



*Needing Trees:*  
**The Nature of Happiness**



A research report commissioned by Planet Ark and sponsored by Toyota Australia.

## Foreword

### Engagement With Nature

'Happiness' is a much misused term in modern society. Through the mass media and marketing, we are constantly bombarded with the idea that our happiness depends on possession of particular products, achievement of wealth and status, participation in exotic experiences. Magazines and movies are filled with images of 'beautiful' people – tall, slim, finely featured, expensively-dressed – whose apparent happiness leads us to thinking that we too can be happy only if we become like them. If this is true, then many of us who are (for example) short, not especially beautiful in looks, neither wealthy nor famous, seem doomed to a life of unhappiness. But is this popular depiction of happiness correct?

The Journal of Happiness Studies draws attention to the fact that there are two key aspects of human happiness: our satisfaction with life (that is, how well life measures up to what we expect it to be) and our enjoyment of life (our mood).

One of the problems with the portrayal of happiness in our society (depicted above) is that it focuses on 'extrinsic aspirations' – aspirations for those things that in themselves are not inherently satisfying but which rely on satisfaction based on their ability to elicit admiration from others. There is, of course, a problem with such a focus – it feeds an upward spiral of acquisitiveness that leaves us perennially trying to 'keep up with the Joneses' and, thus, perennially dissatisfied with our current situation.

Research cited in this Planet Ark report highlights the fact that engagement with nature can counteract this tendency by promoting 'intrinsic aspirations' – the adoption of goals which are inherently satisfying, such as personal development and social connectedness. My own research and my personal experience tells me that engagement with nature also fosters concern to ensure the protection of our planet for future generations – a critical issue in the context of current environmental degradation – and promotes wellbeing, as well as physical health.

But the second aspect of happiness – mood – is also strongly impacted by contact with nature. Over recent years, I have (with colleagues) been involved in research into the impacts of environmental volunteering. Using scales to measure mood before and after hands-



on environmental activities, that research has shown (almost without exception) that people's mood improves after engagement with nature.

In 1894, John Muir wrote: "Climb the mountains and get their good tidings. Nature's peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you, and the storms their energy, while cares will drop off like autumn leaves". Muir's message is as true today as it was more than 120 years ago: in this world in which we are constantly bombarded with bad news stories and messages that we need to acquire more and more, we need trees and nature to focus our goals, to truly satisfy our needs and to lift our moods. Nature contact is the true elixir of happiness!

**Dr Mardie Townsend**  
Deakin University



## Foreword

# Insights on Nature and Happiness

I spend a lot of time immersing myself in nature and the beach is somewhere I'm naturally drawn to. The ocean is a place where I feel truly nurtured, where I learned to go with the flow and get in touch with what's important. Throughout my life, nature has helped me maintain a healthy balance.

I loved the outdoors as a kid – I was a very hyperactive child so the best way to expend energy was by being physically active. My love of the beach has definitely been influenced heavily by my upbringing and being introduced to surfing as a four-year-old. I love having sand between my toes, the sun on my face and the water on my skin. It makes me feel so alive.

When there's no ocean around I find that as long as I can take my shoes off and walk barefoot in the grass, or breathe fresh air or experience sunshine, it just brings me back to the moment, gives me a sense of fulfilment and happiness and reduces my stress and anxiety. Being in nature is incredibly important for me to feel empowered, inspired, healthy, motivated and continues to bring me back to the present moment.

It's very easy, especially living in a city, to feel restricted when I'm surrounded by buildings. When I'm in nature I feel expansive, I feel limitless.

Nature engages with your intrinsic motivation – you do it based on how it's going to make you feel, as opposed to what you're going to benefit from it, and it's the benefits that then increase your motivation, not the other way around. I know that if I haven't been outside I start going stir-crazy. So I encourage anyone who is feeling restless, anxious, unhappy or discontent to get away from technology, which is just a distraction, and just go for a walk around the block.

Taking a five-minute walk around the block was a strategy I learnt when I was doing my HSC. I found it increased my capability for learning, improved my memory and improved my mood. I feel it's really important to encourage kids to go for a bike ride or a walk or just hang out in the backyard and throw a ball around. It has so many natural and wonderful benefits for their health and wellbeing, short-term and long term.



### Engage the Senses

Nature engages with both sides of the brain. It increases creativity and self-awareness, and lifts the spirits. It saddens me that we live in such a beautiful country with so many wide, natural, beautiful environmental precincts and kids choose to sit inside and play video games. For many the only way they interact with nature is visually. Nature is a tactile thing, you have to touch it, feel it, because it activates and engages with all your senses.

The ocean especially has helped me through some of the most dramatic and dark periods of my life, from the deepest depths of depression, pain and suffering. The one place I always resort to is the ocean because it's free of judgement, free of criticism and it's a place where I can leave my troubles on the beach and dive into the water, which rinses my mind, body and soul. I use that visualisation to cleanse me of the torment, pain and suffering that I may be experiencing at the time. It allows me to be present in the moment and enjoy the environment that I'm in. My time in the water is when I can do a lot of my own healing, thinking and I just feel free and liberated.

I commit to immersing myself in nature every single day, whether it's in the ocean, walking barefoot on the grass, going for a bushwalk or a bike ride – it's an important part of my life and it's something that I prioritise every day.

#### **Layne Beachely**

Seven time world surfing champion



## About This Report

Over the past four years Planet Ark has commissioned independent public surveys and released research reports in the lead up to National Tree Day examining Australians' contact with nature. These reports include:

- 2011 - Climbing Trees: Getting Aussie Kids Back Outdoors highlighted the dramatic changes that have taken place over just one generation in the way that children play and interact with nature.
- 2012 - Planting Trees: Just what The Doctor Ordered reviewed the intellectual, psychological, physical and mental health benefits of contact with nature for children, and the understanding of these benefits by Australian parents.
- 2013 - Missing Trees: The Inside Story of an Outdoor Nation explored the attitudes and behaviour of Australians in regards to outdoor activity and contact with nature.
- 2014 - Valuing Trees: What Is Nature Worth? investigated how much Australians value nature at work, home and school and the financial value that people assign to nature.

These previous reports largely focussed on the benefits of contact with nature for children, the views and opinions of Australians on how they utilise and value nearby nature and the amount of time that Australians spend in nature. This year's report investigates how contact with nature makes people happy across all life stages and discusses the long-term implications that reduced contact with nature during childhood could have on the future happiness and wellbeing of today's children. Australian and international studies that examine the influence of nature on a person's emotional wellbeing and the short and long-term physiological changes this causes to the brain are also reviewed.

The report includes the results of two surveys. The first survey was commissioned by Planet Ark and conducted by research consultancy Pollinate in March 2015. The survey of 1102 people aged 14-64 years was conducted online and is nationally representative in terms of age, gender and residential distribution. This survey from here on will be referred to as the Planet Ark National Survey. The second survey was conducted by Planet Ark of past National Tree Day coordinators and participants using Survey Monkey in April 2015. The survey of 483 people aged 14-64 years was female biased (4:1), but this is representative of the larger female participation rate in National Tree Day and there was no statistical difference in the results of male and female respondents. This survey from here on will be referred to as the Planet Ark National Tree Day Survey. Both surveys used the nature relatedness scale (NRS)<sup>1</sup> and subjective happiness scale (SHS)<sup>2</sup> to measure the connection to nature and happiness of participants. Participants were allocated a score for each based on their level of agreement or disagreement with a series of statements like 'I always think about how my actions affect the environment' and 'I take notice of wildlife wherever I am' for the



**Children who engage in a third more outdoor activities than their peers each week grow up to be happier adults.**

NRS, and 'In general I consider myself a very happy person' and 'Compared to most of my peers I consider myself more happy' for the SHS. Based on these scores, participants were allocated to a high, medium or low group for happiness and their connection to nature.

