

# Some hidden benefits of the urban forest

*Stephen Kaplan*

*University of Michigan, Department of Psychology, University of Michigan  
525 E. University, Ann Arbor, MI 48019-1109, USA*

*E-mail: skap@umich.edu*

## **Abstract**

While such popular concepts as stress, recreation, and aesthetics help explain some of the psychological benefits of the urban forest, these traditional concepts are not adequate for explaining what is in fact a great diversity of benefits. Economic approaches, too, have been unable to successfully put a value on this diverse collection of positive influences. Attention Restoration Theory provides an approach for uncovering a wealth of hidden benefits. Research dealing with health challenges, overcoming social and economic disadvantages, and stages in the life cycle demonstrate not only the pervasiveness of the psychological benefits of nature, but also their significance in people's lives. These studies also support the emphasis of Attention Restoration Theory on the central role of attention and the fatigue of attention in competence and quality of life. An unexpected bonus of this review of research is the discovery that many of these benefits have a moral quality; in other words, they represent qualities that societies value and encourage. This way of looking at the urban forest thus has implications not only at the individual level, but for meeting social goals as well, thereby providing new opportunities for collaboration among government agencies, urban foresters, and community leaders.

**Key words:** attention restoration theory, directed attention, mental fatigue, nature benefits, well being.

## **1 Introduction**

There is growing recognition worldwide of the significance of the intangible values of the urban forest. In part this recognition is based on an intuitive sense that nature has remarkable beneficial effects on people. While this intuitive understanding has advantages, it has its difficulties as well. The intuitive concept that many people hold implies that nature is relaxing, that it is a way to recover from stress. The problem is not that this is incorrect, but that it represents only a small part of what nature does for people. To the extent that this intuitive notion stands in the way of a serious and careful study of the full range of benefits, it hinders the recognition and appreciation of how pervasive the contribution of the urban forest is to human well being.

The popularity of the intuitive notion of nature benefits is but one of several ways in which overly simplified analyses leave many important benefits hidden.

The all-too-human tendency to force new concepts into old categories has a similar effect. Thus, for example, the urban forest is acknowledged as playing an important role in recreation. Its aesthetic contribution is also noted. But neither of these familiar categories adequately acknowledges the profound importance of this resource. »Recreation« is a rather broad, diffuse concept. People participate in sporting events and watch TV as part of what they consider their recreation. The urban forest plays a special role in the lives of many people that is profoundly different from these activities. Comparably aesthetics also fails to capture the special contribution of the urban forest. A number of studies have shown that even natural environments that are not highly preferred (i.e. not considered particularly aesthetic) are effective with respect to the psychological benefits they provide (Kaplan 2001a).

The attempt to capture the benefits of nature in economic terms has similar difficulties. From an economic perspective, nature is often viewed as an aesthetic addition, an »amenity« that, while nice, is not essential. However, as we shall see from a review of some of the research in this area, the effects of a nature experience can be life-changing, not what one would expect from an amenity. Further, there is a problem inherent in the economic analysis, due to its dependence on the concept of substitutability, i.e., how much would one be willing to trade for access to nature. Many people whose lives have been altered by nature experiences would be no more willing to trade anything for nature than they would for the air they breathe or the water they drink.

There are thus a number of reasons why many of the psychological benefits of the urban forest are hidden. Perhaps if we had a clearer understanding of the way nature plays a role in human experience and functioning, some benefits that are currently hidden might become evident.

## **2 Stress vs. mental fatigue as alternative ways of looking at nature benefits**

Many people have an intuitive sense that contact with nature is beneficial; that it helps one become whole again, helps one feel better and perform better. While a portion of this benefit is due to the stress-reducing power of contact with nature, this is only part of the story. Stress is a bodily reaction to harm or to threatened harm. Among its most characteristic expressions are sympathetic nervous system reactions such as rapid heart rate, increased blood pressure and sweaty palms. However, one can feel »worn thin«, not necessarily because of bad things, but simply as a result of too many things. People can benefit from nature even though they are not anticipating harm and have none of these sympathetic nervous system symptoms.

