

**Healing Gardens in Healthcare Facilities:  
Linking Restorative Value and Design Features**

Debra Barnes

Bachelor of Landscape Architecture, University of British Columbia, 1999

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF  
THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF ADVANCED STUDIES IN ARCHITECTURE

in

THE FACULTY OF GRADUATE STUDIES

We accept this thesis as conforming  
to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

May 2004

© Debra Barnes, 2004

## Library Authorization

In presenting this thesis in partial fulfillment of the requirements for an advanced degree at the University of British Columbia, I agree that the Library shall make it freely available for reference and study. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by the head of my department or by his or her representatives. It is understood that copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Debra Barnes

Name of Author (*please print*)

11 May, 2004

Date (dd/mm/yyyy)

Title of Thesis: Healing Gardens in Healthcare Facilities: Linking Restorative Value and Design Features

Degree: Master of Advanced Studies in Architecture Year: 2004

Department of Architecture

The University of British Columbia  
Vancouver, BC Canada

## ABSTRACT

For most of the previous century, the program and design of healthcare facilities supported the dominant cure-based medical model of illness treatment. In the closing decades of the twentieth century increasing interest in a holistic approach to patient care that acknowledges a connection between mind, body and spirit supported the inclusion of healing gardens in healthcare facilities.

Empirical evidence suggests that patient support requires the provision of access to nature and outdoor spaces. If space in healthcare facilities is to be programmed for outdoor use, what design features of this setting cares for patients, both psychologically and emotionally while supporting their physiological needs? Further, does the therapeutic benefit and significance of discrete garden features vary depending on the illness and healing processes of a particular patient population?

This thesis begins to answer the above-noted questions by reviewing the literature on the historical approach to patient care based both on documented anecdotal information and as evidenced by the design of healthcare facilities and their adjacent outdoor spaces. Current multi-disciplinary research and empirical evidence supporting the link between nature and restorative benefit is also presented. Finally, the healing gardens supporting three special patient populations (Alzheimer's, AIDS, and Pediatrics) are reviewed, endeavoring to link specific design features to restorative value.

The result of this investigation is a matrix synthesizing the relative benefit of discrete garden design features to specific patient populations. The matrix lists over fifty design features of a healing garden and groups each feature into one of three categories: experiential, functional, and contextual. In terms of restorative benefit, generally, the matrix rates experiential design features as essential for all patient population types and identifies contextual features as highly desirable. Variation in the importance of the functional design features of a healing garden begins to emerge when considering the particular needs of special patient populations.

This study may be used to guide a design process for the provision of healing gardens in a healthcare facility that recognizes both the therapeutically beneficial experiential design features and significant contextual features of a healing garden, while acknowledging that the functional characteristics of the garden will be informed by the needs of particular user groups and special patient populations.



## TABLE of CONTENTS

<b>Abstract</b>	ii
<b>Table of Contents</b>	iv
<b>List of Tables and Matrixes</b>	vi
<b>List of Figures</b>	vii
<b>Acknowledgements</b>	viii
<b>Preface</b>	ix
<b>Chapter 1 History of Patient Care and Healthcare Facility Design</b>	<b>1</b>
1.1 The Medieval and Monastery Hospice Garden of the Twelfth Century	2
1.2 Healthcare Facility Design of the Fourteenth to Seventeenth Century	5
1.3 The Romantic Movement's Influence on the Healthcare Environment	6
1.4 Nineteenth Century Pavilion Hospitals	8
1.5 Twentieth Century Healthcare Trends	10
<b>Chapter 2 Current Research: The Restorative Value of Nature</b>	<b>16</b>
2.1 Psychological Perspectives on Nearby Nature	17
2.2 Nature's Effect on the Rate of Recovery	23
2.3 The Restorative Benefits of Horticulture Therapy	26
2.4 Biophilia Hypothesis	29
2.5 People-Plant Relationships	30
2.6 Conclusion: Review of Science-Based Evidence	31
<b>Chapter 3 Guiding Principles and Design Feature</b>	<b>33</b>
3.1 All Patient Populations (Clare Cooper Marcus, Marni Barnes, Cheryl E. Ware)	35
3.2 Patients with Dementia and Alzheimer's Disease (Elizabeth C. Brawley)	39
3.3 Pediatric Patients (Robin C. Moore)	42
<b>Chapter 4 Healing Gardens for Special Patient Populations</b>	<b>47</b>
4.1 Leichtag Family Healing Garden, San Diego, California (Children)	47
4.2 Joel Schnaper Memorial Garden, Manhattan New York (AIDS Patients)	54

<b>Chapter 5</b>	<b>Healing Garden Design Features, Restorative Value, and Patient Populations</b>	<b>61</b>
5.1	Healing Garden Matrix	62
5.2	Synthesis	63
5.3	Conclusion	72
<b>Bibliography</b>		<b>78</b>
<b>Figure Credits</b>		<b>85</b>
<b>Appendix I</b>	<b>Toxic Plant List. Canadian Standards Association. Children's Playspaces and Equipment.</b>	<b>87</b>

## **LIST of TABLES and MATRIXES**

Table 1 – Leichtag Family Healing Garden Evaluation. Features of Garden Most Enjoyed by Garden Users	52
Table 2 – Matrix of Restorative Value of Design Features versus Healthcare Facility Population	62

## LIST of FIGURES

Figure 1.1 – Medieval Cloister Garden	4
Figure 1.2 – Walled Medieval Restorative Garden	5
Figure 1.3 – Example of a pavilion-style hospital - Heather Pavilion at Vancouver General Hospital 1905	9
Figure 2.1 – View through a Window to Nature	24
Figure 2.2 – Horticulture Therapy	27
Figure 2.3 – Garden in Healthcare Facility	33
Figure 3.1 – Healthcare facility staff take a break in the garden	37
Figure 3.2 – Wayfinding features at the Joel Schnaper Memorial Garden, New York, New York, United States	42
Figure 3.3 – The garden is a place where family and friends can visit loved ones	46
Figure 4.1 – Plan of Leichtag Family Garden	48
Figure 4.2 – Play element for children at Leichtag Family Healing Garden	50
Figure 4.3 – Leichtag Family Healing Garden Brontosaurus Sculpture	50
Figure 4.4 – Sea-horse fountain at Leichtag Family Garden	51
Figure 4.5 – Plan of Joel Schnaper Memorial Garden	55
Figure 4.6 – Universal design guidelines	56
Figure 4.7 – Sound of water provides sensory stimulation and wayfinding clues	57
Figure 4.8 – Planter height suitable for tending by patients	58
Figure 4.9 – Overhead trellis provides shade on rooftop in Joel Schnaper Memorial Garden	58
Figure 4.10 – Bright flowers, wayfinding elements and visual connection from the patients' rooms to the garden at the Joel Schnaper Memorial Garden	60
Figure 5.1 – Example of dining room with views to nature at St. Michael Rehabilitation Hospital, Texarkana, Arkansas, United States	70
Figure 5.2 – Views from Heather Pavilion Vancouver General Hospital 1905	73
Figure 5.3 – Heather Pavilion Vancouver General Hospital 1928	74
Figure 5.4 – Aerial Photo of Heather Pavilion Vancouver General Hospital 2002	75

## ACKNOWLEDGEMENTS

I am extremely thankful for the insights and contributions that a variety of people have made to this thesis.

In particular, I am indebted to my academic advisors Dr. Sherry McKay and Alan Duncan for their very much appreciated insight and guidance. Also, I am forever grateful to Kay MacIntosh for her encouragement to pursue both undergraduate and graduate studies at UBC as well as her on-going interest in my progress. I am grateful, as well, for the patience and support Robert Leupen and my supervisors, colleagues and friends at the Vancouver Board of Parks and Recreation extended me, particularly during the final stages of this process. Christina Sestan helped make the road to completion a pleasant and memorable one and the staff in the School of Architecture, Theresa Juba and Trish Poehnell simplified the academic administrative process -- for this I am very thankful.

Finally, I would like to thank my daughter Kristy for her inspiration, assistance and understanding.

## PREFACE

Healthcare facilities can be one of the more stressful environments we enter. Ironically, stress is often considered a major causative factor in today's more prevalent diseases and illnesses (heart disease, diabetes, cancer) and can inhibit the rate and extent of recovery. Apart from the inherent emotional stresses associated with illness and emergency care, healthcare environments often include unfamiliar technology and apparatus, unusual and unpleasant smells, artificial light, visual disconnection with the outside world, and lack of privacy and personal control. There is often a paradox between the function of a healthcare facility and the design response of its interior and exterior environment. This thesis will mainly focus on the exterior of the healthcare facility environment and the potential of that environment to assist in the function of health care.

There appears to be an intuitive understanding and considerable anecdotal information suggesting that access to nature and gardens can provide a degree of relief from the symptoms and stresses associated with illness. Research supports what has perhaps been known for centuries, that calming the mind supports healing the body (Kaplan and Kaplan, *Restorative Experience*). David Singleton (lecturer in architecture and landscape design at the Welsh School of Design), however, considers empirical evidence in this area lacking. "There is a clear need to further the guidance to more accurately define the qualities and particularities of the external hospital environment that are most valued and are perceived as beneficial by patients and staff" (Radley 21). This investigation attempts to extrapolate a set of restoratively beneficial design features for special patient populations emerging from the literature on healing gardens and restorative landscapes in the healthcare facility environment.

In western civilizations, belief in the healing power of nature was reflected in the design of healthcare facilities dating back as far as the medieval monasteries with their cloister

gardens filled with therapeutic herbs and sunlight.<sup>1</sup> At the turn of the previous century, however, a new medical model emerged which revered science and technology and rejected natural remedies. The clinical and often sterile high-rise hospital design of the twentieth century reflected this abrupt change in medical procedures and approach to patient care.

In the past two decades, however, western medicine has slowly begun to rediscover that overall health and well-being are dependent on the strength of the mental, emotional, physical and spiritual aspects of human health. This shift in thinking has coincided with the inclusion of design features in healthcare facilities such as views to nature, natural lighting, homey interiors, access to pets and healing gardens.

In considering a number of academic perspectives regarding the role of nature in healthcare environments, a distinction between the terms healing and curing was repeatedly articulated. Enhancing the patient's physical and emotional sense of well being was described as healing, while curing referred to a focus on treating the symptoms of an illness or disorder. This distinction consistently appears to be the point of departure for discussions on the perceived therapeutic benefits of gardens and nature in general.

Modern scientific medical treatments are intended to cure illness while a holistic approach to healing acknowledges and responds to the connection between mind and body. In response to this holistic approach to healing, the programs of healthcare facilities committed to providing a healing environment often include gardens and views of nature.<sup>2</sup>

---

<sup>1</sup>During the medieval period, many monasteries in Western Europe provided physical and spiritual comfort to pilgrims, the homeless, the sick and dying. These hospices included an enclosed courtyard garden that was divided into four squares radiating from the central well or fountain. Patients' rooms looked out into the garden that provided the viewer with a contrived perspective onto nature.

<sup>2</sup> In a 2001 survey of hospital garden users at Children's Hospital and Health Center in San Diego, USA, Sandra Whitehouse, et al reported that ninety percent of the respondents were of the opinion that it is important for hospitals to include healing gardens.

The purpose of this investigation is to explore the relationship between the design of outdoor environments in healthcare facilities and health benefits. I will demonstrate that consideration of the healing process has historically informed the design of outdoor environments in healthcare facilities and will identify design features perceived as beneficial to the healing process. A matrix of design features will be synthesized from the material reviewed.

The first chapter of this paper consists of a historical survey (from medieval times to present day) briefly outlining trends in western healthcare epistemology and the provision of outdoor environments in healthcare facilities. This chapter focuses on healthcare facilities with landscapes and gardens perceived as promoting a sense of well-being, reduced stress and beneficial health outcomes. The historical overview highlights the relationship between the approach to patient care and the approach to site and garden design in healthcare facilities throughout Europe and North America. Distinctions between the treatment and care needs of various patient populations (depending on the particular disease process or illness) and the respective design implications begin to emerge from the historical overview.

Chapter Two reviews current science-based research-providing evidence of a connection between contact with (and views of) nature to improved health outcomes for hospitalized patients. An explanation for these positive health outcomes will be explored by drawing on theories interpreting the relationship between nature and human responses as developed over the past three decades by a number of recognized researchers from a variety of disciplines. The literature review will include research in the areas of environmental psychology, environmental preference theories, therapeutic landscapes, people-plant relations, healthcare management, universal design, design for social interaction, behavioural science, horticulture, landscape architecture and biology.

Chapters Three and Four presents and reviews prescriptions for healing garden design as articulated by a number of prominent design professionals involved in the design and evaluation of healing gardens in healthcare facilities. This phase of my enquiry reviews



and analyzes documented environmental design responses and features that attempt to address the distinct and particular needs of various patient populations in an outdoor setting. The specific design requirements of several healthcare facility and patient populations types are considered.

The final chapter summarizes the outdoor environmental design features identified as beneficial to human health and well-being and perceived as therapeutic in the healthcare environment. This investigation concludes with a matrix developed to illustrate the relationship between garden design and the healing requirements of a number of different patient types. The matrix identifies and summarizes environmental design features of outdoor spaces and gardens in healthcare facilities, ranking each feature in terms of its relative benefit to a particular patient population. Emerging from this investigation is a design sensibility informed by the healing process for developing outdoor spaces that promote and enhance healing, positive human interaction and an increased sense of well-being.

