UHF 470-1

Relf, Diane (editor). 1992. *The Role of Horticulture in Human Well-Being and Social Development*. Portland, OR: Timber Press.

CHAPTER 22

The Restorative Environment: Nature and Human Experience

Stephen Kaplan

Professor of Psychology, University of Michigan

INTRODUCTION

Early human beings were a part of nature. Over the millennia the gulf between humanity and the natural environment has steadily widened. Now, however, there is growing concern that this gulf has become too great, that we have strayed too far for our own good. This shift is due, at least in part, to a change in circumstances. Increasingly, people are confronted by pressures that are inexorably changing their lives. Although these pressures are by no means new, their steady increase and their cumulative impact are leading to increasingly unfortunate consequences.

Many of the pressures people face today are the results of three interacting forces: advances in technology, the knowledge explosion, and the increasing world population. Since these trends are more likely to get worse than better, they provide a useful working hypothesis as to what the pressures facing future populations might look like.

Although these trends each have distinct manifestations, they also have some common consequences. In particular, they all contribute to the experience of mental fatigue, which can lead people to be less tolerant, less effective, and less healthy. Natural environments can play a central role in reducing these unfortunate effects.

The thrust of my argument can summarized in terms of three basic themes:

1. Increasing pressures lead to problems of mental fatigue.
2. Restorative experiences are an important means of reducing mental fatigue, and have a special connection to natural environments.
3. Natural environments, in providing these deeply needed restorative experiences, play an essential role in human functioning.

These themes, in turn, lead to three groups of questions that I shall attempt to address:

1. The first set of questions concerns the pressures members of modern society face: Why are these pressures increasing? What impact do they have?
2. The second set concerns what Rachel Kaplan and I have come to call "restorative experiences," that is, experiences that help people recover from mental fatigue: What is the nature of these experiences? How do they achieve their substantial benefits? How does nature play a special role in providing such experiences?
3. Finally, what makes natural environments so important? What kinds of significant impacts can they have on the life of an individual?

INCREASING PRESSURES AND THEIR IMPACTS

To understand the pressures facing an individual in the modern world, it is essential to understand something about the psychological process of attention, since attention is the aspect of human functioning that seems to suffer most.

For much of human history, information was scarce and the information available was highly selected (Postman, 1985). For a variety of reasons, the situation has changed dramatically in a relatively short time. Information is no longer scarce; as information proliferates, what is now scarce, as Herbert Simon (1978) has pointed out, is attention.

To appreciate what it means to say that attention is a scarce resource, a distinction that the great psychologist-philosopher William James made nearly 100 years ago may prove helpful. James (1892) identified a kind of attention, which he called "involuntary," that is evoked by something interesting or exciting in the environment. Such attention has the advantage of being effortless; attending to something of great interest is not hard work. Involuntary attention has two limitations. It is dependent upon an interesting environment, and sometimes one has to function in an environment that is not interesting. It also ties one to the environment; as such, it favors simple and direct responses rather than those that take advantage of one's higher mental processes.

A second kind of attention, which has come to be called "directed attention" (Stuss and Benson, 1986) does require effort. On the other hand, it permits one to focus selectively upon the environment, and to engage in higher mental processes such as problem-solving and planning. Unlike involuntary attention, directed attention is under voluntary control; when one instructs a child to "pay attention," one is referring to directed attention. The major limitation of directed attention is that it requires effort and that one's capacity to put forth that effort is finite. In other words, directed attention is susceptible to fatigue.

Given this brief sketch of the two kinds of attention, it is possible to begin to examine the pressures on attention that are characteristic of living in the modern world. Some of these pressures are the result of active competition for our attention. The mass media in general, and advertising in particular, are deeply committed to this informational struggle. High technology is employed to make these forms of informational competition ever more seductive. Thanks to marketing research and well-honed intuition, there is now considerable knowledge of what people find inherently interesting. This knowledge is effectively used against us, deflecting us toward stimuli that are hard to ignore but unsatisfying and unhelpful. Mander (1978) argues that in American television this coercive technology has been elevated to a highly refined art.

Some of the pressures on directed attention are not the outcome of an active struggle but take their toll nonetheless. It has become increasingly difficult to find the information one needs, embedded as it is in vast quantities of information that one does not need. Information retrieval has become so difficult that some corporations now favor doing a study

on their own rather than searching the literature to determine whether it has been done before.

As the information explosion increases unabated and as media and advertisers fight over our scarce attention, the need for rest becomes increasingly important. Unfortunately, the trend has been in the opposite direction. The emphasis on efficiency and productivity, coupled with recent technological advances, has tended to reduce or eliminate the moments of rest that were at one time a natural part of everyday life.