An important benefit of the nature experience, which is often overlooked, is the effect nature has on reducing *mental* fatigue and thereby restoring competence. When the capacity to put forth effort is reduced, when it is exceptionally difficult to do things we regard as hard, one is in a state of fatigue. But this fatigue is not of the body, but the mind. It might appropriately be called »mental fatigue«. The difference between mental fatigue and stress might seem to be a subtle one, but it

is not. Imagine that you are boarding a plane for a trip to a conference. You notice that there is a discussion going on among members of the flight crew. Is there a difference between overhearing that »the pilot has been feeling a bit stressed lately« and »the pilot has been feeling a bit incompetent lately«?

Admittedly the term »stress« is far more familiar than »mental fatigue«. This very familiarity can cause considerable confusion. For example, when research participants are asked about feeling »stressed«, they readily endorse this popular term even though what they include under this heading is often more appropriately called mental fatigue. Even if the term is unfamiliar, however, the experience of mental fatigue is familiar to most of us. Unlike stress, which is evoked by a present or anticipated negative event, people can become mentally fatigued by doing what they like to do, but for too long without a break.

### 3 An analysis of mental fatigue

While »mental fatigue« is a useful and easily graspable concept, it is also somewhat misleading. It allows one to distinguish the condition from physical fatigue as well as from stress. The difficulty, however, is that the name suggests that the mind as a whole has fatigued, and this is not the case.

#### What is it that fatigues?

William James (1892), the great American psychologist and philosopher, provided important insights into the issue of mental fatigue in his analysis of attention. He distinguished between two kinds of attention, which in modern terms, might be referred to as »directed attention« and »fascination«. Directed attention is what it takes to get through a difficult or boring task. It is the kind of attention we call upon when working in a distracting surrounding or when trying to make a decision about a complex situation. It takes effort, and it is susceptible to fatigue.

Fascination, by contrast, is effortless. It is the kind of attention that is called forth by exciting events or interesting tasks. Far from being hard work, it is often difficult to tear our attention away from something fascinating. Thus the basic distinction between these two kinds of attention revolves around three themes. Directed attention is effortful, it is subject to voluntary control, and it is susceptible to fatigue. Fascination is at the opposite pole on each of these dimensions. In terms of our analysis of „mental fatigue“ then, it is more useful to name the syndrome in terms of what is actually becoming fatigued – hence we call it Directed Attention Fatigue (DAF).

It may seem strange that so important an aspect of the human mind as directed attention should be so fragile. Yet, in evolutionary perspective, this apparent limitation might have been quite reasonable. To be able to pay attention by choice to one particular thing for a long period of time would make one vulnerable to surprises. The capability of being vigilant, of being alert to one's surroundings may have been far more important than the capacity for long concentration. Further, much of what was important to the evolving human – wild animals, danger, caves, blood, to name a few examples – was (and still is) innately fascinating and thus does not require directed attention. It is only in the modern world

that the split between the important and the interesting has become extreme. All too often the modern human must exert effort to do the important while resisting distraction from the interesting. Thus the problem of fatigue of directed attention may well be of relatively recent vintage.

### **Costs and causes**

Directed attention fatigue can have many consequences. These pervasive costs undermine an individual's competence in many ways. They can be summarised by the following four concepts:

- Individuals with DAF are readily *distracted*; maintaining focus on a goal, a line of thought, or a conversation is difficult and unreliable.
- Individuals with a high level of DAF are planning impaired. They are neither effective at exploring possible futures nor at making plans, furthermore, they have difficulty sticking to plans they were able to formulate (or those provided by others).
- An inclination to be impulsive is another characteristic of individuals with a high level of DAF. They have little patience or capacity for delay and are inclined to act on the first thing that comes to mind.
- Another symptom of DAF is the inclination to be *irritable*. While people are often unaware of their DAF state, unprovoked irritability is perhaps a more easily recognised indicator to recognise. It is also, of course, rather quickly noted by others.

Such consequences of directed attention fatigue would not be a matter of great concern if they were a relatively rare condition. Unfortunately, quite the opposite is the case. Although frequently unnoticed or mislabelled, DAF is widespread and pervasive. The number and variety of conditions that can lead to directed attention fatigue is, unfortunately, substantial. Consequently the symptoms can be found in a wide variety of individuals. Leading the list of such individuals are those suffering from serious illnesses as well as the caretakers of the ill. Another category of individuals for whom DAF is a likely pattern are people experiencing grief over a major loss, whether it be a significant other, a job or one's home. Far more prevalent causes include overwork, sleep loss, and coping with prolonged attention-demanding situations (like urban traffic, for example).

