters' (Odendaal 2000 p. 275). Instead, according to Odendaal (p. 279), AAT has been seen 'as a placebo effect ... treatment that is used for its ameliorative effect on a system or disease, but that actually is ineffective or is not specifically effective for the condition being treated'. Odendaal's research challenged this view and identified a 'physiological basis for affiliation behaviour between humans and dogs' (p. 278), finding during human-dog interaction elevated levels of neurochemicals and hormones which typify chemical changes associated with social bonding.

According to Heimlich 2001 p. 50), another factor involved in the lack of 'full acceptance into the therapeutic mainstream' of AAT has been 'the lack of quantitative data assessing its effectiveness. Heimlich highlights the difficulties of collecting that data, especially with participants who have 'severe mental impairments' (p. 50). In Heimlich's study, these difficulties were compounded by problems with the consistency and reliability of the measurement tools, less than optimal administrative support for the program, and stress within the therapy animal. However, these problems are not evident in all AAT programs, and strategies are available to address these issues. For example, the use of the 'diamond model' (involving the presence of four players in all AAT sessions—animal, handler, health professional and client) serves as a way to engage animals in therapy sessions whilst maintaining a close watch on the animal to avoid undue stress.

Despite the concerns raised by Heimlich, a number of studies have found that animals are effective tools in treatment situations as they help make the therapist and/or therapy appear less threatening (Beck et al., 1986). For example, it is reported that the use of AAT may help to alleviate fear and anxiety in psychiatric patients facing treatment with electroconvulsive therapy (Barker, Pandurangi and Best 2003). Miller and Ingram (2000) report on the use of AAT as a method of relaxation for preoperative and perioperative patients. They cite the example of a patient awaiting coronary artery bypass surgery the next day, who told visiting family members that she would not survive the surgery. She was encouraged to accept a visit from the hospital's therapy dogs, and (after the successful surgery) credited the dogs with her survival: 'Visiting with the therapy dogs the night before surgery reminded me that I needed to get better to get home to take care of my own animals' (p. 477). Other benefits identified by Miller and Ingram include: comfort for family members; comfort for staff members; motivation to participate in rehabilitative activities; and reduced need for pain control medication.

One study found that people pictured with animals are perceived as friendlier, happier, bolder, and less tense (Lockwood, 1983). In a study with psychiatric patients, Beck et al. (1986) matched two groups of patients for group therapy but provided one group with four caged finches. The group with the caged birds had improved attendance rates for group meetings and greater participation of

patients in group activities. Similarly, in a study by Marr et al. (2000), the presence of visiting animals in rehabilitation sessions with psychiatric inpatients with dual diagnosis (mental illness and drug/alcohol abuse) was dependent on the absence of disturbance in the group. Outcome measures showed significantly improved social interactions within the group. Other research has also found that the use of AAT as part of occupational therapy (for example) can motivate people to participate in therapy sessions (Velde, Cipriani and Fisher 2005).

In contact with animals, patients have an immediate emotional reaction drawing them out of themselves and making them more receptive to therapy and the therapist (Beck and Katcher, 1996). Professional therapists have come to value animals as therapeutic aids in treating simple problems such as loneliness in the elderly, as well as more complex disorders such as severe autism in children. In fact, animals are being used in therapeutic ways in many human institutions, from nursing homes to prisons (Beck and Katcher, 1996). A Canadian case study of the use of AAT in the treatment of aphasia (a communication disorder) following brain injury indicates that the presence of the therapy dog prompted higher levels of animation and communication, and seemed to be 'a catalyst to improve both verbal and nonverbal communication skills' (LaFrance, Garcia and Labreche 2007 p. 223). Similar findings emerged from case study research in USA, involving three participants suffering aphasia following left-hemisphere strokes (Macauley 2006). Macauley (p. 364) reports: 'the presence of the dog motivates the people to communicate and may even help provide them with something to talk about'. In Hungary, a small study of long term AAT with institutionalised middle-aged schizophrenia patients found positive impacts on activities of daily living 'not only during the therapeutic sessions but also in the everyday life' (Kovács et al. 2004 p. 485).