## **Healing Gardens in Healthcare Facilities: Linking Restorative Value and Design Features**

---

### **CHAPTER 1 - History of Patient Care And Healthcare Facility Design**

Gardens today are most commonly considered picturesque places, specifically designed to please the visual sense. Various cultures throughout history have, however, created gardens to engage and satisfy all the senses. Many of these gardens were layered with spiritual symbolism, religious significance or mysticism -- depending on the social, historical and geographical context. Gardens have also traditionally been created for pragmatic outcomes including sustenance, medicine and climatic mitigation. One common theme that appears to transcend time and culture, however, is that gardens are created to enhance human well-being. This chapter focuses on the tradition of Western European and North American healthcare facility garden design.

While recreating a pleasing glimpse of nature's beauty is often the basis of garden design, societies throughout history have intuitively recognized the value of gardens as places of healing and repose. This observation has been supported by research demonstrating that gardens and gardening are therapeutic and beneficial for hospital patients and institutionalized residents.<sup>1</sup>

Dr. Sam Bass Warner Jr., urban historian at Brandeis University, Waltham, MA, United States, contends, that the historical periods in which society has viewed nature as essential for human well-being coincide with the appearance of patient gardens in healthcare facilities. In contrast, those periods in history in which art, science and technology were revered by society were the periods in which innovative use of gardens and garden therapy as a clinical aid disappeared from healthcare facilities.

---

<sup>1</sup> Roger Ulrich (a professor in the Departments of Landscape Architecture and Architecture and Director of Health Systems and Design in the Colleges of Architecture and Medicine at Texas A&M University) demonstrated, in his 1984 research, that patients with a view of nature had a faster rate of recovery, needed less medication for pain and were ready to be discharged from the hospital sooner than patients in rooms that looked out on a brick wall (Ulrich, *View Through Window* 420-421).

Historically, the provision of gardens in healthcare facilities has been related to the medical focus of the facility. For example, when the rôle of a facility was to cure or treat the symptoms of an illness or disorder, gardens were usually absent. When healing or convalescing was considered the primary function of the healthcare environment, gardens and views of nature were often incorporated to enhance the healing process (Warner 5-12).

This chapter will provide a historical overview of gardens included in healthcare facilities, dating from medieval times to the present day, to illustrate the link between design features and benefits to patient care. While much of the history (with respect to patient response to gardens) is based on observation and anecdotal information documented in the literature, the next chapter will review current empirical research on the relationship between natural environments and medical outcomes.

### **1.1 The Medieval and Monastery Hospice Garden of the Twelfth Century**

The restorative quality of gardens for the treatment of the ill has its intermittent historical beginnings in the twelfth century. Restorative gardens first appeared in medieval monastery hospices. Many monasteries in Western Europe provided physical and spiritual comfort to pilgrims, the homeless, the sick and the dying. Typically, patients' cells looked out onto a courtyard garden. It was recognized that the healing process benefited from sunlight and a place to sit or stroll amongst seasonal plantings. St. Bernard (1090-1153) wrote the following description of the sensual qualities of the restorative courtyard garden at his monastery's hospice in Clairvaux, France:

Within this enclosure, many and various trees, prolific with every sort of fruit, make a veritable grove, which lying next to the cells of those who are ill, lightens with no little solace the infirmities of the brethren, while it offers to those who are strolling about a spacious walk, and to those overcome with the heat, a sweet place for repose. The sick man sits upon the green lawn, and while inclement Sirius burns the earth and dries the rivers, he is secure, hidden and shaded from the heat of the day, the leaves of a tree tempering the heat of that fiery star; for the comfort of his pain, all kinds of grass are fragrant in his nostrils. The lovely green of herb and tree nourishes his eyes and, their immense delights hanging and growing before him, well might he say, "I sat down in his shadow with great delight, and his fruit was sweet to my taste" [Song of Songs 2:3]. The choir of

painted birds caresses his ears with sweet modulation, and for the care of a single illness the divine tenderness provides many consolations, while the air smiles with bright serenity, the earth breathes with fruitfulness, and the invalid himself with eyes, ears, and nostrils, drinks in the delights of colours, songs, and perfumes.

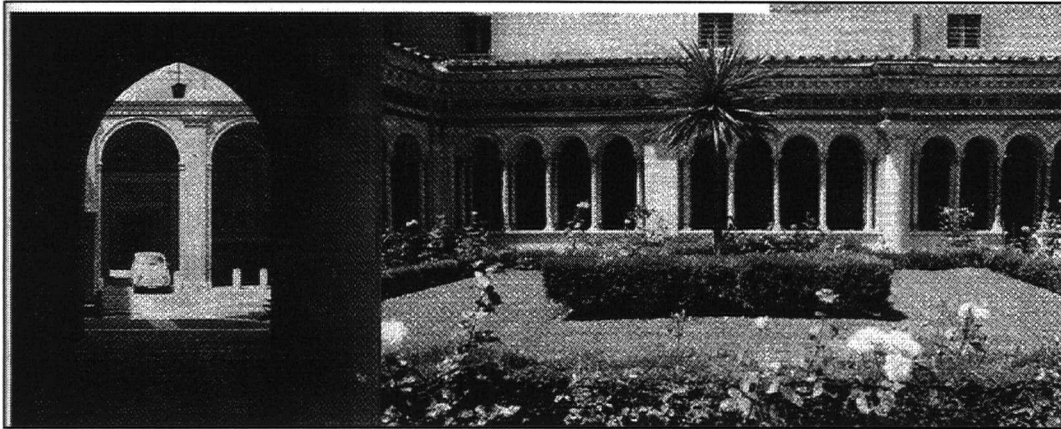
(Spriggs 9)

This understanding of the mesmerizing effect of the garden's sensorial dialogue -- intended to provide patients with a spiritual sense of peace and hope -- was reflected in the design of the monastery courtyard gardens of this time.

The monastery's center cloister, traditionally the most significant open space, consisted of a symbolic spiritual garden suffused with mystique. The church typically formed the cloister's north wall while the facades of the kitchen, living quarters, and dining hall completed the perimeter. A Romanesque peristyle arcade typically provided a sheltered passage between the rooms. Reflecting the bible's description of Eden, the garden was divided into four squares radiating from a central well or fountain.<sup>2</sup> The enclosed garden emphasized control and order, providing the viewer with an ideal perspective of nature. Plant cycles and sky patterns marked the passing of time and the changing of seasons. The harmony and tranquility of the garden was a deliberate design attempt to evoke a reflective mood, believed to calm and comfort the patient (see figure 1.1).

---

<sup>2</sup> Genesis 2:8-10. "Now the Lord God had planted a garden in the east, in Eden; and there he put the man he had formed. And the Lord God made all kinds of trees grow out of the ground -- trees that were pleasing to the eye and good for food. In the middle of the garden were the tree of life and the tree of the knowledge of good and evil. A river watering the garden flowed from Eden; from there it was separated into four headwaters." (Scripture taken from the Holy Bible, New International Version, International Bible Society, 1984. Used by permission of Zondervan Bible Publishers.)



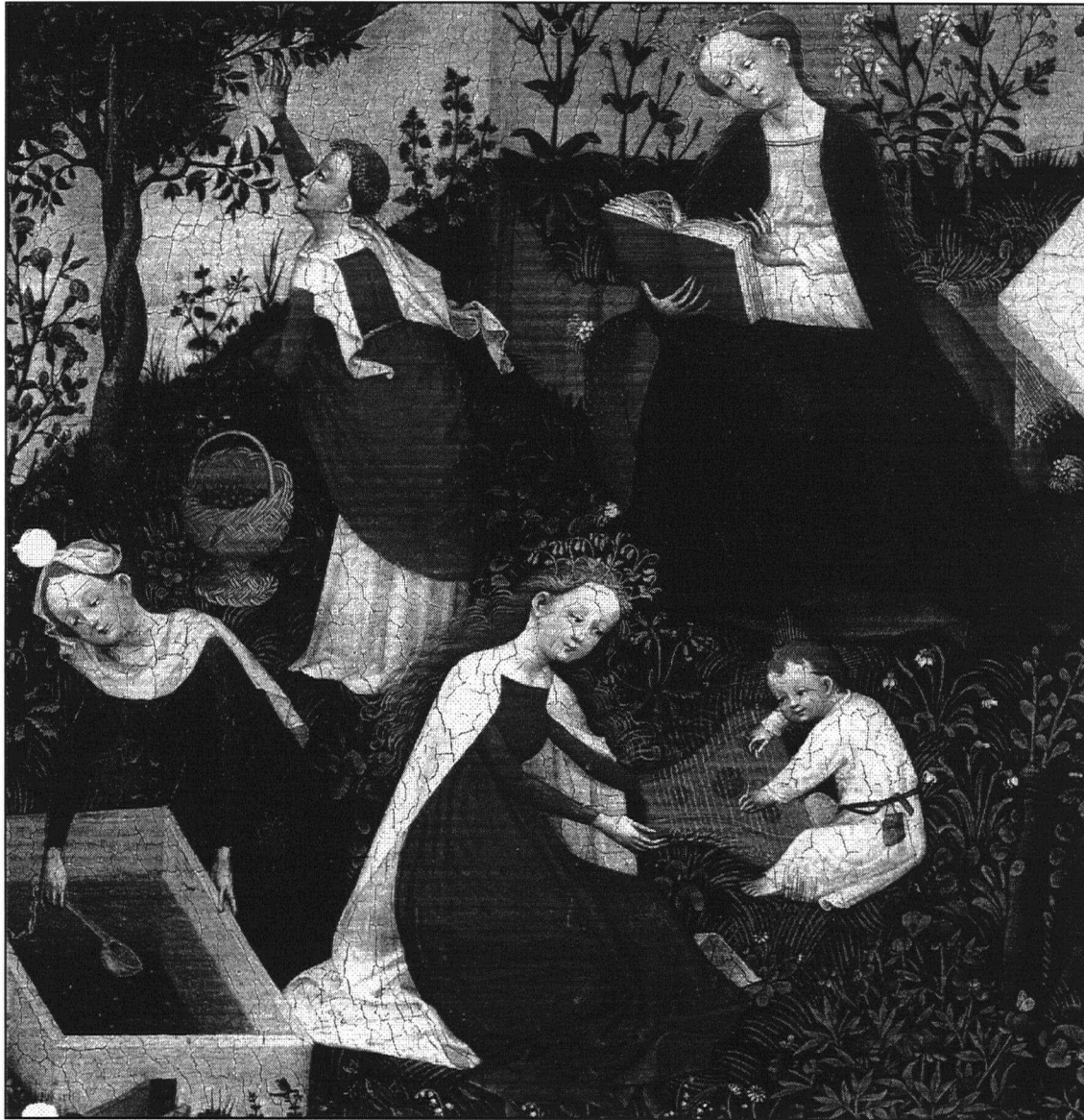
**Figure 1.1 Medieval Cloister Garden**

Medieval society's appreciation of the garden was not confined to its ability to restore the spirit of the ill. Walled pleasure gardens were an important aspect of the well-to-do and bourgeois lifestyle (see figure 1.2).

Reading or simply pausing to meditate upon an illuminated page, playing musical instruments or board games, and dancing in the privacy of one's enclosed garden were common pastimes of a wealthy merchant wife or noble lady. Pleasure gardens often contained fountains, manicured lawns, orchards, and flowerbeds. In spring and summer, these paradise gardens provided sweet smells, shade, and birdsong, a place for playing the psalter, harp or small organ, for reading for playing chess or backgammon, or simply for resting.

(Driver 9)

These pleasure gardens were valued as sources of enjoyment, contemplation and social exchange. The enchantment and inspiration gardens provided were recognized throughout medieval society; the enclosed restorative garden was a setting for pleasure and healing.



**Figure 1.2 Walled Medieval Restorative Garden**

## **1.2 Healthcare Facility Design of the Fourteenth to Seventeenth Century**

During the Renaissance and Reformation healthcare facility design ignored the benefits of the restorative garden, providing little more than a room and a bed for patients. The onset of the bubonic plague in 1347 (along with crop failures) brought instability and fear to many small European towns and droves of migrants sought shelter and public care in the large urban centers.

The national welfare and health administrations of the fourteenth and fifteenth centuries were unable to cope effectively with the erupting demands brought about by panic and crisis; the currently familiar mix of public and private, secular and religious healthcare facilities emerged. American landscape architect Karen Kettlety notes that hospitals of this period “functioned as scientific laboratories where physicians could conduct their observations” (6). Between the fourteenth and seventeenth centuries, European society seemed to have lost sight of the benefits of nature in recovery as medicine focused on finding cures rather than healing.

One notable exception to this trend appeared in 1409 at a mental hospital in Zaragoza, Spain. Regular work along with garden therapy was initiated as part of the patients’ therapy regime. Patient treatment consisted of caring for the hospital’s farm of vineyards, gardens and orchards. This progressive move replaced the beatings and whippings mental patients had previously received as standard, however less effective, treatment for their mental illness. By the late eighteenth century, the long-term success of this innovative approach to patient care became highly regarded in Europe, influencing the work of French doctor and hospital designer, Philip Pinel, and English merchant and philanthropist, William Tuke (Warner 5-12).

### **1.3 The Romantic Movement’s Influence on the Healthcare Environment**

The concept of nature and gardens as places for bodily and spiritual restoration was reborn with the Romantic Movement in the eighteenth century (Warner 5-12). The revival of pastoralism encouraged the therapeutic connection between medical science inside the healthcare facility and the garden outside.