It could be argued that DAF is a plague peculiar to modern life. It is a reflection of adapting to a world in which there are more people and more information than ever before. In particular, environments that are distracting and that are deficient in needed information lead to DAF, as do tasks that are difficult or dangerous. In addition, the demands of carrying out onerous duties also fall in this category (Kaplan 2001b).

## **4 Nature and the recovery from DAF**

The connection between the urban forest and the recovery of competence may not be immediately intuitive. Why might time in nature help in the recovery from DAF? One explanation of how this might work is provided by Attention Restoration Theory, whose focus is on the way restorative environments allow fatigued

directed attention to recover. The version of this framework presented here is brief; fuller discussions are available in a number of sources such as Kaplan & Kaplan (1989) and Kaplan (1995; 2001b).

As we have seen, prolonged use of directed attention leads to its fatigue. In order to rest directed attention it is necessary to find an alternative basis for maintaining one's focus. Fortunately there is such a source, and, equally fortunately, it is widely available. The other form of attention, fascination, provides a way for directed attention to rest. Since fascination is itself resistant to fatigue and takes no effort, being in its presence permits DAF to recover. This, in essence, is the mechanism proposed by Attention Restoration Theory.

There are many sources of fascination. Fascination can come from *content*, and that content can be of various kinds. It can be noisy, like watching auto racing, or quiet, like walking in a natural setting. Fascination can also come from *process*. Recognising despite uncertainty and difficulty, like bird watching, is an example of a process that allows one to pay attention without effort. Predicting despite uncertainty, as practiced by gamblers, provides another process example. Quiet fascination, characteristic of certain natural settings, has a special advantage in terms of providing an opportunity for reflection, which can further enhance the benefits of recovering from directed attention fatigue. I will refer to such opportunities for reducing directed attention fatigue as »restorative experiences« or »restorative environments«.

Fascination is thus a central component of a restorative environment because it permits directed attention to rest. Restorative environments, however, also require some additional qualities (Kaplan & Kaplan 1989). These are being away, extent, and compatibility:

- Being away is useful, but does not guarantee a restorative environment. People often use »getting away« as shorthand for going to a restorative place. Nonetheless, there are many places that are »away« but would not permit the necessary rest of directed attention. A prison cell provides a vivid example.
- The environment should have extent rich enough and coherent enough so that it constitutes a whole other world. Restorative environments work best when one can settle into them, when they provide enough to see, experience, and think about so they take up the available room in one's head.
- There should be substantial compatibility of the environment with one's purposes and inclinations. In other words, the setting must fit what one is trying to do and what one would like to do. Compatibility is a two way street. On the one hand, a compatible environment is one where one's purposes fit what the environment demands. At the same time the environment must provide the information needed to meet one's purposes. Thus in a compatible environment one carries out one's activities smoothly and without struggle. There is no need to second guess or to keep a close eye on one's own behaviour. What one does comfortably and naturally is what is appropriate to the setting (Kaplan 1983).

## 5 Is there research support for this hypothesis?

While some aspects of the Attention Restoration Theory make intuitive sense, it must be admitted that it is far from the common sense view of the way in which nature experience leads to psychological benefits. It is certainly reasonable to wonder if there is any empirical support for this approach. Such support ideally would not only cover the issue of whether there are clear benefits beyond the stress concept, but also whether there is justification for the focus on attention as an essential component of these additional benefits.

As it turns out there is a substantial body of research in this area; it is large enough, in fact, for it being necessary to be selective. The three domains I have chosen are useful in demonstrating how pervasive and serious these issues are. These domains are health challenges, overcoming economic and social disadvantage, and life cycle changes.

### Health challenges

Care-giver fatigue and burnout. In her doctoral dissertation research for a degree in clinical psychology, Canin (1991) studied AIDS care givers in the San Francisco area. Understandably such individuals are prone to fatigue and burnout. Canin examined what activities were most effective in resisting these hazards. The unambiguous results were that locomotion in nature, whether involving walking, running, biking or canoeing, was the most effective antidote to burnout and fatigue. By contrast, watching or participating in sports was not found to be helpful in this way. And interestingly, Canin found that the worst thing one could do when trying to avoid burnout and fatigue was to watch television.

