

EXPLORING THERAPEUTIC RESTORATION THEORIES OF NATURE AND THEIR
APPLICATION FOR DESIGN RECOMMENDATIONS FOR AN ALZHEIMER'S GARDEN
AT WESLEY WOODS HOSPITAL

by

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(Under the Direction of Marguerite Koepke)

ABSTRACT

This thesis project is undertaken to identify design elements necessary to facilitate contact with nature for Alzheimer's patients in order to obtain stress relief and subsequently health benefits. Current research states that nature contact is healthful and innate to humans. Contact with nature can provide stress relief and restoration to healthy and hospitalized individuals. This stress restoration can be achieved with exercise, social support, control and positive distraction producing measurable health benefits if design elements to facilitate them are present. In this paper, we will review current nature theories and the salubrious benefits of interaction with, and access to nature. Designing therapeutic gardens to include elements that foster stress restoration is the goal.

INDEX WORDS: Therapeutic Garden, Healing Garden, Therapeutic Nature, Medical History, Hospital History, Nature History, Man and Nature, Nature Preferences, Alzheimer's Disease, Kaplan, Rachel, Kaplan, Stephen, Kellert, Stephen, Ulrich, Roger S., Wilson, E. O.

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DEDICATION

This thesis is dedicated to my long-suffering husband, Jamie, who has supported my efforts while I pursued my advanced degree while tolerating years of lonely years and countless empty weekends during the production of this scholarly work. To my daughters, Alexandra and Lydia, who saw their mother tied to the computer for months on end but never complained that I had missed a thing and made me laugh through it all. And, to my parents, Doss and Billie Cain, who taught me about the value of learning and perseverance.

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Chapter 1

Introduction

*“We are not ourselves when nature being oppressed,
commands the mind to suffer with the body”*

Shakespeare (King Lear)

Nature, though man’s need for it is well documented, is increasingly difficult to access in these days of industrialization and urbanization; however it remains a basic requirement for health and well-being. All of us have experienced a situation where stress from daily life becomes too extreme and a walk in the nearby park, a wilderness experience or even sitting on a patio looking at nature provides relief, both psychologically and physically. This need for a close and personal relationship with nature may be inherent in our evolutionary heritage (Wilson, 1993, 33). Progressing from a hunter-gather society to agrarianism and on to industrialization, we have moved ever further from our natural roots. For much of our evolutionary history we worked in concert with nature and learned how to survive. It would seem highly unlikely that such learning would be erased completely after many millennia of use, even if we hold to only rudimentary rules. To a variety of stimuli, our preferences and aversions correlate across cultures, indicating historically deep cognitive development that has not been lost over time (Kellert, 1993, 32, 34, 64). This would suggest that our healthful existence relies upon our relationship with nature and its availability to us. Ninety-five percent (95%) of respondents to a survey found that accessibility to nearby nature at a hospital’s open space was important to their positive mental state. Two-thirds noted that incorporating vegetation made the experience more pleasant and half mentioned other sensory experiences that were important such as a fountain and water (Cooper-Marcus, Clare, 1999, 5). While our opinions indicate that we require some access to nature, our behavior

toward the environment does not. Some current socially acceptable growth and development that is destructive toward nature may in hind-site come to be regarded as providing short-term benefit and long-range diminution of habitat (Kellert, 1993, 61).

Over the years, perceived improvements by industrialization and development have taken us ever further from contact with nature. Our ancient history began with sacred space, groves and places which were adopted into monastic gardens where the sick were protected and healed physically and spiritually. Cloister gardens gave way to charitable institutions that promoted positive environmental influence on patients. Over centuries, hygiene and ventilation improved the plight of the sick, thus leading to pavilion-style hospitals. Health had been improved and aided by nature for hundreds of years. The advancement of germ theory in the 20th century was the death-knell of terrace hospitals and the patient's access to the outdoors. Economics also played into this design style, leading to a proliferation of office-like buildings -- sterile, closed and climate controlled. Disease cure became the focus, rather than patient care. (Gerlach-Spriggs, et. al, 1998, 10)

Without exception most people, when asked where they go for a restorative experience, will respond with a description of an area, often far away, that is heavily vegetated or a description of general wild nature. If healthy people are willing to go to this great extreme to experience nature and feel restored, how much more the benefit of nature to those with illnesses, physiologic or psychologic. Indicators are that, as we are part of the biotic genome, we benefit from exposure to nature. It is virtually impossible that our ancient history could be so tied together with nature, and at the first flush of industrialization we could abandon our genetic history. It is far more likely that we have

an innate connection with nature and must experience it to maintain our health and well-being, regardless of advancements of society.

This project is undertaken to provide a review of man's ties to nature and to answer the question, *If incidental observations of improved health occur after exposure to nature, does any type of nature-experience provide healthful benefits? If so, can we design a safe space for a specialized group of patients to access nature and receive nature's healthful benefit?*

Let us look first at man's history with nature, and follow with a review of current man/nature theories that explain why we subliminally feel tied to nature. Then we will review current research that shows measurable benefits of nature on physiologic and psychological markers ending with a discussion of the Alzheimer's patient population, a specific patient population that could benefit from nature contact. Alzheimer's patients are one of the fastest growing patient populations, doubling since 1980. (AOA 2004) Because Alzheimer's patients frequently cannot tolerate medicines, we will discuss designing nature for their use and healthful benefit.

Chapter 2

From Hunter Gatherer to Horticultural Therapy

The first humans depended on botanical knowledge for their daily existence. Yet ease of access and plentiful quantities kept significant value from being placed on them. Early man had no cultivated or domesticated tree or plant, yet knew where to find and how to use the abundant vegetation surrounding him. Few cave paintings chronicle this knowledge, yet as far back as Paleolithic times there is evidence of the importance of plants to humans. Pollen, probably from floral offerings to the dead, indicates the significance and symbolism of plants in the cycle of life, even during this early phase of humankind (Warner, 1994, 5).

Our relationship to the earth and nature seem to be our deepest memory. It causes us to be closely bonded to the earth and living things around us. Plant life is fundamental to life in our world. If humans disappeared, plants would continue on but if plants disappeared, so would all other life forms. Nature contact offers humans a glimpse of the significance of life processes even if it is simply a view of flora and fauna or the act of growing and nurturing a plant. This response to nature may be genetically based. As E. O. Wilson says in "Biophilia" (1984) "humans have an innate tendency to focus on life and life like processes... the emotional and physical attractions of humans to nature implies a hereditary relationship".

The story of humanity is the story of our struggle to dominate and overcome the environment. The more successfully we control or keep the natural world at bay the more likely we are to call this the beginning of culture or civilization. The history of agriculture

and gardening is the beginning of civilization and irrevocably changed the course of mankind. 10 – 12,000 years ago a universal, diffuse pattern of humans working with nature stopped and we began the effort of making nature work for us. Thus, evidence the rise of horticulture as a science, skill and occupation (Gerlach Spriggs, et al, 1998, 11).

The rise of agriculture and gardening for primitive man initially allowed individual groups to grow and increase in number and territoriality. Soon the land was supporting greater numbers of inhabitants than ever before and it even became advantageous to have increased numbers of people to aid with cultivation and domestication. Close on the heel of this new living dynamic came increased disease and plague affecting the numbers of people living in groups and the skill and occupation for agriculture and gardens waxed and waned in use and knowledge. Biblical references provide a window to knowledge and plants used during this time period. Genesis and the Garden of Eden have been representative of the original ideal chased by generations of gardeners for its myth, metaphor and tradition. Proverbs speaks of the importance of a good wife considering the fields and planting it with the fruits of her hands. (Proverbs 31:16 RSV) Ecclesiastes advises us that toiling and gathering food and drink is to find enjoyment from the hand of God as well as reminders about the importance of seasons, when to sow and when to reap. (Ecclesiastes 2:24-26, 3:1-9 RSV) The Song of Solomon speaks of the sexual power and abundance gardens bring to their owners as well as references to walled and locked gardens, water, edible and fragrant plants as well as being an enclosed chamber for the king to recline, restore and rest. (Song of Solomon 4:12-15 RSV). Many of these features were maintained through the Dark Ages and

monastic gardens that managed to keep the knowledge of gardening and agriculture alive by walling out disease, plague and intruders.

Successive waves of discovery and rediscovery kept gardens alive through the Dark Ages within the monastic institution. Symbolism grew, as most gardens were divided into four sections according to the example in Genesis and traditions of Persia and the Middle East. A source of water or a fountain was placed at the intersection of the four paths and often a symbolic tree or statue was included. The enclosed gardens of the monasteries were to provide a safe, well ordered view of nature in contrast to the chaos that occurred outside the cloister walls. Built as a microcosm of wild nature but safer to experience and more easily accessible as well as a place to reflect on one's spirituality, these gardens were the bridge to more secular gardens (Gerlach Spriggs, et al, 1998, 13) that developed in the 1400's with the rise of Middle Age rulers and the European middle class and their effort to separate themselves from epidemics and the migrant poor.

Many monastic gardens in Europe became places that provided health care for the sick and poor coining the term hotel-Dieu or "hostel of God" and thus came our first hospitals (Gerlach Spriggs, et al, 1998, 14) incorporating a garden for the provision of health care and well being. By the 1450's, hygiene had arisen as a concern related to disease and many communal, monastic hospital gardens were restricted in an effort to reduce airborne spread of diseases. By the late 15th and early 16th centuries, Christian care was evolving into secular care with the use of gardens periodically restricted. Spanish hospitals built at this time followed Arabic architecture and traditions that included arcades, courtyards and windows that allowed air and light to stream in to patients. When Louis the XIV built the "Invalides" he followed the same design traditions he had seen in

Spanish/Catholic hospitals (Gerlach-Spriggs, 1998, 15). The idea of sun and fresh air for patients made its way to England with the prison and hospital reformer, John Howard. His reports of European hospital gardens, along with new scientific ideas on hygiene, brought about experimentation with new hospital architecture and design that included the incorporation of sunlight, breezes and gardens. The success with patient welfare in this setting led to the continued use of gardens and this type of design dominated 19th century hospital construction. Unfortunately, no one actually drew the parallel between what gardens offered and the direct benefit to patient welfare.

Shortly after the early success of gardens providing therapeutic benefits in hospitals, “The Romantic Movement” helped further the change in hospitalization particularly of mental patients with the rise of the “Treatment Moral” (Gerlach-Sprigg, 1998, 18). Patients were socialized and allowed physical activity. The hospital designers sought to provide a rural, homelike setting that was restful and supervised. As long as the patient count was low and the staff was trained the success was remarkable.

Unfortunately, no good deed goes unpunished. These successes led to a flood of immigrants and the poor, overwhelming the system and causing its eventual collapse into holding places for the hopeless. Gardens, with the requisite training and funding they required, were abandoned.

Pavilion hospitals, where several related buildings formed a complex with garden grounds and patio space, blossomed at the end of the 19th century. It was noted that the war wounded not confined to the hospital had a lower mortality rate while traditionally hospitalized patients were experiencing an alarming rise in nosocomial infections. These facts were considered when the Johns Hopkins Hospital was built in Maryland. Not only

was Hopkins an avid gardener but he had made his gift to the city with the provision that “...the large grounds...be so laid out and planted with trees and flowers as to afford solace to the sick” (Gerlach-Spriggs, 1998, 22). Outdoor bridges, gardens, roof walkways and sun porches became de rigueur for hospital construction, reaching a peak during World War I. Physicians, nurses and architects were realizing the benefits of out-of-door treatments to patients but still no one has drawn any direct conclusions on exactly how and why it is beneficial.

Florence Nightingale (1820 – 1910) came closest with her observation:

“Second only to fresh air...I should be inclined to rank light in importance to the sick. Direct sunlight, not only daylight, is necessary for a speedy recovery...I mention from experience, as quite perceptible in promoting recovery, **the being able to see out of a window, instead of looking against a dead wall**; the bright colors of flowers; the being able to read in bed by the light of the window close to the bed-head. It is generally said the effect is upon the mind. Perhaps so, but it is not less so upon the body that account... While we can generate warmth, we cannot generate daylight” (Nightingale, 1859, reprint 1980, 392) Emphasis added by author. **See Figure 2.1**

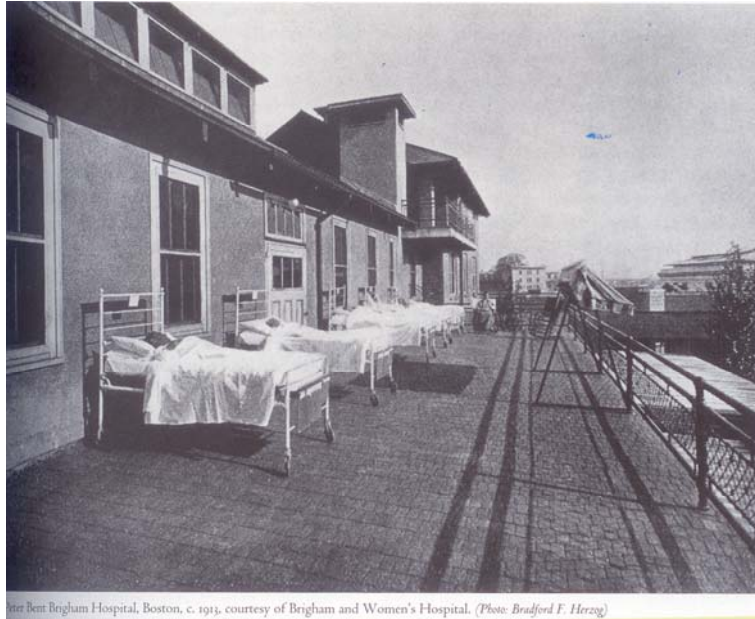


Figure 2.1
Pavilion Hospital circa 1913, Brigham and Women's Hospital Boston, Mass.

Powerful scientific advances occurred following the research and development of World War I. Germ theory was proven followed by vaccines and antibiotics. Specialization, isolation and separation based on disease state, condition, and social standing became popular and even expeditious. Industrialization had hit the hospital market. Mass treatment of similar diseases involving the same body system gave rise to ever increasing building height, saved money and eroded the patient's environment. Growing scientific knowledge of contagious diseases, elevators and air- conditioning forced even more isolation and insulation of patients. The garden became a feature of the entrance or even a thing of the past. Only occupational therapy held on to the garden's palliative and curative benefits.

Occupational therapy came in to its own as an allied health field following World War I. It was a field devoted to rehabilitation of life skills for returning veterans as well as re-development of small motor skills, such as pinching, grasping and wrist-turning.

Garden therapy, farming or agricultural skills were found to be motivational and positive for veterans. Patients suffering from tuberculosis, polio and various psychiatric illnesses also benefited from this creative, nurturing work. Work by psychiatrists, Karl and William Menninger, drove the need for more therapeutic environments subsequently giving rise to Horticultural Therapy as a subset specialty of Occupational Therapy (Gerlach-Spriggs, 1998, 30).

Horticultural therapy became a professional allied health career following World War II. Hospitals through out the country hosted garden club volunteers who worked with veterans. Occupational therapy, psychology and social work programs at various colleges began working with military and veteran hospitals developing ways for patients to work with plants in gardens. By the 1960's, Dr. Donald Watson and Alice Burlingame of Michigan State University had published the first textbook for the field of Horticultural Therapy (Gerlach-Spriggs, 1998, 31). The mid 1970's saw the integration of hospital and garden poised for tremendous growth opportunities. Unfortunately, scientific data was slim and management and insurance companies held different goals. Horticultural therapy remains a subset of occupational therapy and is practiced primarily with the mentally ill, the elderly and patients with specialized injuries, in need of other rehabilitation such as veterans.

Mid 20th century hospitals are being led down the primrose path (Gerlach-Spriggs, 1998, 33) by administrators, insurers and designers who are more concerned with reimbursement than results. Designs increasingly look like office or commercial ventures that do nothing to alleviate the anxiety, fear and disorientation felt by most patients and even visitors (Gerlach Spriggs et al, 1998, 32). **See Figure 2.2**



Figure 2.2
Modern Hospital, Texas Heart Institute, Houston Texas

Incidental results of patients and employees enhanced emotional state when outdoor environments are available are too often rebuffed. The long history of man's need for and even genetically based affiliation for restorative gardens is often overlooked in the design of hospitals and its spaces. Hospital garden spaces need to reflect our deep, rich past being tied to the natural world.

Summary

This theory and design study will examine some of the scientific data as well as the incidental benefits involved in patients experiencing nature. Design suggestions will look at the importance of an accessible, patient based plan to facilitate horticultural therapy or nature contact with a **specific population and disease state** to improve the **well being** and **medical results** of patients participating in horticultural therapy. It is my intent to demonstrate that humans still depend on environmental knowledge and nature contact for our healthful daily existence.