In the period just prior to this era, interaction between patients and the outdoor environment was usually limited to sitting in the sun and fresh air. “The Romantic Era’s attitudes toward nature once again endowed garden spaces with emotional and religious powers of high intensity” (Warner 8). During the romantic era, it appears that commonly held beliefs in the restorative value of nature may have influenced healthcare facility design, as evidenced by the reappearance of gardens and outdoor spaces in veterans hospitals.

Healthcare facilities built in Europe during the seventeenth and eighteenth century to care for sick and injured sailors and veterans often included large centrally located open spaces, suggesting that gardens may have been viewed as an intrinsic component of the healing environment. Louis XIV is credited with building veterans' hospitals, such as Paris' Les Invalides, that included an outdoor open space within the compound for patients to enjoy sunlight, fresh air and regular exercise. Les Invalides (completed in 1676) could accommodate up to four thousand patients and set a precedent in terms of building design, ensuring that the patients' rooms had a pleasant view overlooking one of the fifteen garden courtyards. It appears that the architect of Les Invalides, Liberal Bruant, intuitively considered views of nature as beneficial in the healthcare environment and anticipated that the patients' sense of well-being would be enhanced in a pleasant environment. This approach to patient care and the design of the physical form of the healthcare environment was reminiscent of the medieval period's courtyard monastery hospice.

Prior to the period of Enlightenment, hospitals were often overcrowded, dark and unsanitary with very little ventilation. These unfavorable conditions led to the acknowledgement of the importance of preludes to healing: views of nature, fresh air and sunlight. Society in general became less interested in contemplating the fate of the soul and more interested in the human condition.

(Kettlety 6)

New and innovative patient treatment programs (adopted during the seventeenth and eighteenth centuries) also influenced hospital design. French doctor, Philippe Pinel (1745-1826), and the Quaker, William Tuke (1732-1821) of England, independently lobbied their respective governments for the humane treatment of the mentally ill, promoting psychological nurturing rather than physical punishment (commonly practiced at the time). This new approach was termed the *moral treatment* and it quickly gained popularity in Europe and North America. Both Pinel and Tuke believed that patients could be socialized in a restful physical environment conducive to favorable behaviour, thereby excluding the need for physical punishment. Occupants were considered patients rather than inmates. Regular routine activities, resembling those of the outside world, were prescribed for patients according to their symptoms. This highly successful recovery regime encouraged gardening and participation in farming activities



so patients could benefit from working outdoors in the fresh air.<sup>3</sup> New facilities were designed and built to accommodate *moral treatment*; site planning reflected the value of landscapes in the treatment of the mentally ill, often incorporating intimate courtyards, long vistas, vast natural landscapes and ornamental gardens. These thoughtfully designed institutions provided the environmental, recreational and occupational requirements of this style of psychiatric care. The landscape setting was central to the *moral treatment* and thus patient care.

#### 1.4 Nineteenth Century Pavilion Hospitals

An awareness of the positive effects of sunlight, views of nature and fresh air in encouraging both psychological as well as physical well-being was expressed in the architectural style of the pavilion hospital, adopted throughout Europe in the nineteenth century. In 1853, Florence Nightingale<sup>4</sup> expounded the healing quality of nature intrinsic to the design of pavilion hospitals:

Second only to fresh air...I should be inclined to rank light in importance for the sick. Direct sunlight, not only daylight is necessary for 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 colours of flowers...it is generally said the effect is upon the mind. Perhaps so, but it is not less so upon the body on that account...while we can generate warmth, we cannot generate daylight.

(Warner 7).

Pavilion hospitals of the nineteenth century were modeled after such examples as the Chelsea Royal Hospital (1692) in London and the Stonehouse Royal Naval Hospital (1765) near Plymouth (see figure 1.3). Chelsea and Stonehouse were designed with large windows to allow plenty of light and air to circulate between the well-spaced narrow wards. The open space

---

<sup>3</sup> In North America, the Worcester State Hospital of Massachusetts's administration conducted a follow-up study of their psychiatric patients discharged between 1833 and 1853. This study revealed a remarkable forty-five percent of the patients who had received the *moral treatment* continued to conduct successful lives avoiding further hospitalization, suicide, and welfare, thus providing impressive evidence that the *moral treatment* in the natural environment provided patients with the positive therapy they needed (Warner 10).

<sup>4</sup> Considered the pioneer of modern nursing, British born Florence Nightingale (1820-1910) is particularly recognized for her contribution during the Crimean War where, through improvements to patient care in the military field hospital she managed, the mortality of the wounded was reduced by forty percent to two percent. Nightingale was awarded the Royal Red Cross medal in 1883 and the Order of Merit in 1907. Nightingale invented a diagram known as coxcomb, which she used to record statistical information on patient medical outcomes. <<http://www.free-definition.com/Florence-Nightingale.html>>

between the two- and three-story pavilions provided an opportunity for garden viewing and tending by patients at facilities that included a horticultural therapy regime. The French Royal Commission adopted surgeon Jacques Tenon's similar hospital design guidelines for pavilion wards, thus standardizing good hospital design in the nineteenth century.<sup>5</sup> Tenon and his colleagues refused to consider a hospital simply as a place of charity, and wanted to make it, above all, a place of healing (Tenon 5).



**Figure 1.3 Example of pavilion-style hospital - Heather Pavilion at Vancouver General Hospital 1905**

During the same period in Germany, horticultural theorist, Christian Cay Lorenz Hirschfield, wrote of hospital site and garden design commonly exemplified by the nineteenth century hospital:

A hospital should lie open, not encased by high walls. The garden should be directly connected to the hospital, or even more so, surround it. Because a view from the window into blooming and happy scenes will invigorate the patient, also

---

<sup>5</sup>Jacques Tenon (1724-1816) was commissioned in 1785 during the reign of Louis XVI, to make recommendations for the upgrade of Parisian hospitals. Tenon visited several British hospitals and compiled a detailed account of his observations which he then used as a basis for his hospital design recommendations.

a nearby garden encourages patients to take a walk...The plantings, therefore, should wind along dry paths which offer benches and a chair...A hospital garden should have everything to enjoy nature and to promote a healthy life. It should help forget weakness and worries, and encourage a positive outlook...The spaces between could have beautiful lawns and colourful flower beds...Noisy brooks could run through flowery fields, and happy waterfalls could reach your ear through shadowy bushes. Many plants with strengthening aromas could be grouped together. Many singing birds will be attracted by the shade, peace, and freedom. And their songs will rejoice many weak hearts.

(Marcus and Barnes, *Healing Gardens* 12)

Hirschfield's prescription for hospital site design could well describe the grounds of Riverview Hospital in Coquitlam, British Columbia. Typical of pavilion hospital siting of this period, the views from the patients' rooms at Riverview look out onto a courtyard and beyond to the expansive picturesque grounds and surrounding rural landscape. Over the past one hundred years, as part of their therapy program, the resident patients at this mental health facility voluntarily contributed their labour and time to establish and maintain the gardens of this two hundred and fifty acre hillside site as well as the adjacent four hundred acre riverside site known as Colony Farms.

Mental health facilities established at the turn of the previous century, commonly employed occupational and horticultural therapy in the treatment of their patients, while acute care patients enjoyed gardens strictly for fresh air, exposure to sunlight and as a pleasant environment for convalescent exercise. The extent to which therapy was provided depended largely on the patient's medical condition.

With the advent of medical scientific advancement and high-rise construction, the pavilion-style general hospital came under threat. Efficiency experts attested to the financial benefits of the, now familiar, twentieth century typical high-rise hospital. Aseptic, sterile interiors and impersonal environments replaced gardens at the expense of patients' psychological well-being. Curing and clinical therapy were assumed to be adequately provided solely within the walls of the hospital through "scientific" means.

## **1.5 Twentieth Century Healthcare Trends**

A significant shift in healthcare occurred in the early twentieth century. Dramatic advancements in medical research meant that healthcare facilities could offer cures where only care was previously available. The focus of healthcare changed from caring to curing and this was reflected in hospital design with the advent of the high-rise acute care hospital in North America and Western Europe. This standard acute care hospital design appeared to be adopted by all healthcare facilities regardless of their patient population. The design intent for twentieth century healthcare facilities seemed to shift from enhancing the well-being of the patient to enhancing the efficiency of medical staff. Design emphasis was placed on reducing distances between wards and thus increasing efficiency through a reduction in the amount of time staff spent traveling between wards (Warner 5-12).

The turn of the twentieth century witnessed the beginning of laboratory medicine. Intervention therapy (which could be scientifically tested) began to replace a care regime (based on anecdotal information) that promoted healing by providing patients with views of nature, fresh air and sunlight (Kettlety 11). Kettlety asserts that the “twentieth century acute care hospital represents the high-technology, depersonalized, scientific philosophy that is the core of medical care today” (12). The loss of gardens and garden therapy from healthcare facilities coincided with a shift in the approach of healthcare provision from healing individuals to curing their diseases.

However, at the beginning of the century, after World War I, gardens began to reappear as a recognized recovery-promoting element in healthcare facility design. Psychiatric healthcare facilities led the way in providing gardens and access to gardening activities as a means of promoting health. Veterans’ hospitals were also built with large expanses of lawn and gardens and ensured a strong visual and physical connection between the inside and outside of the facility. At this time, as well, garden club volunteers began assisting with occupational therapy, providing patients with horticultural education and experience (Warner 5-12).

In 1943, Indiana psychiatrist Dr. William Menninger developed a practice known as milieu therapy. Milieu therapy recognized that a patient’s well being was affected by the healthcare

facility environment and experience, including exposure to non-medical healthcare facility staff and fellow patients. Menninger, a believer in the restorative effects of gardens and nature walks, was keenly interested in his staff's observations of the link between nature and patient recovery. Interpretation of individual patient's progress, by therapeutic staff, proved to be a significant contribution for determining appropriate therapy. Many veteran and mental hospitals throughout the United States quickly adopted milieu therapy. Recognition of the vital role therapeutic caregivers provided, led to the independent profession of the horticulture branch of occupational therapy, now known as horticulture therapy. As a result, much research has subsequently been undertaken in an effort to explore people-plant relationships (Warner 12).

Tuberculosis, a prevalent disease with no known cure in the first part of the twentieth century, is an example of patient care where survival is deemed remote. Good nursing practice in tuberculosis sanitariums included wheeling hospital beds outside onto sun porches and roof decks to expose patients regularly to fresh air and sunlight. American landscape architect, Deborah Ryan, concludes that without a cure for tuberculosis and the prevalent belief that fresh air was the only deterrent to its spread, mountain wilderness areas with forests of pine became revered by American society (Ryan 5-8). These particular biomes were thought to be healthy environments, and as a result, tuberculosis sanatoriums were often sited in pine forests as this landscape setting was considered key to patient well-being and an improved chance for recovery.

Further evidence of increasing awareness of the benefits of nature in maintaining wellness was also apparent in American society's attitude toward child health programs such as summer camps and nature studies, which were promoted for city children during this period. The New Deal of the 1930s furthered American society's commitment to the improvement of cities and acquisition of national parks. The prominent American landscape architect of this period and designer of New York's Central Park, Fredrick Law Olmstead, promoted the preservation of open green spaces in urban areas to ensure human well-being: cultural, physical and social. Olmstead was commissioned by several of the large American cities including Boston, Chicago and Buffalo to identify and design parks for the benefit and enjoyment of their citizens. This period in history illustrates Warner's contention (as did the medieval and romantic era) that when

society as a whole values nature, value is given to the benefits of the restorative garden and nature in the healing process (Warner 5-12).

The last decade of the twentieth century witnessed the beginnings of a resurgent international interest in restorative or healing gardens in healthcare facilities. A number of contemporary academic perspectives articulating the role of nature in healthcare environments distinguish between the terms healing and curing. Enhancing a patient's physical and emotional sense of well-being was typically described as healing, while curing usually referred to a focus on treating the symptoms of an illness or disorder. This distinction consistently appears to be the point of departure for discussions on the perceived therapeutic benefits of gardens and nature. Scientific medical treatment is focused on curing the illness while healing is a holistic approach to illness and disorders that acknowledges and responds to the connection between mind and body. Access to nature and gardens is currently thought to provide a degree of relief from the symptoms associated with illness, and as such, is considered beneficial to the healing process (Lewis, *Gardening as Healing Process*; Kaplan and Kaplan, *Experience of Nature*; Marcus and Barnes, *Gardens in Healthcare Facilities*; Ulrich, *View through Window*).

American epidemiologist<sup>6</sup> Dr. Richard Joseph Jackson, asserts "medicine alone will be inadequate to deal with the health challenges of the twenty-first century, even with the help of the sequenced genome and advances in robotic surgery" (Jackson 1). Jackson suggests that the prevalence of chronic diseases in an aging population will result in escalating costs for healthcare provision. Jackson contends that improving the quality of our living environments could mitigate rising medical costs. "Health for all, especially for the young, the aging, the poor, and the disabled, requires that we design health-fullness into our environments" (Jackson 1). Jackson explains that while the average American's life span doubled (from forty to eighty years of age) during the previous two centuries, only seven of those added years are a result of better disease

---

<sup>6</sup> An epidemiologist is a medical doctor concerned with finding the causes of a disease and means for its prevention. Epidemiology is the study of the demographics of disease processes, including the study of epidemics and other common diseases, even those that are not contagious such as diabetes, coronary heart disease and high blood pressure. The founding event for the science of epidemiology was in 1854 when Dr. John Snow suppressed an outbreak of cholera in London's Soho District by identifying a public water pump as the source of the infection. <<http://www.free-definition.com/Epidemiology.html>>

care. Jackson attributes the dramatic increase in life span to, "higher living standards and a healthful environment, including clean water and food, and better and safer housing" (1). The health challenges of the twenty-first century, in Jackson's opinion are, "assuring a healthy aging population, protecting mental health, thwarting environmental threats, preventing and controlling chronic diseases such as diabetes and obesity and eliminating disparities such as diminished health among the poor."<sup>7</sup> Jackson believes our living environments can be designed to improve health. Designing safe places to walk is one example Jackson cites of an environmental design feature that can contribute to improved mental and physical health for all ages particularly the institutionalized and elderly.