### Planet Ark Environmental Foundation

Planet Ark is an Australian not for profit environmental organisation. Founded in 1992, Planet Ark's vision is to unite people, businesses and governments through positive environmental actions.

2015 is the 20th year of National Tree Day. Part of the focus this year is to celebrate the 21 million trees, shrubs and grasses that have been planted by over 3.5 million people.

### Toyota

Toyota Australia has been the major sponsor of Planet Ark's National Tree Day since 2000. Toyota provides on-ground support for National Tree Day at local community tree planting sites around Australia by utilising its national dealer network and ambassadors. By supporting National Tree Day, Toyota is able to give something back to local Australian communities and demonstrate its commitment to supporting the environment and sustainability.

### Acknowledgements

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People who take part in National Tree Day are 15% happier and 21% more connected to nature than the average Australian.

## Executive Summary

The purpose of this report is to examine the influence that nature has on happiness and mental health, and the consequences this has for Australia in light of previous Planet Ark research, which identified that the amount of time Australians are spending outside is decreasing.

The report consists of a review of both Australian and international studies and presents results from two surveys conducted on the general Australian population and past participants of Planet Ark's National Tree Day. Both surveys used the nature relatedness scale (NRS) and subjective happiness scale (SHS) to measure the connection to nature and happiness of participants. Participants were scored according to their level of agreement or disagreement with a series of statements, based on these scores participants were allocated to a high, medium or low group for happiness and their connection to nature.

The below diagram provides a snapshot of the key findings of the two surveys, and the influence of nature on the brain.

The results of the two surveys highlight the significant impact that nature has on a person's happiness and wellbeing, with contact during childhood continuing to influence happiness into adulthood.

Past Planet Ark research, however, has consistently shown that despite the clear benefits of nature the amount of time that Australians are spending outside is rapidly decreasing. For example, whilst three out of four adults played outdoors more often than indoors when they were young, only one out of ten children do so today. Changes in technology, including easier, faster and personalised access to television, the Internet and computer games is contributing to changes in behaviour, with research showing these activities activate areas of the brain linked with addiction.

Coinciding with this decrease in spending time in nature has been a rapid increase in levels of stress and depression, with depression-associated disability



costing the Australian economy \$14.9 billion a year. In just two generations the likelihood of a person suffering from depression has increased tenfold, with rates increasing the fastest among youths. This suggests that Australian children are on track to grow up to be the unhappiest generation so far, with a disconnection from nature and an indoor lifestyle leading to lower happiness levels than their parents and grandparents before them.

Changing the behaviour of Australians and incorporating nature-time into children's lives is likely to be the best course of action to limit or even stop the current path Australia is on to creating the unhappy generation. Previous Planet Ark research showed that the more time parents spend outside, the more time their children spend outside too. So behavioural changes need to happen for the whole family, with time outside being incorporated into our everyday lives at home, work and school.

 <p>9/10 people associate outdoor activities with feeling happy and relaxed</p>	<p>Engaging in just a third more outdoor activities each month leads to people being significantly happier</p> 	 <p>Children who engage in a third more outdoor activities each week grow up to rate themselves as happier than people who did not</p>
<p><i>nature + family + nutrition + exercise = happy child</i></p> <p>Carers of children list nature along with strong family and social networks, sleep, diet and exercise as essential pillars to creating inspired, relaxed and happy children</p>	 <p>Office workers with low happiness scores spend 34% less time in nature than their happier colleagues.</p>	<p>People with a low connection to nature have smaller social networks in their personal lives (17%) and at work (21%)</p> 
<p>National Tree Day participants are 15% happier and 21% more connected to nature than the average Australian</p> 	 <p>Viewing nature activates areas of the brain associated with happiness-induced recall and feelings of wellness</p>	<p>Viewing urban scenes activates areas of the brain associated with anxiety, fear and unpleasantness</p> <p><i>Stress</i></p>



# Introduction

## Happiness

Happiness is an aspiration of every human being. It is the experience of joy, contentment and positive wellbeing, combined with a sense that one's life is good, meaningful and worthwhile<sup>3</sup>. As happiness is very personal, with everyone having different views and opinions on how different aspects of their life influence how happy they feel, behavioural scientists use the term subjective wellbeing (SWB), where people's evaluations of their own lives are studied<sup>4</sup>.

A clear fact from studies examining happiness is that there is no single specific asset or behaviour that makes a person happy<sup>5</sup>. In general, people living in an economically prosperous country where freedom and democracy are respected, who have good relationships with family and friends, are physically healthy, successful in their job and involved in the community, are much happier than those who are not<sup>6</sup>. However, a variable that appears to have a significant influence on a person's

happiness, both directly on brain activity and hormone levels, and indirectly by affecting social relationships, job satisfaction, mood and health, is the level of exposure to nature.

The ability of nature to affect our wellbeing is possibly due to the fact that humans evolved in forests and savannahs, not in built up cities. The biophilia hypothesis<sup>7</sup> states that because of our origins we are innately connected to nature; it therefore predicts that activities that enhance our engagement with the natural world are vital for good mental health.

In this report we will examine how spending time in nature influences our subjective wellbeing and the long-term consequences this has for Australia in light of the significantly reduced time spent in nature over the past generation. As 2015 is the 20<sup>th</sup> year of National Tree Day, this report will draw together past Planet Ark research and the opinions of participants to gauge the importance of promoting contact with nature over the next 20 years. The results of two surveys, the Planet Ark National Survey and the Planet Ark National Tree Day Survey, which used the nature relatedness scale (NRS)<sup>1</sup> and subjective happiness scale (SHS)<sup>2</sup> to measure the happiness and connection to nature of participants are also presented.



Nine out of ten people associate outdoor activities with feeling happy and relaxed.





**The Biophilia hypothesis predicts that activities that enhance engagement with nature are vital for good mental health.**

## Australia Vs The World

Although Donald Horne meant the sentence to be ironic, ‘Australia the lucky country’ has become iconic, and has been used to describe everything from our beaches to our economy<sup>8</sup>. But how lucky is a person to live in Australia compared to the rest of the world?

According to the OECD Better Life Index<sup>9</sup>, which compares well-being across countries, Australia performs well and ranks among the top countries in a large number of topics, such as income, employment, life expectancy and voter turnout. In the life satisfaction category Australia ranked 11<sup>th</sup> out of 36, with 8 out of 10 people reporting that they have more positive experiences in an average day than negative ones. The 2015 UN World Happiness report ranked Australia as the 10<sup>th</sup> happiest country out of 135<sup>10</sup>, whilst Gallup’s Positive Experience Index ranked Australia 18<sup>th</sup> out of 138 countries<sup>11</sup>.

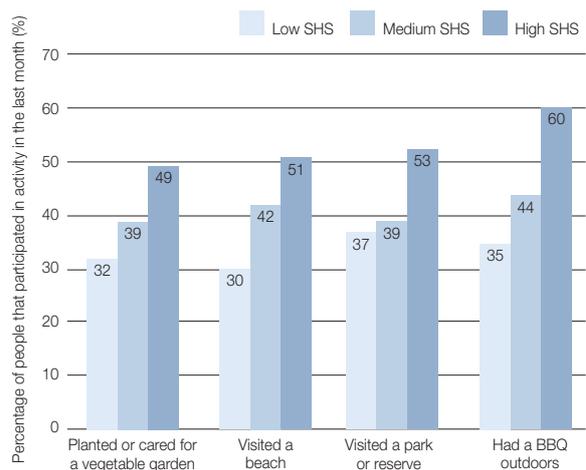
The category in which Australians said they were least satisfied was their work-life balance<sup>9</sup>. This may be a symptom of the fact that despite Australia being known as ‘an outdoor nation’ Australians now spend on average over 90% of their time indoors<sup>12</sup>.