At Purdue University in the US, researcher Nancy Edwards found that the presence of brightly coloured fish in aquariums improved the behaviour and eating habits of people with Alzheimer's disease (Gaidos, 1999). She found that after four weeks exposure to the fish tanks, disruptive behaviour by patients decreased and they appeared more relaxed. Dr. Edwards felt the use of fish tanks in nursing homes may help reduce the need for nutritional supplements and medication required to calm disruptive patients (Gaidos, 1999). Reporting on a small Japanese study of AAT with dementia sufferers, Motomura, Yagi and Ohyama (2004) noted that AAT appeared to reduce patients' apathy and thereby increase their levels of activity and social interaction. Research currently being undertaken by The University of Queensland's Australasian Centre on Ageing, using AAT with older people suffering from Alzheimer's disease, appears to be producing promising results. According to the Deputy Centre Director, 'this type of therapy has the potential to greatly improve the quality of life of Alzheimer's patients' (Kidd 2007).

That animals may reduce the costs of caring for elderly people has also been suggested elsewhere (Bustad and Hines, 1983). Bustad and Hines (1983) state that companion animals could potentially permit the elderly to live independently in their homes longer, to experience better health, and reduce dependence on medication.

In other AAT scenarios, animals can help patients who have become suddenly disabled through accident or injury in the transition to a different way of life (that is often more restrictive) and can provide a new meaning or focus for life (McCulloch, 1983). This is achieved by giving the patient a sense of dignity and self worth, as well as a source of unconditional love (McCulloch, 1983). As McCulloch (1983) states, if animal assisted therapy offers hope for relief of human suffering, it is our professional obligation to explore every possible avenue for its use. Discussing the use of therapy dogs within paediatric wards of hospitals and

within classrooms, Jalongo, Astorino and Bomboy (2004 p. 16) described AAT as 'a surprisingly powerful, positive force on children's physical health, psychological well-being, social interaction, and academic achievement'.

Hippotherapy (or equine assisted therapy) is AAT using horseback riding. Studies of the effectiveness of hippotherapy for children with cerebral palsy have shown significant improvements in muscle activity, as well as benefits in terms of fun and social activity (Benda et al. 2003; Liptak 2005). According to All, Loving and Crane (1999 p. 54):

Horseback riding, out in the fresh air and away from facilities associated with chronic illness and disability, imparts a sense of general well-being. The world expands instead of shrinking, as is common for those with a disability. The excitement of riding stimulates the rider, encouraging him/her to talk about it and thus increases one's interest in life. Riding encourages risk taking, development of patience, emotional control and self-discipline, sense of normality, and expansion of the locus of control.

On the basis of the existing evidence of effectiveness of AAT, it has been suggested that AAT should be considered for use with other population groups, including survivors of sexual assault who are suffering Posttraumatic Stress Disorder (Lefkowitz et al. 2005) and with people with eating disorders (Christian 2005).

However, AAT also has application among people with no cognitive or other specific impairment. Dogs and birds are being used to assist in the rehabilitation of prisoners (Adams, 2001; Pfankuch, 1999; Roberts, 1999; Washington State Correctional Center for Women, 1998). There are now several prison pet-placement programs operating both overseas (e.g. the 'Birdmen' of Pollsmoor Prison in South Africa) (Adams, 2001) and in Australia (e.g. Women inmates training guide dogs at the Northfield Prison Complex) (Beck and Katcher, 1996). It is thought that by caring for a living creature and assuming responsibility for its needs, inmates regain their compassion. This can aid in their recovery for release back into society.

A recent Italian study (Colombo et al. 2006) involved 144 elderly residents within aged care facilities being assigned to one of three groups: a group receiving a canary; a group receiving a plant; and a group receiving nothing. After three months, the mental state and perceived quality of life of participants was compared with baseline data. Although 'the group that received a plant seemed to benefit from the experience, they did not achieve the same positive results ... exhibited by the group that received a pet' (p. 207).

Conclusion

The success of nature-based therapy in treating patients who are severely physically and/or mentally unwell is indicative of the powerful effect that nature can have on the psychological, spiritual, and physical aspects of human health and wellbeing. It implies that there are benefits to be gained from nature across the board, to all humans, regardless of their health status. Furthermore, the ability of these programs to encourage healing through a holistic approach and achieve success where other, more traditional, methods have failed should be enough to prompt further research in this area and encourage modern medicine to adopt a more holistic attitude towards human health and wellbeing.

Principal health outcomes

Below is a summary of the main benefits to the health and wellbeing for individuals and communities that arise from contact with nature. The benefits are summarised into the Australian Institute of Health and Welfare's seven dimensions of holistic health (Australian Institute of Health and Welfare, 1998), including: 1) biological/mental wellbeing; 2) social/community wellbeing; 3) economic wellbeing; 4) environmental wellbeing; 5) life satisfaction; 6) spiritual/existential wellbeing; and 7) 'other characteristics valued by humans'. As the components of health are interrelated, there is some overlap.