Over the past twenty years, a number of healthcare administrators across North America and Europe have explored the possibility that access to nature can increase a patient's sense of well-being and as a result have incorporated healing gardens into their respective healthcare facilities. Increasingly, patient-centered healthcare facilities are conceived and designed to meet the specific needs of the patient by acknowledging the beneficial role of nature in the recovery process (Warner 12). Interest in utilizing rooftops of existing and new multilevel healthcare facilities for therapeutic purposes has resulted in the installation of healing gardens such as the Joel Schnaper Memorial Garden (to be discussed further in Chapter 4). As construction of long-term care facilities for our aging population is expected to rise dramatically to meet the anticipated demand over the next thirty years, understanding the guiding principles and beneficial design features of therapeutic healing gardens for this facility type, as well as others,

---

<sup>7</sup> Dr. Richard Jackson, MD, MPH, Director of the National Center for Environmental Health, Centers for Disease Control and Prevention in Atlanta, Georgia, United States suggests the following link between health and environmental design: An example of a disease problem epidemic that is exacerbated by bad environmental designs is that of the epidemic of obesity in the United States. Twelve per cent of the United States' population were obese in 1991; eighteen percent were in 1998. Obesity is unhealthy, it raises risks of heart disease, high blood pressure, diabetes, stroke, and diminishes vitality. For diabetes, from 1980 to 1994 the prevalence in the population increased by 2.2 million cases, an increase of thirty-nine percent, and diabetes is the seventh leading cause of death in the United States. Type 2 diabetes (formerly only associated with older and often obese adults) has increased in every age group in the population. Lack of exercise, or any physical activity, contributes to obesity and diabetes epidemic. Despite common knowledge that exercise is healthful, fewer than forty percent of adults are regularly active, and twenty-five percent do no physical activity at all. The way we design our communities makes us increasingly dependent on automobiles for the shortest trip, and recreation has become not physical but observational. There is increasing evidence (though much more research is needed) that contributing to the obesity epidemic is the lack of safe and healthy places to pursue even the most basic physical exercise, walking. Walking is a socializing and safe exercise for everyone, and the prime exercise for the elderly (Jackson 1).

will be critical to maximizing their healing benefits. Toward identifying principles and design features, the next chapter reviews the current scientific research linking exposure to nature with positive medical outcomes.



## **CHAPTER 2 - Current Research: The Restorative Value of Nature**

With the exception of the Renaissance and Reformation periods in Western history, Chapter One demonstrated that, up until the twentieth century, society intuitively recognized the restorative value of nature. This was evidenced in the design of healthcare facilities, ensuring patients were provided with either a passive or active experience of nature. Healthcare facility design intentionally allowed for views of a garden from patients' rooms, easy access and mobility from the hospital interior out into and through a garden, and sometimes a place to work in the garden. Healthcare facility design appeared to be based on anecdotal information related to the benefits of nature as scientific research linking wellness, stress-recovery, and healing to nature was lacking. The need to provide for nearby nature ceased to influence hospital design with the adoption of the science-based, twentieth century medical model and its emphasis on the need for scientific evidence. With rapid advancements in the science and technology of medicine during the first part of the twentieth century, emphasis was increasingly placed on providing functional environments designed to accommodate newly-developed medical apparatus and the efficient delivery of medical-based technology (Warner 5-12).

The shift from accommodating people with illness in an environment that addressed their psycho-physiological need for the comfort of a natural setting (i.e. medieval cloister gardens) to one that strictly addresses their physical need for medical intervention (i.e. the modern high-rise hospital) has subsequently been evidenced in the program, design and administration of many North American healthcare facilities (Warner 5-12).

During the latter part of the twentieth century, however, science-based research examining the relationship between nature and human well-being was increasingly undertaken, sparking a

renewed awareness of the benefit of nature in the recovery from illness.<sup>8</sup> Anecdotal evidence suggesting the benefit of nature to human well-being and the healing process continues to proliferate. This chapter, however, focuses specifically on the science-based research of a number of leading researchers in this area. In this chapter I will provide an overview of current interdisciplinary science-based evidence related to the affects of nature on human well-being, as follows: Psychological Perspectives on Nearby Nature (Stephen and Rachel Kaplan); Nature's Affect on Recovery Rates (Roger S. Ulrich, Terry Hartig, M. J. West); The Restorative Benefits of Horticulture Therapy (Patrick Mooney); The Biophilia Hypothesis (Edward O. Wilson, Jay Appleton, Judith Heerwagen, Gordon Orians); People-Plant Relationships (Charles A. Lewis).

The decision to review studies conducted by recognized experts from a broad range of disciplines including environmental psychology, behavioural science, horticulture, biology and landscape architecture is based on my premise that the findings of researchers in a variety of disciplines are consistent and will strengthen the argument supporting the inclusion of nature in the design of healthcare facilities. While the research presented in this chapter highlights the benefits of nearby nature for human well-being, the next chapter will elaborate on the implications we may glean from this investigation for healthcare design.

## **2.1 Psychological Perspectives on Nearby Nature**

Doctors Stephen and Rachel Kaplan, leading researchers in the field of environmental psychology, and authors of the 1989 and 1998 books respectively, The Experience of Nature and With People in Mind, have been studying the relationship between people and nature for over

---

<sup>8</sup> In the 1990s, little research linking dysfunctional physical settings with health outcomes was published. In 1996 researchers Haya Rubin and Amanda Owens identified 270 articles of 38,000 potentially relevant titles from medical databases that appeared to describe investigations into the impact of environmental elements on health outcomes. Of the forty-three articles identified as specifically detailing the relation between patient well-being and environmental factors, many were assessed to be of limited applicability due to methodological limitations. This literature review was circulated among healthcare providers and designers resulting in a general acceptance that nature content, views, windows, and appropriate colors needed to be a priority in renovation and new construction of healthcare facilities. Healing and restorative gardens have begun to reappear in the outdoor healthcare environment and there is an ongoing effort to bring nature indoors in the form of the skylit atrium, fountains, waterfalls, trees, plants, and flowers, and in various representations of nature (Verderber 345). Rubin and Owens concluded: "[Investigations] into the effect of environmental manipulations have generally supported the hypothesis that environmental features affect patients' health...Thus, improvements in health outcome are likely to be available through research on this subject, and it is an important topic to pursue" (Rubin and Owens).

thirty years. During this time, the Kaplans have accumulated a substantial body of research indicating that “people prefer natural environments to other settings,” and that “there are other benefits beyond the mere fact of enjoyment” (Kaplan, Kaplan, and Ryan ix). The Kaplans assert that “nearby nature can foster well-being and nature views have been demonstrated to be related to greater physical and mental health and further that activities that are nature-related have been shown to help people go about their lives more effectively” (Kaplan, Kaplan, and Ryan 2). The following discussion summarises the Kaplans’ understanding of the psychological dimensions for healing of having nature nearby.

The Kaplans use the word “nature” broadly. Nature is not necessarily characterized by its distance from human settlement, nor is it necessarily unaltered by human intervention. The Kaplans’ definition of nature simply describes any outdoor setting with a substantial amount of vegetation. The Kaplans have found, through a great deal of research, that people’s concept of nature is broad and inclusive, emphasizing everyday natural environments often ordinary but nearby as opposed to wild, distant, dramatic or even lush. The Kaplans’ definition of nature includes almost any outdoor setting including parks, vacant lots, street trees, open spaces, backyards, fields and forest. For their purposes, these places range in scope and size from tiny to expansive, from highly maintained to virtually neglected.

The Kaplans also found a great diversity of natural settings are beneficial to human well-being. They feel the restorative environment can vary in terms of physical space and the duration of experience. The Kaplans have explored the qualities and characteristics of restorative environments and the psychological benefits natural settings provide and contend that “restorative environments offer a concrete and available means of reducing suffering and enhancing effectiveness” (Kaplan and Kaplan, *The Experience of Nature* 176).

More recently, the Kaplans have considered the concept of, as well as the potential avenues for, recovery from mental fatigue. The Kaplans suggest that stress and mental fatigue are two distinctly different concepts. Where stress is an outcome of preparing for a threatening or harmful event, mental fatigue is the result of intensely directing one’s attention to a task that

could even be described as enjoyable. The Kaplans have theorized that when one experiences mental fatigue, the underlying cause is fatigue of directed attention resulting from the struggle to pay attention in a highly-distracting environment. The Kaplans have undertaken a number of studies to examine the correlation between mental fatigue and mood. In one such study, participants were less helpful, tolerant and sensitive, and more aggressive, after exposure to attention-demanding tasks under conditions of high distraction. The Kaplans contend that rest is needed to counter mental fatigue. While sleep is not always practical or appropriate, according to the Kaplans, time spent in an environment that does not demand directed attention could provide beneficial rest.

Environments that are conducive to resting the mentally-fatigued individual are referred to by the Kaplans as restorative environments. The concept of the restorative experience is based on the idea that mental effort, coping with hassles, and the everyday demands of living in the modern world, all tend to fatigue one's capacity to direct one's attention. A restorative environment is considered to be an environment that fosters this recovery.

The Kaplans have defined restorative environments as having the following four characteristics:

- ◆ **Being away** – The Kaplans believe that recovering from mental fatigue requires a change of environment from the source of the fatigue. Being away can involve a physical change or it can be as simple as allowing the fatigued mind to wander off by gazing out through a window to a view of nature. The Kaplans contend the “distinctiveness and separateness of the experience from the workaday experience may be as important as the literal distance” (Kaplan and Kaplan, *The Experience of Nature* 190). The sense of being away can even be experienced by casually wandering through a small garden, noticing the textures and patterns of new growth and flower buds. This experience can provide hospital staff, volunteers and visitors with needed relief from mental fatigue, an opportunity to relax, relieving them temporarily from pressures and obligations.

- ◆ **Extent** - The issue of size and preference of natural areas was explored in studies on environmental preference conducted by Bardwell (1985), and Talbot, Bardwell and Kaplan (1987) which generally found that smallness is not detrimental. The Kaplans' study participants identified factors that make an area seem larger (extent) as well as factors that enhance their preference. The factors identified were similar for both extent and preference and included: "spacious, wide-open areas," "trees, especially large and numerous," and "trails and pathways" (Kaplan and Kaplan, *The Experience of Nature* 152). The Kaplans suggest that while wilderness areas typically provide extent, the experiential quality of extent can also be provided in a garden as one's mind elaborates and wanders through the garden anticipating seasonal changes.

Rachel Kaplan discovered that "a park does not need to be large to be highly valued, and creating one large space was less preferred than creating a setting with many smaller regions" (Kaplan and Kaplan, *The Experience of Nature* 154). The Kaplans concluded that "rather than size itself being the important issue, it may be the perception of extent that is of greater significance. Areas that suggest there is more to explore than is immediately apparent, has a special attraction" (Kaplan and Kaplan, *The Experience of Nature* 155). They suggest it is important to consider how the space is designed to achieve the valued qualities of views of trees, intimate spaces within a larger area, and hints of more to explore.

- ◆ **Fascination** – When involuntary attention is held, it is typically termed fascination. The Kaplans found that fascination is important to the restorative experience because it does not use directed attention but evokes involuntary attention, "fascination," and when individuals are functioning without directed attention they are resting their directed attention capability. Gardening research has revealed that the attention-holding power of the garden was one of the most highly-rated benefits of gardening.<sup>9</sup> The Kaplans termed fascination in a garden as "soft-fascination." They feel a garden that combines beauty and interest provides

---

<sup>9</sup> In 1976, Rachel Kaplan and Charles Lewis surveyed members of the American Horticultural Society. Of the over four thousand replies received, the respondents rated "nature fascination" as the second most satisfying benefit derived from gardening. Nature fascination was described as "getting completely wrapped up in it [gardening] and never failing to hold interest [the garden/gardening], (Kaplan and Kaplan, *The Experience of Nature* 169).

opportunities for the mind to be distracted from any unpleasant thoughts and open to other thoughts and experiences. Gardens that include patterns and shadows created by sunlight or moonlight through foliage, emphasizing the changing seasons and mood of the garden through colour, scent and a variety of textures invite the mind to wander and contribute to the sense of being away. Even viewed through a window, a small familiar natural environment that captures the ephemeral qualities inherent in nature can be fascinating and ease the mind.

- ◆ **Compatibility** - Compatibility refers to the degree to which an environment supports the actions or desires of an individual. An environment that is experienced as pleasurable can provide rest for directed attention. Many people experience functioning in a natural setting as less effortful than functioning in an urban environment, even though their familiarity with the latter is often far greater (Cawte, 149-161); the term compatibility describes this experience. Gardening and bird watching are examples of activities or purposes that are compatible with being in a natural environment.