The shift in the relationship of people to computers that has occurred in the past 30 years provides a vivid illustration. When I arrived in graduate school, the analysis of variance (a statistical technique) had recently been developed. With the aid of an electric calculator, such a statistic could be computed by a graduate student in about one year of work. This heroic effort then became the core of the student's dissertation. By the time I completed my graduate work, the computer had not only arrived on the scene but had become an accepted part of the institution's functioning. It was available to compute our statistics, and we had only to wait 24 hours for the results. Now waiting 24 hours for results would seem like an eternity; we expect to obtain them on-line, and many users are unhappy if their personal computers are not capable of multi-tasking, i.e., of doing several things at once. The rests one takes in between events are rapidly disappearing.

A story told by an Amish farmer provides a useful contrast (Kline, 1990). He was discussing the advantages of a horse over a tractor as a source of locomotive power on the farm. "Because God didn't create the horse with headlights, we don't work nights," he commented. Owning a tractor, by contrast, would lead to a powerful temptation to plow after dark. He also pointed out that the horses need to rest after a morning of work. As a result the family could assemble for lunch and a rest. Again, owning a tractor would have made it tempting to eliminate this important midday respite.

The increased pressure on directed attention forces us to expend more effort in order to retain focus on what is important. We thus call on directed attention with increasing frequency. At the same time, the decline in opportunities for rest leaves us less able to deal with the growing fatigue. The fatigue that results from these multiple assaults on our attention is not physical, but mental. Indeed, physical activity is often welcomed by individuals suffering from mental fatigue.

Everyone has experienced mental fatigue at one time or another; certainly everyone who has ever been a student remembers how one felt after completing final examinations. Despite this widespread experience, the implications and the seriousness of this mentally depleted state are not widely recognized. A compilation of the results of a variety of studies yields the following description of individuals suffering from this all-too-common condition: They have difficulty concentrating and are highly susceptible to distraction; find it difficult to make decisions; are impatient and inclined to make risky choices; are irritable and less likely than usual to help someone in distress; have difficulty either planning or carrying out previously made plans.

This is hardly a desirable state of affairs either for oneself or for someone with whom one associates. In extreme form, it could lead to excessive alcohol consumption or other drug abuse and/or to violent behavior. Even in milder form, such a state is unlikely to be conducive to creativity and effectiveness. Certainly if there were a way to reduce the overall level of mental fatigue in the population, it would be worth a substantial investment to do so. Fortunately, there is such a way.

THE RESTORATIVE EXPERIENCE

The concept of restorative experiences arose in the context of a research program in the wilderness (Kaplan and Kaplan, 1989, chapter 4). The U.S. Forest Service had asked us to study the benefits of an ongoing wilderness program that was being carried out in Michigan's Upper Peninsula. Wilderness was not a primary research interest of ours, and the project was certainly not one we would have initiated on our own. What we learned from the research, however, was well worth the effort and turned out to have far broader applications than we would have expected.

The participants in the wilderness program we studied found the experience to be a profoundly restful and even healing one. In addition to recovery from mental fatigue, many of them found themselves in a reflective mode, stepping back to consider their lives and their priorities. They found nature more powerful, and at the same time more comforting, than they had ever imagined; they left the wilderness at the end of the trip worrying about how they could maintain their contact with this unexpectedly significant environment. An experience such as theirs, which leads to a recovery from mental fatigue as well as a variety of associated benefits, we have come to call a restorative experience.

Of particular interest for our present purposes are the four components of the restorative experience that we identified in the course of this research program. To understand these components and how they fit together, it might be helpful to pause for a moment to look at the thought process that occurs in restorative settings, and to see how it differs from the kind of thinking that occurs everyday. In this way, understanding the aspects of the environment that support this rather special pattern of thinking may be easier.

Let us return to the most basic aspect of the restorative experience, namely that it facilitates the recovery from mental fatigue. Our present task is to consider what goes on in the mind that accounts for this recovery process. This can be understood in terms of two basic themes:

1. Peoples' behavior depends upon the models of the world that they carry around in their heads.
2. When people can run that model effortlessly, they can rest that part of the mind that readily becomes fatigued.

Perhaps a little explanation is in order. What does it mean to say that one has a model of the world in one's head? Let us start with the assumption that under normal circumstances, people know something about what they are doing. Even a setting that one has never been in before may be sufficiently like other, familiar settings that one has some idea of what to do. In such cases, one has a model of the environment in one's head, and this model helps guide behavior (Kaplan and Kaplan, 1982).