Dealing with life-threatening illness. Cimprich's (1990; 1992) studies with cancer patients provide particularly striking findings. Cancer patients are generally instructed in self-care when they leave the hospital. They not only tend to have difficulty remembering such information; some even deny that they ever received it. It has also been observed that cancer patients with a clean bill of health from a medical point of view often suffer persisting coping problems of many kinds, including marital difficulties and severe limitations in returning to their former activities (Obrist & James 1985).

Cimprich's observations of cancer patients suggested to her that they were showing serious directed attention fatigue problems. Her studies with post-surgery breast cancer patients thus included a wide range of measures of directed attention. Participants were randomly assigned to either the experimental or control group for the 12-week duration of the study. The former involved having each person sign a contract agreeing to participate in three restorative activities (of at least 20 minutes each) per week. The control group was not told about restorative activities until the study was completed. While the notion of restorative activities was explained in broad terms with numerous examples, participants generally selected nature-based activities (such as walking in nature and gardening) to fulfil their contracted time.

Cimprich found the participants in both groups showed severe attentional deficits shortly after surgery. Over the four times of administering the directed attention

tasks the experimental (restorative) group showed gradual but steady improvement; the control group did not. Further, in the restorative group participants went back to work sooner and were more likely to return to full time work. Another striking difference was the inclination of members of the restorative group to start new projects (like learning a language or losing weight). The control group participants reported no new projects. And finally, experimental group members showed significantly greater gains on quality-of-life ratings.

What is particularly remarkable about this study is the effect of a very modest intervention (an activity of at least 20 minutes carried out three times per week) on a problem that, according to the literature in this area, has the capacity to undermine people's lives for a matter of years.

### **Overcoming economic and social disadvantage**

A notoriously dismal public housing facility in Chicago is the setting for a remarkable series of studies carried out by Frances Kuo, William Sullivan and their students. Two features of this setting make it particularly interesting as a context for research. First, it is a situation where finding ways to improve the life quality and life prospects of individuals is exceedingly difficult. Second, from an experimental standpoint, it provided a control that is difficult to achieve in a real world context: the residents are essentially randomly assigned to the apartment they live in and cannot afford to refuse their housing when it becomes available. The real world setting had some other manifestations that are important to mention. The housing tenants would have regarded the research team members with suspicion and mistrust, therefore two residents of the facility were trained to conduct interviews and administer tests of directed attention. In a series of studies the researchers examined the impact of access to the natural environment, with a particular emphasis on trees.

Community and safety. Previous research has indicated the close relationship between people gathering together and the sense of community and safety (Yancey 1971). In the, often bleak, world of public housing, getting people to gather and come to know each other is a major challenge. The question, then, is how to create environments that encourage such behaviour. Coley, Kuo and Sullivan (1997) found nearby vegetation plays an important role in fostering social interaction. Social interaction in such settings, in turn, led not only to stronger neighborhood social ties, but also to a greater sense of safety and adjustment (Kuo, Sullivan & Coley 1998).

A major factor in discouraging gathering in public housing contexts is fear. Such fear has a basis in fact, since aggressive behaviour is not uncommon in these massive, faceless housing complexes. Both fear and aggression have been shown to be responsive to the presence of nearby nature. Kuo and Sullivan (2001a) found that residents who had nature outside their apartments were less likely to use aggression and violence in dealing with problems. Through a careful statistical analysis this effect was found to be due to differences in directed attention capacity. If residents who have nature nearby were less inclined to use violence, one would expect that such settings would be more peaceful. Such was in fact the case; greener surroundings led to lower levels of fear and fewer reported crimes (Kuo & Sullivan 2001b).

Effectiveness at managing life issues. Residents of public housing face enormous challenges in dealing with poverty, discrimination and inadequate education. While it might be difficult to imagine how trees could help in this difficult context, once again ingenious research yields some striking findings. Kuo (2001) found that residents who have the benefit of nearby nature were less likely to procrastinate in dealing with the major issues of their lives. Further, such residents felt more hopeful and less helpless about the issues facing them. Once again, this effect of nature was found to be due to greater attention capacity.