To summarize, the Kaplans describe restorative environments as natural settings that counter the effects of mental fatigue and are characterized by enabling the viewer or participant to sense: being away, fascination, extent and compatibility. When people suffer from mental fatigue, they are prone to human error, can become irritable, experience a decreased attention span and lack peace of mind and tranquility. Nature can play a critical role in restoration from mental fatigue. Even undramatic natural settings can be helpful in providing restoration including when viewed from a distance for a relatively short period of time. Similar to Ulrich's findings, the Kaplans assert that, "many of the benefits from restorative environments can be achieved by having a view from a window" (Kaplan and Kaplan, *The Experience of Nature* 76). As noted in the previous chapter, typical medieval cloisters also supported the restorative experience by ensuring intimate views to a courtyard garden from the residents' rooms.

The Kaplans suggest "basic to human well-being is an environment that fosters understanding and provides opportunities for exploration" (Kaplan and Kaplan, *With People in Mind* 28). Preferred environments are those perceived as safe and hence are opportunities to rest directed attention and are referred to as restorative environments. While restorative benefits are enhanced

in environments that are perceived as secure, thus permitting one to become absorbed, research on preferences for various environments consistently indicates that mystery is highly rated. When mystery and charm are introduced through a view partially concealed with foliage or a winding pathway, for example, one is compelled to explore that landscape.

Further, the Kaplans contend that aesthetically pleasing natural environments give pleasure and are satisfying to experience while supporting exploration and recovery from mental fatigue. Further, the nervous system experiences pain at the exclusion of pleasure hence the experience of pleasure can reduce or eliminate pain. The Kaplans contend that contact with pleasurable stimuli can reduce pain and the need for directed attention. As natural settings are preferred environments, this provides the theoretical basis for expecting natural environments to be restorative. In addition, the benefit of including a garden to provide pleasure in a hospital setting becomes obvious in terms of its potential to reduce the level of pain experienced by patients (Kaplan, Kaplan and Ryan, *With People in Mind*; Kaplan and Kaplan, *Experience of Nature*).

The Kaplans concluded that the natural environment has restorative benefits and that natural settings are preferred to most other environments because of the aesthetically pleasing qualities of nature. The Kaplans also concluded that while extended periods of time in natural settings may provide additional restorative effects, viewing nearby nature also provides restorative benefits. Natural environments permit tired people to regain effective functioning and there appears to be sufficient evidence about the benefits of nearby natural environments to support the creation of such settings.

The Kaplans demonstrated that mentally fatigued individuals can benefit from natural settings that allow for passive involvements such as noticing different colours in fall leaves, listening to the wind, watching the clouds go by, or delighting in the antics of a chipmunk. The Kaplans conclude that the inclusion of natural environments in healthcare facilities provides the setting needed for staff, volunteers, visitors and patients to find respite and recovery from their particularly demanding and often stressful circumstance.

## 2.2 Nature's Effect on the Rate of Recovery

Dr. Roger Ulrich is a Professor of Landscape Architecture and Architecture at Texas A+M University, and serves as Director of the Center for Health Systems and Design, an interdisciplinary centre housed jointly in the Colleges of Architecture and Medicine. Ulrich, a behavioral scientist, conducts research on the effects of healthcare gardens and buildings on patient medical outcomes and his work has influenced the resurgent international interest in restorative or healing gardens.

In 1970, while doing his doctorate studies under Stephen and Rachel Kaplan, Ulrich began exploring theories of restoration and tranquility derived from natural settings. Ulrich measured the psycho-physiological effects of green environments to explore the role of plants in restoration from stress. Ulrich studied the rate of recovery response by comparing subjects who, after watching a worker-safety film depicting violent injuries, viewed scenes of nature with others who viewed scenes of concrete urban environments. All subjects experienced increased heart rate, blood pressure and muscle tension as a result of watching the safety film. These symptoms, however, subsided much more slowly in the group not shown the nature film afterwards. Ulrich discovered that the group viewing nature showed higher levels of stress-recovery, concluding that viewing nature can reduce stress and therefore positively influence rates of recovery and promote health.

In a related study, Ulrich, while a professor in the University of Delaware's Department of Geography, set out to determine whether "a room with a window view of a natural setting might have restorative influences" (Ulrich, *View Through Window* 420). Ulrich's landmark research compared two patient groups recovering in a Pennsylvania hospital after gallbladder surgery. Over a nine-year period (1972 through 1981), the records of twenty-three patients with a view to a group of deciduous trees were compared to the records of twenty-three patients in post-operative rooms with windows looking out on to brick walls. The patients' records were studied comparing the length of hospital stay, strength of the pain medication received and the number of negative evaluative comments in the nurses' notes. In 1984, Ulrich's findings, which were



published in Science, suggested that the “natural scene had comparatively therapeutic influences as the patients with the tree view had fewer negative evaluative comments from nurses, took fewer moderate and strong analgesic doses, and had slightly lower scores for minor post-surgical complications” (Ulrich, *View Through Window* 421).

Ulrich concluded “the results imply that hospital design and siting decisions should take into account the quality of patient window views” (Ulrich, *View Through Window* 421) (see figure 2.1). Subsequent research permitted Ulrich to build on his theory that “viewing trees, flowers, and other vegetation reduced stress and induced a sense of well-being that promoted health, particularly for people in confined, stressful environments such as hospitals” (Thompson 74).

The significance of Ulrich’s research is evidenced by the fact that his studies were clinically conducted on real patients in real hospitals, not on people in laboratories or simulated situations. The beneficial influences, derived from viewing nature through the patients’ recovery room windows, resulted in many positive health outcomes and are thought to have a psychological component. The resulting positive health outcomes included: reduced need for pain drugs; fewer typical minor complications such as persistent headache or nausea; a decline in blood pressure; more relaxed muscles. It is also important to note that Ulrich’s findings revealed that the subject patients’ brain electrical activities changed, suggesting they were feeling more wakefully relaxed (Ulrich, *View Through Window* 420-21).



**Figure 2.1** View through a window to nature

Ulrich's findings, suggesting clinical benefits of a greater connection to the natural environment, are also supported by a 1991 study by Terry Hartig, Associate Professor in Applied Psychology, Institute for Housing and Urban Research and Department of Psychology at Uppsala University in Sweden. Hartig and his associates (Mang and Evans) studied stressed individuals and their responses to a forty-minute walk in a heavily-treed urban nature area compared to stressed individuals that took a walk in an urban setting without trees. Hartig found that the individuals who walked in the natural area reported improved emotional states over those who walked in the urban area with no trees.

Also in accordance with Ulrich's findings, Joanne Westphal, a medical doctor and professor of landscape architecture in the United States conducted a study of Alzheimer's patients in 2001 which revealed that patients with access to healing gardens for more than ten minutes a day showed marked improvements in blood pressure, heart rate, weight, aggressive behavior and requested less medication.

Ulrich continues to conduct research on the effects of healthcare gardens and buildings on patient medical outcomes showing that the benefits of viewing nature extend beyond aesthetics to include positive effects on emotional well-being and reduction of pain and stress. Considered internationally as the leading healthcare design researcher, I found Ulrich to be the most widely cited healthcare design researcher and it appears that his studies have influenced the site planning and architectural form of many recently- constructed healthcare facilities in the United States.

### **2.3 The Restorative Benefits of Horticulture Therapy<sup>10</sup>**

Patrick Mooney is an Associate Professor of landscape architecture in the Faculty of Agricultural Sciences at the University of British Columbia. Mooney has won research awards from both the Canadian and American Societies of Landscape Architects for his work on the effects of exterior environments for people suffering from Alzheimer's disease and related dementia.

Mooney's research, discussed in "The Design, Planning and Evaluation of Healing Landscapes," indicates that the restorative benefits of nature are most significant for individuals that are the most degenerated psychologically. Mooney tested eighty elderly individuals in a long-term healthcare facility in North Vancouver, British Columbia, Canada. The patients population was divided into two groups, with half participating in a horticulture therapy program for six months and the other serving as a control group. Individuals participating in horticultural therapy had test results indicating that they improved markedly on the belligerence/irritability and anxious/depressed scale. Sensory-motor impairment scores also showed improvement while the control group's (no horticulture therapy) test results indicated no change in behaviour and function. This study by Mooney of seniors in intermediate care demonstrated that horticulture therapy could be beneficial, offsetting the negative effects of institutionalization (see figure 2.2).

---

<sup>10</sup> The American Horticultural Therapy Association (AHTA) [www.ahata.org](http://www.ahata.org) defines horticultural therapy as "a discipline that uses plants, gardening activities, and the natural world as vehicles for professionally conducted programs in therapy and rehabilitation."



**Figure 2.2 Horticulture Therapy Program**

Mooney suggests that residents can experience a sense of connectedness to their place of residence when they contribute to their environment. Gardening activities provide opportunities for the elderly to give something personal of themselves by caring for plants or growing fruit and vegetables to share with the other residents. Gardening can provide the institutionalized with a sense of satisfaction, pride and purpose. "Horticulture therapy appears to be particularly suited to the aged since it can be tailored to a range of physical abilities and interests including flower arranging, food preparation and preserving, while providing a sense of usefulness and purpose that contributes to emotional well-being" (Mooney and Errett 6).

The success of therapeutic gardens depends, however, on their ability to meet the particular requirements of the related patient populations. People suffering with dementia and Alzheimer's disease can find it difficult to interpret and respond to their immediate environment and as a result become anxious and overly-stimulated, resulting in difficult behavior for staff to manage.

In a previous study (Mooney and Nicell 23-29), the research team of Patrick Mooney and Lenore Nicell discovered a reduction in violent incidents resulting from redesigning a patient garden at

Cedarview Lodge, a special care facility for one hundred and fifty Alzheimer patients in North Vancouver, British Columbia, Canada. Mooney and Nicell (Cedarview Administrator) discovered that the patients responded negatively to the outdoor environment at the facility, which provoked behavior that was difficult for staff to manage. The outdoor space was redesigned with special attention paid to garden features such as non-glare pathways (to reduce confusion and facilitate walking, not stopping), screening the fence with plant material (to diminish distractive elements), adding a central landmark (to help orient patients), and the use of pastel colours and soothing, softly fragrant plant material (to reduce agitation). Once the outdoor space had been modified to meet the needs of the patients, they found the rate of violent incidents declined by nineteen percent over two years. The rate of violent incidents, however, increased by six hundred and eighty-one percent over the same period in a similar facility without the benefit of a restorative garden, used as a control for that study.

Mooney and Nicell's findings provide further evidence that environmental design affects health outcomes and of the positive benefits and need for appropriately designed restorative gardens to improve the quality of life of people living in healthcare facilities with Alzheimer's and other dementias.

## **2.4 Biophilia Hypothesis**

In his 1984 book, Biophilia, Edward O. Wilson, Harvard Science professor and two-time Pulitzer Prize winner, describes and defines the study of the human response to the natural environment as biophilia. Wilson theorizes that biophilia is the force that connects us to nature and is defined as a love for nature. Wilson argues that "Modern humans innately respond to natural content and configurations that characterize environments favorable to pre-modern humans. A frequently-cited example is that modern humans feel comfortable in replicas of the African savanna, such as the trees and lawn setting of an urban park" (Dannenmaier 60). The biophilia hypothesis states that our innate affiliation with nature results in positive responses promoting health and benefiting emotional states. Roger S. Ulrich summarizes this concept in his essay on biophilia and natural landscapes:

The speculation that positive responses to natural landscapes might have a partly genetic basis implies that such responses had adaptive significance during evolution. In other words, if biophilia is represented in the gene pool it is because a predisposition in early humans for biophilic responses to certain natural elements and settings contributed to fitness or chances for survival.

(Ulrich, *Biophilia* 75)

Wilson's biophilia hypothesis was developed nine years after British geographer Jay Appleton suggested that humans prefer landscapes with elements of prospect (extent or view) and refuge (protection from danger). It should be noted here that Stephen and Rachel Kaplan's work in the field of environmental preferences also examined the human response to landscapes that offered both prospect and refuge. The Kaplans discovered, as did Wilson and Appleton, that humans prefer natural environments that consist of an expanse of lawn with single trees dotted throughout, consistent with the ancestral habitat of the African savanna landscape.

I should also note that Dr. Judith Heerwagen,<sup>11</sup> environmental psychologist, and Professor Emeritus Gordon Orians, professor in the Department of Biology at the University of Washington, similarly describe the Biophilia Hypothesis as preferred landscapes consisting of "habitability cues, resource availability, shelter and predator protection, hazard cues, wayfinding and movement" (Heerwagen and Orians 142-146). Heerwagen and Orians surveyed people in a variety of countries around the world, discovering remarkable similarities amongst cultures, with respect to preferred landscapes. Heerwagen and Orians found that regardless of culture, preferred landscapes consisted of natural elements consistent with landscapes that are a potential

---

<sup>11</sup> Judith Heerwagen, Ph.D. works with the Pacific Northwest National Laboratory and has her own consulting practice, J.H. Heerwagen & Associates, Inc. based in Seattle Washington, USA. Heerwagen provided this abstract of her presentation at Green World, May 18, 2000 in Seattle:

Human Resource Sustainability: Toward a Theory of Congenial Environments

This talk will look at sustainable building design from a human factors focus, linking building features and attributes to physical, psycho-social, and neuro-cognitive functioning. At the present time, green building research focuses on the physical aspects of health associated with indoor air quality and improved thermal environments. However, sustainable design has strong philosophical and theoretical links to human-nature relationships. There is strong emerging evidence that buildings which incorporate nature and natural processes may have far reaching impacts on psychological, social and cognitive functioning. Drawing upon theories of habitability, biophilia, and natural design, Dr. Heerwagen will look at how features and attributes of interior spaces – including aesthetics – can inhibit or facilitate a wide range of work behaviors and outcomes highly valued by organizations, including creativity, collective intelligence, and social networks. In this perspective, the building is viewed as a habitat for people and as an investment in human resource sustainability. The presentation will identify basic "habitability" features of built environments and will link variation in these features to variation in human well-being and performance. And finally, sustainable design will be linked to other environmental factors to develop a theory of "congenial environments."

source of food, shelter and places to explore, such as copses of trees with horizontal canopies, water, elevation changes, distant views, and flowers. The Kaplans, Appleton, Heerwagen and Orians' findings all support Wilson's work in this area.