Chapter 3

Theories on Nature: Preference or Predilection

As we have seen, there is a plethora of historical documentation tying man to the earth and his continued health and well being to unrestricted contact with nature. Does any type of nature exposure provide restoration and therapeutic benefit? Are there underlying themes or preferences that must be met for nature to provide relief? Researcher Rachel Kaplan tells us of her study results (completed in the 1980's) that "Nature matters to people. Big trees and small trees, glistening water, chirping birds, budding bushes, colorful flowers – these are the important ingredients in a good life" (Kaplan, 1983, 155). E. O. Wilson's book "Biophilia" hypothesizes that our relationship to all things natural is "an innately emotional affiliation of human beings to other living organisms" (Wilson, 1984, 1993, 31). His further studies in 1993 find that the rules that we use for living have developed over time, been embedded over thousands of years and that it would be unimaginable that just a generation or two of urbanization would erase all that we innately know (Frumppkin, 2004, 18). As to the particular view, environmental preference studies have shown that there are distinct preferences for views and elements within those views that cut across gender, age and cultural lines. Green nature is preferred over urban and random outdoor world views (Ulrich, 1993, 93, 95; Kaplan and Kaplan, 1983, 1989, 110; Lewis, 1979, 330).

Over 100 years ago, Frederick Law Olmsted wrote about his intuitive ideas that space, light, and accessible nature had recuperative powers, could reduce urban stress and

provide mental restoration (Olmsted, 1822-1903, reprint 1971, 76-77). A variety of theories have sprung up concerning why nature plays such an important role in psychological well being (Gerlach–Spriggs, 1998, 35). The seminal scientific studies advancing these theories were performed primarily by Rachel and Stephen Kaplan, Edward O. Wilson, Stephen Kellert, and Roger Ulrich. Their results found that indeed natural, restorative environments positively influence the psychological and physiologic response of patients. Each tested and advanced his own theory explaining why exposure to nature provides benefits for human health and well being.

Edward O. Wilson’s Biophilia Theory

Edward O. Wilson, Ph. D. is currently the Pellegrino Research Professor in Entomology for the Department of Organismic and Evolutionary Biology at Harvard University. He introduced and popularized his biophilia theory in the 1984 book entitled “Biophilia”. The term literally means "love of life or living systems or the appreciation of life and the living world” (Answers.com, website, 2006) and has been used to describe a productive psychological orientation or state of being, (Eric Fromm, Wikipedia.com, 2006). Wilson defines the term as “the connections that human beings subconsciously seek with the rest of life” (Wilson, Biophilia, 1984, Biophile.com website, 2006). His theory suggests that there is an innately emotional bond between human beings and other living systems (Wilson, 1993, 31). He suggests the possibility that the deep affiliations humans have with nature are rooted in our evolutionary genetics and biology, we are programmed to respond positively to certain kinds of nature. Not hard-wired instincts of the mind but a set of adaptive, learned, problem-solving rules. Human attractions, preferences and positive feelings toward certain habitats, activities, and objects in their

natural surroundings are the result of millions of years of refinement through experience, evolution, culture and development. The gene-culture evolution would develop over time being manifested as a certain genotype producing a behavioral response that produces an enhanced chance for survival and thus reproduction. For example; early hominid, with a predilection for identification of landscapes suited for survival and sustaining life, would likely chose an area that was savannah-like in depth and spatial openness. He would certainly look for trees with specific canopy shapes and color that indicated food sources (Heerwagen and Orians, 1993, 156) and water proximity was essential for drinking as well as drawing animals that were potential sustenance. Initially, skill might have been genetically inherent but cultural behavior would have supported and enforced it. This favorable genotype therefore becomes more ubiquitous within the population, the favorable survival response becomes more prevalent and subsequently ingrained into cultural legend, and thus a biocultural response is established. The behavior theoretically would persist through the millennia of biocentric development, passed from generation to generation through biology and narrative, and be manifested recently as best it can in the changing world environment. As noted earlier, it is hard to believe that this type of knowledge, ingrained over millennial time, could be lost in just a few centuries.

Theoretic arguments for biophilia are strengthened when we take a little yin with our yang. If we are genetically predisposed to learn favorable natural landscape responses, must we not also learn which views are unfavorable? Adaptive fear/avoidance responses to animals still persist despite the lack of relevance in industrialized environments. A functional evolutionary response to the physical environment is implied through this learning (Wilson, 1984, 37). If some habitats could increase survival chances

clearly others were insalubrious. Humans would be expected to biologically respond with avoidance to such spaces. Biophobic reactions occurred in studies evaluating nature views with blocked view settings as well as settings that would be present traditional evolutionary survival risks. High-depth, spatially open views were preferred. This lends credence to the theory of biological learning and interpretation of natural areas (Ulrich, 1993, 86). The scientists now studying biophilia have identified a profound need for man to interact with and relate to the natural living world. Findings suggest that the restorative value of the natural world, whether in active interaction or viewed passively, is a powerful source of recovery from sickness and in the renewal from mental and physical fatigue (Biophile website, 2006). Whether man enhances nature and receives health benefits or degrades nature and suffers the consequences there is an undeniable tie between condition of the environment and man's well being.

Kaplan Theory – Cognitive, Content and Spatial Perception

Rachel Kaplan, Ph.D. is Professor of Natural Resources at University of Michigan. Currently the Samuel Trask Dana Professor of Psychology specializing in Environmental Psychology & Behavioral Research Methods. Stephen Kaplan Ph.D. is her husband and research partner, also a professor in the Department of Psychology, as well as a professor in the Electrical Engineering and Computer Science departments of University of Michigan.

Since the mid 1960's, Rachel and Stephen Kaplan have studied people's perception of the natural environment. They define nature as "places where plants grow" not "those faraway, vast and pristine places... [rather]...Parks, open spaces, meadows...fields...backyard gardens" (Kaplan and Kaplan, 1989, 2). While variety

might be the spice of life, this does not seem to hold true in studies determining nature preference. The Kaplan's found two distinct types of views preferred, content based and spatial configurations. Habitats suitable for survival, anticipation and information were most often chosen by those in the Kaplan study. Content of scenes was extremely important including such things as water, trees or vegetation for depth perception as well as spatial definition and scenes with relatively smooth ground were particularly favored. A park-like view or savannah type area was ideal for most participants. Areas that had blocked views or were too open with no opportunity for cover or safety tended to be less preferred. The ability to obtain information quickly, remain oriented and feel a sense of orderliness all seem to be the recurring themes in participant choices. Water, paths, light, accessibility and direction were salient findings when choosing preferred views. Our long historic relationship with the earth has apparently left us with deep seeded preferences for natural settings. These related concepts led the Kaplan's to define and predict nature preference on a matrix. They postulated that humans need understanding and exploration in their environment. Informational factors that satisfy these needs are: coherence and legibility to foster understanding as well as complexity and mystery to aid exploration. Thus we have "The Preference Matrix" **SEE TABLE 3.1** (Kaplan and Kaplan, 1989, 53) which can be used to evaluate a natural or designed setting for its satisfactory appeal. Coherence provides recognizable patterns and a sense of order necessary for survival. Legibility appeals to our sense of orientation and way finding aided by landmarks for memory. Complexity provides visual richness and depth or spatial orientation to a scene. It goes hand in hand with coherence. Mystery appeals to our need for continued information and knowledge about a scene. Continuity is required to prevent mystery

becoming surprise and creating a less inviting space. The matrix can be used to predict characteristics of natural areas that would provide positive or therapeutic benefits to the observer. “In an environment that fosters effective functioning, one might expect the individual to experience a sense of both safety and competence. “One might also expect the individual to feel reasonably comfortable about the situation” (Kaplan and Kaplan, 1989, 68). Their research shows there are definite themes and preferences involved in our choices of natural environment. We can use this matrix to elucidate the necessity for good design to achieve the full beneficial effect for long term well being.

**Table 3.1
Kaplan Preference Matrix**

	UNDERSTANDING	EXPLORATION
IMMEDIATE INFORMATION	COHERENCE	COMPLEXITY
INFERRED INFORMATION	LEGIBILITY	MYSTERY

(From Kaplan and Kaplan, Experience of Nature, 1989, 53)

The Kaplan's studies go on to examine the way in which this restorative effect of preferred nature is achieved and what properties make it possible. We tend to search for restoration when mental fatigue sets in as a result of worry, anxiety or intense mental effort or prolonged attention to task. Two types of attention; involuntary and directed, have been identified by the Kaplan research (Kaplan and Kaplan, 1989, 179).

Involuntary attention requires little or no effort to be sustained. It is the experience we have when something interesting, exciting or intriguing captures our eye, such as moving, wild or bright things. Directed attention, on the other hand, requires a great deal of effort to be sustained and may involve inhibiting other stimuli and distractions. The mechanism may be called upon repeatedly in a day, a week or longer resulting in "fatigue of directed attention" (Kaplan and Kaplan, 1989, 180). Results of this type of fatigue can be noted as aberrant behavior, increased irritability, aggression, and accident prone individuals.

In order to recover from fatigue of directed attention, an environment must provide stimuli to engage involuntary attention and allow directed attention to rest. Wilderness or outdoor recreation can offer such stimuli, but is not always available. The Kaplan's synthesized these experiences to advance four components that would satisfy the need to engage involuntary attention and allow mental capacities to be recharged and thus restore man to a healthy baseline state.

1. "**Being Away**" or escape from the ordinary distractions, getting away from the details requiring deep concentration or mental escape from either of the above.

2. "**Extent**" or escape involving being in a whole other world. The experience must be complete enough to become immersed as in suspending reality such as the

experience while reading a book, visiting the theatre or an extreme example such as a trip to 'Disney World' yet still remaining connected to the world as a whole.

3. **“Fascination”** or the trigger stimulus that captures the involuntary attention.

No data exists to define what constitutes this property but certainly, bright, shiny, moving or wild things as well as learning, puzzles or sequencing information into a larger connected pattern.

4. **“Compatibility”** or the ability to function in the environment as one would expect. This is a sort of 'Form Follows Function' approach to experiencing the space (Kaplan and Kaplan, 1989, 189).

Nearby nature can offer all of these components to allow for restorative benefits to man. Vegetation and wildlife in a backyard setting that allows wandering among elements of soft fascination such as pattern, motion or sound can provide stimulation for involuntary attention and provide pleasure and recovery. Pleasure can control pain and reduces the need for directed attention. Thus we have achieved what we desired, a preferred natural space with a restorative effect.

Ulrich's Psycho-Evolutionary Theory

Roger S. Ulrich Ph.D. is an environmental psychologist and Director of the Center for Health Systems and Design at Texas A&M University, an interdisciplinary center sponsored by the College of Architecture and College of Medicine.

Dr. Ulrich, has studied arousal and overload theories and determined that environments high in visual complexity, noise, intensity, and movement can overwhelm and fatigue normal human coping systems leading to high levels of stress responses that create negative psychological and physiological effects. Stress, when the body prepares

for an anticipated, harmful or frightening event evokes the flight or fight syndrome. Stress is different than the cognitive, attention fatigue theories advanced by the Kaplan's. For example, stress can be induced by a life threatening experience, while directed attention or mental fatigue can be induced by a work situation or learning new, detailed information over a prolonged period of time. Prolonged stress can have deleterious effects on human health such as increased blood pressure, heart rate and sympathetic nerve conduction that are elevated in order to respond to anticipated threats (Ulrich, 1992, 94). Excessive stress can worsen existing risk factors for heart disease such as hypertension and high cholesterol levels. Chronic stress can alter the body's normal response and immune systems in such a way that typical "aging" conditions such as frailty, functional decline, cardiovascular disease, osteoporosis, inflammatory arthritis, type 2 diabetes, and even certain cancers are more likely to occur (Ulrich, 1999, 28). Research also suggests that stress impairs the brain's ability to block certain toxins. This stress condition is common to patients suffering from Alzheimer's disease. Studies also show that frequent hostility or anger is a behavior common to those under stress (Weiss, APA website, 2005).

Ulrich's theory promotes that a quick, emotional or affective response to nature views are central to our thoughts about nature, including memory, meaning and behavior. Our response may be dictated by learned memories from childhood or cultural associations, as virtually every society cherishes nature and gardens in some form. This need for an aesthetic experience of nature has been suggested by the apparent inadequacy of urban, artificial or man-made substitute views when people are exposed to them. This preference for natural design and pattern has been revealed in a variety of studies by

Ulrich and others (Ulrich, 1991, 202). “One of the most clear-cut findings... is the consistent tendency to prefer natural scenes over built views, especially when the latter lack vegetation or water features. Several studies have shown that even unspectacular or sub-par natural views elicit higher aesthetic preference than do all but a very small percentage of urban views” (Ulrich, 1983, 109). He proposes that visual depth and spaciousness provide risk information that humans need on a biologic level in order to ascertain threats, escape options and the continued ability to survey the area for repeated evaluation of this information. These studies show that we are biologically prepared to feel safe and comfortable in a “high-depth, spatially open, natural environment” (Ulrich, 1983; Ulrich, 1986; Ulrich 1993, 82). Ulrich points out that culture can explain how preference and response is maintained but nature’s healing power seems almost genetic and is content specific for restorative preferences and the influences it offers (Ulrich, 1992, 96). “Although far from conclusive, these findings cast some doubt on the position that aesthetic preferences vary fundamentally as a function of culture” (Ulrich, 1983, 110). Three adaptive responses can be considered; aesthetic liking, stress recovery and high-order cognitive enhancement (Ulrich, 1993, 89).

Aesthetic Liking

Aesthetic liking of natural scenes shows “Consistent cross cultural patterns in aesthetic preferences provide circumstantial support for the hypothesis that biophilia is at least partly genetic” (Ulrich, 1993, 87). Aesthetic preferences crossed cultural boundaries with findings from both Eastern and Western culture groups preferring natural landscapes over built environment or urban views (Ulrich, 1993, 87, 92, 94). Most studies found visual preference in the savanna – like setting particularly in areas incorporating water.

Outdoor environments that integrate water, vegetation, mountains and light had high preferences as would be expected on the functional evolutionary scale. The strong tendency across cultures to prefer natural over urban settings lends itself to the perception that aesthetic liking is both genetic and learned.

Stress Recovery

Life for early humans was no 'walk in the park'. Physically and mentally exhausting, each day was a test of survival. From a functional evolutionary perspective, a rapid response to a stressor followed by a rapid return to restoration would be required to maintain cognitive functioning and survival. When a healthful response to the natural surroundings occurred a beneficial restoration resulted for the individual. If we follow our genetically based - evolutionary train of thought, this could be predicted and would be expected to occur at a rapid rate for early man to be readily prepared to successfully face the next danger. If our nature preferences are biologically trained then it stands to reason that our restorative responses would also be genetically ingrained (Ulrich, 1983, 1991, 1993, 99). It does not appear that restoration stems from deep and complicated cognitive thought processes but from a direct emotional responding to nature (Ulrich, 1993, 108.) Findings from a number of studies worldwide have shown that individuals viewing unthreatening nature scenes show more complete and faster recovery from stress symptoms than those viewing urban or built environments. The participants had a reduction in fear, anxiety and aggression (Ulrich, 1993, 101). Similar tests in Europe and the US measuring physiological data such heart rate, pulse and muscle tension found faster more thorough recovery from stress when participants were exposed to natural scenery (Ulrich, 1993, 104).

Cognitive Functioning

It is no secret that stress reduction can improve mental performance. Even the writings of Frederick Law Olmsted over 140 years ago affirm the curative power of natural scenery is universal (Olmsted, 1885-1888, reprint 1997, 31). These curative powers may extend to a genetic predisposition for enhanced high order cognitive functioning when the task is not stressful or urgent. Integrating unrelated elements, association of concepts and creative problem solving are all high order functions leading to the development of long term memory and language development. Positive emotional states created by aesthetically pleasing natural surroundings can elicit cues for positive associations making information recall easier. The ability to integrate remote associations, think creatively and retrieve interrelated information occurs more readily. It might be possible that ancient man who experienced more positive moods in response to non-threatening environments was seen as smarter, more creative. Perhaps the genetic remnant is that individuals tend to be smarter and more creative thinkers when responding positively to non-threatening landscapes as opposed to built environments. Empirical evidence is equivocal at this time regarding duration of exposure, attenuation of benefit and simulation benefit.

Clearly, this body of scientific evidence tells us that any type of nature exposure is better than none at all and clearly better than monotonous, built views. Humans seem to be programmed to prefer certain elements in the landscape and these visual elements are aesthetically pleasing across age, gender and cultural lines. Mainstream science has recently added credence to the belief that biologic or genetic factors play heavily in behavior and aptitude. It would be rather surprising that evolution of humans had not left

a partly genetic mark on how we respond to nature. For millions of years natural settings were the context of everyday life and the source of learning, survival and adaptation. It is time to expand our understanding of the man - nature continuum and the positive responses and benefits nature has offered in the past and can still provide today.