# Nature Improves Happiness

## Nature Improves Mood and Emotions

The Planet Ark National Survey revealed that engaging in just a third more (37%) outdoor activities each month leads to people being significantly more likely to rate themselves high on the subjective happiness scale (Figure 1). This happiness is likely due to nine out of ten people surveyed (92%) saying that outdoor activities are associated with positive emotions, such as feeling happy and relaxed.

 **Engaging in just a third more (37%) outdoor activities each month leads to people being significantly more likely to rate themselves high on the subjective happiness scale.**



**Figure 1. The percentage of people within each SHS group that participated in planting or caring for a vegetable garden, visited a beach, visited a park or reserve and had a BBQ outdoors within a month prior to the survey.**



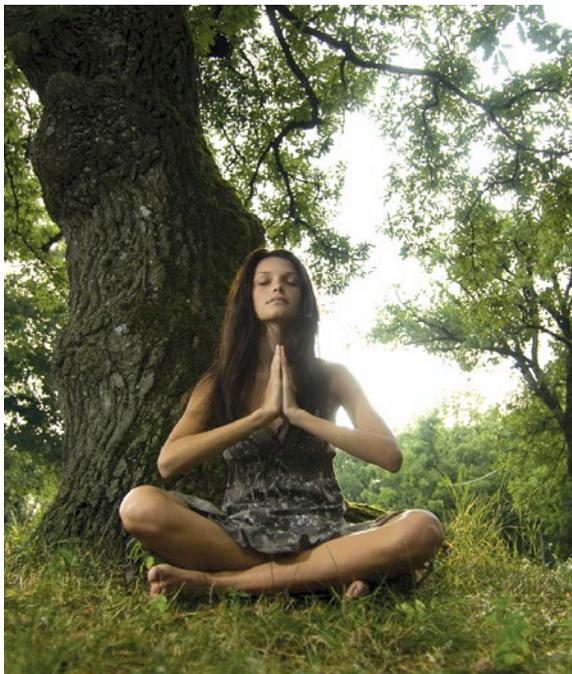


**Moving to a greener neighbourhood improves overall mental health.**

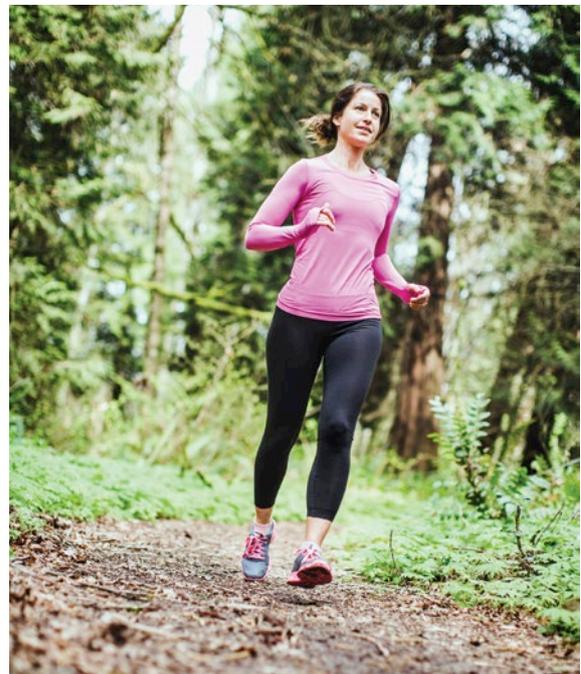
These results coincide with studies examining the influence of nature on emotions. A two-week study compared participants who engaged in outdoor activities in nature to participants who engaged in mental challenges in the form of anagram puzzles. Results found that the people who were assigned to the nature group had increased levels of daily wellbeing, with participants finding their time in nature to be intrinsically pleasant regardless of what their opinions on nature were before the study.<sup>13</sup> To confirm that exposure

to nature was creating the positive impact on mood rather than the associated exercise, a review<sup>14</sup> of eleven different studies comparing people who engaged in indoor and outdoor exercise was conducted. The review showed that exercising in outdoor natural environments was associated with significantly greater feelings of enjoyment and positive engagement, decreases in tension, confusion, anger and depression and increased energy levels compared to indoor exercise. Similarly, a three-year study that followed people moving from urban to greener areas found that the relocation was associated with sustained mental health improvements<sup>15</sup>.

Simply viewing nature, even within an indoor environment, can elicit positive emotions such as relaxation, calmness, self-worth and enjoyment. This is documented in multiple studies that have identified improvements in mood when participants are shown pictures of nature scenes compared to urban scenes<sup>16,17</sup>, and when people are exposed to indoor plants<sup>18</sup>. Interesting anecdotal evidence of the calming influence of scenes of nature comes from a Swedish psychiatric hospital. Over a period of 15 years staff observed that patients had vandalised paintings on the walls, however only the abstract paintings were damaged, with none caused to paintings of nature and landscapes.<sup>19,20</sup>

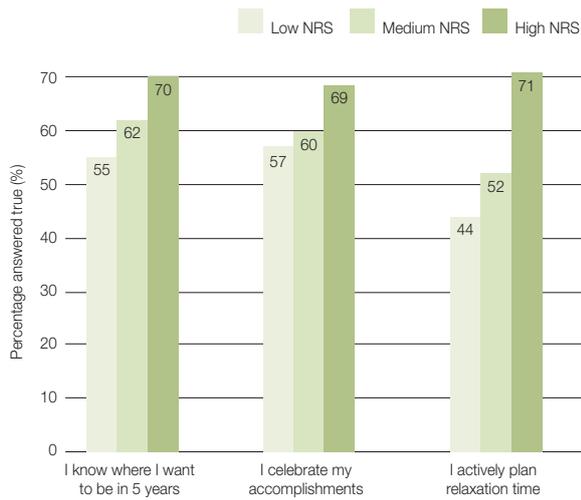


**Time in nature decreases feelings of tension, anger and depression.**



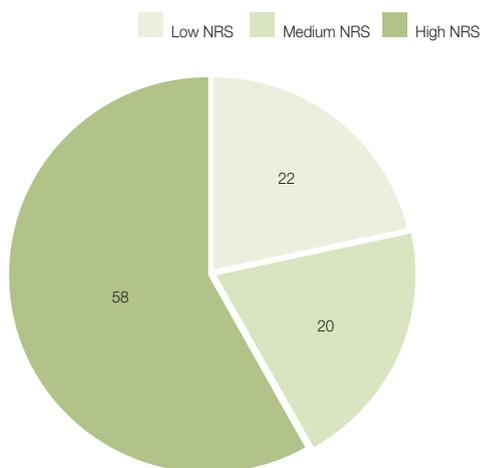
**Exercising outside creates greater feelings of enjoyment and positive engagement, compared to exercising indoors.**





**Figure 2. The percentage of people with low, medium and high nature relatedness scores who know where they would like to be in five years, celebrate their accomplishments and actively plan relaxation time.**

Having a good connection to nature also increases the chances of a person engaging in other positive activities. The Planet Ark national survey showed that people with higher nature relatedness scores were more 1.4 times more likely to know where they would like to be in five years, celebrate their accomplishments and actively plan relaxation time (Figure 2). A high connection to nature also triples a person's chance of having a very restful night's sleep, a factor that has significant implications on mood, productivity and health<sup>21,22</sup> (Figure 3).