Children who grow up in public housing are understandably at risk; breaking out of the cycle of poverty and inadequate education presents an awesome challenge. Here again these researchers have shown that nature makes a difference. Faber Taylor, Kuo and Sullivan (2002) report that girls with greener views from home had greater self-discipline. They were less impulsive and had better concentration. This in turn led to better life decisions and better school performance. These findings applied only to girls; boys are apparently farther ranging, spending more time farther away from home than girls.

### **Life cycle challenges**

The capacity for directed attention varies over the life span. This capacity develops gradually in young children, probably reaches a peak around the undergraduate years, and gradually declines thereafter.

Children. Since young children do not yet have fully developed capacity for directed attention, one would expect some degree of attention problems in normal children. Patrik Grahn and his students wanted to study the effects of nature on these attention lapses, such as being distracted, not listening to others, interrupting, and not waiting their turn (Grahn et al. 1997). To assess the level of attention problems they used a measure that was devised for children with Attention Deficit Disorder (ADD). While normal children do not have as frequent or severe attention problems, the nature of the problems is similar. The study was carried out at two Swedish pre-schools that were similar in many respects, but had play areas differing in naturalness. The children who played in the more natural play area displayed substantially fewer attention problems.

These results are strikingly parallel to a study of ADD children by Faber Taylor, Kuo and Sullivan (2001). They asked parents of ADD children to describe situations that were most and least healthy for their children. Although in many cases the parents had not categorised them in that way, the findings showed that the most helpful settings were natural environments. In an interesting parallel to Canin's findings, the setting that most strongly evoked ADD symptoms was watching television.

The elderly. Ottosson and Grahn (2002) have studied the effects of nature on elderly people in nursing homes. They report that even an hour outdoors in nature improves directed attention capacity. This effect is stronger the more impaired the individual is.



## 6 Conclusion: beyond competence

The psychological benefits made possible by the urban forest are pervasive and far-reaching. They range from simple enjoyment to enhancing the quality of life to what could only be described as life-changing impacts. These benefits are indeed impressive. As I attempted to summarise the research findings, however, I realised that a new dimension of benefits has emerged. I was struck that some of the benefits have a strikingly moral flavour. In other words, the decline of directed attention leads to less responsible and less constructive behaviour on the part of the individual as well as to social and interpersonal difficulties, all of which have far-reaching societal implications.

Table 1 places the findings reviewed earlier in three columns. The column on the left represents what appear to be moral concerns while the column on the right represents aspects of competence. The centre column includes benefits that resist confident placement into either of these categories. While one can point to a set of benefits that represent aspects of competence and another set that reflect moral issues, the distinctions are not sharply drawn and the boundaries are fuzzy.

*Table 1. Categorisation of urban forest benefits.*

<b>Moral virtues</b>	<b>Both</b>	<b>Intellectual strengths</b>
Civility	Find meaning	Focus despite distractions
Self discipline	Patience	Follow through on decisions
Continue in the face of difficulty	Listen to others	Hold multiple perspectives
	Consider consequences of one's actions	

The difficulty of separating the moral from the competent suggests what may be a new perspective on moral behaviour. Many of these desirable characteristics may not simply be a matter of choice based on one's upbringing or having the »right« attitude. Rather they may at least partially depend on competence-related issues, and these, in turn, may depend upon experiences such as those provided by the urban forest. This suggests the importance of a healthiness of mind in order to call upon these socially valued strengths. People lacking such healthiness are not necessarily mentally ill in the technical sense, but their impairment can express itself in moral handicaps as well.

Moral exhortations remain a popular means to improve people's behaviour despite the limited effectiveness of this approach. Perhaps such exhortations would be more effective when falling on the ears of people who are not suffering from directed attention fatigue. In many cases the motivation may already be in place, needing only a healthier state of mind in order to lead to appropriate behaviour.

The urban forest may hold vast potential not only in helping people during difficult times, but in helping bring about a saner, more liveable world as well. This conclusion has numerous implications. First, it suggests why economists have such difficulty providing a money value for the worth of the urban forest; the benefits are far too diverse and too difficult to achieve in other ways. Second, this suggests that the opportunities both for alliances with different groups and for support from community and government for the urban forest are even more

extensive than one could have ever guessed. And finally, this unexpectedly vast potential also suggests that there may be the basis here for a new and largely unexplored approach to improving society and reducing social ills.

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