More specifically, the main thrust of Ulrich's theory on the healing benefits of nature views is that the information and subconscious learning provided by high depth and spacious views of nature allows the body to recover from the effects of persistent, chronic stress such as loss of control, lack of exercise, decrease in social support and inability to enjoy contact with nature. A feeling of safety and comfort is provided allowing the body to recover from the protective flight or fight posture, reducing stress and its related negative physiological and psychological effects. Findings from a number of studies worldwide have shown that individuals viewing unthreatening nature scenes show more complete and faster recovery from stress symptoms than those viewing urban or built environments. The participants had a reduction in fear, anxiety and aggression (Ulrich, 1993, 101). Similar tests in Europe and the US measuring physiological data such heart rate, pulse and muscle tension found faster more thorough recovery from stress when participants were exposed to natural scenery (Ulrich, 1993, 104). **SEE FIGURE**

3.1

Hospitalization is fraught with situations that are counter productive to health and healing. The inability to maintain **control** over one's situation, the loss of social support while being hospitalized, a marked reduction in physical exercise and freedom of movement, and the loss of **access to nature** and other positive distractions are primary culprits for stress related side effects (Ulrich, 1999, 32). The absence of control harkens

back to the needs of humans to relate to the living, natural world as theorized by Wilson. Kaplan's observed need of "being-away" is also hampered. Prolonged, unmitigated stress can have deleterious effects on health outcomes. Patients are subject to stress from fear and anxiety when anticipating pain from surgery or procedures or while receiving the news of an unfavorable diagnosis. Cognitive and emotional control may become erratic, heart rate, respiration, blood pressure and skin conductance may rise, even behavior patterns may become unpredictable. Stress hormones may become over-stimulated creating changes in circulation and the immune system that impede healing by reducing the ability of the body to fight infection and illness. All patients lose control of events when hospitalized and this can be a leading cause of stress. The inability to determine who does what to you and when, coupled with the lack of privacy in the hospital environment can produce negative effects such as feelings of helplessness, depression or high blood pressure (Ulrich, 1999, 32, 36, 38). Mental fatigue from the stress of anticipating the next intimidating test or result is common. Anger and depression are also pervasive when the patient is interned short term but is prevalent with the chronically hospitalized or for those with terminal illnesses.

Research support exists from a wide variety of studies that the phenomenon of temporary escape or "being away", where the park or garden user daydreams or has "another world" feeling, can offer restoration and relief from stress. These studies found that nature contact benefited the user whether they were active participants or passive users. The ability to escape in either form offered "perceived or actual control" of the user's situation. Additional studies on park use found that psychological benefits were imparted to local residents who just "knew the park was there", indicating that some

benefit is gleaned by just knowing that if one needed to get away, nature was near-by and accessible (Ulrich, 1999, 140). The Kaplan studies support the same response from “being away”, in that one can distance oneself from negative surroundings or situations (Kaplan, 1998, 18, 1989, 183).

Even those who do not actively use the garden can experience immersion and engagement of imagination. A space designed to capture our imagination, to pretend that we are somewhere else, can reduce mental fatigue and the side effects that it brings forth. By providing stimuli that engage the involuntary attentions of the brain, the portion of our brain that focuses and shuts out distractions or ‘directed attention’, has time to restore (Kaplan, 1989, 179). This restoration allows patients to recover normal mental functioning in order to sustain the next round of required, directed attention necessary to handle hospitalization and the stress it induces (Kaplan, 1989, 177-184, Kaplan, 1992, 134). This near-by nature not only allows patients visual and mental restoration but a form of control that is all but lost to most hospitalized patients. The ability to temporarily ‘escape and avoid’ offers patients and even staff and visitors to the hospital some control of an otherwise uncontrollable environment. By achieving control of some aspect of their stay, many patients experience a resultant reduction in stress by way of control - related benefits.

While hospitalized, patients also lose direct contact with their **social support** system. Studies indicate that the overall number of social ties or contacts people have relates to their overall health status (Ulrich, 1999, 42). The more social ties and interactions a patient has the more likely they are to have high healthful responses. Salutary properties of gardens are available to patients, staff and visitors alike.

In a 1995 study of California healthcare gardens, Cooper–Marcus and Barnes noted that 73% of garden users engaged in visiting and talking while in the space and 36% of users were in the garden to visit with a patient (Cooper-Marcus and Barnes, 1995, 54). Whether providing patients an area for private reflection or a space to visit with friends or family, evidence exists that gardens provide increased support for patients either emotionally or socially.

Inhibition of physical movement and **exercise** is another facet of hospitalization that contributes to stress affects on health outcomes. Increased exercise has been linked to reductions of depression, heart disease and mortality (Ulrich, 1999, 47). The ability to move about aids in a patient’s perception of control as well as the benefit offered from aerobic and non aerobic exercise. Restoration may come in the form of improved circulation, muscle strength as well as physical and mental stimulation with the change of scenery provided by ambulation.

Finally, the lack of **positive distraction** in nature is acknowledged as a stressor for hospitalized patients. Worrysome thoughts can increase stress, blood pressure, respiration and depression (Ulrich, 1999, 49). Nature can provide distraction and extent to allow the mind to revive and restore itself. As noted above in the discussion on control related benefits of nature, the benefits offered by day-dreaming, perceived ‘being – away’ and temporary distraction from the situation at hand can engage the involuntary attention allowing directed attention to restore itself, revive naturalistic and utilitarian feelings and improve cognitive functioning. These benefits of visual exposure to nature may be its most important offering.

These results lead us to concur with Ulrich that nature views provide a therapeutic influence and benefit and therefore thoughts on where to site a hospital or medical facility as well as design determinations for the grounds, gardens and patient views should taken into consideration when making these decisions.

Stephen Kellert's Human Environmental Value Theory

Stephen R. Kellert Ph.D. is currently the Tweedy/Ordway Professor of Social Ecology and Co-Director of the Hixon Center for Urban Ecology in Yale University's School of Forestry and Environmental studies. Professor Kellert's work focuses on understanding the connection between human and natural systems with an interest in the value and conservation of nature as well as ways to harmonize the natural and built environments. He has identified nine basic ways in which meaning and benefit are derived from man's relationship with nature. The values are "weak" genetic rules that have been learned and persisted over time signifying that a diminution of man's dependence on nature will lead to a degradation of our existence. These nine values offer a theoretical explanation for the ways people attach meaning to and derive benefits from nature. They provide a conceptual framework for universal expression of human affinity for nature and the connection between physical and mental benefits provided by nature. The occurrences of healthy, natural landscape features that people value and appreciate; foster social, psychological and economic benefits that encourage positive identification with these places and a desire to sustain them. Poor environmental quality landscapes produce surroundings where people are less concerned with nature and often possess a poorer quality of life. Lacking adequate exposure to nature the values may atrophy or remain undeveloped resulting in deficits to the human intellectual and emotional mind.

Therefore, contemporary learning strengthens these values that we have as a genetic foundation and cultural learning emphasizes our association with them. The values represent physical, emotional, intellectual and moral benefits offered by nature (Kellert, 2005, 50). We all inherently have these values in our genetic biology; the extent to which they have developed in each of us will reflect the benefit we achieve from contact with nature.

Theoretical Values in Nature

Aesthetic = Physical appeal of and attraction to nature

Dominionistic = Mastery and control of nature

Humanistic = Emotional attachment to nature

Moralistic = Moral and spiritual relation to nature

Naturalistic = Direct contact with and experience of nature

Negativistic = Fear and aversion to nature

Scientific = Study and empirical observation of nature

Symbolic = Nature as source of metaphorical and communicative thought

Utilitarian = Nature as source of physical and material benefit

(Kellert, 2005, 34)

*“Shall I compare thee to a summer’s day? Thou art more lovely and more temperate:
Rough winds do shake the darling buds of May,
And summer’s lease hath all too short a date.”*

- - William Shakespeare, Sonnet 18

Aesthetic values are similarly universal in our associations with nature. The impact that nature’s beauty exerts on our daily life is unparalleled by any other force. Even when we are not predisposed to a positive impression, beautiful surroundings can

elicit a favorable response. Aesthetic appreciation is often tied to genetic biophilic predilections for water, promontories, shelter and food. Aesthetics aid in recognition of order, symmetry, harmony and balance. These concepts along with a genetic predisposition for universal aesthetic traits can provide man with feelings of safety, security and support for the ability to endure and thrive.

The **Dominionistic** value reflects the desire for man to conquer and control nature. People achieve physical and mental fitness when subduing nature, creating feelings of safety and security, heightened self esteem and increased coping skills. Although survival in wild nature is no longer required for survival a sense of personal strength is cultivated.

The world viewed through **Humanistic** values is a place of emotional bonding and physical support. The non judgmental responses of plants and animals enhance self esteem and self confidence. Nurturing or caring for another can increase capacities for cooperation and sociability. This is often the value or experience sought when people seek the “healing power of nature”.

Nature as a moral and spiritual inspiration gives rise to **Moralistic** values. An underlying unity of all life forms cultivates faith and confidence. A connection with creation increases understanding, respect and a universal connection to all things living as well as an acceptance of the cycle of life. This bond transcends our humanness to link us to the natural environment (Kellert, 2005, 34).

Naturalistic values come from the immersion of oneself in nature. Akin to the fascination and ‘being away’ tenants of the Kaplan theory, naturalistic values foster mental stimulation and imagination as well as feelings of calm and peacefulness. The

absorption afforded by naturalistic involvement in nature allows people to rest directed attention demands and invoke involuntary attention releasing tension and mitigating stress. Physical and mental benefits from nature may be our most ancient motive for contact and awareness of the world environment.

Negativistic values are similar to our genetic biophobic responses. Aversion to some forms of nature implies awareness of surroundings and control of risk taking behavior. Fear, awe and admiration come from the respect of the sheer power and strength of nature.

Development of a **Scientific** value toward nature implies the ability to know something about your surroundings. Whether it is process, problem-solving or the traditional prospect-refuge ability to scan and evaluate risk and safety, taking information from the natural environment can provide stimulation, improved cognitive ability and competence.

Symbolic values are probably the most common of the associations we have with nature. We use nature as a method for language development, imagery and metaphor. Natural symbols are used to fashion stories that deal with developmental and psychosocial maturation. They aid in communication of complex thought, self identity and conflict.

The **Utilitarian** value represents physical and material benefits provided by nature. It may also offer craft and skill opportunities that subsequently offer emotional and intellectual benefits even in the absence of need. Linking to ancient circadian rhythms can produce a feeling of connectedness to nature generating feelings of independence, security and confidence.

These nine principles collectively connect human well being to the natural world and the need to interact and experience it. Benefits from nature come as a result of upholding the quality of nature and the realization that the nature you experience and its benefits are only as good as the environment that you encounter. Sense or spirit of place reinforces our connection to the land and helps maintain the secure satisfying feeling that people have when they are involved with a secure and accessible setting. We are more likely to benefit from our surroundings if we feel tied to and identify with our environs. Poor environmental quality, lack of exposure or poor design that inhibits access or use can diminish the nature experience and even atrophy value development and maintenance and diminish personal adaptability (Kellert, 2005, 51). Spirit or sense of place can be viewed as the fusion of social and environmental forces that combine stability and heritage as well as shared relationships creating harmony and intimacy with the land. Ecosystems that are healthy and familiar allow us to draw meaning and identity from the place as well as aid in the ability to sustain life as well as mental and physical well being.

Summary

The four theories concerning benefits of nature for man are intertwined and almost interdependent. If the biophilia theory proposes an explanation for man's deep, subconscious need for nature and even indicates certain historically 'learned' genetic elements needed for mental and physical benefits, then the Kaplan cognitive theory offers a matrix explaining how these elements are combined and perceived for the greatest positive effect on human functioning. Ulrich's theory goes a step further in explaining that these elements provide not only psychological but physical benefits that improve health and well-being. His theory contends that certain elements must be visible in the

landscape in order to provide certain coping mechanisms that allow us to reduce stress and thereby achieve a healthy steady physical state allowing us to be ready for the next round of stress reducing events. Kellert's studies on man's inherent nature values show us that our genetic memory of nature must be engaged and maintained to be effective for emotional and intellectual benefits. His theory states that some level of familiarity with the landscape and continued exposure to healthy landscapes benefit man on many levels of intrinsic values. The depth and breadth of our response would indicate that our 'need' for nature is perhaps more complex than recently learned behavior. The positive health related benefits afforded by adhering to the elements of these theories are available to all who come in contact with nature and may be augmented when that nature is properly designed. If these theories are correct, then landscape design should begin and end with these tenants in place. Having identified that health care has a history of involvement with nature contact and that there are scientific theories that support nature as a source of health and well being in man, let's turn our attention to empirical data that confirms for us that exposure to nature keeps us well and improves our health when we are ill. **SEE**

TABLE 3.2

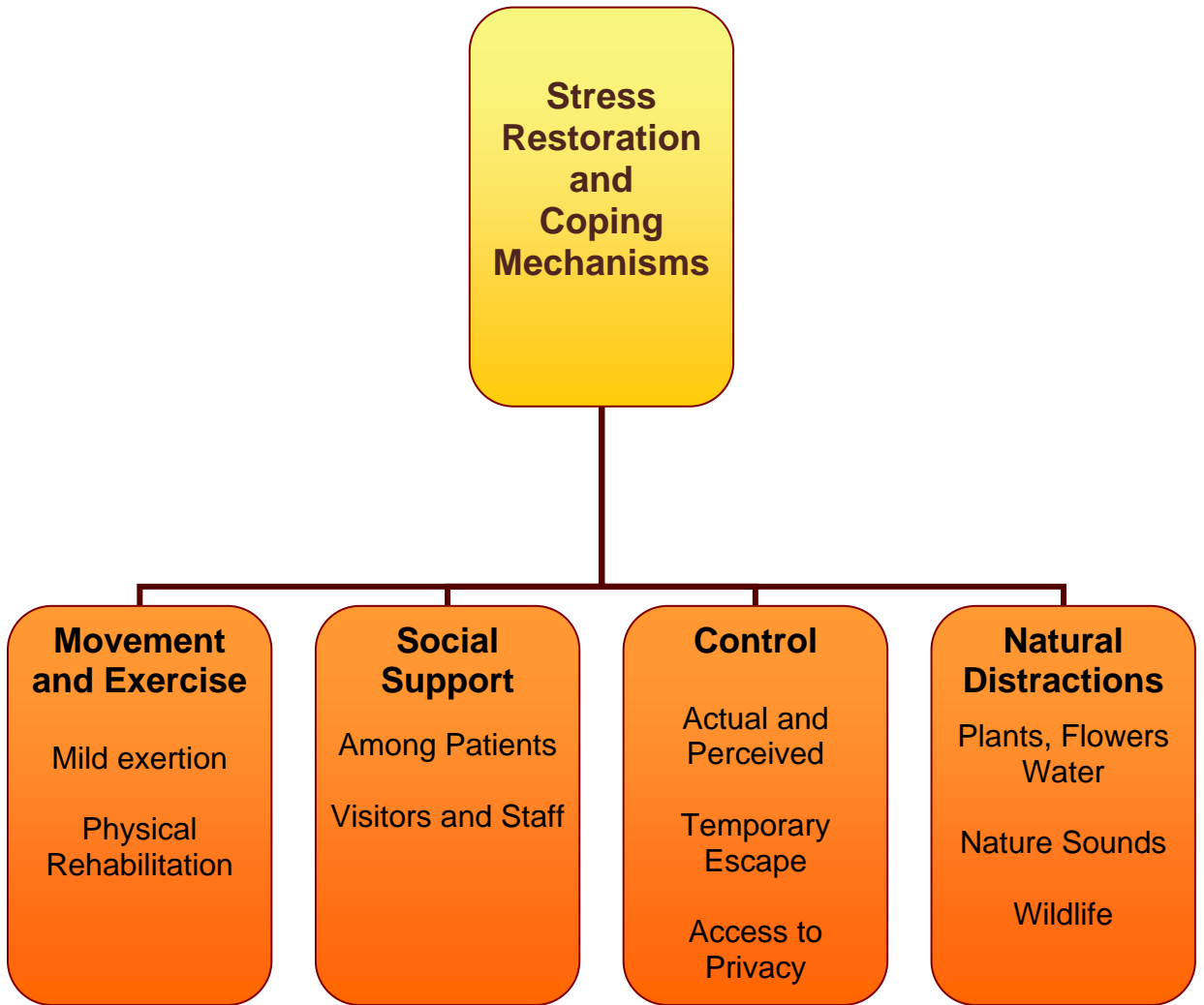


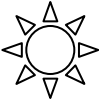
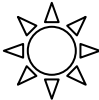
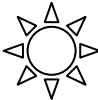




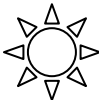

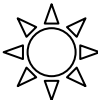









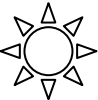


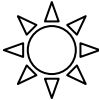

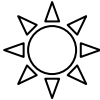
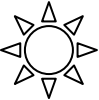


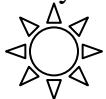
Figure 3.1
Ulrich's Stress Restoration and Coping Mechanisms

Table 3.2
LINKING THEORIES OF NATURE EXPOSURE
WITH BENEFICIAL ELEMENTS

	Biophilia	Cognitive Functioning	Aesthetic Liking	Stress recovery	Quality of life	Sense of place	Environmental Values
Wilson							
Kaplan							
Ulrich							
Kellert							

Key:

Theory Correlation:



High Correlation



Medium Correlation



Low or No Correlation

Chapter 4

Study Data: Perception to Proof

“It’s a beautiful day! You should be outside, it’s good for you.” is a typical parental refrain for most of us. It is certainly no secret or surprises that nature and being outdoors makes you feel better. Sunlight helps the body produce vitamin D and generally fresh air and exercise facilitate improved mental and physical health. Frederick Law Olmsted in his strong, intuitive belief claimed that nature in the city would bring “tranquility and rest to the mind” (Olmsted, 1857-1861, reprint 1983, 212). Since much of the information on the benefit of nature has been incidental, let’s look at scientific data and see if what your mother told you is true.