Having a model is half the battle. To be able to run the model effortlessly, one also needs cooperation from the environment. Each of the four components of the restorative experience we identified in the wilderness research offers an essential aspect of this environmental support.

Being Away. Being in some other setting makes it more likely that one can think of other things. People often talk of having to get away, of needing a change, when they are exasperated by the accumulation of mental fatigue (although they may not put it in those terms).

Extent. Being away does not guarantee a restorative experience, however. Many settings may provide a change, but they are limited in scope. By contrast, restorative settings are often described as being "in a whole different world." Two properties are important to this experience: connectedness and scope; together they define what I mean by extent.

Scope requires that the environment is experienced as large enough that one can move

around in it without having to be careful about going beyond the limits of the model that one is running. To have *connectedness*, the various parts of the environment must be perceived as belonging to a larger whole. Without that, one must repeatedly expend effort to find the model that is appropriate to the current momentary situation. A situation that allows a model to be left to run on "automatic pilot" requires far less effort.

Although the notion of extent is pertinent to a physical setting, it applies in a more conceptual, or imagined, sense as well. Thus, the experience of being in some distant "place" can also be realized when one is absorbed in a novel or by a performance.

Fascination. In addition to the need for extent, restorative experiences depend upon interest or fascination. A fascinating stimulus is one that calls forth involuntary attention. Thus fascination is important to the restorative experience, not only because of its intrinsic attraction, but also because fascination allows one to function without using directed attention. Here, too, the ease with which one can run one's mental model of the world is directly affected. Without fascination, there is always the danger that the model one should be running will give way to distraction or to daydreaming. Effort is required to keep the appropriate model in focus. One of the great benefits of fascination is that it frees one from the need for effort of this kind.

Just as extent can be based on the physical environment or on one's perceptions and thoughts, fascination can be derived from objects in the environment, as well as from ways of doing things. People are fascinated by figuring things out, by predicting uncertain events, by challenges. Thus, restorative experiences can draw on a great variety of circumstances, as long as there is sufficient extent and enough to keep one absorbed by it.

Compatibility. Even with fascination and extent, an environment can still fall short as a setting for restorative experiences. The final component of the restorative concept calls upon the compatibility among the environmental patterns, the individual's inclinations, and the actions required by the environment (S. Kaplan, 1983).

The importance of compatibility is easiest to see in its absence. There is no lack of settings in which the environment undermines what one is trying to accomplish, where one's goals and actions are obstructed by the demands made by the environment. Such situations require considerable mental effort. In a compatible environment, by contrast, what one wants to do and is inclined to do are what is needed in and supported by the environment. When what intuitively feels right is what the situation requires, one's model is thoroughly supported by what is happening in the environment. In such cases, one's relationship to the environment takes on an effortless quality that can be deeply restorative.

Although these properties of a restorative experience emerged in the context of the wilderness experience, it quickly became evident that they were by no means unique to such settings. In particular, the garden experience (R. Kaplan, 1973), which is different in so many ways, turned out, on a deeper level, to have striking similarities.

APPLYING THE RESTORATIVE CONCEPT TO THE NATURAL ENVIRONMENT

Although the restorative environment is by no means restricted to natural settings, natural environments seem to be particularly restorative. Of particular importance in this context is the role of "accessible nature." This role should become increasingly clear as we examine each of the properties of the restorative experience discussed above in the context of natural settings in general. The emphasis in this section is on settings that, while often undramatic and small in scale, have the essential property of being readily accessible.

Being Away. Natural settings are often the preferred destinations for extended restorative opportunities. The seaside, the mountains, lakes, streams, forests, and meadows are all idyllic places for "getting away." Yet for many people in the urban context, opportunities for getting away to nature spots in their nearby environment are minimal. Natural

environments that are easily accessible thus offer an important resource for resting one's directed attention.

Extent. In the distant wilderness, extent comes easily. But extent need not entail large tracts of land. Even a relatively small area can provide a feeling of extent. Trails and paths can be arranged so that a small area seems much greater. Miniaturization provides another device for providing a feeling of being in a whole different world, though the area is in itself not extensive. Japanese gardens sometimes combine both of these devices in giving the sense of scope as well as connectedness.

Extent, as already mentioned, also functions at a more conceptual level. For example, settings that include historic artifacts can promote a sense of being connected to past eras and past environments and thus to a larger world.