## 2.5 People-Plant Relationships

After thirty years of studying the relationship between people and plants, in 1996 horticulturist Charles A. Lewis, published Green Nature, Human Nature: The Meaning of Plants in our Lives. Lewis concurs with Wilson that the strong human response nature elicits must have an evolutionary basis. Lewis draws this conclusion from numerous studies of the human species' affinity for nature, independent of social, economic, and cultural variables. Lewis believes that "humans seek out nature as a refuge because we evolved in nature" (Dannenmaier 60). This natural human instinct to seek the comfort and protection of the natural environment emphasizes the need to address this requirement of those suffering from illness. Allowing patients an opportunity to interact with nature, nurtures a basic human need.<sup>12</sup>

The role of plants in human healing is based on ancient natural remedies for illness. Herbalists recorded the healing properties of plants. The first botanical gardens were established for the enlightenment of physicians. Today, however, we seek a healing quality in gardens and gardening that acts primarily on mind, not body – medicine not to be taken orally but rather perceived sensually, to heal scars on the human psyche.

(Lewis, *Gardening as Healing Process* 244)

In 1976, Charles Lewis and Rachel Kaplan prepared and distributed the 'People Plant Survey' to members of the American Horticultural Society. Of the four thousand replies received, sixty percent of the respondents indicated that the greatest satisfactions derived from gardening were a "feeling of peacefulness" and a "source of tranquility." Kaplan revealed that a number of what she has termed "satisfaction factors" are experienced from being in nature: "sensory joy, the feeling of peacefulness, quiet and tranquility derived from walking or being in the garden, and

---

<sup>12</sup> Stephen Scharper, an assistant professor of religious ethics and environmental studies at the University of Toronto suggests that the human urge to get back to the garden is primal; at its root is a longing to choose life. (Scharper, Stephen. Interview with Mary Hynes. "Back to the Garden". Tapestry. Canadian Broadcasting Corporation. 12 Apr. 2004.)

soft fascination experienced when one becomes so engrossed in the work of gardening that rest is provided from stresses plaguing the mind” (Mooney and Errett 4). Kaplan asserts:

The capacity to direct one’s attention is a fragile resource. It is worn down by distraction, confusion, and by other hassles of various kinds. As this capacity is worn down, or more accurately, fatigued, there can be numerous unfortunate consequences. Among these are impatience, irritability, proneness to error, the inability to focus, and a generalized state of discomfort or pain. Ultimately the decline in the ability to direct attention can challenge the integrity of an individual’s mental or physical health. Given the potential damage created by the hassles and pressures of everyday life, both large and small, the restorative experience has the potential of playing a vital healing role.

(Kaplan and Kaplan, *Restorative Experience* 243)

Lewis and Kaplan’s research indicates that gardens can provide an ideal, natural healing environment. Their research results have inspired the adoption of horticulture therapy programs in many healthcare facilities in the United States and Canada.

## **2.6 Conclusion: Review of Science-Based Evidence**

The work of several researchers studying the affects of nature on human well-being is presented in this chapter. While the researchers represent a variety of disciplines, including environmental psychology, behavioural science, horticulture, biology and landscape architecture, similar conclusions are being drawn. Each researcher reports science-based evidence that supports the notion that humans benefit mentally and physically from either passive or active interaction with the natural environment including contact with plants and viewing nature and landscapes.

Roger Ulrich’s work suggests that patients recovering from surgery in a room with a view of nature have a more positive medical outcome and healing process than those with a view of brick walls. Edward Wilson developed the biophilia hypothesis stating that the innate human affiliation with nature results in positive psycho-physiological responses promoting health and benefiting emotional states. Charles Lewis and Stephen and Rachel Kaplan established that people derive feelings of peacefulness and tranquility from gardening and being in nearby nature.



Patrick Mooney's research indicated that dementia patients benefit psychologically from participating in horticulture therapy programs. The work of these researchers provides a broad multidisciplinary base for the assertion that natural outdoor environments and contact with nature can contribute positively to health and well-being.

The human need for and benefit of nearby nature, confirmed by the researchers discussed in this chapter, substantiates the assertion that outdoor natural environments and healing gardens need to be considered in healthcare facility design. The next chapter will review the implications this and other research has for the design of outdoor environments adjacent to healthcare facilities (see figure 2.3).



**Figure 2.3** Garden in healthcare facility

### CHAPTER 3 - Guiding Principles and Design Features

This chapter examines the design principles and features of restorative, therapeutic and healing gardens emerging from the literature reviewed in previous chapters. In this chapter I compare the work of several design professionals and researchers, highlighting reoccurring themes that appear to guide and inform the design of outdoor space in healthcare facilities to benefit human health and well-being. Specific design requirements for special patient populations and user groups will be articulated through this exercise.

Roger Ulrich suggests that the specific characteristics, needs, and disabilities of the particular patient groups must be taken into account [when designing a healing garden]. One group may need a lot of social interaction. Others may need passive restoration. Others may need great variety, including some stimulation. It is imperative, if one is dealing with very stressed, emotionally upset people, to be unambiguously positive in the garden context.

(Thompson 74)

This awareness that specific garden features may elicit a positive or negative response, depending on the symptoms of the patient's illness, infers a key design consideration -- the patient. Ulrich contends "health care is clearly headed toward patient-centered or often family-centered healing-oriented design" (Thompson 74).

The one garden feature that appears to consistently evoke a positive response is green plants. "Anything green makes patients feel better...any plant any tree," claims Nancy Chambers (a horticultural therapist at the Rusk Institute of Rehabilitation Medicine, in New York, New York, United States). Chambers has witnessed firsthand how plants can relieve stress and improve a patient's mood, and how simple, repetitive gardening procedures such as propagating a plant can serve as a form of physical therapy for severely traumatized patients" (Thompson 55).

As noted in the previous chapter, the Kaplans' research suggests the healing power of the restorative experience can be experienced in nearby and undramatic natural environments. Although the restorative effect of such environments may be less profound than that of the wilderness, the Kaplans conclude that their far greater accessibility gives them a significant role. The Kaplans contend that the quintessential micro-restorative environment, the one that most closely brings together the multiple themes of the restorative experience into a single, small, intensely meaningful space is the garden (Kaplan and Kaplan, *Restorative Experience* 241, 243).

The Kaplans' suggestion of a "small, intensely meaningful space," is reminiscent of the medieval courtyard garden ambience as described by St. Bernard in Chapter One (Kaplan and Kaplan, *Restorative Experience* 243). While layered with symbolism and cultural meaning, the basic features of the typical medieval courtyard garden were:

- ◆ fresh air
- ◆ plants
- ◆ shade
- ◆ colour
- ◆ water
- ◆ birds
- ◆ soothing sounds
- ◆ fragrance
- ◆ views from rooms
- ◆ sunlight
- ◆ season variations
- ◆ paths for strolling through the garden

In this chapter I will present emerging themes in healing garden design in healthcare facilities as they relate to specific patient populations. I will also continue to extrapolate from the literature

the guiding principles and garden features that appear to enhance the restorative experience and sense of well-being derived from viewing or being in a healing garden in a healthcare facility.

Healing garden design considerations for the following special patient populations have been generated and generalized through post-occupancy evaluations of numerous healing gardens by the corresponding highly recognized designers, researchers and authors: All Patient Populations (Clare Cooper Marcus, Marni Barnes and Cheryl E. Ware); Dementia and Alzheimer's Patients (Elizabeth C. Brawley); and Pediatrics (Robin C. Moore). In keeping with the style of the original text the following information is at times presented in point form.

### **3.1 All Patient Populations (Clare Cooper Marcus, Marni Barnes; Cheryl E. Ware)**

Clare Cooper Marcus is Professor Emeritus in the Departments of Architecture and Landscape Architecture at the University of California, Berkeley. Marcus is internationally recognized for her pioneering research on the psychological and sociological aspects of landscape design and architecture and is concerned with distinguishing elements of public open spaces such as gardens around healthcare facilities. Marcus is an associated partner of Healing Landscapes, a consulting firm that specializes in user-needs analysis related to the programming, design and evaluation of outdoor spaces in healthcare settings.

Marni Barnes is an American landscape architect and Principal of the landscape architecture and consulting firm DEVA Designs in Palo Alto, California, United States. Marcus and Barnes have received several awards and co-authored Healing Gardens: Therapeutic Benefits and Design Recommendations, 1999.

Marcus and Barnes studied the use and therapeutic benefits of gardens by observing and interviewing people in a number of healing gardens in Northern California healthcare facilities. Ninety-five percent of the people in the gardens reported a therapeutic benefit (Marcus and Barnes, *Gardens in Healthcare Facilities* 65).

Marcus and Barnes identified the following features of a healing garden as suitable for all healthcare facilities including long-term care, acute care and out-patient facilities and as beneficial to all patient populations (see figure 3.1):

- ◆ colourful lush plantings
- ◆ auditory sound of water
- ◆ shade and sun
- ◆ flexibility -- choice of seating locations -- moveable chairs
- ◆ fragrance
- ◆ quiet, privacy from interior -- not a fishbowl
- ◆ scale not too many big benches -- comfortable benches i.e. wooden with armrest and backs, comfortable, padded seats e.g. for AIDS patients losing weight
- ◆ rustling leaves willows or poplars
- ◆ wide smooth paths suitable for wheelchair or gurney
- ◆ lighting in gazebo
- ◆ wildlife – birds
- ◆ variety of textures and colours in plant material
- ◆ sense of enclosure
- ◆ deciduous trees e.g. provide green outlook for those in offices and patient rooms in the floor above the garden.

(Marcus and Barnes, *Gardens in Healthcare Facilities* 1-65)

Marcus and Barnes' description of the Flower Garden at the Stanford University Medical Center in Palo Alto, California, United States, provides an illustration of the elements considered important to provide in a garden intended to benefit patients, staff and visitors:

The planting in the gardens is exemplary: under planting of shade-loving ferns, camellias, azaleas, and impatiens beneath the birches; massed plantings of blue agapanthus, pink and white roses, white and blue petunias, white cosmos, white and pink dahlias, pink pentagon, blue lobelia, and blue delphiniums. The effect is of a very colourful "cottage garden" with the birches in two corners and cherries in the third, acting as backdrop. While one side nearest the corridor is obviously planned for use – seating clusters and pathway – the other two sides are faced by the windows of offices and patient rooms. The depth of the garden and the height and variety of planting ensure complete privacy for those inside. The overall experience in this garden is of being very remote from the hospital atmosphere, in a human-scale, secure and enclosed setting, with the sound of moving leaves and views onto a wonderful variety of plants, flowers, leaves, shadows, and textures – a true oasis experience. No smoking permitted – generally used by lone people reading and eating, groups of visitors talk, elderly patients in wheelchairs with a

companion looking at the flowers and dozing, small children exploring in the shrubbery.

(Marcus and Barnes, *Gardens in Healthcare Facilities* 21)

Marcus and Barnes noted that many of the healthcare facilities they studied commonly had gardens that were unknown to staff and visitors indicating a need for adequate signage and information.



**Figure 3.1** Healthcare facility staff take a break in the garden

Cheryl E. Ware is an American landscape architect with Spink Corporation, a multi-disciplinary construction and design firm in Sacramento, California, United States, and has designed Healing Gardens for California healthcare facilities. Ware, a breast cancer survivor, suggests “A well-designed Healing Garden should become an integral component of modern health facility planning and operation. These gardens can help calm patients, reduce blood pressure, relieve stress, encourage healing and host a badly needed break for harried staff or worried family members” (Ware 323).

Ware suggests that the following guiding principles and design features are beneficial for all patient populations in any healthcare facility including long-term care, acute care, and out-patient facilities:

- ◆ Incorporate into or ensure the garden is adjacent to a healthcare facility that performs procedures that require a waiting and/or recovery period at the facility, including long term care such as hospices or elderly care homes.
- ◆ Easily accessible to patients, visitors and staff, including persons with disabilities.
- ◆ Create “a sense of place,” separate and distinct in style from its surroundings with a feeling of privacy and quietness.
- ◆ Ensure space feels safe with staff able to oversee the site unobtrusively.
- ◆ Provide shaded and sunny areas.
- ◆ Provide seating areas for quiet reflection and physical rest.
- ◆ Include visually-pleasing plantings that are colourful, seasonal, and interesting to explore with the eye.
- ◆ Stimulate all senses: hearing (singing birds, trickling water), smell (fragrant flowers, fragrant trees), taste (herbs, fruits), touch (stone, wood, water, leaf textures) as well as sight (seasonal changes, flowering plants, butterfly garden).
- ◆ Walking paths for exercise with handrails or frequent rest areas for unstable walkers.
- ◆ Traditional medicinal herbs with educational signage.
- ◆ Statuary or fountains.
- ◆ Raised planting beds included to allow wheelchair-bound or unstable visitors to touch and smell low plantings.
- ◆ Gently lit for use after dark allowing visual or physical access.
- ◆ Planted and maintained by local volunteers, especially as part of a horticulture therapy program.
- ◆ Incorporate into the healing program at the facility: group meditations, counseling sessions, religious services, exercise programs, etc.