**Figure 3. Percentage of people in each of the low, medium and high nature relatedness groups that say on average they have very restful sleep at night.**

## Nature and a Happy Childhood

A study of adults showed that almost every person (97%) described an outdoor area when asked to remember their favourite place during childhood<sup>23</sup>. The association between nature and 'happy places' is the result of nature's positive impact on emotional wellbeing. Natural environments therefore become associated with memories of being happy, relaxed and calm, feelings that are not generated from watching television or playing computer games<sup>24</sup>. Parents and guardians agree with this finding, with the Planet Ark National Survey showing that the carers of children believe time outside in nature to be as important as strong family and social networks, sleep, diet and exercise for creating inspiration and imagination in children and inducing increased relaxation and happiness.



**97% of adults describe outdoor areas when asked about their favourite place during childhood.**



A US study set out to examine whether proximity of the home to natural settings had an impact on the wellbeing of children<sup>25</sup>. In order to do this the researchers collected data from 337 children aged 6 to 12 years old in rural upstate New York in the US by conducting interviews with parents and children and carrying out detailed assessments of their houses. The results showed that the impact of stressful life events, such as family relocation, bullying, peer pressure and being punished, on how a child views their self-worth was significantly reduced in children with a high degree of exposure to nature. Furthermore, the buffering effect of nature was most prominent in children experiencing high levels of stress. This finding shows that the benefits of time in nature are greatest for children in most need.

 ... naturalised school grounds increased student enthusiasm, engagement and creativity, and decreased behavioural problems.

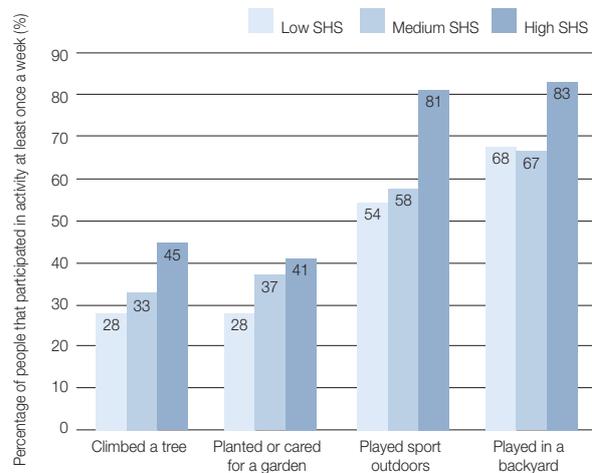
Studies comparing patterns of play and creative play (which has been shown to be important for social, cognitive and emotional development<sup>26</sup>) in green and built spaces have consistently found that green spaces support healthier child development<sup>27</sup>. Studies have demonstrated that outdoor play areas in childcare centres and schools increases imaginative play<sup>28</sup>, the development of positive relationships<sup>28</sup>, increases the engagement of children in unstructured free play<sup>29</sup> and reduces problem behaviour<sup>30</sup>. Similarly, an examination of 56 schools in the US found that naturalised school grounds increased student enthusiasm, engagement and creativity, and decreased behavioural problems<sup>31</sup>.

## Nature in Childhood Creates Happy Adults

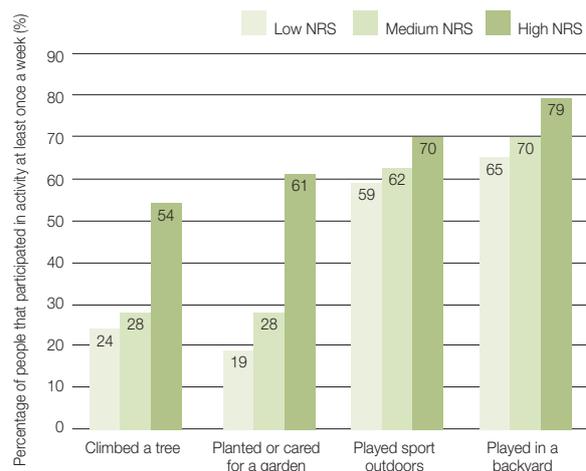
The benefits of exposure to nature by children continue into adulthood. The Planet Ark National Survey showed that people who rated themselves as 'high' on the subjective happiness scale had engaged in one third (31%) more activities outside each week as children, than people who rated themselves as 'low' on the subjective happiness scale (Figure 4). Not surprisingly, spending time outside in nature as a child also resulted in a higher connection to nature as an adult. Adults with a 'high' nature connection score on average engaged in 42% more outdoor activities when they were children than adults with a 'low' nature connection score (Figure 5).



**Outdoor nature play areas in childcare centres and schools increases imaginative play and the development of positive relationships.**



**Figure 4. The percentage of people in each of the low, medium and high subjective happiness groups that participated in specific outdoor activities at least once a week during childhood.**



**Figure 5. The percentage of people in each of the low, medium and high nature relatedness groups that participated in specific outdoor activities at least once a week during childhood.**





The positive effect of nature is greatest in children experiencing high levels of stress.

 People who rated themselves high on the subjective happiness scale had engaged in one third more activities outside each week as children (31%).

These results have significant implications. Happiness is arguably the most important trait that parents want for their children after being healthy. These results show that the amount of time children spend outside influences how happy they will be as adults.

## Nature and Happiness at Work

The mental health and wellbeing of employees is becoming an increasing area of concern for businesses. Mental health issues are the single most common cause of long-term absences from work offices and the second most common cause of short-term absences, after minor illnesses such as colds and flu<sup>32</sup>. With the average full-time employed Australian working 40 hours a week<sup>33</sup>, it is not surprising that emotional wellbeing during this period can have a significant influence on a person's overall happiness.

 Employee access to nature is related to improved levels of comfort, pleasure and wellbeing, improved job satisfaction and performance.

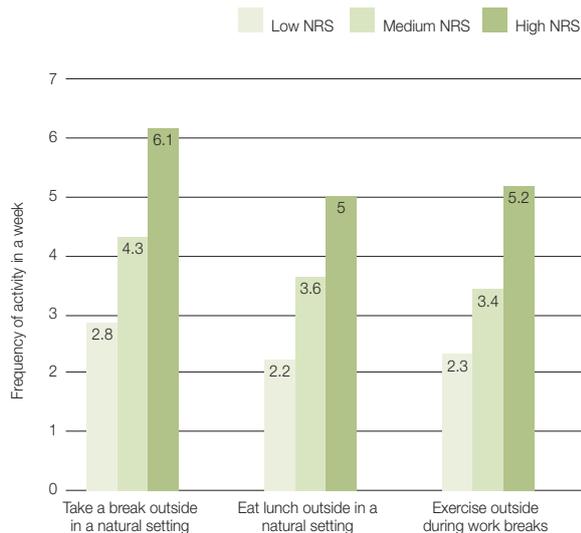
A survey of 503 employees in an American office found that people with more contact with nature during their workday reported significantly less perceived stress and stress-related health complaints<sup>34</sup>. Other studies have reported that employee access to nature is related to improved levels of comfort, pleasure and wellbeing<sup>35,36</sup>, improved job satisfaction and performance<sup>37</sup> and a decreased likelihood of quitting<sup>38</sup>.

Planet Ark's National Survey found that Australian workers with low subjective happiness scores (the least happy workers) were the people who spent the



The average full-time employed Australian works 40 hours a week. Plants are linked to productivity.