Fascination. Nature is certainly well-endowed with fascinating objects, as well as offering many processes that people find engrossing. Many of the fascinations afforded by the natural setting might be called "soft fascination." Clouds, sunsets, snow patterns, the motion of the leaves in a breeze—these readily hold the attention, but in an undramatic fashion. Attending to these patterns is effortless, and they leave ample opportunity for thinking about other things.

When one thinks of sources of soft fascination, vegetation is a recurring theme—the view of trees and grass out the window, masses of flowers, the garden. People find these patterns aesthetic and pleasurable; in the context of this pleasure, people can reflect on difficult matters that would be too confusing or too painful to contemplate under other circumstances.

Compatibility. The natural environment is experienced as particularly high in compatibility. It is as if there were a special resonance between the natural setting and human inclinations. For many people, functioning in the natural setting seems to require less effort than functioning in more "civilized" settings, even though they have much greater familiarity with the latter.

It is interesting to consider the many patterns of relating to the natural setting. There is the predator role (such as hunting and fishing), the locomotion role (hiking, boating), the domestication of the wild role (gardening, caring for pets), the observation of other animals (bird watching, visiting zoos), survival skills (fire building, constructing shelter), and so on. People often approach natural areas with the purposes that these areas readily fulfill already in mind, thus increasing compatibility.

A nearby, highly accessible natural environment cannot provide the context for all of these goals and purposes. Yet even such a setting is likely to be supportive of the inclinations of those who seek a respite there. It is amusing to think of the factory worker who races off during the lunch period, fighting traffic and distractions, to find a spot in the shade of a tree for a peaceful break. If the peaceful effect would have been totally worn off by the time the return trip is made at the end of the hour, would this ritual be repeated again tomorrow?

CONCERNING THE IMPORTANCE OF THE NATURAL ENVIRONMENT: RESEARCH RESULTS

A recently completed study (Cimprich, 1990) brings together many of the themes of the conference in a particularly striking fashion. Years of experience working as an oncology nurse at Sloan-Kettering Institute in New York led Dr. Cimprich to wonder why preparing patients to care for themselves after they left the hospital was so difficult. She also wondered why patients who no longer required treatment and were considered to have excellent prospects from a medical point of view, so often experienced serious problems. They reported difficulties in managing their lives and difficulties with their marriages. They experienced symptoms they were unable to explain, which disturbed them and led them to distrust the

clean bill of health they had been given. One of the characteristic difficulties, involving severe limitations in the capacity to focus, has been found to persist for at least three years after treatment. Patients often compensate for this limitation by a progressive narrowing of their lives.

A number of years ago, Dr. Cimprich, then a doctoral student in the School of Nursing at the University of Michigan, was taking a course with me. When the topic of directed attention and mental fatigue was discussed in class, she immediately recognized its relevance to the plight of the cancer patients with whom she had worked. When viewed from this perspective, the experience of the cancer patient can be seen as a multifaceted attack on the unfortunate individual's directed attention.

For her dissertation project, Dr. Cimprich decided to work with breast cancer patients who had an excellent prognosis for a full recovery. She set out to find a battery of objective measures of attentional capacity. Lacking any pure measures of directed attention, I proposed that we add a novel technique to the battery of tests. Many people are familiar with the wire frame drawing of a cube (technically called a "Necker cube" in the psychological literature) that appears to "reverse" as one focuses upon its center for a period of 30 seconds. In other words, which face of the cube appears to be in front seems to change from time to time, assuming that one stares at it long enough. The rate of these reversals varies considerably from one person to the next.

Although the basic phenomenon of the apparent cube reversal is widely known, what is less well known is that it is possible to slow the rate of reversal by making an effort to do so. If one focuses one's attention on the cube as it appears at a given moment, its apparent change to the other possible cube will in general be delayed. This phenomenon is of great theoretical interest because directed attention is believed to achieve its focusing influence by inhibiting potentially interfering material. Thus by asking the participants in this study to attempt to slow the rate of reversal of the cube, we could assess the strength of this inhibitory factor relatively directly.

Participants in this study were randomly assigned to one of two groups. Individuals in the intervention group were told that people in their condition sometimes benefit from setting aside some time for restorative experiences. These were explained and a list of potentially restorative activities was offered. From this list they chose four activities. These were then listed in a contract that stated the patient's commitment to participate in at least three such activities per week, with a minimum duration of 20 to 30 minutes. Both the patient and Dr. Cimprich signed the contract.