Is Nature Therapeutic for Healthy People?

If “tranquility and rest to the mind” is our goal for healthy people, we can look at the data that shows benefits for stressed people. As noted in a previous chapter stress can be defined as “a rapid biologic response to a stressor that commands sustained directed attention or elicits the flight or fight syndrome” (Kaplan and Kaplan, 1989; Ulrich, 1983, 1992, 87). Healthy people can experiences stress daily, as can those who are hospitalized. Hospitalization causes a loss of control for the patient, reduced social support, lack of exercise and decreased contact with nature.

Our previous review of the therapeutic theories of Nature tells us it is a critical component in how people perceive their environment. Whether it is deep, biocultural subconscious knowledge of our environmental connections, a sense of place determined

by inherent value systems at work, stress reductions from association with nature or preferred views that effect our coping systems; the availability of nearby nature and ease of access to it can affect the perception of well being and satisfaction with one's surroundings. Exercise is a widely known to improve physical health and reduce mortality. It can also relieve stress and lift depression (Ulrich, 1999, 47). Pleasant destinations and stimulating scenery can increase the likelihood that outdoor experiences will take place. 99% of retirees find green space and plants essential to their lives, and it is not just the recreation they are after. Something about the experience of being around plants makes them feel better. (Howard Frumkin MD – personal communication, 2005). Culturally, we have learned to associate positive feelings with natural environmental features. Evolutionarily, if we look to the four nature theories as a clue to why we feel better after contact with nature we find that it fulfills human needs in diverse ways. When looking at studies concerning the man-nature connection among non- patient groups, we find stimulus, refuge and symbol as the most common advantages taken from nature experiences. For example:

1. University students who were polled regarding places of healing from mental or emotional stress returned results of 71% preferring nature and outdoor settings (Cooper-Marcus and Barnes, 1999, 6).

2. 90% of respondents to a questionnaire regarding a visit to the Morton Arboretum indicated that attractive nature views incorporating flowers were their most positive memories (Ulrich, Parsons, 1992, 97).

3. 300 participants in a workshop seminar were asked to envision and describe an environment that aided their emotional healing. Every environment cited included some element of nature as a significant part of the space (Cooper-Marcus and Barnes, 1999, 8).

4. The results of a People-Plant survey logged in 4000 responses to how nature and plants were beneficial to people's lives. 60% of respondents cited feelings of "peacefulness" or a "source of quiet and tranquility" (Lewis, 1990, 15).

5. The strongest predictor of local resident satisfaction in a survey by M. Fried cited by R. Kaplan (Kaplan, 1992, 129) tells us that ease of access to nature was the strongest predictor for local resident satisfaction and the second most important factor in life satisfaction.

6. 99% of respondents to a retirement community survey indicated that "living in pleasantly landscaped grounds" was essential or important (Browne, 1992, 75).

7. Circumstantial evidence exists that shows park users achieve psychological benefits not only from contact with nature but from the social interaction with peers.

8. In urban gardens, public housing residents received benefits from strengthening social ties and increasing a sense of interaction and belonging (Cooper-Marcus and Barnes, 1999, 44).

9. Rachel Kaplan performed a study in 1991 that yielded results from office workers that a window with a view of nature reduced their frustration and offered the perception of better life satisfaction and overall improved health (Ulrich, 1999, 57).

10. Ulrich's 1981 study in Sweden of unstressed students measured alpha brain wave activity when viewing slides of nature or urban scenes. The alpha wave activity was

higher when viewing nature scenes indicating a more relaxed, restful state (Ulrich, 1992, 99; Ulrich, 1999, 54).

11. A study in 2001 of home gardeners indicated that gardening activities provided creative outlets, exercise, aided confidence, reduced stress provided respite and tranquility. The benefits were complex and included health and well being (Catanzaro, C., and E. Ekanem, 2004, 269 – 275).

For healthy people, nature exposure may provide a persistence of normal mental arousal, holding interest and maintaining emotional states. Stressed individuals may achieve an increased benefit (greater reduction in stress) from non-threatening nature or ephemeral views. The view generates an affective reaction of fascination leading to a thoughtful evaluation of the scene eliciting a preference and remembrance for the sight. In times of stress, a lengthy cognition (as involuntary attention) and remembrance would allow one time to modify emotions and produce changes in physical and mental arousal states. Thus, the stressed individual has achieved a more pronounced state change than persons not experiencing heightened arousal or overload (Ulrich, 1983, 92). Aesthetic preferences as well as evolutionary perspectives can offer plausible explanations for these stress reducing responses. In a similar study conducted by Ulrich in 1977, analyzed by Daniel and Vining, showed findings that the objective content of the scenes ground texture, depth and complexity, provide salient information to humans and who can then determine if a scene is preferred or not. Subjective information such as mystery and coherence are more difficult to assess as they are not physical features of the landscape (Daniel and Vining, 1983, 68). Even passive contact with nature can be enough to trigger the chain of mental and physical responses (Ulrich, 1983, 95). Physical participation is

often an even more intimate, nurturing experience. Successful nurturing of another living entity elicits deep processes in the mind responding to biologic rhythms of nature, season and growth. Predictable patterns allow for relief of anxiety and tension. A heightened sense of self esteem and mastery ensue followed by increased social interaction and cooperative actions. Nature becomes a place of stimulation, peace, memory and tranquility (Lewis, 1992, 64).

Therapeutic Results for Stressed, Non Hospitalized People

If a person's psychological state is one of stress, excessive arousal or mental overload, studies tell us that visual or physical contact with nature can educe feelings of pleasantness and generate feelings of fascination, there by holding one's interest and suspending stressful thoughts (Ulrich, 1983, 95). Additional benefits may come from physical exertion, discovery and nurturing. Simple aesthetics, fascination or evolutionary rejoinder may be the genesis for the positive response. (Thompson, HealthDay News, 2006)

In a 1987 study by Hartig, Mang and Evans subjects were stressed with a difficult cognitive task then asked to relax by listening to music or walking in either an urban or nature setting. Those who walked in a nature setting reported more subjective positive feelings than either of the other two groups (Ulrich and Parsons, 1992, 98). Hartig in 1993 compared the magnitude of therapeutic relief between stressed (driving in city traffic) and unstressed patients exposed to nature versus built environments, recording blood pressure and subjective emotional reports. The greatest positive effect was noted in participants who were initially under stress. Hartig et. al., performed an analogous study in 1996 comparing stressed (college exams) and non-stressed participant responses to

simulated (slide) nature walks versus urban walks which produced comparable results. A study of elderly resident's struggling with depression in an assisted living facility, were involved in gardening program. Emotional assessments made after 10 sessions revealed a significant decrease in depressive symptoms, improvement in socialization and peer support and an increase in life satisfaction (Cummings, 2003, 608- 621). A similar study by Honeyman yielded like results (Honeyman, 1990, 143). As stated above, the data remained the same; participants responded better to the nature walks and in these studies it was noted that they did so rather quickly, in a matter of just a few minutes (Ulrich, 1999, 55). The results of the studies were confirmed by Ulrich's review of a wide variety of studies in 1999, finding that recovery from stress can occur in as little as 3 – 5 minutes. Determinant measurements included but were not limited to decreases in blood pressure, heart rate, muscle tension and skin conductance and subjective pain evaluations. This follows the discussion of the previous chapter that there is an evolutionary need for nature to provide a quick response to stress so that early man was prepared for survival action (Ulrich, 2002, 27; Ulrich, 1992, 100).

SEE FIGURE 4.1, 4.2, 4.3

Therapeutic Benefits of Nature for Hospitalized Patients

The positive results for non-hospital patients can lead us to surmise that nature exposure is in fact providing unquestionable mental and physical benefits. Study data also tells us that stressed individuals receive an even greater benefit from nature exposure. If we follow this line of thought, data on hospitalized patients viewing or accessing nature should be even more propitious and impressive.

In a 1993 study of cardiac surgery rehabilitation patients, patients were randomized to one of four groups. One group had open nature scenes with water and trees the other a shadowy forest scene. The other two groups were exposed to either an abstract picture or no picture (control group). Those viewing the nature scene had less post-operative anxiety and required fewer doses of pain medication. The shadowy forest did not reduce anxiety compared to the control group. Those viewing the abstract painting actually exhibited higher anxiety than the control group indicating that some visual distraction can increase rather than diminish anxiety symptoms (Ulrich, 1999, 60).

New York University conducted a study on 100 cardiac rehabilitation patients. Divided into two groups, both went to educational lectures but one group was required to spend time in the hospital garden. Those prescribed contact with nature had a reduction of heart rate and a subjective improvement in mood. “Greenery reduces stress and is a complement to high-tech medical fixes,” reported horticultural therapist Matthew Wichrowski (Kalb, 2005, 1).

In a study by Dr. Bruce Rabin, MD, PhD, of the University of Pittsburgh, Sunlight can reduce the need for pain medicine. Surgical patients in sunny rooms had a 21% decrease in pain medicine costs compared to patients in darker rooms. His deduction is that sunlight improves mood and therefore feelings of pain are lessened (Rabin, 2004, 9).

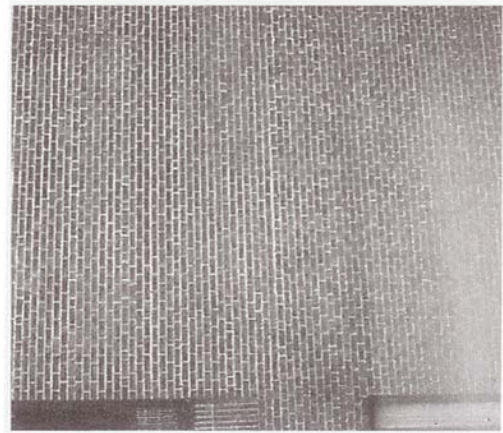
A study testing cardiac responses in schizophrenic patients, showed changes in EEG readings, blood pressure and heart rate while looking at a wall or a plant. Statistically significant changes occurred in blood pressure and heart rate while looking at the plant but not while observing the wall. EEG delta waves were lower (showed greater

relaxation) with eyes open looking at the plant even following physical stress. The results are consistent with results noted on healthy patients bringing us to the conclusion that patients with mental impairment respond positively to nature exposure (Sun, 2004, 269).

The most famous study dealing with improvement of hospitalized patients as a result of nature exposure is Ulrich's 1984 seminal study "View through a Window May Influence Recovery from Surgery". Dr. Ulrich reviewed records of patients who had successfully recovered from cholecystectomy (gall bladder removal) surgery over a 10 year period. His goal was to determine if those patients assigned to a room with a view of nature had positive effects from that view that subsequently improved their recovery. The premise of the study was based on research evidence that suggests natural scenes are more preferred than urban built scenes and can positively influence a patient's emotional state. Water and vegetation can sustain interest and attention and the whole natural environmental package reduces fear, blocks stressful thoughts and might aid in restoration from fear and anxiety. Statistically significant results were obtained with nature view patients requiring fewer and lower analgesic doses following surgery. **SEE TABLE 4.1** Post surgical complications were lower for nature exposed patients though not statistically. Nature view patients logged in shorter post operative stays and fewer negative nursing notes. This data suggests that nature views provided a positive therapeutic influence on this group of patients compared to the monotonous brick wall view (Ulrich, 1984, 420-421).



Hospital window view of trees (from Ulrich, 1984).



Hospital window view of brick wall (from Ulrich, 1984).

Figure 4.1:
View of Nature or Wall used in Ulrich's Study
(Ulrich, 1999, 59)

In a more recent study, a Swedish University has divided medically diagnosed 'stressed' participants into a garden experience group and a medication/rest group. Although the study is still underway, the staff comments on remarkable progress (faster, deeper stress relief) being made by the garden exposed patients, in just three months (Cooper-Marcus, May 2006, 26).