**Figure 6. The mean number of times people in each of the low, medium and high nature relatedness groups took a break outside in a natural setting, ate lunch outside in a natural setting and exercised outside during work breaks across a working week.**

least amount of time outside during work hours across the week, spending a third less time (34%) in nature compared to people with medium and high happiness scores. Furthermore, it is the people who are more connected to nature that make sure they spend time outside during the work day, engaging in more than double the number of outdoor activities (220%) during the working week than people with a low connection to nature (Figure 6).

## Cubicle with a View

Viewing nature through a window has the ability to positively impact a person's happiness. It is also one of the simplest ways of incorporating a green outdoor environment into the working day<sup>36</sup>. This is an important finding as the majority of office workers have been shown to spend no time outside during the work day, mainly due to the perception of being too busy and a working culture that rarely includes outdoor activities<sup>39,40</sup>. Comparisons of employees with either views of nature or buildings outside the window in their work area have shown that a natural view results in employees feeling less frustrated, depressed and angry, with increased patience, enthusiasm, job satisfaction and life satisfaction<sup>38,40,41</sup>. Furthermore, the number of indoor plants proximal to a worker's desk correlates to productivity<sup>42</sup>.



**The number of plants proximal to an office desk correlates to the worker's productivity.**

Fortunately, incorporating nature into urban views will still improve employee wellbeing. This is because the buildings do not need to be blocked from sight as it is the presence and extent of types of nature in the view that promotes wellbeing, not the absence of development per se<sup>43</sup>.

## Happier Ageing

Interacting with nature continues to have benefits on mental health and wellbeing into old age.

Access to nature has been studied as a method to reduce agitation and provide stimulation for people with dementia. These natural environments are often in the form of gardens that are well arranged, walled and directly connected to a dementia care unit, allowing



**The presence of public green spaces increases social interactions among elderly people.**



patients to experience plants, nature and fresh air in a safe and secure environment<sup>44</sup>. Benefits to wellbeing that have been identified from studies examining the influence of time in gardens for dementia patients include: an association between the number of days spent in a garden and decreased agitation levels<sup>45</sup>; a reduction in inappropriate behaviour and improvements to overall mood<sup>46</sup>; and improvements to sleep and cognition<sup>47</sup>.

Studies have demonstrated that the presence of public green space increases social interactions among elderly people. As social interactions and strong social ties have significant impacts on the wellbeing of older people, having access to nature in old age is clearly an important factor in maintaining and increasing happiness. This is particularly important in Australia today, as one out of ten people over the age of 65 say they experience loneliness most of the time, a figure that increases to one out of two for people over the age of 80<sup>48</sup>.

## Nature and Social Skills

Residential areas with more green spaces and trees have greater social networks and senses of community<sup>49,50</sup>, factors that correlate to happiness and wellbeing<sup>51</sup>. The Planet Ark National Survey identified that people with a

low connection to nature have smaller social networks, with less close friends in both their personal lives (17%) and their place of work or study (21%).

A set of experiments in America was conducted to test whether time in nature can influence a person's opinion of society and how much they care for their local community, compared to how much they value more self-centred aspirations such as personal wealth<sup>52</sup>. Participants were exposed to images of either natural or urban environments, followed by indoor environments with either high or low numbers of plants. The results showed that individuals who were exposed to images of nature and immersed in indoor environments abundant with plants showed significantly greater aspirations that valued communities, relationships and caring. Participants who were assigned to the non-nature group favoured aspirations with self-centred goals, such as wealth and fame. The authors state that the results suggest nature, which is inherently unrelated to human intervention, brings individuals closer to others, whereas human-made environments orient toward more selfish or self-interested ends<sup>52</sup>.

 **People with a low connection to nature have smaller social networks.**



Natural environments increase how much a person values communities.



# How Nature Creates Happiness

Spending time in nature has the ability to influence a person's happiness because it has direct effects on the brain and hormone secretion that induce positive responses. Nature is, in a sense, giving a 'happy high'. The biophilia hypothesis<sup>7</sup> states that just as we have evolved to gain pleasure from seeing the faces of our babies smiling<sup>53</sup> or from romantic love<sup>54</sup>, humans are innately connected to nature, with activities that enhance our engagement with the natural world receiving neurological and biochemical positive feedback.

The advancement of science and medicine means that we are able to observe the specific reactions of our brains and endocrine systems to nature in greater detail than ever.

## Short-term Brain Activation

One of the first observable effects of nature on the brain was identified by Ulrich (1981)<sup>55</sup>, who used an electroencephalograph (EEG) to identify that viewing natural environments produced more alpha wave activity compared to viewing urban environments. Alpha brain waves are generated during wakeful states characterised by a relaxed and effortless alertness, and have been shown to be greater in creative individuals<sup>56,57</sup>, to be reduced during periods of high anxiety<sup>58</sup> and reduced in children showing aggressive and antisocial behaviour<sup>59</sup>.

More recently, functional magnetic resonance imaging (fMRI) has been utilised to map the effect of nature on the brain. A 2010 study showed<sup>60</sup> that different areas of the brain are activated following exposure to images of natural views, compared to urban views. Identifying these areas means that it is possible to understand how the information is being processed, i.e. whether areas of the brain associated with stress or relaxation are being activated (Table 1 and Figure 8).

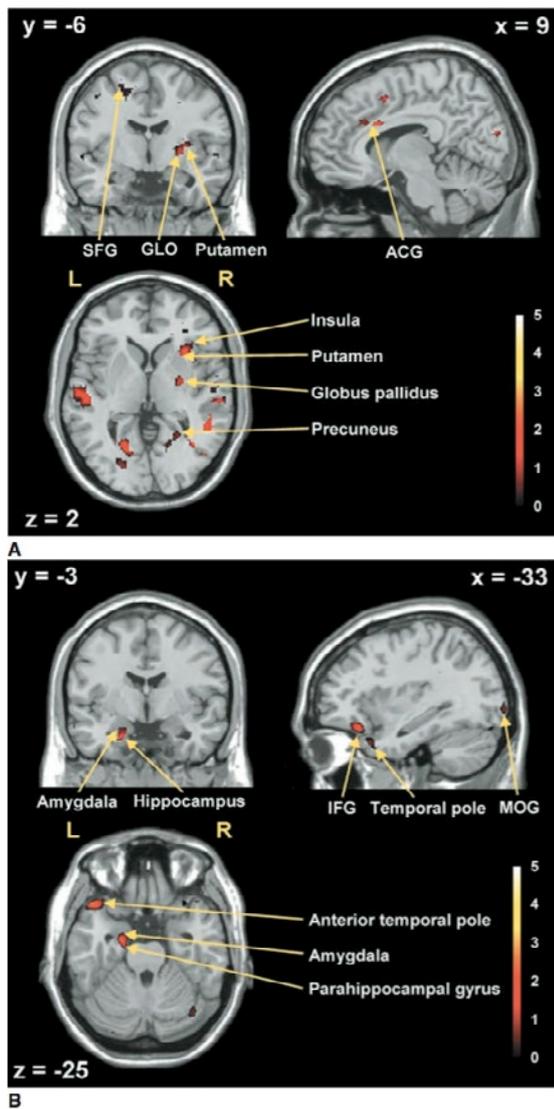
Brain Areas	Only or predominantly active in		
	Natural views	Urban Views	
Frontal lobe	Superior frontal gyrus	✓	
	Middle frontal gyrus	✓	
	Inferior frontal gyrus		✓
Parietal Lobe	Superior parietal gyrus	✓	
	Precuneus	✓	
Temporal lobe	Superior temporal gyrus	✓	
	Anterior temporal pole		✓
Occipital lobe	Superior occipital gyrus	✓	
	Middle occipital gyrus		✓
	Inferior occipital gyrus		✓
Insula	Insular cortex	✓	
Limbic system and basal ganglia	Anterior cingulate gyrus	✓	
	Globus pallidus	✓	
	Putamen	✓	
	Caudate nucleus	✓	
	Parahippocampal gyrus		✓
	Hippocampus		✓
	Amygdala		✓

**Table 1. Areas of the brain activated in response to images of natural views and images of urban views in the fMRI study by Kim et al. (2010)<sup>60</sup>**

The limbic system and basal ganglia are a series of structures in the brain that are functionally and anatomically interconnected. This system regulates autonomic and endocrine functions, particularly in response to emotional stimuli.