1 **Biological and mental wellbeing**

- Contact with nature provides a sense of wellbeing and positively influences immunity and cardiovascular function;
- Contact with nature reduces the magnitude of the physiological response to stress and enhances the ability to cope with, and recover from, stressful episodes;
- Some positive physiological effects of viewing nature include reduction of heart rate, muscle tension, blood pressure, and skin conductance;
- Viewing or touching a pet or animals reduces stress, decreases blood pressure and heart rate;
- Views of nature improve psychological health, particularly emotional and cognitive;
- Natural surroundings assist cognitive functioning in children (including reducing the symptoms of attention deficit disorder);
- Views of nature improve performance in attention demanding tasks and can restore concentration/attention;
- Nature and parks promote healing in patients suffering from severe trauma, cancer, depression, anxiety, and other life-altering afflictions;
- Pet ownership can reduce the risk factors for heart disease (systolic blood pressure, plasma cholesterol, plasma triglycerides) independently of lifestyle and other health factors;
- Views of nature reduce self-reports of illnesses, such as headaches and digestive disorders, in people who live or work in confined, indoor spaces (such as offices and prisons);

- Nurturing living organisms may have distinct beneficial physiological (and emotional) responses that improve overall health and wellbeing;
- Contact with nature improves self-awareness, self-esteem, self-concept, and positively affects mood state, which have positive flow-on effects to physiological state (such as boosting immunity);
- Contact with nature is effective in alleviating the symptoms of anxiety, depression, and psychosomatic illness (including irritability, restlessness, insomnia, tension, headaches, and indigestion);
- Pet ownership and interacting with plants (i.e. via gardening) encourages individuals to undertake physical exercise;
- Pet-ownership can improve mental health by providing companionship (regardless of overall health, socio-economic status, or physical exercise).

2 Social and community wellbeing

- Interacting with nature or participating in nature-based activities in one's local neighbourhood (such as Friends of Parks groups) can promote a sense of community, foster a sense of belonging or sense of place, and enhance social ties/relationships;
- Pet ownership can foster social relationships through contact with other pet owners (or park users), thereby expanding social networks;
- Contact with nature reduces the stresses associated with urban living (such as crowding, noise, pollution, etc).
- Natural environments foster social capital within neighbourhoods by providing settings for groups to meet formally and informally for recreational or leisure pursuits;
- Where community members are engaged in civic environmentalism (for example, Friends of Parks and other community volunteer groups) there are significant spin-offs for social connectedness and social capital;
- Residents who have nature nearby, or who regularly pursue nature related activities have greater neighbourhood satisfaction, and have better overall health than residents who do not;
- Nature in high density urban living can reduce vandalism, violence, crime rates, ease racial tension or prejudices, and result in neighbourhood and personal transformation;
- Contact with nature can foster a sense of identity and ownership, and provide a sense of integration rather than isolation for newly arrived migrants;
- Horticultural therapy and animal-assisted therapy programs in prisons (via contact with plants or animals) can reduce aggression and vandalism in inmates, provide job training, and enhance self-esteem.

3 Economic wellbeing

- Views of nature from detention centres and prisons have the potential to reduce the incidence of illness (particularly stress related illness) in inmates, reducing health care costs in prisons;
- Views of nature from hospitals and other care facilities (such as nursing homes) have the potential to reduce recovery time (number of days spent in hospital), reduce the quantities of medication required to treat patients, and reduce incidences of post-operative surgery in patients;

- Contact with nature improves job satisfaction, overall health, and reduces job stress in the workforce as well as reducing number of sick days and employee absences;
- Parks and natural features attract businesses;
- Trees in urban streets attract consumers and tourists to business districts, and are seen to increase appeal;
- Tourism is the third largest industry worldwide, with growth occurring particularly in wilderness or nature-based tourism;
- Parks and nature tourism generate employment in regional areas;
- Significant natural features, including parks and gardens, raise real estate values;
- Contact with nature can potentially reduce the burden of disease on the current health care system. For example, for pet ownership alone preliminary estimates of savings to the health care system are between AUD\$790 million to AUD\$1.5 billion annually (Headey and Anderson, 1995);
- Views of nature from detention centres and prisons have the potential to reduce the incidence of illness (particularly stress related illness) in inmates, also reducing health care costs in prisons;
- Interaction with nature encourages a holistic/ecological approach to health, giving people a sense of control over their own health and wellbeing which may lead to less reliance on health care services.