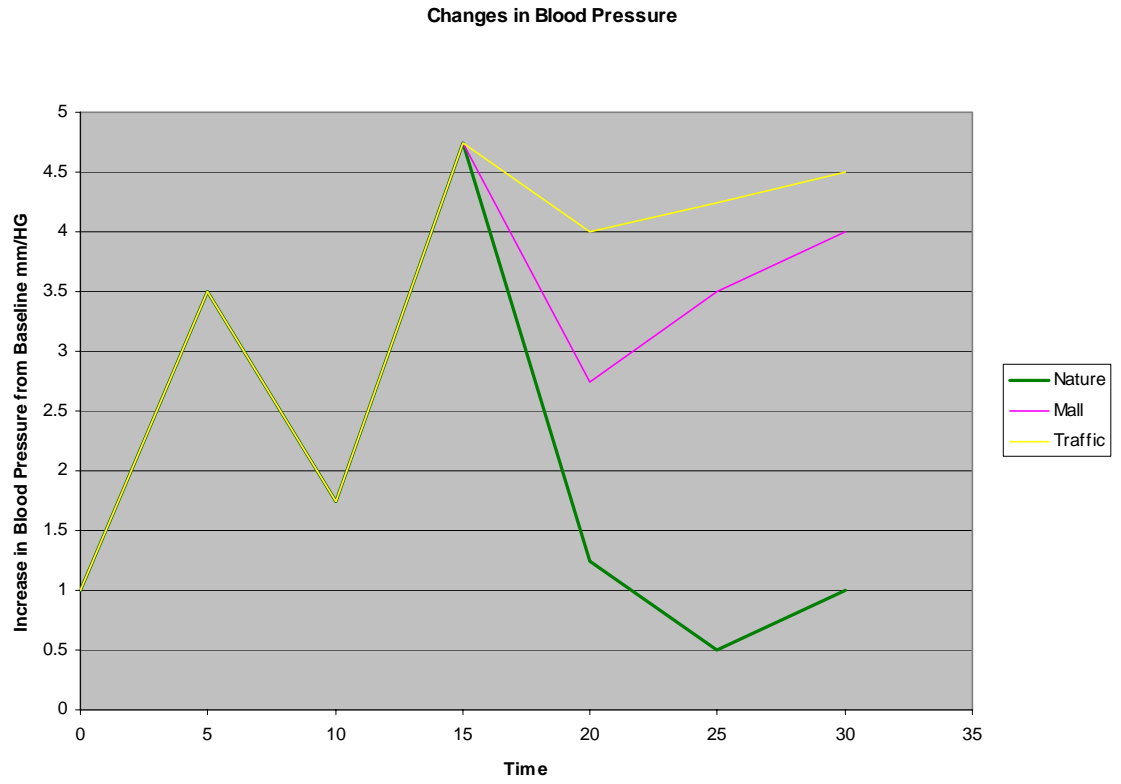


Figure 4.2
Graph of Blood Pressure Decrease after Nature Exposure
Ulrich, 1991

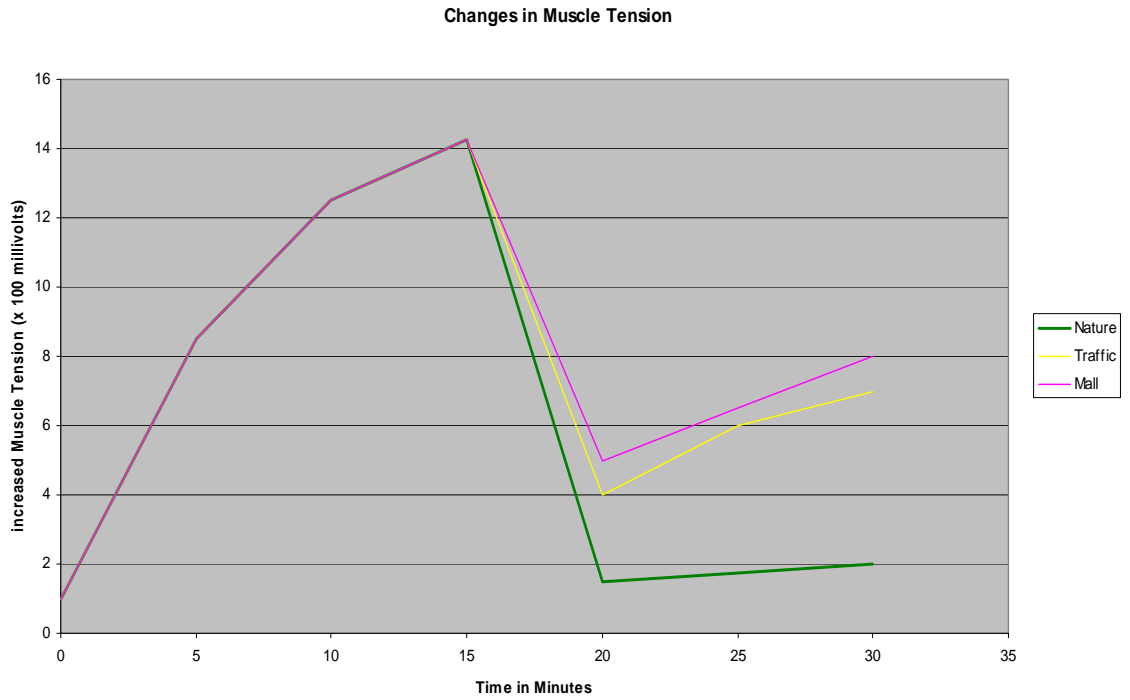


Figure 4.3
Graph of Muscle Tension Decrease after Nature Exposure
Ulrich, 1991

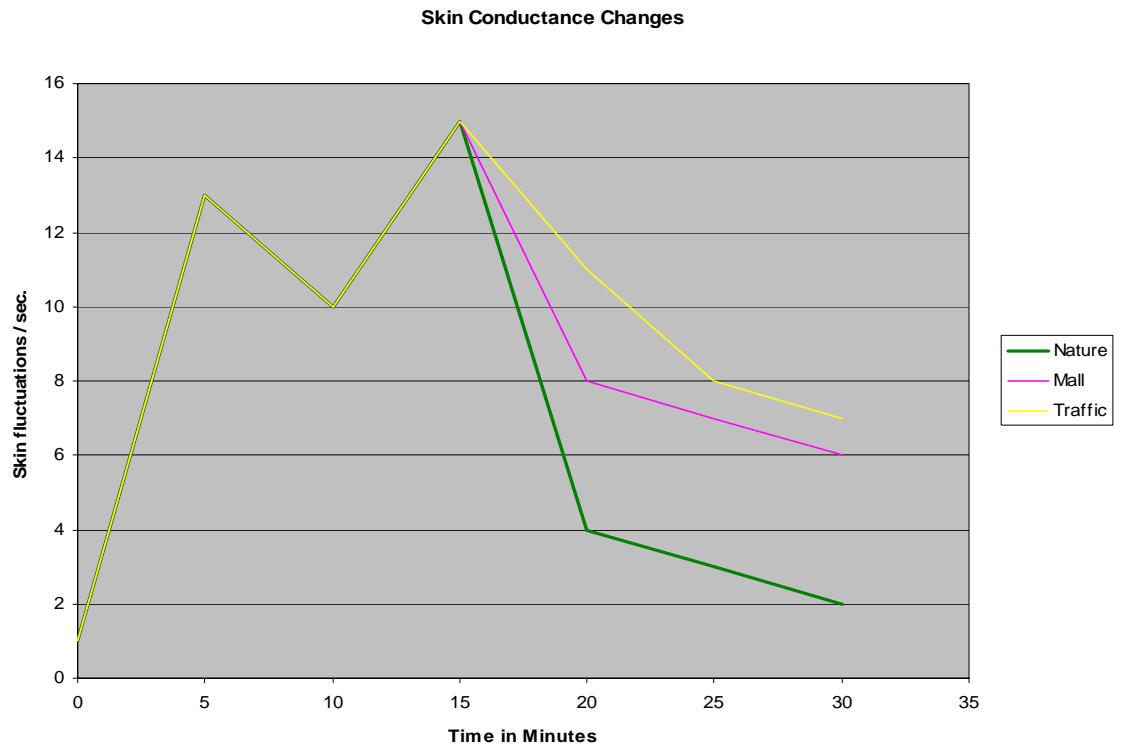


Figure 4.4
Graph of Skin Fluctuation Decrease after Nature Exposure
Ulrich, 1991

Summary

It is clear from this body of evidence that nature provides a benefit not only of generalized stress reduction for healthy individuals but the healing extends into the arena of measurable medical outcomes. While it is difficult to control a study on nature exposure, evidence based health outcomes are conclusive that passive and active nature contact can provide healing benefits to patients that improve recovery time, reduce medication costs, lower stress related complications and improve psychological well being. Coupled with data that indicates access to gardens improve staff work environments and therefore improves job satisfaction reducing costly employee turnover, the evidence is overwhelmingly in favor of adding accessible garden space to healthcare facilities (Ulrich, 2002, 26). Revised environmental quality standards from the Joint Commission on Accreditation of Healthcare Organizations are recommending hospitals provide orientation and access to nature and the outside and its calming restorative powers (Ulrich, 2002, 28). This data now makes the leap from being significant not only to the patient but also to the hospital administrator and clinician. The cost saving advantages of shorter in-patient stays coupled with decreased need for expensive pain medication are salient points to gain administrators approval for accessible garden space. All of this adds up to one important point, your mother (Nature) was right.

Chapter 5

Alzheimer's Overview

Alzheimer's disease (AD) is a growing national and global problem. AD is the most common cause of dementia in Western countries. 10% of all people over the age of 70 have significant memory loss with more than half of those a result of AD. (Faaci, Anthony, 1998, p. 2348) In the year 2000, 35.9 million people in the US were 65 years old or over, by the year 2010 the number is expected to rise to 40.2 million and in 2030 that number is expected to increase to 71.5 million, with 9.6 million over the age of 85. (AOA, 2004) If indeed the greatest risk factor is age, the skyrocketing number of older Americans will clearly tax the existing system and overwhelm healthcare workers and facilities. Approximately 4.5 million Americans have AD, a doubling since 1980. By 2050 the number could reach between 11.3 – 16 million. Over 161,000 Georgians are afflicted with the disease. 70% of AD patients live at home at a cost of approximately \$19, 000 per year out of pocket for the caregiver. The approximate yearly cost range for nursing home care for an individual with AD is \$42,000 – 70, 000 with the average lifetime cost approximately \$174, 000. Medicaid expenditures on residential care are expected to increase from \$21 billion dollars in 2005 to \$24 billion in 2010 – a 14% in only five years! Business are losing an estimated \$61 billion a year due to AD, \$36.5 billion related to caregivers absenteeism and lost productivity (www.Alz.org, 2006). Clearly, we are looking at a national crisis if the disease is left unaddressed.

The Disease

Alzheimer's disease (AD) is a progressive brain disorder that gradually destroys a person's memory and ability to learn, reason, make judgments, communicate and carry out the activities of daily living. The symptoms of the disease as a distinct entity were first identified by the German scientist, Emil Kraepelin in 1906. The characteristic neuropathology was observed and documented during the same year by a German psychiatrist, Alois Alzheimer, working with Kraepelin. It was Dr. Kraepelin who decided the disease should bear Alzheimer's name (Weber, 1997, 637).

For most of the twentieth century, the diagnosis of Alzheimer's disease was reserved for those individuals younger than age 65 who developed symptoms of "pre-senile dementia" as dementia was considered part of the normal aging process. By the late 1970's the name Alzheimer's disease began to be used equally for all individuals with senile dementia and was adopted formally for all individuals with the common symptom pattern and disease course which we now refer to as Alzheimer's disease.

While there is no single known cause for AD, scientists are aware that whatever triggers the disease begins to damage the brain years before symptoms appear. As described by Alzheimer in 1906, the hallmarks of the disease are two abnormal microscopic structures called "plaques" and "tangles" (Price, D. L. 1986, 29). Amyloid plaques are masses of protein that accumulate outside the brain's nerve cells while tangles appear to be twisted strands of another protein that forms inside the cell. Scientists do not yet know whether these plaques or tangles cause AD or are a by product of some other process.

Risk Factors and Symptoms

The most important risk factor for AD is age. The number of people with the disease doubles every five years after the age of 65. While family history and genetics play a role in early-onset familial AD (Breitner, 1991, 601) which occurs between 30 and 60 years of age, the most common form is late –onset occurring after age 65 with no obvious inherited pattern. AD patients survive only half as long as a patient the same age without dementia. Scientists continue to study possible causes and contributing factors such as diet, environmental elements, high blood pressure, heart disease, high cholesterol, and low levels of certain vitamins such as folate and vitamin E. Evidence is mounting for physical, mental and social activities that are protective against AD (Stern, 1994, 1004).

The symptoms of AD are consistent among patients though the disease advances at widely different rates. There are seven stages defining AD from stage one (1) with no cognitive impairment evident to stage seven (7) or late-stage AD with very severe cognitive decline which is considered the final stage of the disease. Most patients have lost the ability to respond to their environment, speak or control movement in stage seven. Speech, walking or sitting up without support may not be possible, reflexes are abnormal and muscles are rigid, swallowing may be impaired. The average duration of the disease is 8 – 20 years. (www.Alz.org, 2006) Usually the first symptom noticed is memory loss which is progressive over time from simple forgetfulness to a pervasive loss of recent memory. This is followed by a loss of well-known skills despite the physical ability to perform them (apraxia) and difficulty in linking names with familiar objects and people (aphasia). In additions, aphasia disorientation and disinhibition may accompany the loss of memory. The inability to comprehend an object may follow (agnosia), the

patient may be able to see the object but not recall what it is for or accomplish the successful use of it with out help. Finally, the progression of the disease may be such that behavioral changes occur such as violent outbursts, deterioration of mobility, inability to feed or cloth oneself, incontinence or hallucinations and delusions. (www.Alz.org.) Situations may play a role in these behavioral symptoms such as relocating the patient, the environment, misperceived threats or fear and mental fatigue from trying to puzzle through an increasingly confusing world. A key principle in intervention is redirecting the person's attention. Agitation can be ameliorated by creating a calm environment with stressors removed; a safe, quiet place for rest and privacy as well as moderate exercise with visual reminders of early memories (www.Alz.org). Finally, death ensues through external susceptibility or deterioration of brain function necessary to keep the body in operation. (www.Alz.org).

The diagnosis of AD is made by a primary care physician by clinical observation and tests of memory and intellectual functioning over a series of weeks or months. There exists no single blood or diagnostic test that conclusively diagnoses AD. Blood and neuro-imaging tests are usually used to rule out other diagnoses that mimic dementia (Folstein, and Folstein, 1975, 189). In 90% of cases a definitive diagnosis can only be made at autopsy.

Table 5.1

Stages of Alzheimer's Disease

- Stage 1: No impairment
 - Stage 2: Very mild decline
 - Stage 3: Mild decline
 - Stage 4: Moderate decline (mild or early stage)
 - Stage 5: Moderately severe decline (moderate or mid-stage)
 - Stage 6: Severe decline (moderately severe or mid-stage)
 - Stage 7: Very severe decline (severe or late stage)
- <http://www.alz.org/AboutAD/Stages.asp>

Treatment

Treatment at this time is combination of drug and non-drug intervention. If the disease symptom can be identified and addressed with remediation of the environment this is the most desirable course of action. Drug intervention is fraught with side effects that mask some symptoms, increase the incidence of others and even increase the risk death for some patients (Basil, et.al, 2006, 20; www. Alz.org). Current drug treatments include anti-depressants (such as Prozac), anti-anxiolytics (such as Ativan), antipsychotic medications (such Zyprexa) and sedatives. These drugs all require prescriptions and should be used with caution and full disclosure to the care-giver about potential side effects.

Study Data Supporting Nature Benefits for AD

Alzheimer's patients, a special focus of this paper present an additional wrinkle to the problem of offering nature benefits to patients. These patients experience confusion, memory loss and diminished visual acuity as part of an advancing age and illness. It would be important to note that these patients benefit from nature views and exposure as much or more than hospitalized patients not dealing with some of the subtle nuances of this disease. The theories we have discussed regarding natural elements that have been important to man through time including water, vegetation, shade canopy and sunshine are the same elements that Alzheimer's patients respond to positively in studies (Carman, 2002, 112). In advanced stages of the disease, vestigial remembrances may be all that remains of the patient's life. Therefore studies that show us whether benefits are achieved through nature exposure and what the measurable benefit may be are of particular interest. A 2006 study published in the *Annals of Internal Medicine* and reported on in

the New York Times (1/24/2006) followed 2,581 participants in Seattle, Washington for 6 years and showed a protective association between physical exercise and dementia. Initially, none of the participants showed evidence of mental decline. Those who exercised more than three times a week developed dementia at a rate slower than the general population, a 30 – 40% reduction in risk. The investigators speculate that if someone is beginning to decline, exercise may significantly slow or delay the progression of dementia or Alzheimer's disease (Larson, Eric B. MD, 2006, 79). There is also medical evidence that chronic emotional distress is a risk factor for development and progression of Alzheimer's disease. Anti-depressants may alleviate some of the deleterious effects on memory caused by the stress (Wilson, 2003, 1483). Unfortunately, anti-psychotic drugs increase negative side effects and even result in an increase rate of death, as much as 1.6 – 1.7 times that for elderly Alzheimer's patients treated with placebo. This is leading to a search for alternative agents to treat cognitive symptoms of dementia (Basil, 2006, 20).

Additional Studies Supporting Nature Exposure for AD

A 2002 study by Joanne Westphal, MD, ASLA, of patients visiting the Martin Luther Alzheimer's Garden, reveals patients who spent more than 10 minutes per day in the garden had improvements in measurable medical results such as reduction in blood pressure, heart rate, aggression and requests for medication. Those who spent less than 5 minutes showed no improvement and even some decline (Martin, 2002, 83). These positive results occurred in a space designed specifically for Alzheimer's patients, again bringing to light the importance of designing in order to enhance and parallel medical treatment (Westphal, personal communication, 2005).

In a 1994 study, 80 seniors were divided into two groups. One group participated in horticultural therapy; one was a control group with no additional activity. The most deteriorated patients gained the greatest benefit with a reduction in antisocial behavior as well as belligerent/irritability and anxious/depressed scores (Mooney in Francis 1994, 179). This confirmed similar results from an earlier study by Mooney and Nicell in 1992 with Alzheimer patients showing marked physical and emotional benefits when participating in garden exposure over a control group with no additional nature exposure. Patients experienced joy at seeing and experiencing nature and the opportunity for nurturing afforded by the gardening experience (Mooney, 1994, 184).

A study on Alzheimer's patients who experienced "sundowning" a disturbance of the circadian sleep-wake cycle common in advanced Alzheimer's, found that light therapy, environmental cues and activity could most effectively diminish the severity of symptoms. Coupled with social cues and rest/sleep controls as additional interventions, Alzheimer's patients could remain functional for longer periods of time (Vance, 2003, 12).

Remembrance therapy that incorporates sensory stimuli has also yielded positive results for Alzheimer's patients. When compared with groups receiving traditional, conversational psychotherapy or no intervention, patients participating in sensory stimuli remembrance therapy achieved greater memory scores following treatment (Namazi, 1994, 31).

Horticultural therapists working with Alzheimer's patients in 2000 noted that sensory stimulation can improve orientation and long term memory. Direct interaction with plants can also provide an effective technique to verbalization and socialization

(Haas, 1998 248, Kiyota, 2002, 165). Reports from nurses in two separate Finnish nursing homes reported that familiar plants evoked resident's memories and aided in conversation, growing plants benefited functional abilities, and maintained patient's seasonal awareness (Rappe, 2004, 78).

A 2002 study found that Alzheimer's patients who participated in a study growing, harvesting and eating food grown in the garden restored old skills and allowed patients to learn new ones (Jarrott, S. E, 2004, 140). A wide variety of research indicates that residents exhibit fewer signs of dementia when they are in a home-like, familiar looking environment (Zeisel and Tyson, 1999, 439). Leopold Liss of Ohio State's University College of Medicine has found disruptive behaviors of patients can be diminished and accommodated in a properly designed garden if wandering and walking are allowed. Patients have a feeling of control, general improved health, better appetite and improved sleep patterns (Zeisel, 1999, 443).

Nature Theory Application

As the resident's world becomes smaller due to fewer environmental options, reduced independence with diminished mobility and changing abilities, it is clear from the data above that gardening and nature exposure can provide non-drug intervention to slow the development of AD and provide needed behavioral intercession and stress relief for the AD patient (Larson, Wilson, Westphal, Alz.org). As physical ability and interests decrease, social support and outside contacts diminish, activities are increasingly controlled by others, autonomy is lost, exercise and movement are constrained, views and safe natural areas for distraction and attention redirection become increasingly important (Browne, Charlene, 1992, 79). Whether gardening provides a remembered source of

food, early skills, source of tangible benefits of success, orientation or season, nature contact seems to supply calming distractions, exercise, social interaction and control that we stated earlier were essential for hospitalized patients to speed healing and achieve a state of well being.

As Alzheimer's patients have an advancement of disease state, global memory breaks down and current memory gives way to lingering long term recall. Initially images and resources from earlier years provide a connection to the past, confirming pleasurable memories. This can be represented as the functioning of past personal memory. As the disease progresses however, deep cultural images may be the only memories strong enough to elicit a positive recall response. Aesthetic, naturalistic or symbolic value images may be what the patient relies on to identify and connect with nature, remembering a distant but positive past. The connection that the patient had to a place and his sense of identity and ownership may be linked to remembering it. We'll call this classical memory. In the last stages of the disease, memory may regress to the limited scope of innate response to the environment, those from our genetic heritage. Integrating sensory experiences that relate to our inherent environmental memory can provide critical connections between mind and nature that maximize quality of life. This type of memory can be called genetic memory. As described, these three types of memory reflect the nature theories discussed in an earlier chapter. Past, personal memories relate to what we have experienced, seen and known all our lives and recalls positive visual combinations that provide positive physical responses. Past, personal memory can be seen as a combination of the Kaplan and Ulrich theories. The classical memory is deeper and called upon as recent memories fade to near nothingness. This type of memory is

reminiscent of the values and sense of place related by Kellert. Obviously, genetic memory is the vestigial response that we have to nature when all other recall has abandoned us and is the response most closely associated with the theory of nature espoused by E. O. Wilson.