 **Structures in the brain commonly activated in response to happiness-induced recall and pleasant pictures, were activated predominantly when viewing scenes of nature.**





**Figure 8. Brain activation of natural (A) and urban (B) scenic views.** SFG = superior frontal gyrus, GLO = globus pallidus, ACG = anterior cingulate gyrus, IFG = inferior frontal gyrus, MOG = middle occipital gyrus. Taken from Kim et al. (2010)<sup>60</sup>.

Structures in the limbic system of the brain commonly activated when expressing anxiety, fear and unpleasantness, or when recalling and re-experiencing emotional distress (the amygdala, hippocampus and parahippocampal gyrus), were the areas of the brain activated when viewing urban scenes. In contrast, the structures in the limbic system commonly activated in response to happiness-induced recall and pleasant pictures (the anterior cingulate gyrus, globus pallidus, putamen and caudate nucleus), were activated predominantly when viewing scenes of nature.

Key differences in activation between nature and urban views also included nature inducing an area of the brain (the precuneus) involved in episodic memory and self-awareness, whilst urban scenes activated an area (the anterior temporal pole) associated with negative emotional responses, such as anger and unpleasantness. The researchers of this study<sup>60</sup> concluded that the brain activation patterns were associated with personal preference for the scenes of nature, meaning that the patterns of brain activation occurred because the subjects had a positive emotional response to nature and that these patterns would not be seen if negative memories or feelings were coupled with the natural world.

 **Nature activates areas of the brain abundant in opioid receptors... triggering feelings of wellness and the motivation required for positive behavioural modification.**

fMRI has also been used to show that viewing images of nature activates areas of the brain abundant in opioid receptors. These opioid receptors have connections to the brain cells within the dopamine reward system, triggering feelings of wellness and the motivation required for positive behavioural modification. When opioid receptors are activated people are less likely to perceive themselves as stressed, they are more likely to form emotional bonds and they tend to dwell less on negative memories, focusing instead on the positive<sup>41,61</sup>. The stress reduction effect of opioid receptor activation is also thought to be the explanation for blink rate being significantly slower when viewing nature scenes compared to urban scenes<sup>62,63</sup>.

Although it is difficult to directly compare the effects, nature is stimulating areas of the brain linked with positive emotions that have also been shown in fMRI scans to be stimulated by seeing the face of loved ones<sup>64</sup>, viewing works of art<sup>65</sup> and listening to 'happy' classical music<sup>66</sup>. Activities that similarly activate the dopamine reward system include exercise<sup>67</sup>, meditation<sup>68</sup> and certain drugs commonly abused by humans (opiates, ethanol, nicotine, amphetamine and cocaine)<sup>69</sup>.



## Long-term Brain Benefits

Experienced-induced plasticity in the brain refers to cerebral neurons changing their structure and function in response to an individual's experiences<sup>70</sup>. Brain plasticity has been shown to occur during all stages of life, including early development, adulthood and the aging brain<sup>71</sup>.

 **Exposing children to environments that reduce stress and increase wellbeing has long-term effects on the structure of the brain and happiness later in life.**

Children who grow up in stressful environments have larger amygdalae compared to children with no such exposure, creating a long-term processing bias towards negativity and danger within the brain<sup>20,72</sup>. Exposing children to environments that reduce stress and increase wellbeing will therefore have long-term effects on the structure of the brain and happiness later in life. Amygdala activity has also been shown to be greater in individuals living in cities compared to people living in the country<sup>73</sup>. City dwellers also have greater activity in the perigenual anterior cingulate cortex, a major part of the limbic stress regulation system, with activity increasing linearly the longer a person has been living in a city environment<sup>73</sup>.



**City dwellers have greater activity in a major part of the brain's stress regulation system. Nature helps protect against this.**



**Exposing children to nature changes the actual structure of the brain in a positive way.**

As it can be logistically difficult to identify specific changes in the human brain, many studies have examined how different environments influence neurological structure and function in other animals. Studies ranging from rodents to primates have identified that environmental enrichment has an anatomical influence by increasing cortical thickness and weight, size of the cell soma and nucleus, dendritic arborisation, length of dendritic spines and synaptic size and number. Environmental enrichment also increases hippocampal neurogenesis, reduces apoptotic cell death and has beneficial effects in models of nervous system disorders.<sup>74</sup> Exposure to nature therefore changes the actual structure of the brain.

## Hormone Balance

Cortisol is a vital hormone regulating the body around the 24-hour circadian cycle and has a key role in responding to acute stressors. When a person is feeling stressed their cortisol secretion increases and becomes irregular. Nature, however, reduces the body's response to stress, with cortisol secretion and irregularity decreasing with the more green space a person is exposed to<sup>75</sup>. This reduced response to stress has further benefits for the body, with irregular cortisol patterns linked to an abundance of negative health outcomes, including weight gain, diabetes, suppression of the immune system, muscle wasting, osteoporosis, depression and reduced life expectancy<sup>76</sup>.



## The Happy Domino Effect

Being in nature induces a range of other behaviours and emotions that further reinforce happiness, thereby creating a positive feedback loop.

### Smiling

When a person experiences happiness and the brain sends signals to the facial muscles to smile, there is a positive feedback loop that returns to the brain and reinforces the feeling of happiness<sup>77</sup>. The influence of facial expression on emotional state has been highlighted in multiple studies. When people wrinkle their noses they rate odours as more noxious, and when they raise their eyebrows they judge information to be more surprising<sup>77</sup>. If a person is asked to smile while viewing a cartoon they will judge it to be funnier<sup>78</sup>, and if they are asked to knit their eyebrows together when viewing photographs they will view them as sadder<sup>79, 80</sup>.

 **When nature elicits happy facial responses, it is not just having an effect on the brain but is also having a physiological effect on the whole body in a way that reinforces the initial positive emotion.**



**Smiling triggers a positive feedback loop to the brain that reinforces the feeling of happiness.**



**People with a high connection to nature are more likely to have very restful sleep at night.**

At the autonomic (unconscious) level, alterations in facial expression lead to immediate changes in heart rate, skin conductance, skin temperature and blood pressure. Furthermore, these changes occur regardless of whether people are instructed to evoke a memory that makes them feel a certain emotion, or if their muscles are artificially placed that way by an experimenter<sup>80,81</sup>. So when being in nature elicits happy facial responses, it is not just having an effect on the brain but is also having a physiological effect on the whole body in a way that reinforces the initial positive emotion.

### Sleep

As outlined above, people with a high relatedness to nature were significantly more likely to report having very restful sleep at night. This finding has considerable consequences on a person's mood and highlights again the 'domino' effect on other areas of life that the happiness induced by nature can have on a person.