4 Environmental wellbeing

- Greater financial and in kind support for parks will assist conservation and improvement of the natural (indigenous) values of parks;
- Increased participation in 'Friends of Parks' and other volunteer groups may improve natural values/capital within parks
- Improved understanding of the need for natural areas may lead to green corridors and extended conservation areas
- Greater awareness of the human health and wellbeing benefits of nature may improve conservation of additional natural spaces (such as those set aside for industry, for example).

5 Life satisfaction

- Contact with nature reduces the incidence of negative feelings such as anger, fear, anxiety, and frustration, and induces peace of mind;
- Contact with nature, or having nature nearby, improves quality of life, work satisfaction, and the coping ability of residents in urban areas;
- Natural environments foster a state of reflection, enabling one to gain perspective on life, and create an awareness of one's surroundings;
- Knowing that nature is nearby (particularly animals) improves quality of life and neighbourhood satisfaction of residents;
- Contact with wilderness can develop leadership abilities, which translate positively into other areas of life;

6 Spiritual / existential wellbeing

- Nature provides spiritual inspiration, enabling people to gain a different or deeper perspective on life, for example by the realisation that they are part of something larger and universal;
- Contact with nature can inspire feelings of peace, oneness, connectedness, and strength;
- Nature is important to all people/cultures, in 'developed' and 'undeveloped' nations, for providing spiritual inspiration;
- Contemplation of nature can inspire a sense of freedom, reverence, encourage humility, prompt introspection and reflection on personal values, and lead to spiritual growth or enlightenment;
- Spirituality arising from contact with nature can reduce psychosis, substance abuse, and heal those suffering from violence and/or injury.

7 Other characteristics valued by humans

- Parks and nature are an affordable, non-elitist, highly accessible means of improving community health that may help people reach their full potential;
- Parks are a public resource yet to be fully utilised for individual and community health and wellbeing.

Policy outcomes

Parks, nature and triple bottom line reporting

Triple bottom line reporting is a framework for measuring and reporting corporate performance against economic, social, and environmental parameters (SustainAbility Limited, 2002; Elkington, 1997). With their environmental and social focus, park management agencies were perhaps some of the earliest organisations to pursue the triple bottom line, before it was popularised as such. As it has become established in the business community, however, park organisations have almost seamlessly updated their approach to conform to contemporary triple bottom line concepts.

In parks management, the social bottom line previously has been satisfied by tailoring parks to visitor/user needs, enabling access for all user groups, supporting extensive volunteer and community projects (particularly Friends groups and providing community grants), providing education and interpretation, and promoting and protecting significant environmental and cultural heritage sites. Now, parks have the opportunity to expand their social bottom line in terms of the key role they play in human health and wellbeing.

Human health and wellbeing is taking on an expanded role in triple bottom line reporting and sustainability. In fact, it has been hailed as one of the key indicators for sustainable development (Kickbusch, 1989a). What is needed, however, is a focus on social equity, social investment, and social innovation in health and environment policy (Kickbusch, 1989b). By promoting the health benefits of interacting with nature, and assuming a role in public health, parks could provide the innovation required.

The triple bottom line and public health

The triple bottom line is almost effortlessly integrated into public health if an ecological approach to public health is adopted. Public health requires an expansion of the knowledge base underlying environmental health to include the triple bottom line of social, economic, and environmental outcomes in

interpreting human/environment interactions (Brown, 1996). In other words, these two disciplines can easily be combined in order to satisfy the requirements of the triple bottom line. Furthermore, it is important that the scope is broadened to include links between global, national, and international scales (Brown, 1996). This is echoed in the concept of biohistory established by Professor Stephen Boyden (Boyden, 1992; Boyden, 1996; Boyden, 1999) relating to global human health, and its total reliance on the health of the biosphere. As Boyden (1999) states, human society and culture have the capacity to affect the biosphere, both positively and negatively, and vice versa.

The triple bottom line concept is essentially the principles of an ecological theory of health put into practice. It entails enhancing individual and community health, wellbeing, and welfare by following a path of economic development that does not impair the welfare of future generations; providing for equity between and within generations; and protecting biodiversity and maintaining essential ecological processes and life support systems (Brown, 1996).

Recommendations

It is clear from the evidence that humans have strong ties to nature that includes physical, mental, and spiritual ties. Understanding how and why has partly been explained by theories such as biophilia, but researchers are still a long way from knowing all of the answers. More work is needed. Unfortunately, if governments, other decision-makers, and individuals wait for complete knowledge before changing current policies and lifestyles that are not sustainable, it may damage the health of the biosphere beyond repair, with potentially devastating consequences for humans.