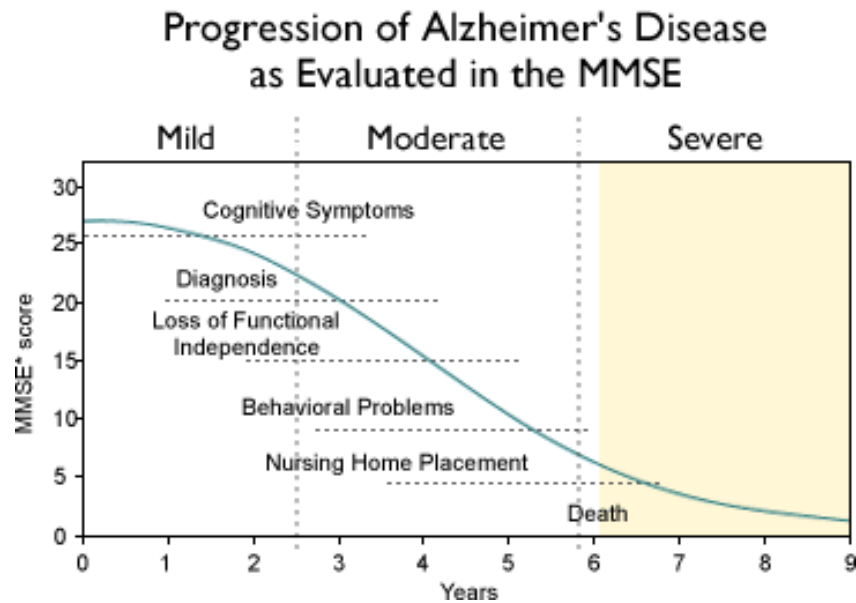


Figure 5.1

MMSE Curve for Progression of Alzheimer's Disease

Reproduced from: Feldman H, Gracon S. Alzheimer's disease: Symptomatic Drugs under Development. 1996. (MMSE = mini-mental state examination)

Summary

With the graying of the Baby Boom generation hospitals, healthcare facilities and families will be taxed to the breaking point while trying to care for family members with this progressive, debilitating disease. Already the increase in the numbers of people afflicted each year with this ailment is skyrocketing. While we search for direct relational causes and confirmed cures and aids for the Alzheimer's patient, it is important to use the tools at hand. Familiar surroundings, schedules, visual and memory cues to the past "good life" lived, contact with nature active or passive, as well as medicines and other medical

interventions seem to be tools in our current arsenal. As we have documented here, all combined can aid an Alzheimer's patient and even slow the progression of the disease. While it is impossible to know for sure what exact benefit is offered to each AD patient in the garden it is safe to say that benefits from contact with nature include its ability to: 1) Offer some **control** for patients, who can wander about independently and safely with private yet visible seating, so that they experience a sense of freedom. 2) **Socialization** may improve when the garden feels safe and familiar to them. Family might visit more often in comfortable surroundings. Aggression and agitation may diminish (Weiss, APA, 2000) and patients may talk among themselves. 3) **Exercise** can be encouraged when patients walk about the paths or stop and bend to perform gardening tasks. 4) **Nature** can provide exposure to sun, fresh air and distraction can help reduce mental fatigue and promote relaxation. Patients become oriented to seasonal cues.

The Alzheimer's Organization and current research recommend environmental intervention as a treatment for these patients. Our focus hospital offers such intervention, albeit in a garden not intended for dementia patients. Wesley Woods Hospital which is providing treatment to AD patients in stage 5, 6, or 7 who have experienced a bout of agitation serious enough to require hospitalization. The next chapter will analyze the current garden space and make design recommendations for a more patient – friendly, success-oriented space.

Chapter 6

Evaluation and Design Recommendations For a Courtyard Garden at Wesley Woods Hospital

So far we have discussed that health care has a history with nature. Nature offers a variety of psychological and physical benefits through several different theoretical pathways including engaging our primitive mind, connectivity to identity, values and a sense of place and offering sensory stimulation that provides stress relief allowing us to restore normal baseline mental and physical functions. This data has been supported in scientific studies as well as incidental observations on how we feel following exposure to nature. We can achieve the full benefit of nature's restorative/healing processes by offering key elements to the user.

According to the theories that we have reviewed, Ulrich's evolutionary theory states that lessening psychological pressure and the increase of positive emotions is why a natural environment helps individuals relieve stress. The highest psycho-physiological benefits came from viewing nature and water. Kaplan points out that relaxation is related to "being away", one of the four features of a restorative environment. Fascination, another feature of a therapeutic environment, can restore directed attention or cognitive functioning and lead to deep comfort and restoration of fatigue, reduction of fear, anxiety and aggression. Landscape features that people value and appreciate encourage positive personal identification through aesthetic, moral, spiritual and emotional attachments. We have noted that when hospitalized, patients experience a loss of control over their

environment, a decrease in social support, lack of freedom of mobility and lack of positive distractions (Ulrich, 1999, 36). Design decisions should be geared toward providing these absent essentials. It is important to note that any planted space does not a therapeutic garden make. When dealing with healthcare facilities and patient targeted gardens, an understanding of the facility, the disease and its prognosis and current treatments, and how the space is to be used is critical to a successful design. “No one garden prescription works for all sets of patients. Each garden is different is size, scope and concept. There are different needs, psychologically and physically that require different design solutions.” (Clare Cooper Marcus – personal communication 5/2006). A multi-disciplined approach to design decisions often yields the most pertinent information required to successfully create a therapeutic space and facilitate healing (Martin, 12/2002, 82). It is also a time to abandon the desire to provide ‘cutting edge’ design in order to tailor the design to the specialized needs of the patient and facility. A major design statement may look good on paper but if it has no relationship to the patients, facility or healing goals it is a missed opportunity (Hines, 12/2005, 112). It may also inadvertently create a space that is scattered with obstacles, hazards and potential problems (Rauma, 2003, 50). By offering environmental elements that assist the patient in coping with stress we can reduce its negative effects by providing a sense of control, socialization, exercise and distraction and thereby assist and speed healing.

In this thesis we have looked at the study data on benefits imparted to hospitalized patients through nature contact, and then more specifically benefits obtained by Alzheimer’s patients when nature access is available. Our efforts now will focus on a specific garden design to assist a specific patient group.

Wesley Woods Hospital of Emory Healthcare

The Wesley Woods Hospital was constructed and opened in 1987 – 1988. It was intended specifically for the treatment and care of a geriatric population. The Wesley Woods Hospital encompasses a wide spectrum of care for older adults including a geriatric hospital, a long-term nursing care facility, and independent living facilities for seniors, as well as an outpatient center and a health center. The center, hospital and other facilities are located on 72 wooded acres in Atlanta, Georgia within 2 miles of the Emory University of which it is a teaching hospital for medical residents and other allied health students.

Wesley Woods Hospital is an all-inclusive acute care facility specializing in the comprehensive medical needs of adults over the age of 65. It is a uniquely designed, 100-bed acute care hospital and outpatient clinic. More than 2,347 inpatients and 34,320 outpatients come to Wesley Woods Hospital each year. The hospital was established in 1987 as the first comprehensive outpatient and acute care facility of its kind to specialize in the fastest growing segment of the population---aging adults. Wesley Woods Hospital was established in October 1993. This facility is for adults of all ages who no longer require treatment in the intensive care unit of a regular hospital, but still need acute and complex care.

Care at the hospital consists of medical treatment, rehabilitation, psychiatry and neuropsychiatry, as well as long-term acute care. Our particular patient population is comprised of those adults diagnosed with agitated dementia, dementia with behavioral dyscontrol and Alzheimer's disease with agitation serious enough to warrant in-patient medical care and reevaluation of medicines. Agitation can be defined as wandering,

pacings, combativeness, calling out, refusal of medication or destructiveness. These patients populate the neuropsychiatry ward, one of four wards within the Geriatric hospital proper. The secure unit and courtyard garden were not designed specifically for an agitated, demented population. Subtle protective measures and changes have been instituted such as limited wall art or moveable items that could be destroyed, broken or taken apart. Fewer accessories are available within the ward for the same reason. These safety requirements do inhibit the ability to make the ward appear home-like.

The maximum number of patients that can be accommodated is 24 with the census generally numbering around 17. Patient demographics tell us that more women than men are patients and their average age is 84. The average length of stay for most patients is from 8 – 10 days. Most patients are residents of Georgia but they may hail from anywhere in the nation as older Americans relocate to be nearer their grown children who assist in their care. The Southeast is the area of the country predominantly represented. Patients are not discharged until their symptoms have decreased and any eating, sleeping or medical issue must be resolved. Discharge determination may also depend upon criteria in place at an assisted living facility or nursing home where the patient may reside (Kirk W. Hines – personal communication, 2006).

Horticultural Therapy at Wesley Woods Hospital

The horticultural therapy program was founded in 1993 by Kirk Wells Hines, Registered Horticultural Therapist, as adjunctive therapy for the hospital's patients. An educator, author, frequent lecturer, member of the American Horticultural Therapy Association's national board and former president of the Georgia-Alabama Chapter of AHTA, Mr. Hines was more than qualified to design a program for therapy for the

Wesley Woods patients. Therapy at Wesley Woods occurs in two courtyard gardens, on the psychiatry and neuropsychiatry wards, a greenhouse, ambulation garden and three mobile lighted plant shelves. Horticultural therapy sessions occur with groups (on average 2 -6 patients) as well as with individuals in all patient populations. Sessions are held daily on the units, in the gardens, and in the greenhouse or at bedside if needed. Each session lasts about 45 minutes. As the horticultural therapist, Mr. Hines works closely with occupational therapy, physical therapy, and speech pathology to assess the patients' needs and determine therapy goals, then designs and assists in achieving them. Planting, sowing seeds, taking cuttings and maintenance tasks in the garden are all utilized to achieve the rehabilitation goals for the patient. Stimulating all the senses, recalling memories and nurturing skills are all important targets of the therapy. As the hospital ward and garden were not designed with agitated, dementia patients in mind, Hines has had to modify the courtyard in order to successfully meet the demands of his patient population. A concrete pathway, raised beds, a few planted pots, a bench, a table and four moveable chairs and non-patient worked, planted, ground level beds comprise the whole of the system that he has to work with in the neuropsychiatry garden. It is our collective opinion, that by evaluating the space, identifying areas of concern and suggesting improvements to the space, that we will be able to facilitate his horticultural therapy work, reduce stress in the patients, provide them with some control over their environment, offer a place for socialization, provide a source for positive distraction, offer a connection to available memories and even provide a safe area for movement and pacing. The ultimate goal of a patient/disease specific design is to reduce stress which can produce a reduction in agitation symptoms with a concomitant reduction in

antipsychotic drugs in a short period of time (Basil, et.al., 2006, 23: Kirk W. Hines – personal communication, 2006).

Analysis of Wesley Woods Neuropsychiatry Garden

The garden space utilized by the Alzheimer's patients was not originally intended as a space for patients with dementia. It is identical to another space in the Wesley Woods Hospital that serves vastly different patient populations. These spaces seem an afterthought of the architect who designed the building, leaving the horticultural therapist to piece together a workable space.

The area that has been set aside for the garden is a pentagon offering approximately 1680 square feet and measuring 40 x 42 feet at its widest spot. It is surrounded by the two story hospital building. The interior space is angular, grey and vinyl sided with white trim surrounding four (4) windows that all look out from the garden into several long halls (or from the halls into the garden). These hallways are used by many visitors and staff but no patients. Additional windows are located behind the neuropsychiatry nurses station, the sides of the common room and a pair of floor to ceiling windows on each side of the garden. It should be noted that from the garden, these very large windows give a view out into the hallway where the locked doors to the ward are accessed by staff and visitors and people can be seen coming and going. Within the space, there is a two story maple tree that provides limited shade and seasonal cues and assorted evergreen shrub plantings. A table with a shade umbrella and four moveable chairs are located in the sunniest spot in the courtyard. This is the only shade structure available for groups to utilize and allow some sun for warmth. This north wall of the garden receives sun for six (6) to eight (8) hours of each day. There is no seating

available in the central, part sun part shade area, or any seating in the deep shade area at this time. Five constructed, raised beds are available for Mr. Hines to offer horticultural therapy treatments. A sheltered bench is available for smokers. The ground plane is a circular concrete path around brick pavers that house the only drainage port for the space. At this time there is significant settling of the pavers and they do not provide a usable walking area for patients. No handrails are available. There are two doors into the space, both lead back into the patient common room which is located in front of the nurses station. Patients may enter and exit from either door and are returned to the same room regardless of their pattern. A circular pattern of wandering can occur outside on the concrete path or by exiting one door, following the concrete path to the other door, passing the nurses station to return to the garden at the other door. This is a pattern followed by a high percentage of patients. There are short ramps of low rise at each door but a fairly high threshold. There are currently no signs or visual way-finding cues to tell patients which door they are in front of or what side of the garden they are on. The space is small and unblocked visually allowing a clear view to all corners and across the courtyard from door to door.

See Figure 6.1 – Site Inventory and Analysis of garden space at Wesley Woods Hospital

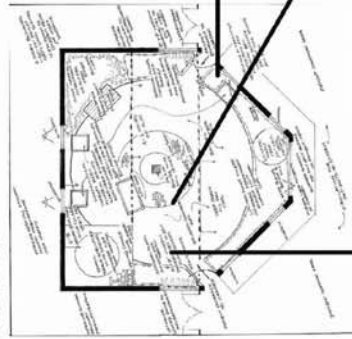
Issues with the space at this time include:

1. Doors are too heavy for most patients to open with out assistance.
2. Ramps at doors are not wide and threshold can pose a tripping hazard due weight of door.
3. No handrails around planted areas for independent enjoyment of space.
4. Ground planted areas have limited flowering plants, limited color palette, limited fragrance or texture available to patients for cognitive stimulation.
5. Limited seating.
6. Limited usable shade.
7. Extreme heat and sun in one corner of the space.
8. Uneven ground plane.
9. Built elements were not constructed for permanence (rotting of some wood structures) and are not ideal in construction for the patient population (non-rounded corners exist due to construction material and budget constraints).
10. Floor to ceiling windows that look out into public hall space encourage patients to try and elope from the ward. Tripping hazards result, plants are crushed and patient may become increasingly frustrated.
11. No water feature.

It should be noted at this juncture that we are not allowed to paint the walls or trim in the space, nor attach structures, affix canopies, brackets or holders to the building. Plantings will need to be spaced so that the siding is undisturbed by the planting materials during growth, or in the event of wind, rain or ice.

See Figure 6.2- Photos of the Current Wesley Woods Hospital Alzheimer’s Garden

**Wesley Woods Hospital
Alzheimer's Garden**
ATLANTA, GEORGIA



6.2a Patio Left Door



6.2b Patio Door Right

6.2c Patio from Above



Figure 6.2

Photos of Current Garden Space
NTS

Design Program for Wesley Woods Alzheimer's Garden

Our discussion of nature theories has revealed that benefits of nature are best obtained when the environment offered feelings of being away, fascination, extent and compatibility. These can be conferred to the site using a mix of legibility, coherence, mystery, and complexity. (Kaplan theory). Views that offer high depth, spatially open vistas of nature with smooth, uniform ground texture appeal to our biophilic information and learning needs allowing us to relax and release feelings of apprehension. (Wilson theory) Aesthetically pleasing views incorporating vegetation, water and memory cues that trigger our deep cultural environmental values or genetic memory allow us to relate to a scene without fear or anxiety. (Kellert theory) These intangible benefits can provide what hospital patients need most: control, social support, movement and exercise and positive distractions. (Ulrich theory) “What are the tangible elements we might use to accomplish this?”

The therapeutic goals for the design are to provide a garden for Alzheimer's patients that will foster stress reduction, reduce agitation and improve medical outcomes such as lower drug use and a swift return to permanent living arrangements (Ulrich, 1984, 420). It will offer the patients ways to achieve movement and exercise, improved social support, some form of control, and distractions from daily routines. This can be accomplished by providing missing elements (as identified in the previous section) or improving existing conditions. A table that lists these stress coping mechanisms along with some of our objectives for achieving those goals is useful.

SEE TABLE 6.1

Table 6.1
DESIGN PROGRAM
GOALS AND OBJECTIVES

A. GOAL: Facilitate **Horticultural Therapy**, movement, light **Exercise** and performance of remembered skills.

OBJECTIVES:

1. Improve walking path ground plane
2. Provide more than one (1) looping, returning path.
3. Provide one (1) large, raised horticultural bed of varying access height.
4. Incorporate handrails into the garden to assist the infirmed
5. Plant non poisonous plants safe for patients to pick or plant.
6. Wide paths for wheelchair accessibility.