(Ware 332-333)

### 3.2 Patients with Dementia<sup>13</sup> and Alzheimer's Disease (Elizabeth C. Brawley)

Elizabeth C. Brawley is an American Interior Designer based in Los Angeles, California and author of the 1997 book Designing for Alzheimer's Disease. Brawley has considered the needs and symptoms of patients with Alzheimer's Disease and has the following suggestions for a healing garden in a long-term care residential healthcare facility for seniors with dementia and Alzheimer's Disease.

While the short-term memory is the first casualty of Alzheimer's Disease, for many the ability to walk and be physically active remains intact far into the disease process. With diminished memory and ability to reason, patients often respond more intensely to the immediate environment. Alzheimer's Disease affects a person's ability to interpret, understand and respond to the physical environment. People with dementia can be upset, aggressive or hostile by confined, monotonous and enclosed spaces lacking windows. More severely impaired people are negatively affected by glare, noise, odors and insufficient access to safe and secure outdoor areas. Patients often experience a decrease in visual acuity, strength, endurance, balance and coordination. The high incidence of osteoporosis among the elderly results in impaired physical mobility and falling.

Currently four million people in the United States suffer with dementia and Alzheimer's Disease; according the National Alzheimer's Association that number will increase to fourteen million in the next thirty years. Brawley contends that "the average facility conspires to reinforce dependency and to immobilize residents and that the single largest missing ingredient in healthcare facilities for the elderly is light -- affecting sight, mobility, level of functioning and stress" (Brawley xii, xiii). Brawley believes the environment has a great impact on behavior and that designers can create spaces that provide support for residents' abilities and improve quality of life.

---

<sup>13</sup> Dementia is the loss of intellectual function (such as thinking, remembering, and reasoning) of sufficient severity to interfere with a person's daily functioning. Dementia is not a disease in itself but a group of symptoms that characterize certain diseases and conditions. Symptoms may also include changes in personality, mood, and behavior. Dementia is irreversible when caused by disease or injury but may be reversible when caused by drugs, alcohol, hormone or vitamin imbalances or depression. Alzheimer's disease is the most common form of dementia (Brawley 290).



While persons in mid to late stages of dementia respond to a peaceful, calm, quiet environment, many early stage residents delight in a more active and stimulating environment. Dull, monotonous surroundings encourage adverse reactions such as anxiety, fear, and distress; however, with beautiful gardens and a variety of outdoor spaces available, residents able to move about during the day can be treated to a desirable and pleasing change of pace and space. Gardens can be a wonderful source of sensory stimulation -- sight, sound, light, colour, fragrance, birds, and small domestic animals.

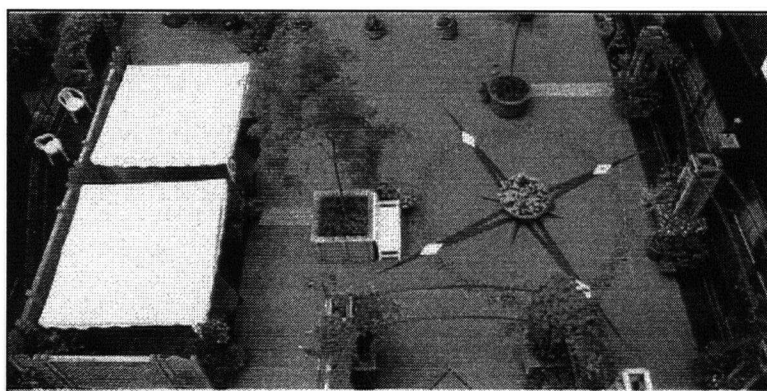
(Brawley 211)

Brawley has noted through firsthand observation of patients with dementia or Alzheimer's Disease that the following design features of a healing garden are beneficial for the users:

- ◆ Opportunities to be outside in the fresh air and daylight light levels are essential for the well-being of institutionalized residents. Outdoor spaces/gardens need to provide a connection with the natural environment and be less confining than the indoor environment to enlarge the scope of residents' daily experiences.
- ◆ Enhance residents' physical and emotional well-being while addressing the two greatest concerns related to this patient population; the outdoor settings must be safe and secure minimizing falls and preventing exiting. As residents experience increasing cognitive deficits and diminishing visual and auditory acuity, physical mobility, strength and endurance, the risk of injury from hazards not seen or heard increases.
- ◆ Residents need to be provided with opportunities to socialize and develop skills in a relaxed natural setting.
- ◆ An outdoor setting needs to provide institutionalized residents with places to seek needed solitude.
- ◆ Minimize falls by providing handrails and ensuring that paving surfaces are glare-free, non-slip and uniform in texture and colour. As it is common for residents to shuffle, surfaces must be gently sloped to drain well, remain non-slip in wet and dry conditions and be free of irregularities such as cracks, potholes or uneven spots.
- ◆ Pathways should be wide enough to accommodate two-way traffic without physical contact (including walkers, wheelchairs and gurneys).
- ◆ A high degree of contrast is needed between paving edges and bordering areas to increase the patients' ability to distinguish between walking surfaces and non-walking surfaces.
- ◆ Adequate level of light is needed in the garden to assist visibility, however, glare must be minimized. Using materials of medium to dark colour value will help reduce glare.
- ◆ Help ensure residents are safe; the nursing station should oversee the garden.
- ◆ The outdoor space must be a protective and secured environment surrounded by a minimum six foot high fence to prohibit climbing, vaulting, and exiting. The secured parameters of the space should be softened with vines and plantings to provide enclosure yet alleviate the sense of confinement. Trees and garden structures need to be located far enough away from the building to discourage their use as climbing aids.

- ◆ Views of parking lots and facility exits should be screened from residents' view to reduce the urge to exit. Gates and locks also require camouflage to minimize attention by the residents.
- ◆ Include space for activities to stimulate residents' long-term memory of their previous home life, e.g. mowing the lawn with a push mower, raking leaves, gardening, and hanging clothes on a clothesline.
- ◆ Include elements of familiar garden styles and plants popular during the 1940's and 50's to evoke memory, as this is the period in which residents may have tended their own garden.
- ◆ Provide a variety of spaces within the garden to increase stimulation; allow for solitude or socializing to address the range of residents' needs from early to late stages of the disorder.
- ◆ Extend the use of the garden during the year by positioning the garden to maximize the southern exposure and access to the sun's warmth. Provide covered shelter, e.g., a gazebo, porch, pergola, awning or adjustable umbrellas to define a space for activities and provide protection from showers and the sun's seasonal heat and glare.
- ◆ Deciduous trees should be planted to provide partial shade and filtered light, however, trees and plants that drop fruit should be placed away from walking areas to avoid possible slipping and tripping hazards.
- ◆ Seating should be provided throughout the outdoor setting to provide resting spots and places to sit and enjoy the garden. Residential lawn furniture made of non-reflective materials is suitable and flexible. Seating placed under trees or trellises can filter the sunlight and create a sense of privacy.
- ◆ The relationship between the indoors and outdoors should be considered in terms of the transition between the outdoor and indoor ground plane. The transition should be smooth with a flow of colour leading into the garden. A porch can soften the transition from inside to outside as well as expand the interior space for sitting and walking in the outdoors in a wider range of climatic conditions.
- ◆ Large windows overlooking the garden help to connect residents inside with the natural environment outside while increasing interior daylight and views of the garden's flowers, trees, and birds.
- ◆ Many residents are inclined to walk and benefit from outdoor settings designed specifically to accommodate their needs. Pathways must be clearly defined and loop back to the starting point; this will help residents find their way. It is important to avoid paths that end abruptly as residents are likely to become confused and agitated in that circumstance. Providing handrails that clearly contrast with the background, ensures additional safety and security for frail residents, serves as support, and helps guide and return residents to their destination.
- ◆ While small courtyards that relate well to the interior of the facility are often successful garden spaces, roof top gardens are not recommended as residents can not be safely left unaccompanied.

- ◆ Wayfinding<sup>14</sup> and orientation cues are vital, maximizing awareness and orientation and reinforcing the residents' ability to exercise freedom of choice through movement. Examples of successful wayfinding elements in the garden setting include distinctive landmarks, familiar items from the past, and self-contained looping paths. A porch can also serve as a large visual landmark for a safe return (see figure 3.2).
- ◆ Nontoxic planting is essential in this type of facility as patients with dementia often put things in their mouths and eat flowers and plant material. Ingesting plants is not typical of early to midstage dementia but it is more common in the later stages of the disease (see Appendix 1).
- ◆ Create interesting focal points within the outdoor space. Fragrant gardens, bird feeders, garden ornaments, weather vanes, and flower gardens provide diversion, destination goals, relief from the interior environment, and motivate residents to go outdoors.



**Figure 3.2** Wayfinding features at the Joel Schnaper Memorial Garden, New York, New York, United States

### **3.3 Pediatrics (Robin C. Moore)**

Robin C. Moore is a Professor in the Department of Landscape Architecture at North Carolina State University. Moore has studied children in healthcare facilities and has provided design recommendations for healing garden features in a general hospital for children.

Moore contends that gardening, working, and playing with plants provides constant opportunities for children to participate in the processes of life (Moore, *Healing Gardens for Children* 323-384; Moore and Wong, *Natural Learning*). The following list of guiding principles and design considerations and features were developed by Moore (*Healing Gardens for Children* 323-384)

---

<sup>14</sup> "Wayfinding refers to what people see, what they think about and what they do to find their way from one place to another. Wayfinding systems are the assistive mechanisms for persons to find their way from one place to another; these may be signs, arrows or other environmental methods including person to person assistance" (Brawley 294).

as an outcome of a number of hospital garden case studies<sup>15</sup> undertaken to elicit design themes supporting positive health outcomes and contributing to a restorative experience.

- ◆ The garden should provide a myriad of opportunities for children to engage with nature through hands-on activities that heighten the senses. Natural elements, i.e., a diverse plant palette that changes with the seasons, producing fruit and flowers can provide many activity opportunities for children. Given an appropriately designed space, a horticultural therapist can facilitate well-being through such child-nature interactions as helping children to plant seeds and harvest flowers as well as to gather pussy willows and budding forsythia branches to bring indoors. Playing in and with water is a memorable childhood experience and can be a symbolic source of life in a healing garden (Moore and Wong, *Natural Learning*). Natural habitats, including water, attract fauna such as birds and butterflies and can provide an additional source of discovery and fascination for children in a healing garden.
- ◆ Children's hospitals accommodate a range of patients with a variety of illness and disorders. A garden in a children's hospital needs to support the restorative needs of this diverse patient population.
- ◆ Children recovering from surgery or a severe illness may seek rest in the garden while children with developmental disabilities, for example, benefit from the challenges an outdoor setting can provide (Moore, *Healing Gardens for Children* 378). Opportunities for hands-on activity in the garden can provide opportunities for manipulative play.
- ◆ Children's gardens can benefit from an artist's participation during the design and programming phase. The Leichtag Family Healing Garden exemplifies the contribution artistry can make to enrich a garden.

The pediatric patients' symptoms at a general hospital are diverse, and include but are not limited to pain, nausea, stress, emotional and developmental disorders. Children's hospitals often care

---

<sup>15</sup> Moore studied a number of American healthcare facilities for children including: the Therapeutic Garden at the Institute for Child and Adolescent Development, Wellesley, Massachusetts; the Garden Court and Garden Play Program at Children's Memorial Center, Chicago, Illinois; the Prouty Terrace and Garden, Children's Hospital, Boston, Massachusetts; the Leichtag Family Healing Garden, Children's Hospital and Health Center, San Diego, California; as well as the Gardens at Lucas Gardens School, Canada Bay, New South Wales, Australia; (Moore, *Healing Gardens for Children* 323-384).

for temporary and long-term resident children receiving medical services from a variety of departments including postoperative, oncology, psychiatric, and developmental impairments. Healing gardens in children's hospitals should therefore accommodate a wide range of patient needs.