As an outcome of the findings reported here, recommendations to governments, planners, park management bodies, and health policy makers are:

1 Support further research

Further 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 research into the benefits to individuals and communities to be gained from contact with nature. Specifically, research should be focused on:

- a collecting further empirical evidence demonstrating the health and wellbeing benefits of contact with nature;
- b exploring new opportunities for application of the health and wellbeing benefits of contact with nature by investigating nature-based interventions to address existing and emerging health problems;
- c exploring opportunities for using the health and wellbeing benefits of contact with nature as a preventive 'upstream' health measure.

2 Encourage and facilitate the repositioning of parks

- a By **communicating** to governments and the wider community that:
 - contact with nature is essential to human health and wellbeing;
 - through providing access to nature, parks improve and maintain human health and wellbeing (both at an individual and community level);
 - by improving and maintaining human health and wellbeing, parks have the potential to reduce the burden on the health care system;
 - contact with nature and parks facilitates an holistic/ecological approach to health and wellbeing that is beneficial to individuals and society, as well as the environment;

- through providing an holistic/ecological approach to health, contact with nature and parks reinstate people with a sense of empowerment and control over their own health and wellbeing.
- b By **educating** government departments, health professionals, and the wider community:
- as to how the above can be applied for improved health and wellbeing;
 - about how to incorporate this knowledge into public health policy and health promotion;
 - about how to collaborate in the pursuit of common goals;
 - about the need for broadening the knowledge base in this area (via further research) for future dissemination.
- c By **facilitating** the engagement of the community with nature in order to re-establish the importance of nature in people's lives and cultivate a holistic attitude towards life and health:
- by the communication and education outlined above;
 - by continued exploration of the benefits to individuals and communities to be gained from contact with, and preservation of, nature through parks and other reserves;
 - by fostering park management practices which support community engagement with nature.

3 **Develop ways of integrating parks and nature into public health**

- a Cooperation through a partnerships approach is required between government departments, park management agencies, health professionals, and researchers to successfully integrate parks and nature in public health;
- b Health promotion agencies have already recognised the need for innovative, 'upstream' approaches to health and wellbeing, and are seeking potential alliances/opportunities to this end;
- c It may be beneficial to initiate this process by examining how contact with nature via parks could be used as a preventive measure, potentially contributing to, for example, the Australian National Health Priority Areas of Cardiovascular Disease and Mental Health;
- d The use of parks and nature to improve health and wellbeing is supported by the Jakarta Declaration (World Health Organization, 1997) and its predecessor, the Ottawa Charter for Health Promotion (World Health Organization, 1986) which calls for creating supportive environments (both natural and social) and a reorientation of health services to be shared among individuals, community groups, health professionals, health service institutions, and governments.

Appendix—Key Assertions

The following is a summary of some key assertions about the health benefits of interacting with nature based on current knowledge, as a guide for further research.

Evidence key A = Anecdotal, T = Theoretical, E = Empirical

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	✓	✓	✓	(Frumkin, 2001; Beck and Katcher, 1996; Rohde and Kendle, 1994; Ulrich et al., 1991; Parsons, 1991; Friedmann et al., 1983a; Friedmann et al., 1983b)
Natural environments, such as parks, foster recovery from mental fatigue and are restorative	✓	✓	✓	(Kaplan, 1995; Hartig et al, 1991; Kaplan and Kaplan, 1990; Kaplan and Kaplan, 1989; Furnass, 1979)
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	✓	✓	✓	(Fawcett and Gullone, 2001; Crisp and O'Donnell, 1998; Lewis, 1996; Russell et al 1996; Beck et al, 1986; Katcher and Beck, 1983; Levinson, 1969)
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		✓	✓	(Herzog et al, 2000; Newell, 1997; Parsons, 1991)
The majority of places that people consider favourite or restorative are natural places, and being in these places is recuperative	✓	✓	✓	(Herzog et al, 2000; Herzog et al, 1997; Newell, 1997; Korpela and Hartig, 1996; Rohde and Kendle, 1994; Kaplan and Kaplan, 1989)
People have a more positive outlook on life and higher life satisfaction when in proximity to nature (particularly in urban areas)	✓	✓	✓	(Kuo, 2001; Kuo and Sullivan, 2001; Kaplan, 1992a; Leather et al, 1998; Lewis, 1996; Kaplan and Kaplan, 1989)
The majority of health problems society will face, now and in the future, are likely to be stress-related illnesses, mental health problems, and cardiovascular health problems	✓	✓	✓	(Commonwealth Dept of Health and Aged Care and Australian Institute of Health and Welfare, 1999; Australian Institute of Health and Welfare, 1998)
Social capital is decreasing and is likely to continue to decline	✓	✓	✓	(Putnam, 1995)
Exposure to natural environments, such as parks, enhances the ability to cope with and recover from stress, cope with subsequent stress, and recover from illness and injury	✓	✓	✓	(Parsons, 1991; Ulrich et al, 1991; Ulrich, 1984)
Observing nature can restore concentration and improve productivity	✓	✓	✓	(Taylor, et al, 2001; Leather et al, 1998; Tennesen and Cimprich, 1995)
Having nature in close proximity (e.g. urban or national parks), or just knowing it exists, is important to people regardless of whether they are regular 'users' of it	✓	✓	✓	(Cordell et al, 1998; Kaplan and Kaplan, 1989)