Whilst poor sleep has been shown to result in mood and behavioural problems<sup>82</sup>, decreased work performance<sup>83</sup> and lower cognitive functioning<sup>84</sup>, good quality sleep is associated with greater long-term wellbeing and improved psychological functioning<sup>85</sup>. This is because a good night's sleep increases rewarding behaviours that induce positive emotions, such as improved academic performance<sup>86</sup> and social functioning<sup>87</sup>.



# Time In Nature Is Decreasing

The previous sections of this report highlight the huge impact that contact with nature has on a person's happiness, with nature contact during childhood appearing to have long-term benefits throughout life. However, previous Planet Ark research has shown that the amount of time Australians are spending outside in nature is decreasing, with children today spending more time indoors than any previous generation.



**For every hour of outdoor recreational activity that Australians engage in, they spend seven hours watching television and surfing the Internet.**

Planet Ark has shown:

Behaviour	Statistics
Children and adults spend more time indoors than ever.	<ul style="list-style-type: none"> <li>• For every hour of leisure time Australians spend doing outdoor recreational activity, they spend 7 hours watching television and surfing the internet<sup>88</sup>.</li> <li>• One quarter of children spend less than 2 hours of their spare time a week playing outside<sup>88</sup>.</li> <li>• One third of adults spend less than 2 hours a week doing outdoor recreational activities<sup>88</sup>.</li> <li>• Three out of four adults played outdoors more often than indoors when they were young, compared to only one in ten children today<sup>26</sup>.</li> </ul>
Australians are engaging in fewer outdoor activities.	<ul style="list-style-type: none"> <li>• Two thirds of parents and guardians climbed a tree as a child, compared to only one quarter of children today<sup>26</sup>.</li> <li>• Only one third of Australians will have played casual sports or games in their backyard or park in the past month<sup>88</sup>.</li> <li>• One in three children have never been camping<sup>88</sup>.</li> <li>• One in three children have never cared for a tree or plant<sup>88</sup>.</li> </ul>
People do not realise the full potential of time outdoors in nature.	<ul style="list-style-type: none"> <li>• Only one in ten parents and guardians consider contact with nature a top method for improving confidence and self esteem in children<sup>89</sup>.</li> </ul>
Australian workers are not getting enough nature time during the workday.	<ul style="list-style-type: none"> <li>• One quarter of Australians said that they do not ever take breaks outside<sup>90</sup>.</li> <li>• Half of Australian workers cannot see a window that leads to the outside world<sup>90</sup>.</li> </ul>

Planet Ark's past research, combined with this year's findings that nature time generates happiness, suggests that Australian children are on track to grow into an unhappy generation disconnected from nature and living an indoor lifestyle.



# Consequence: The Unhappy Generation

## Growth in Mental Health Issues

During the same period that time spent outside in nature has been decreasing among Australians, levels of stress and depression has been increasing:

- Adults today are ten times more likely to suffer from depression than in 1945<sup>91</sup> and three times more likely than in 1998<sup>92</sup>.
- One out of every six Australians will now be affected by depression in their lifetime<sup>93</sup>.
- One out of four Australians reported feeling moderate to severe levels of stress in 2014<sup>94</sup>.
- The volume of antidepressants dispensed in Australia doubled between 2000 and 2011<sup>95</sup>.
- Levels of stress and depression are increasing fastest among Australian youths<sup>96-98</sup>.

This problem is not only occurring in Australia, across the developed world rates of mental illness are increasing<sup>91</sup> and by 2030 the World Health Organisation predicts that depression will be the leading cause of disease burden globally<sup>99</sup>.

 **A quarter of young Australians say that they are unhappy with their lives.**

Of particular concern is the increasing rate of stress and depression occurring among young people, with a quarter of young Australians saying that they are unhappy with their lives<sup>100</sup> and suicide accounting for 27% of deaths among 15-24 year olds<sup>101</sup>. Suffering from depression during adolescence also increases an individual's risk of other negative life experiences, such as divorce<sup>102</sup>, adult obesity<sup>103</sup>, criminal behaviour and drug addiction<sup>104</sup>.



**One out of every six Australians will be affected by depression in their lifetime. Contact with nature can help reduce the effects.**

Depression-associated disability currently costs the Australian economy \$14.9 billion a year and accounts for 6 million working days of lost productivity<sup>105</sup>. If the emerging pattern continues and the 'indoor' generation grows up with lower happiness levels and increased susceptibility to mental illness, this economic burden will grow.

## Mental Health and the Indoor Lifestyle

Reducing the amount of time that Australians spend outside not only has the negative consequences associated with decreased contact with nature, but also has the adverse effects associated with the behaviours and activities that are being conducted indoors.



## Television

Australians are watching more television than ever before, with new streaming services making access easy 24-hours a day and creating a new culture of 'binge watching'<sup>106</sup>.

Australian children (<12years old) on average watch 2 hours and 15 minutes of television every day<sup>106</sup>, a worrying figure considering studies have shown just 2 hours of television a day in children is associated with higher body-mass indices, lower cardio-respiratory fitness, raised cholesterol and increased cigarette smoking in adulthood. But the physical health consequences of television viewing are relatively predictable given its sedentary nature, and most people are aware of them. What are less known though are the mental health repercussions.

People gain pleasure from watching television. As individuals are free to choose the amount of television that they view, it is assumed that they only watch an amount that satisfies them. Recent studies however suggest that this is not the case and that the formation



**The average Australian child watches two hours and fifteen minutes of television every day. Actively planning outdoor activity helps balance this.**

of daily habits and self-control problems means that the immediate benefits of watching television e.g. entertainment and relaxation, are chosen over the desire to avoid the potential longer term costs e.g. reduced sleep, underinvestment in social contacts, education and career<sup>24</sup>. The result is that many people tend to regret the amount of time that they watch television for and that people who watch less than half an hour of television a day score the highest on wellbeing surveys, a figure that gets worse as television viewing time increases<sup>24</sup>. Increased television viewing is also linked with increased materialistic attitudes<sup>107</sup> and evaluating ones own standard of living more negatively, resulting in increased dissatisfaction with life<sup>108</sup>, attachment anxiety and depression<sup>109</sup>.

## Computer Games

Computer games are a \$2.46 billion industry in Australia and the development of apps for smartphones and tablets means that access is easier than ever<sup>110</sup>. Although the association between violent video games and aggressive behaviour is a hotly debated issue<sup>111,112</sup>, changes in frontal-lobe activity in the brain with extended computer game play is similar to that seen in the early stages of addiction, correlating with cravings for alcohol, cocaine, marijuana and tobacco<sup>113</sup>. Computer game and internet addictions are associated with poor nutritional intake<sup>114</sup>, depression<sup>115</sup>, anxiety and low scores on life satisfaction surveys<sup>116</sup>.

 **Changes in frontal-lobe activity in the brain with extended computer game play is similar to that seen in the early stages of addiction, correlating with cravings for alcohol, cocaine, marijuana and tobacco.**

There are many ways in which technology has enhanced lives, such as advancements in health and communication, but it has also created a range of new issues. Increasing attachment, and in some cases addiction, are driving a move indoors and creating a generation that will be left with the psychological repercussions.



# Positive Action – Sow Happiness

In a society where it seems everything has a price, it is great that spending time in nature is a free and easy way to increase your happiness and wellbeing, inducing observable changes to the brain. Incorporating time in nature into the lives of Australian children now will hopefully be able to reduce or even stop the current path that we are on to creating the unhappy generation.