B.: GOAL: Promote **Social Support** for patients.

OBJECTIVES:

1. Provide more seating for family, friends and staff to passively enjoy the garden.
2. Provide seating that allows private or group seating.
3. Provide more shade in the sunniest corner (North) to encourage passive use of the garden.
4. Provide signage in the garden to help family and friends locate and use the garden with patients.
5. Enlarge shaded patio area to accommodate more users.

C. GOAL: Creatively offer patients some **Control** of their environment allowing for some independence.

OBJECTIVES:

1. Provide signage in the patient common room showing the way to the garden.
2. Provide more seating allowing for various groups to form.
3. Provide moveable and stationary seating in a variety of locations.
4. Provide handrails to assist independent movement.
5. Ensure that ground plane is level and of a suitable material for safe footing and reduced glare.
6. At least one path wide enough for two (2) wheelchairs to pass.
7. Create more than one (1) path so several patients can wander without contact.
8. Create a raised planting bed with varying access height to accommodate patients who can stand and garden as well as those in wheelchairs.
9. Define space with paving changes.
10. Suggest automatic doors so that patients can enter and exit the garden with ease.
11. Use different plant material as each entry/exit door to aid in way-finding and patient's visual location in the garden.

D. GOAL: Positive Distractions

OBJECTIVES:

1. Provide a water feature for sound and visual distraction and stress relief. (Kaplan and Ulrich).
2. Plant heirloom plants for memory cues, aesthetic appeal and sense of place. (Ulrich, Kellert, Kaplan).
3. Add a focal point for interest.
4. Plant material shall offer 4 season interest.
5. Plant material shall offer blooms, color, texture, fragrance interest to the garden and provide memory triggers, visual, tactile, olfactory stimulation.
6. Utilize shade plant material with white or yellow foliage or blooms to attract attention and reduce feelings of discomfort in the deep shade area.

Exercise and independent movement is a lost privilege of Alzheimer's patients. Usually space is limited and if not, there is simply no where to go. A safe, secure space where patients benefit from an adjacent scenic area can provide a destination and a view. Smooth ground texture on looping paths where there is little chance of getting lost or disoriented can motivate a patient and instill confidence. Eliminating blocked views, deep shadows, and mystery is desired as they can frighten and stifle a patients desire to stroll. A ramp, if necessary, with less than 1 ft rise for every 12 feet in length (<8%) (Carman, 2002, ADA, 2003, 518) and sidewalks with 36" – 48" minimum clear width and 60" clear for passing (ADA, 2003, 519; Kavanagh, 1998, 306). Handrails should be available and mounted 34 – 38" high with at least a 1 ½" clearance between building and rail (ADA, 2003, 520). Pavement should be smooth and incorporate a color that reduces glare as the older patient population has increased eye sensitivity and diminished compensatory response to high light environments. Landmarks and destinations within the garden can also ameliorate the lack of exercise issue. An interesting destination or "nodes of activity" viewed from a window or door while the patient is still inside may also encourage movement. (Clare Cooper Marcus, - personal communication 5/2006). Raised planting beds might be an interesting destination as well as a way to exercise by planting, weeding or harvesting. To investigate a colorful patch of flowers, water feature, or shady place may be the trigger that inspires a patient to venture forth.

Now that we have identified some ways in which to provide exercise, let's consider elements that aid **socialization**. One of the greatest sadness's of families dealing with Alzheimer's can be the inability to communicate with the affected family member. Often, communication is difficult at best and hospital or nursing home environments are

not always conducive to relaxed visitation. Family members often rush in on the patient and place demands on them to be a functioning member of the family unit. For most patients it is all too swift and stressful. Garden areas provide space to reminisce while sitting on benches or at tables. The environment is more familiar, relaxed and provides more topics of conversation for patient and family. Wheelchair accessible tables and benches with armrests and backs make sitting and transitioning from wheelchair or walker more comfortable. A 90-degree orientation makes visiting easier. Tables, chairs and benches should be nomadic as well as structured and set for privacy, both visual and spatial, as well as group participation (Zeisel and Tyson, 1999, 453). Consider where one person might be comfortable as well as several. Memory triggers can aid in socialization too. Seasonal changes, flower fragrance and color, miscellany of household chores and hobbies can elicit interest, memories and perhaps conversation. Active participation in horticultural therapy or related activities may stimulate patient conversation with therapist or other residents. It may be a basis for conversation with family members when they visit.

Gardens designed appropriately can increase feelings of **control** for patients. Knowing that the garden exists is one thing, finding it is another. Way finding to and through the garden are important considerations as well as ease of accessibility for all. To offer some control to patients we might incorporate definite access to the garden for all abilities represented in our patient population. Signage to a well secured, safe garden as well as signage through the space back to the entrance, if necessary, is invaluable. Way finding can also be incorporated using visual cues such as different plants at different entrances and exits or at certain points along pathways; garden furniture, structures, even

flags or umbrellas can also be useful way-finding focal points. Walls below 12” in height can pose a tripping hazard as they are below the site line. Raised beds at 18 – 24” are best suited to wheelchair bound patients and maximum heights of 36” – 42” will accommodate most other patients with walkers or standing unaided (Kavanagh, 1998, 306). Reaches across the plant bed should range from 20” – 34” with a maximum forward reach of 48” (Kavanagh, 1998, 340). All of this will be for naught if we do not provide doors that can be operated by the patients. Doors must have a minimum clearance width of 32” with thresholds not greater than ¾” in height and then with a beveled top not exceeding a slope of 1:2 (ADA, 2003, 527). Doors for ingress/ egress should not require more than five pounds of force to open (ADA, 2003, 529). Automatic doors shall not open to back check faster than 3 seconds and should be stopped with 15 pounds of force or less (ADA, 2003, 531).

Positive distractions are probably what the garden really lives for. Wildlife, bright things, moving things and interconnectedness all engage the involuntary attention and allow for fascination of the mind with time for mental restoration to take place. The natural sound of water from fountains or other water features, the visual change of the sky at sunrise or sunset, the smell of turned earth or fresh herbs, the feel of the grass under your feet can be powerful memory triggers. Visual, tactile and auditory sensations can bring a memory back for a patient and can assist in connecting back to family members. The topic of conversation may be about the immediate item that triggered the memory or it is a stroll down memory lane to the place where the memory was first created. The sense of smell is directly tied to the human limbic system, the part of the brain associated with emotion, motivation, and emotional association with memory. If

one is careful with the strength and balance of fragrance it can provide a powerful recollection of memories (Tyson, 1998, ix). Other positive distractions that can evoke fascination are watching birds, butterflies, clouds, or even the change of day or seasons. As we discussed in an earlier chapter, this group of patients often suffers from sun-downing and a disassociation with time. To watch the day and seasons change can often help in resetting the internal time clock (Vance, 2003, 2).

Patients in the neuropsychiatry ward at Wesley Woods who have both dementia and Alzheimer's disease offer a special Alzheimer's patient population. Each has experienced some type of behavioral catastrophic event to result in their admittance to the ward. They have acted out in a manner that shows that they are a threat to themselves and others and hospitalization is required to observe the patient, their medications and determine long-term actions that will restore them to balanced behavior and allow them an opportunity to return to their full time living arrangement. A properly designed garden will allow them to safely contact nature and engage genetic coping mechanisms to reduce stress as well as perhaps trigger memories of long dormant skills of planting and harvesting. It is important that we correctly design the garden for this group as there is evidence that an inappropriately designed garden can delay stress recovery and worsen outcomes (Ulrich, 1999, 73). A garden that engenders feelings of risk or poor safety, prevalence of hardscape, crowding, intrusive sounds or smells or ambiguous design can hinder restoration and recovery (Ulrich, 1999, 74). Horticultural therapist Teresia Hazen of Legacy Health System in Portland Oregon recommends 70% plants to 30% hardscape as well as advocating a high quantity of native plants and materials as part of that percentage to establish a sense of place (Hines, 12/05, 112). She also notes well designed

gardens have been shown to serve as calming places for patients and families as well as offering exercise and rehabilitation settings that are more inspiring than hospital rooms (Rojas-Burke, 3/06, D-1). A study from 1992 showed that two Alzheimer's facilities that incorporated a garden into their residence saw a 19% reduction in catastrophic events in residents who spent time outdoors (Carman, 2002, 113). While noting that gardens need to be calming and restorative we should also keep in mind that this patient population suffers from lack of stimulation and activity as well. Visual, tactile and olfactory senses may diminish with age (Lovering, 1990, 35). Heritage plants that offer strong fragrances from childhood facilitate remembrance therapy. Brightly colored flowers that attract interest and mark nodes of activity are also useful and successful. Large lettering for signage (white on a dark background) may engage the patient to provided cognitive stimulation and way finding within their ability and all may provide connectivity thought to have been diminished by age (Westphal, 10/2005, personal communication). If we use the above information to create a space to facilitate the engagement of stress coping mechanisms, a place for stress reduction and an area of safe memory triggers we can develop a working matrix of design elements including goals they fulfill. This tool will ensure that we have included the key elements needed by the hospitalized Alzheimer patient. See **Table 6.2**

Table 6.2
ALZHEIMER'S GARDEN DESIGN ELEMENTS
AND HEALTH BENEFITS THEY SUPPORT

DESIGN ELEMENTS	EXERCISE/ MOVEMENT	SOCIAL SUPPORT	CONTROL	POSITIVE DISTRACTIONS
Benches		X		
Colorful heirloom plants				X
Destinations				X
Handrails	X		X	
Landmarks			X	
Moveable tables and chairs		X		
Non-poisonous plants	X			
Pathways	X		X	
Patient workable doors for accessibility			X	
Patio		X		
Privacy		X		
Raised planting beds	X		X	
Safety/Security	X			
Seasonal plants				X
Seating		X	X	
Sensory stimulation				X
Shade		X		
Signage		X	X	
Smooth ground texture	X		X	
Water feature				X
Wheelchair & handicap accessibility	X		X	

Recommendations for Redesign of the Garden Space

Mainstream, traditional design does not apply to this space as function becomes the most important element. Forming studies were performed to determine the most suitable way to bring use and physical forms together. Rectilinear, diagonal, angular and arc/tangent forms all reinforced the hard lines within the very small garden and therefore were not chosen. They accentuated the closed feelings already created by the two story walls and pentagon shape of the space. They created a formal, hard lined, uninviting feeling on the ground plan and did not readily accommodate the typical circulation patterns followed by most patients. Curvilinear forms overlapped with circular elements allowed a more inviting, flexible design that easily accommodated circulation and reduced hardscape. Patient's typical circular progression or arc pattern (wandering back through the common room) is facilitated as well as making figure eight movement if so desired. Circulation is logical, clear and can occur spontaneously without confusion. The placement of many of the garden features was driven by the sun/shade exposure and the horticultural therapy program needs. The size of the space does not allow for other types of successful forming within the space or overlaid on the proposed design. Certain design elements were not appropriate for this group due to limitations that we cannot even imagine that have resulted from their disease state. The work needs and selections were guided by the horticultural therapist. The curvilinear design allows us to meet our goals of providing stress coping mechanisms within a framework suitable to the patient's abilities. It should be noted that patient's at this advanced stage of AD may throw, disassemble, eat or get into plant beds, fountains or other garden feature. Safety makes this group ineligible for some of the more traditional memory garden elements. **See Figure 6.3**

Movement and Exercise

The new design offers a varied but clear path system. All paths loop back to connect to one another so the patient is never at a dead-end nor becomes confused. The main circulation is 60” wide for wheelchairs and passing with auxiliary paths varying for 36 – 48”. Wider ramps have been recommended at the doors with less than an 8 % slope which is currently what the slope that patients have to negotiate. Paths should be constructed of colored brushed concrete for safe footing and smooth transition into the sun, reducing glare. Ground level, planted beds should be flush with paths or edged so that patients do not fall into planted area. Rolled edges at the limits of the concrete ramp and at the planting beds would be advantageous to prevent accidental missteps. The addition of handrails will promote safety and confidence for independent movement. A powder coated rail of dark color will reduce glare. A raised horticultural therapy bed of stacked stone in the back corner of the garden will draw interested patients out to see non-poisonous plants used in therapy sessions. The improved horticultural therapy bed may encourage users of all abilities to participate in therapy sessions adding to the exercise obtained by patients in the ward. ADA specifications have been followed and were noted in the previous section. See **Table 6.3**

Table 6.3
STRESS REDUCTION WITH DESIGN ELEMENTS
FACILITATING MOVEMENT AND EXERCISE

DESIGN ELEMENT	SIZE	MATERIAL	COMMENTS
PATHWAY	Looping 60" Wide for passing 36 – 48" Clear < 8% Slope at ramp from doorway	Brushed Concrete	Colored concrete to reduce glare
GROUND PLANE	Smooth 36" – 60" wide	Brushed Concrete Slate Patio	Smooth transition from door to path to patio No extreme color changes Slightly raised edges to hold wheelchairs Eliminate blocked views
RAISED HORTICULTURAL THERAPY PLANT BED	18 – 24" for wheelchairs 36 – 42" for standing patients 20 – 34" Reach with a maximum of 48"	Stacked stone	Create interest with non poisonous plants Ensure rounded edges Use remembered skills, planting, sowing, harvesting
HANDRAILS	34 – 38" high	Powder coated aluminum	Dark color such as dark green or black to reduce glare
NON-POISONOUS PLANTS	Varies	See Plant List Table 6.7	http://www.ansci.cornell.edu/plants/index.html

Social Support

In order to facilitate social interaction between patients and their families, care givers and perhaps even each other, additional seating and shady spaces have been incorporated. Placing moveable furniture (tables and chairs) under a shade structure will be welcomed by passive users as well as allowing groups of any size to join together. This furniture needs to be heavy enough that it is not carried away or thrown. Arm chairs will allow wheelchair patients to transition out of their seats and proper height at the tables will allow them to roll up to use the table. Benches with arms will serve the same function. They have been placed around the garden in the sun, part sun and shade areas to allow patients a choice as well as privacy with a family member or caregiver. (See **Figure 6.1** - Site inventory and analysis for sun vs. shade margins). Interior signs can direct visitors toward the garden to have time with the patient or to use the garden themselves. They might wish to utilize the space under the new shade structure in the northwest corner. As noted earlier in this chapter in Figure 6.1 - site inventory and analysis, only 1 table and 4 chairs with a small umbrella is available for seating and shade. The size recommended for the redesign is 10 – 12' in height to soften the hard lines of the building and an increase in shaded patio surface to approximately 100 square feet from the existing approximately 50 square feet. This is recommended to provide more shade, increase the number of tables to 2 and number of moveable chairs to 8 and accommodate more users.