What the research demonstrates with promise

Assertion	Evidence			Key Reference/s
	A	T	E	
People have an innate affiliation with nature that enhances health, and humans rely on nature intellectually, emotionally, physically and spiritually	✓	✓		(Fawcett and Gullone, 2001; Frumkin, 2001; Roszak et al, 1995; Kellert and Wilson, 1993; Katcher and Beck, 1987; Wilson, 1984)
There may be a genetic basis to human affiliation with, and attraction for, nature	✓	✓		(Kellert, 1997; Newell, 1997; Kellert and Wilson, 1993)
Separation from nature via modern living is detrimental to human development, health, and wellbeing	✓	✓		(Frumkin, 2001; Scull, 2001; Stilgoe, 2001; Kellert, 1997; Katcher and Beck, 1987)
Regular contact with nature, such as provided by parks, is required for mental health		✓		(Roszak, 1995; Levinson, 1983; Levinson, 1969)
There are psychological and physiological benefits to health from the act of nurturing living things (including plants, animals, and humans)	✓	✓		(Kellert, 1997; Bustad, 1996; Wilson, 1993; Lewis, 1992; Katcher and Beck, 1987)
Nurturing is an essential part of human development, and lack of opportunities to nurture may be detrimental to health and wellbeing	✓	✓		(Kellert, 1997; Bustad, 1996; Wilson, 1993; Lewis, 1992; Katcher and Beck, 1987)
Too much artificial stimulation and lack of exposure to natural environments, such as parks, can cause exhaustion and reduce vitality		✓		(Stilgoe, 2001; Parsons, 1991; Katcher and Beck, 1987; Furnass, 1979; Stainbrook, 1973, in Lewis, 1996)

What research is required

Assertion	Evidence			Key reference/s
	A	T	E	
Theoretical and/or empirical evidence on whether human health is affected by lack of opportunities to experience nature	✓			(Frumkin, 2001; Stilgoe, 2001; Kellert, 1997; Katcher and Beck, 1987)
Theoretical and/or empirical evidence on whether the destruction of the natural environment directly affects human health and wellbeing and is linked to the prevalence of mental disorders in modern society	✓			(Roszak et al, 1995)
Anecdotal and/or empirical evidence on the importance of parks to the community in terms of health and the actual health benefits people derive from parks		✓		(Kickbusch, 1989)
Theoretical and/or empirical evidence on the role that natural environments (natural capital) play in facilitating social and human capital, and the outcome/s in terms of health	✓			(Frumkin, 2001; Putnam, 1995)
Empirical evidence on the role of nature in wilderness and adventure therapy	✓	✓		(Crisp and O'Donnell, 1998; Crisp and Aunger, 1998)
Evidence on whether the health and life satisfaction of some population groups (e.g. Friends of Parks groups, park volunteers, wildlife feeders and carers, or birdwatchers) is greater than others, where those groups have regular contact with nature/wilderness via parks	✓			(Townsend and Maller, 2003; Townsend, 2006; Moore, Townsend and Oldroyd, 2007)
Evidence on the extent, nature and process of the impact of nature and parks in maintaining psychological health	✓			(Krenichyn, 2005; Wood et al., 2008)
Evidence on the extent, nature and process of the impact of nature and parks on quality of life (and happiness)	✓	✓		(Wood et al., 2008; Ho et al., 2005; Louv, 2005)
Evidence on whether exercise carried out in natural settings (parks) has greater health benefits than indoor exercise	✓	✓	✓	(Pretty et al., 2007)

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