Each patient was tested four times on the battery of attentional measures (over a period of 90 days since surgery). At the initial testing point, the average scores of these patients were so low as to fall in the range characteristic of brain-damaged patients. The recovery of the control group was erratic and uneven; many of their scores at the end of the period of testing were not significantly different than at the beginning. By contrast, the intervention group showed improvement on all measures. Perhaps most striking was their performance on the "slowed" Necker Cube task. It showed steady improvement throughout the testing interval.

The benefits of this remarkably modest intervention were not restricted, however, to measures of attention. There were two areas in which there were indications that the intervention group was well on its way to returning to a normal, healthy life. More of these participants went back to work during these initial 90 days, and more of them went back full-time. Perhaps most fascinating of all, many of the participants in the intervention group started new projects during this time. They decided to undertake challenges such as losing weight or learning a new language. None of the participants in the control group could think of any new projects they had initiated during that interval.

No single study can in itself be considered definitive. Replications and extensions of this important work are clearly needed. Yet the insights and implications of this initial study are too fascinating to ignore. Let us examine a few of them:

1. Out of the various restorative activities on the list, the predominant choice by far was of nature-related activities.

2. It is unlikely that breast cancer patients are the only ones who suffer assaults on their attention or could benefit from systematic participation in restorative activities. Many illnesses, traumatic experiences, and difficult life transitions can be seen in this new context as likely to place extreme demands on directed attention and to call for similar treatment. The limited attentional capacities of the elderly suggest that they, too, could benefit. It is interesting to contemplate the pressure on natural settings, the increased demand for garden opportunities, and the other claims on this limited resource that would occur if all groups who could benefit knew about and partook of this opportunity. Either we need to keep the information a well-guarded secret, or we need to redouble our efforts to preserve and conserve open-space.

3. We are now a step closer to understanding the effect of the natural environment on human health. The impressive studies of improved health in prisons (Moore, 1981; West, 1986) and enhanced healing in hospitals (Ulrich, 1984; Verderber, 1986) when a more restorative view was available have made it abundantly clear that such an important relationship existed. It is now possible to begin to grasp one of the underlying mechanisms. There is good reason to believe that activities essential to maintaining, or, indeed, recapturing one's quality of life are dependent on directed attention. Further, it appears that a fatigued directed attention is benefitted by even a modest amount of restorative activity.

4. The difference between nature as an amenity and nature as a human need is underscored by this research. People often say they like nature; yet they often fail to realize that they need it. The same restorative opportunities were available to all participants in this study; there is every reason to believe that they all would have benefitted. Yet only the participants who had contracted to do so consistently carried out these activities. An educational and a cultural gap needs to be addressed. Nature is not merely "nice." It is not just a matter of improving one's mood, rather it is a vital ingredient in healthy human functioning.

ACKNOWLEDGMENT

Work on this paper and on the research that led to it was supported, in part, by the U.S. Forest Service, North Central Forest Experiment Station, Urban Forestry Project, through several cooperative agreements. I would also like to thank Rachel Kaplan for her many and substantial contributions to this paper.

LITERATURE CITED

Cimprich, B. 1990. Attentional fatigue and restoration in individuals with cancer. Doctoral dissertation, University of Michigan.

James, W. 1892. Psychology: The briefer course. Holt, New York.

Kaplan, R. 1973. Some psychological benefits of gardening. Environment and Behavior 5:145–152.

Kaplan, R. and S. Kaplan. 1989. The experience of nature: A psychological perspective. Cambridge University Press, New York.

Kaplan, S. 1983. A model of person-environment compatibility. Environment and Behavior 15:311–332.

Kaplan, S. and R. Kaplan. 1982/1989. Cognition and environment: Functioning in an uncertain world. Praeger, New York. (Republished in 1989 by Ulrich's, Ann Arbor, Michigan)

Kline, D. 1990. Great possessions: An Amish farmer's journal. North Point Press, San Francisco.

Mander, J. 1978. Four arguments for the elimination of television. Morrow-Quill, New York.

Moore, E. O. 1981. A prison environment's effect on health care service demands. Journal of Environmental Systems 11:17–34.

Postman, N. 1985. Amusing ourselves to death. Penguin Books, New York.

Simon, H. A. 1978. Rationality as process and as product of thought. American Economic Review 68:1–16.

Stuss, D. T. and D. F. Benson. 1986. The frontal lobes. Raven, New York
Ulrich, R. S. 1984. View through a window may influence recovery from surgery. Science 224:420–421.
Verderber, S. 1986. Dimensions of person-window transactions in the hospital environment. Environment and Behavior 18:450–466.
West, M. J. 1986. Landscape views and stress responses in the prison environment. Unpublished master's thesis, University of Washington.