Australians are fortunate to live in a beautiful country, which facilitates an outdoor lifestyle year-round. Planet Ark's 2013 report, *Missing Trees: The Inside Story of an Outdoor Nation*, showed that the more time parents spend outdoors, the more time their children spend outdoors too. So behavioural changes need to happen for the whole family, with time outside being incorporated into our everyday lives, learning to embrace the amazing country that we live in.

## Reduce the Bad

- No or limited phone/ Internet time every day for the whole family, such as during the evening meal to encourage communication.
- Plan which television show(s) you are going to watch in advance, and turn the device off when the programme has finished. This will help to avoid chain watching one show after another simply because the television is turned on, even if you are not that interested in the programme's content.
- Avoid being the unsocial group of people that are sitting together but are all on their phones. Restrict your use of social media to when you are not in the company of other people and let phone calls go to voicemail so that they will not be interrupting your meal or conversation.

## Increase the Good

- Actively plan outdoor play for your children during the week and mark it on your calendar to make sure that it does not get forgotten or the time you had arranged for it double-booked. The activity can be anything from playing on the equipment in a playground, dancing, skipping, throwing a Frisbee, playing with a ball or flying a kite.



Turn an indoor activity into an outdoor one.



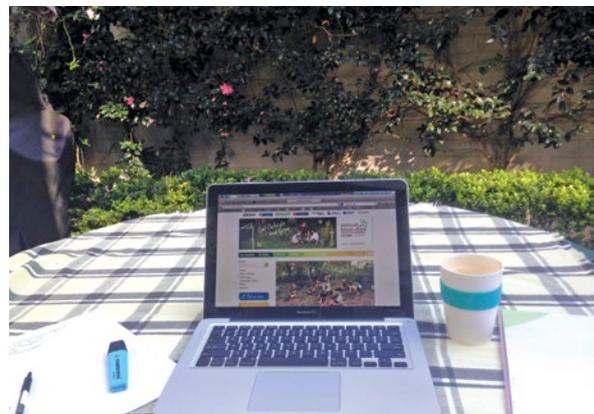


**Plan to eat one meal a week outside.**

- Turn an indoor activity into an outdoor one. Playing with toys, board games, and drawing are all activities that can easily be moved outside into a backyard, increasing a child's time outside without having to change the activity that they are engaging in.
- Read a nature book outside and see what your children can see or find in their surroundings. Reading Australian nature books is especially important so that they are reading about animals and trees that are in their own backyard.
- Plan to eat one meal a week outside, either in your garden or taking a picnic to a local park or beach. This could be with the whole family or as special quiet time on your own.
- Buy birthday and Christmas presents for children that will encourage outdoor play, such as bicycles, skateboards, scooters and surfboards.
- Plan outdoor breaks during your work day. Find a nice area to eat your lunch or to walk to during an afternoon break. Invite your colleagues along too, or if you are the boss suggest it to your staff as an activity that you encourage them to do.
- Personalise your work desk not just with photos but also by adding a touch of nature with a pot plant.

Low maintenance plants that are able to handle the air conditioning are best, such as a Peace Lily, Janet Craig or a Zanzibar Gem.

- Mobile technology means that it is possible to take your office outside. Take your laptop to a nearby park or even into your backyard if you work from home, allowing you to use your work hours to also increase your nature time.
- Take part in National Tree Day!



**Set up a work area outside.**



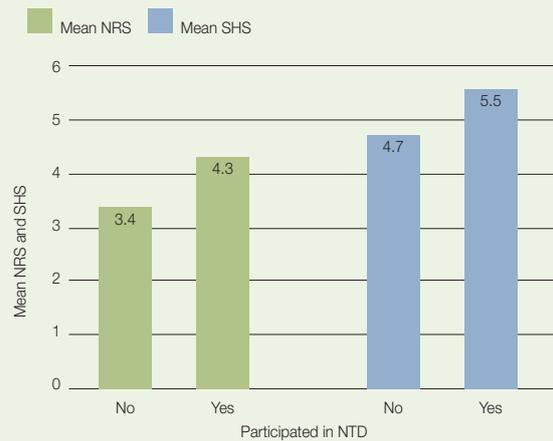
# National Tree Day Creates Happiness

Planet Ark's National Tree Day is Australia's largest community tree-planting and nature care event. Currently in its 20<sup>th</sup> year, National Tree Day has planted 21 million trees and plants with the help of more than 3 million volunteers since the event began in 1996<sup>17</sup>.

National Tree Day does not only benefit the environment, but has a positive effect on the volunteers who participate. The Planet Ark National Tree Day survey of past participants found that people who take part are on average 15% happier and 21% more connected to nature than people who have never participated in a National Tree Day event (Figure 9). National Tree Day therefore acts as key example of nature-based activities making people happy.

 **“The smiles brought to the faces of the students, teachers and parents were huge.”**

Jennifer Franks, Jasper Road Public School.



**Figure 9. The mean nature relatedness score and subjective happiness score of people who have and have not participated in National Tree Day before.**

 **“For many of the students it was a unique experience because they live in units and don't have the opportunity to garden. Many did not want the day to end and one little girl said it had been the best day of her life!”**

Carol Bagnell, Penrith Public School.



# National Tree Day: 20 years of smiles!



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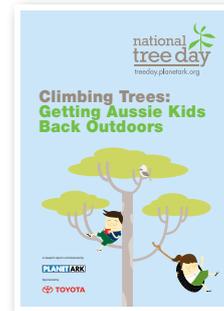
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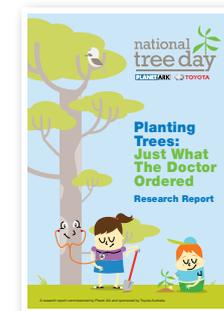
# Previous Planet Ark Research

Planet Ark has commissioned surveys and written reports in the lead up to National Tree Day for the past four years in order to highlight the benefits associated with time in nature. The full reports and summaries of the key findings can be found at [treeday.planetark.org/about/health-benefits.cfm](http://treeday.planetark.org/about/health-benefits.cfm)

Planet Ark's 2011 report, ***Climbing Trees: Getting Aussie Kids Back Outdoors***, explored the dramatic shift in Australian childhood experience from outdoor to indoor play over just one generation. The report was based on an independent study of Australians' attitudes, opinions and recollections. It outlined the nature of children's outdoor play in Australia, the decline of outdoor activity in recent decades and the perceived benefits of and barriers to outdoor play.



Planet Ark's 2012 report, ***Planting Trees: Just What The Doctor Ordered***, delved deeper into the intellectual, psychological, physical and mental health benefits of contact with nature for children. It combined a review of current local and international academic research in this field, as well as the results of an independent attitudinal survey that provides an insight into how Australians perceive the link between nature and children's health, wellbeing and development.



Planet Ark's 2013 report, ***Missing Trees: The Inside Story of an Outdoor Nation***, focused on outdoor recreation and contact with nature, among adults as well as children. The report outlined the results of an independent survey that explored Australians' attitudes, opinions and behaviour in regards to: the backyard and its decline in Australia; whether the great outdoors is still a key part of how we view ourselves as Australians; and whether there is a link between backyards and the amount of time people spend doing outdoor recreational activities. The report also includes references to a number of relevant external studies.



Planet Ark's 2014 report, ***Valuing Trees: What is Nature Worth?***, took a broader focus and looked at the economic, environmental, health and social benefits of nature in the workplace, at home, in neighbourhoods and in schools. The report examined how much Australians value nature and outlined the results of an independent survey that explored the financial figures people are willing to allocate to these benefits.