SEE TABLE 6.4 – Stress Reduction with Design Elements Facilitating Social Support

Table 6.4
STRESS REDUCTION WITH DESIGN ELEMENTS
FACILITATING SOCIAL SUPPORT

DESIGN ELEMENT	SIZE	MATERIAL	COMMENTS
SEATING	36 – 60” Benches 2 – 48” Round Tables 8 to 10 moveable arm chairs	Teak Wood Weighted Aluminum	Arms to assist patients when sitting Moveable Furniture must be heavy enough that patients can’t move Table height should accommodate wheelchairs
PRIVACY	36 – 60” Benches with arms	Teak Wood	Arms to assist patients when sitting Locate throughout garden so privacy obtained
SHADE	Structure to cover approximately 100 sq.ft.	Wooden Supports with Canvas Top	Accommodate 2 table and 8 – 10 moveable chairs Space large enough for groups to separate if desired Structure must be free standing
SIGNAGE	2’ x 2’ sign	Laminated Poster or sealed Board	Provide large black lettering with representation of garden Arrow pointing toward access points

Control

The loss of control of every facet of life is pervasive for this patient group. Elements have been added to the garden to offer some form of control back to these patients keeping in mind the limitations of their disease. More and improved seating is provided that offers the choice to sit in sun, part sun or shade as well as allowing the opportunity to sit alone or with others. Handrails provide a chance for independent movement for those not steady on their feet. The ground plane as brushed concrete offers stable non slip footing which allow a choice about whether to go out or not if safe footing is an issue. By changing the scoring in the concrete in a portion of the path system, a choice is offered for which way to walk as well. The patio area is yet another different ground plane choice for patients if we use slate paving under the shade structure. More than one pathway that loops, preventing dead ends and confusion, also offers choice of destination as well as how the patient gets there. This group of patients is often afraid of the others sharing the same space and the ability to choose a path that no one else is on also provides control. Raised therapy planter beds with a sloping height and appropriate arm reach limits allow everyone the choice regarding participation. Doors that open automatically following ADA guidelines can facilitate the ingress/egress of patients regardless of their strength and mobility. Non-poisonous heirloom plants provide a chance to recall a memory or perform long forgotten skills such as planting, sowing or harvesting plants. **SEE TABLE 6.5 - Stress Reduction will Design Elements Facilitating Control**

Table 6.5
STRESS REDUCTION WITH DESIGN ELEMENTS
FACILITATING CONTROL

DESIGN ELEMENT	SIZE	MATERIAL	COMMENTS
SIGNAGE	2' x 2' sign	Laminated poster or sealed board	Provide large black lettering with representation of garden. Arrow pointing toward access point
SEATING	36 – 60" Benches 2 - 48" round tables 8 to 10 moveable arm chairs	Teak wood Weighted Aluminum	Arms to assist patients when sitting Match chairs / heavy enough that patients can't move Table height should accommodate wheelchair
HANDRAILS	34 – 38" high	Powder coated aluminum	Dark color such as dark green or black to reduce glare
GROUND PLANE	Smooth 36" – 60" wide	Brushed Concrete Slate Patio	Smooth transition from door to path to patio No extreme color changes Slightly raised edges to hold wheelchairs Eliminate blocked views
PATHWAYS	Looping 60" Wide for passing 36 – 48" Clear < 8% Slope at ramp from doorway	Brushed Concrete	Colored concrete to reduce glare
PRIVACY	Benches More than 1 Looping Path	Heavy wooden Level Brushed Concrete	These patients often experience agitation and wish to sit or walk alone. Providing elements that offer personal space to them is valuable in stress reduction. (Personal observation)
RAISED PLANT BEDS	18 – 24" for wheelchairs 36 – 42" for standing patients 20 – 34" Reach with a maximum of 48"	Stacked stone	Ensure rounded edges One bed for many abilities will aid the therapist in conducting group sessions All patients can access the bed at any time
DOORS	32" minimum clearance ¾" maximum threshold height 5 lbs of force to open < or = 15 lbs of force to close < or =	Automatic doors recommended	Not all patients can open the existing doors when they desire to go into the garden. ADA accessibility or automatic doors provide the freedom to come and go from the garden
PLANT MATERIAL	Varies	heirloom plants non-poisonous plant	Memory triggers can result from the plant material. There is no concern for patient safety handling the plants http://www.ansci.cornell.edu/plants

Positive distractions

These elements can be the most powerful in aiding patients with memory recall. (Tyson, 1998 ,ix). Familiar fragrances, the feel of a plant long unseen and forgotten or just the time and place to passively enjoy nature, shadows, clouds and changing light can relax and aid the patient. A water feature has been incorporated into the garden that produces splashing or falling water sounds and will become a destination for patients and hold their attention. Perennials and familiar shrubs can go a long way toward creating a home-like atmosphere and reducing the institutional look most healthcare facilities now have (CCM- personal communication 5/2006). Memory recall is aided by using heirloom shrubs such as camellia, gardenia, tea olive and pearl bush. Verbena, blue eyed grass and periwinkle are favorites in old southern gardens. Butterfly bush, sweet shrub and mock orange attract butterflies and offer distraction from the daily routine. Shade gardens need light reflective plants such as our choice of goat's beard and white margined ferns and hostas. The plant material can aid patients as landmarks also. The garden area where patients try to exit the ward can be screened with different shrub plantings at each door to stop elopement attempts as well as give a landmark for direction in the garden space. Seasonal interest and cues can be obtained by the patients to orient them in space as well as time. Horticultural therapy sessions can aid distraction as patients' sow and wait for plants to grow and bloom. Only non-poisonous plants should be used as a safety measure in light of the patients' disease state and condition. See **Table 6.6**

Table 6.6
STRESS REDUCTION WITH DESIGN ELEMENTS
FACILITATING POSITIVE DISTRACTIONS

DESIGN ELEMENT	SIZE	MATERIAL	COMMENTS
WATER FEATURE	48" height maximum 48" width maximum due to size of garden space	Stone	No moving or removable parts due to the nature of the patient's disease state. Patients are prone to eat, disassemble or move things in a hazardous fashion.
HEIRLOOM PLANTS	See plant list Table 6.7	Varies	Memory triggers can result from the plant material. There is no concern for patient safety handling the plants
FOCAL POINT LANDMARK DESTINATION	Varies	Specimen tree Water feature Shade structure	All of these elements included in the garden can stimulate interest and distraction. Access to moving parts, destructibility and injury must be considered when choosing the element. Eliminate blocked views
SEASONAL INTEREST	Varies	Plants	Seasonal and timing cues are essential to these patients. Plants that lose their leaves, change color, alternate bloom times all help orient the patient to their surrounding world.
SENSORY STIMULATION	Varies	Plants Water feature	Texture of foliage, color of blooms and leaves, smells from soils and blooms, sounds of the water or rustling plant material all help orient patients and provide memory cues. Birds and butterflies that are attracted by plants aid provide positive mental distraction as well.

The planting selections offer blooms, fragrance, texture and sound during all four seasons of the year. The recommended Italian cypress adds green vertical relief to the 2 story grey building that surrounds the courtyard and will grow to only 2' in width. The windmill palm is chosen because it adds a touch of whimsy and provides a sense of 'being away'. As patients come from all over the southeast it can also be a familiar plant from home. Plant height will be kept low in the center island to facilitate a clear view of the entire garden for patient control, comfort and security. (See Figure 6.1 to see section elevation for plant height vs. patient height) Plants along the sides of the building can be taller to soften the vertical and horizontal lines and screen problematic windows identified in the inventory and analysis. Heirloom shrubs provide memory recall aids, seasonal cues and time orientation. Evergreen plants and ground covers provide a background for annuals and deciduous plants as well as tactile sensory stimulation. All plants are non-poisonous based on the Cornell University Poisonous plant list. Plants were chosen based on their long standing use in Southeastern gardens giving them the status of 'heirloom'. Also important in determining plant choice was their suitability for sun or shade garden success, non-toxic, non-berry producing status, their seasonal interest and sensory stimulation properties.

TABLE 6.7
Suggested Therapeutic Plants:

Shade areas:

1. Hosta ssp.
2. Ferns: *Dryopteris erythrosora*, Autumn fern; *Polystichum acrostichoides*, Christmas fern; *Athyrium niponicum* 'Pictum', Japanese painted fern.
3. *Vinca minor* 'Alba', Periwinkle
4. *Aruncus dioicus*, Goat's beard
5. *Astilbe japonica* 'Peach Blossom', Astilbe
5. *Ophiopogon japonicus*, Dwarf Mondo

Part Shade areas:

1. *Exochorda x macrantha* 'The Bride', Pearl Bush
2. *Camellia japonica* x 'Buttemint'.
3. *Camellia sasanqua* 'Yuletide'.
4. *Osmanthus fragrans*, Fragrant tea olive
5. *Calycanthus floridus*, Carolina sweet shrub
6. *Hydrangea macrophylla*, Hydrangea 'Penny Mac' or 'Dooley'
7. *Gardenia jasminoides* 'Radicans', dwarf gardenia
8. *Cercis canadensis* var 'Covey', Weeping Red Bud
9. *Corylus avellana* 'Contorta', Contorted filbert
10. *Ophiopogon japonicus*, Dwarf Mondo.
11. *Sisyrichium angustifolium* 'Lucerne', Blue Eyed grass
12. *Sarcococca rustifolia*, Fragrant sweetbox
13. *Itea virginica* 'Little Henry', Virginia sweetspire
14. *Stachys byzantina* 'Silver Carpet', Lambs ear
15. *Phlox subulata* 'Emerald Blue', Creeping Phlox

Sun area:

1. *Trachycarpus fortunei*, Windmill palm
2. *Cupressus sempervirens*, Italian Cypress
3. *Hemerocallis* spp. 'Stella de Oro', Daylilly
4. *Philadelphus* x 'Snowbelle', Snowbell Mock orange
5. *Buddleja davidii* nanhoensis 'Monum', Petite Plum Dwarf Butterfly Bush
6. *Rosmarinus officinalis*, Rosemary
7. *Thymus x citriodorus* 'Archer's Gold', Gold lemon creeping thyme
8. *Clematis terniflora*, Sweet Autumn Clematis
9. *Verbena x canadensis* "Homestead Purple"

As previously mentioned, plants need to be 70% of the garden space with hardscape being only 30% (Hines, 12/05, 112). The objective is to fill the space with appropriate plants for mental distraction and memory triggers while ensuring safety. Our garden should offer interest through blooms, fragrance or texture during every season of the year. Our choice of plants must be based on facilitating these attributes as well as allowing us to be successful in aiding stress relief; positive distraction and memory recall benefits for patients in addition to offering seasonal cues and orientation. Again, safe functioning and sun orientation drove decisions and plant choices. Plants in the center plant beds must not be so tall as to impede patients being able to view the door back into the ward. Hollies which offer evergreen plant attributes and seasonal cues with winter berries could not be used for this very reason – the berries might be eaten by the patients. Aucuba which could be a “light adding” plant to the deep shade areas on the south side of the garden could not be used because of berry production. Iris, Lily of the Valley and Lenten Rose were all on the Cornell Poisonous plant list (<http://www.ansci.cornell.edu/plants/>) and could not be used. As noted earlier, mainstream choices do not always apply. The patient’s abilities and disease limitations must be understood and planned for with selection of plant material as well as its placement.

SEE TABLE 6.8 – Plant Attributes and Choice Justification

**TABLE 6.8
PLANT ATTRIBUTES AND CHOICE JUSTIFICATION**

Plant name	Heirloom	Evergreen	Spring	Summer	Fall	Winter	Fragrance	Color	Texture
Shade Plants									
Hosta sp.	x			x					
Autumn fern		+/-			x				
Christmas Fern		x							
Japanese Painted Fern		x							
Periwinkle	x		x	x					
Goat's Beard	x		x					x	
Astilbe	x		x	x				x	
Dwarf Mondo Grass		x							x
Part Sun/Shape Plants									
Pearl Bush	x		x					x	
Camellia japonica	x	x				x		x	
Camellia sasanqua	x	x			x	x		x	
Tea Olive	x	x	x		x		x		
Sweet Shrub	x		x				x		
Hydrangea	x			x					
Macrophylla									
Gardenia	x	x		x			x		
Weeping Red Bud			x					x	
Contorted Filbert			x	x	x	x			x
Blue Eyed Grass	x			x					
Fragrant Sweetbox	x						x		
Virginia Sweetspire	x						x		
Lambs Ear									x
Creeping Phlox	x	x	x						
Sun Plants									
Windmill Palm		x							
Italian Cypress		x							
Daylilly				x					
Mock Orange	x		x				x		
Butterfly Bush				x			x		
Rosemary	x						x		
Creeping Thyme	x	x					x		
Sweet Autumn Clematis	x						x		
Homestead Verbena	x			x				x	

Summary

The proposed plan provides different elements that satisfy the goals and objectives put forth earlier in this chapter which satisfy the four elements needed for stress reduction by hospitalized Alzheimer's patients. The site was challenging due to the size, shape and activities limiting the space. The size is less than 1500 square feet with no borrowed views to draw on as it is enclosed by a two story building. The shape is a symmetrical pentagon that does not lend itself to many design form choices. The garden is used for a very special patient population with limited abilities mentally and physically. In addition, the horticultural therapy component that is to be highlighted adds an additional element that must be incorporated into the space.

The pentagon shape is not receptive to many design forms. It can appear tight and rigid with formal design elements, straight lines, mirrored elements and symmetrical layouts. A desire for a free form design that exhibits movement in the ground plane elements and planting beds provides better path flow and more plants in the space. The area for a shade structure and patio surface is almost mandated due to the shape, door and window placement.

The small size in which the garden is located requires careful selection of elements in order not to overwhelm the space with any one feature or use elements that are out of scale. Balance with repetition of some material gives unity such as in the benches, plants and paving materials.

Special requirements due to the patient's disease state and the horticultural therapy activities that will occur in the space create additional considerations for the space. Windows noted in the earlier site inventory and analysis (Figure 6.1) need to be

screened to end elopement attempts. A fountain or water feature offering the sound and visual element to aid stress reduction must have no element that can be removed, broken, carried away or eaten. Plants have to be non-poisonous as patients often put things in their mouths while exploring.. No changes could be made to the existing building façade. This required a free standing shade structure and seemed to require something taller than the existing windows on the first floor but not to block windows on the second floor. Therefore, a height of 10 – 12’ was deemed appropriate. It also increased the usable shade area and allowed for a larger patio space. As there is no access to mow turf or do heavy, repeated pruning, plant choices required that these activities not be necessary.

Sun exposure noted in the site inventory and analysis (Figure 6.1) determined where the shade structure and horticultural therapy bed would be placed. It also relegated what plants could be used where.

Patients tend to use one or two patterns of wandering or circulation through the garden. One is to enter the garden from the patient common area by one door and travel at a slight arch to the other door on the opposite wall and exit. The other pattern is to wander in a circular fashion over and over in the contained garden space. (See Figure 6.1) A looping path system is worked into the design form. It accommodates both patterns. The arched pattern is defined by changing the scoring in the brushed, colored concrete used in both paths in order to provide some visual orientation for the patient.

A quick table can determine if we have met our goals and objectives from Table 6.1. **See Table 6.9**

TABLE 6.9
Meeting Goals and Objectives for Stress Restoration
of Alzheimer's Patients at Wesley Woods Hospital

A. Exercise and Movement:

1. Improved paths – addressed new material, slopes, edging,
2. Looping path – determined circulation patterns and provided matching paths
3. Horticultural therapy bed – centralized and improved with rounded corners and varied height
4. Handrails - installation recommended for entire perimeter of all planted beds
5. Destinations within the landscape – shade structure, water feature and horticultural therapy bed all placed within the site

B. Social Support:

1. More seating including benches and chairs with arms and backs – for comfort and various groups of single seating
2. Privacy seating – benches place in different places in garden and moveable chairs available
3. Shaded areas for seating and gathering – increase height and size and recommend large, free standing structure
4. Way finding – recommend signage inside patient area
5. Improved patio space – size increased and additional improved material to be added

C. Attributes of Control:

1. Signage – signs within patient common area recommended
2. More seating – increased with an increase under the shade structure and with benches among the plantings
3. Handrails – recommended around perimeter of all planted areas
4. Improved pathways, grade, material and color – new brushed, colored concrete with appropriate pitch and varied scoring
5. Better access to raised beds – recommend a varied height bed to be accessed by all patient abilities
6. Visual cues – different plants at each door, screen to decrease elopement attempts
7. Automated doors - to allow easy access to garden

D. Positive Distractions:

1. Water feature – proposed near shade structure for passive enjoyment
2. Focal point to draw the patient out into the landscape – horticultural therapy beds, water feature heirloom plants.
3. Memory triggers – water sounds, heirloom plants such as camellia, pearl bush, hydrangea etc.
4. More plantings for memory stimulation – lamb's ear, thyme, rosemary, plants the patient actually plants and harvests in the therapy bed
5. More sensory stimulation planting – increase plant palette, offering dwarf mondo grass as a turf like texture, palm trunk is a different texture, plant have coarse, medium and fine visual texture.

CONCLUSION

This research has revealed that design matters. The knowledge that we gleaned from studies on nature and its impact on man and his healthful survival has been put to use with modern day implementation and is hoped to bring positive medical outcomes to Alzheimer's patients. We have seen that a space with plants is not sufficient criteria to call the space a healing or therapeutic garden. The patient's disease state, provider goals, access and the ability to give some of the lost personal attributes back to the patient must be the driving force for the garden concept. Inclusion of all patient abilities is a key factor to a successful garden regardless of the disease state being addressed by the designer. Multi-discipline approaches are best as they tend to yield the highest cross contact and information for the designer as well as creating an atmosphere of positive acceptance of the garden. Working with the patients in the garden is likely to be supervised by many healthcare workers and a positive reception to its creation by all who would be involved in its use will ensure its continued utilization and appreciation. Additionally, many difficulties that exist for the patient or healthcare professional may not be evident to the designer and therefore may go unaddressed. A successful therapeutic garden is a combination of professionals, disciplines and desires all working toward the same goal of patient health and well being.

EPILOGUE

This thesis has revealed that nature and design matter. Incidental observations, noted at the outset, of improved health for all people after nature exposure has been proven to offer benefits to those who are hospitalized also. We have shown that some nature access is good but nature that provides stress reduction coping mechanisms can be designed and is superior in the quality of benefits it provides. The knowledge that we gleaned from studies on nature and its impact on stress reduction and coping, leading to man's healthful survival and improved quality of life have been put to use with modern day implementation and is hoped to bring positive medical outcomes to Alzheimer's patients.

The future implications of the built garden can offer increased knowledge for designers, medical care givers and hospitals. We can determine our success for this Alzheimer's patient group by working with current care givers at Wesley Woods to document whether our garden offers improved access to the garden by noting if the number of patients in the garden increases. We would like to note whether activities in the garden increase. Is there an increase in the numbers of patients passively or actively using the garden? Do they participate only in programmed activities (horticultural therapy) or does the participation in individual, non-programmed activities increase? Do other therapies (pet, music, art) find the garden more useful? This data collection will assist in future efforts to design hospital based, disease specific spaces as well as adding to the body of scientific evidence supporting garden design.

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