Moore developed the following design responses for children's healing gardens based on a number of case studies:

- ◆ **Site Planning:** The garden's orientation is important as lush plantings are a key component of healing gardens and plants need sunlight to grow. The human comfort of the space benefits from protection from prevailing winds and the warmth of the sun throughout the year in northern climates. Conserving natural site features (mature trees, water, rock outcroppings) can enhance the potential therapeutic benefit of the garden. As easy access to the garden is critical, site selection needs to ensure minimal topographical variation from the interior to the exterior of the hospital as well as throughout the garden.
- ◆ **Location:** The garden should be located as close as possible to patient rooms and playrooms. Patient rooms should overlook the garden, enhancing the link between indoor and outdoor environments. Gardens visible from the facility entrance or dining area tend to attract more visitors.
- ◆ **Security:** A children's garden should be contained, preventing children from exiting and inaccessible from any public areas surrounding the exterior of the hospital.
- ◆ **Microclimate:** Shelter from wind and the intense summer sun is desirable. Exposure to the sun in the spring, fall and winter is desirable in temperate climates. Filtered sun through deciduous trees can provide shade in the summer and access to sunlight through the cooler months. Overhead shelter from rain (e.g. a translucent, ultraviolet light-resistant fabric) over part of the activity space can increase the use of the garden.
- ◆ **Entering and Exiting:** Entrances need to be welcoming to children. This may be accomplished with topiary animals, bright colours, playful water features, and child-friendly sculptures.
- ◆ **Accessibility/usability/wayfinding:** The garden must be universally designed to accommodate children using wheelchairs, transporters, walkers, cots and gurneys. The height of plantings and features must relate to the height of children using these various means of mobility. For children confined to lying on their backs, consideration should be given to providing visual interest overhead such as tree canopies or kinetic sculptural elements. The safe movement of children with temporary and permanent sight impairments benefits from pathways with strongly defined edges and smooth, even surfaces (e.g. concrete is a suitable surface material as it is smooth can be coloured to enhance wayfinding and reduce glare).
- ◆ **User Group Territories (Children, Adolescents, Parents, Staff, Visitors):** Grieving and highly stressed families need quiet secluded places within the garden, conducive to the restorative experience, whereas adolescent inpatients may be seeking a venue for social interaction in the garden. The design of the garden needs to allow spaces for both these

and other uses simultaneously. Plants that screen and help to define sitting areas are useful and comforting as are areas that provide prospect and refuge.

- ◆ Supervision: A parent or healthcare worker most times accompanies children using the garden so comfortable seating for parents and staff needs to be provided.
- ◆ Attracting Trained Volunteers: Well-designed healing gardens attract and retain volunteers and staff.
- ◆ A Range of High Quality Social Settings: A choice of settings (from public to private) is needed within the garden as the desire for social exchange varies from user to user. If space permits, a place for special events within the garden is useful (see figure 3.3).

In summary, based on the expertise of several design professionals and academic researchers, this chapter draws from the literature the features of healing gardens identified as desirable for all-patient populations, children, patients with dementia and Alzheimer's Disease, as well as healthcare facility staff and visitors. These design features are generalized and, while not site specific, they do provide an insight into the basic features of healing gardens that appear to benefit the quality of life, well-being and healing process of patients, staff and visitors.

The documented work of the individuals reviewed in this chapter, illustrates the need to consider the particularities of the patients' disease or illness as well as the symptoms of its progression when considering design features for a healing garden. The following chapter reviews the application of the design features noted above in two case study healing gardens as described in the literature for children and AIDS patients.



**Figure 3.3** The garden is a place where family and friends can visit loved ones

## CHAPTER 4 - Healing Gardens for Special Patient Populations

The design of the following two healing gardens for children and AIDS patients, respectively, are presented and discussed in terms of their guiding principles and design features as I was able to extrapolate from the literature.

Leichtag Family Healing Garden, San Diego, California, United States (Topher Delaney)

Joel Schnaper Memorial Garden, Manhattan, New York. United States (David Kamp)

### 4.1 Leichtag Family Healing Garden, San Diego, California<sup>16</sup> (Children)

Topher Delaney<sup>17</sup>, an American landscape architect, designed the Leichtag Family Healing Garden at Children's Hospital and Health Center in San Diego, California, United States. The Children's Hospital and Health Center cares for hospitalized and outpatient children from birth through adolescence; two-thirds of the patients are under four years old. The Children's Hospital accommodates over 200,000 inpatient and outpatient visits annually with the Cancer Care Center treating four hundred children each year.

Completed in July 1997, the Leichtag Family Healing Garden has replaced a four thousand square foot parking lot. The guiding principles for the creation of the garden included: providing an escape for families, patients, and staff from the stressful environment inside the hospital; restoring hope and energy; reducing stress; and increasing consumer satisfaction.

The concept of the Leichtag Family Healing Garden is to nourish the physical, emotional, mental and spiritual needs of children, their families and the hospital staff through a healing environment. The garden is to be a place for the entire family, a refuge for them to get away

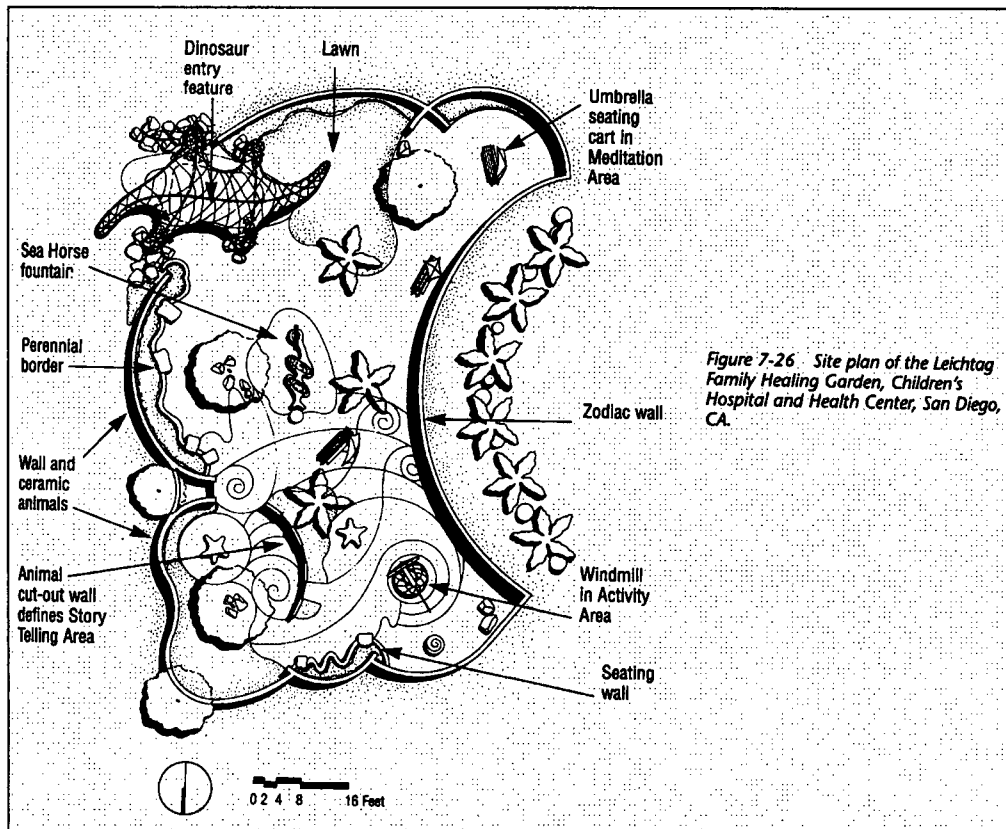
---

<sup>16</sup> The Leichtag Family Healing Garden at Children's Hospital and Health Center, San Diego, California, United States is listed as an exemplary facility by The Center For Health Design, Pleasant Hill, California, United States. Founded in 1988, the Center for Health Design is a non-profit, non-membership organization that is working to make people's lives better by demonstrating that using evidence-based design in hospitals and healthcare facilities can improve the quality of healthcare. <<http://www.healthdesign.org/stories.html>>

<sup>17</sup> Topher Delaney is a San Francisco landscape architect and cancer survivor. Since her breast cancer treatment experience "in a grim hospital setting," she has been on a mission designing healing gardens for hospitals (American Cancer Society 2002).



from the stress of the high-tech environment of the hospital. The goal is for garden users to feel strengthened and renewed by visiting the garden; the theme of nature and art is intended to engender a feeling of peace. The design includes representations of the sky, earth, ocean and plants as well as all kinds of animals, symbolizing the beauty and hope of life (see figure 4.1).



**Figure 4.1 Plan of Leichtag Family Garden**

The Children's Hospital Healing Environment Steering Committee articulated the following definition to guide the development of the Leichtag Family Healing Garden as part of their healing environment program:

The Healing Environment is a term used to describe the physical and cultural atmosphere created to support families through hospitalization, medical visits, healing and bereavement. Guiding the Healing Environment is a philosophy of caring; that is, the desire to develop a space that engenders feelings of peace,

hope, upliftment, joy, reflection, and solace and one which provides opportunities for relaxation, enrichment, spiritual connection, humor, and play. Motivating this philosophy is the belief, which is supported by research, that these factors play a considerable role in the physical, emotional, and spiritual healing process. The goal of the Healing Environment is to transform the hospital setting into a place that addresses the human spirit and supports families to positively cope with and transcend illness. The cornerstones of the Healing Environment are building design, the arts, family support, and staff attitudes. Physical components of the Healing Environment are the interior and exterior building designs, gardens, family spaces, and the art collection. Programmatic components of the Healing Environment are the arts and culture programs -- musical performances, storytelling, artists-in-residence, and the like. Equally important to the Healing Environment are the ways in which we support and treat our families -- customer service, family-centered care, and the Golden Rule of compassion and consideration.

(Whitehouse 303-304)

The Leichtag Family Healing Garden<sup>18</sup> is an example of a healing garden typology described by Moore (*Healing Gardens for Children* 323-384) as an 'informal, strolling garden,' focusing on "de-stressing, exploration, restoration, meditation, prayer, and relaxation (for children, parents, siblings and staff)." The design features of this type of garden accommodate walking, privacy, sitting, socializing, and sensory interest (colour, texture, fragrance, butterflies fluttering, birdsong) (Moore, *Healing Gardens for Children* 335).

The symptoms experienced by the pediatric patients at the Children's Hospital are diverse, and include but are not limited to pain, nausea, stress, emotional and developmental disorders. Hospitalized children need outdoor play opportunities for "play leadership" and links between the indoors and outdoors (Moore, *Healing Gardens for Children* 327). A study conducted by Paine and Francis in 1990 observed the needs of children (as patients and visitors) in three hospitals, indicating that children need outdoor environments supporting creative, imaginative, and physical play (see figure 4.2).

---

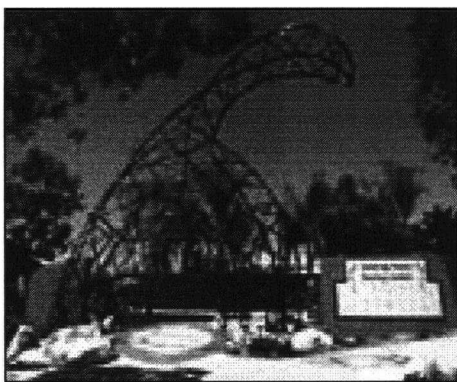
<sup>18</sup> The Leichtag Family Healing Garden was selected to review in detail as it is listed as an exemplary facility by The Center For Health Design in California, United States and identified as an example of best practice in children's healing gardens for its type by Robin C. Moore (1999), Professor, Department of Landscape Architecture, North Carolina State University, Raleigh, North Carolina USA.



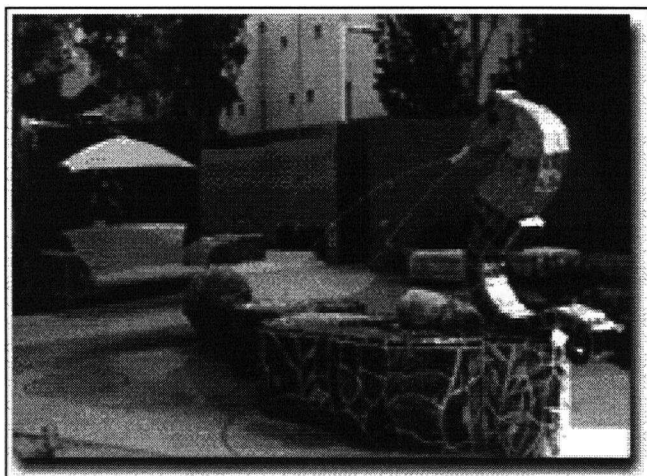
**Figure 4.2** Play element for children  
at Leichtag Family Healing Garden

The following are the design features of the Leichtag Family Healing Garden:

- ◆ A steel-framed brontosaurus named, “Sam,” standing forty feet in height. Sam’s bowed head peeks into the second floor windows of the surgery recovery area, (see figure 4.3). Covered in purple trumpet vines and soft night lighting, Sam is the garden’s focal point.
- ◆ A sea-horse fountain sculpted with blue-green ceramic tiles including murals of fish swimming through seaweed. The soothing sound of the fountain can be heard throughout most of the garden (see figure 4.4).



**Figure 4.3** Leichtag Family Healing Garden  
Brontosaurus Sculpture



**Figure 4.4 Sea-horse fountain at Leichtag Family Garden**

- ◆ Mauve constellation wall with colourful stained glass disks representing the zodiac.
- ◆ A fourteen foot tall windmill with rainbow coloured blades and metal birds that “fly” within the structure.
- ◆ A multi-coloured semi-circular “shadow wall” of cutouts of animals. As the sun moves across the sky, the animal shadows lengthen. Children, engaging their imagination, can touch the cutouts.
- ◆ Flowers and plants in the garden were selected for their fragrance, medicinal properties, and to attract butterflies and hummingbirds. The garden’s lavender flowers are cut by parents for their children’s room and the geraniums give the scent of lemon, mint and chocolate.
- ◆ Deciduous trees provide shade and a sense of enclosure.
- ◆ A sense of enclosure and child-scale outdoor rooms were further created by providing curvilinear, brightly-painted walls four to seven feet high around the garden - creating niches of privacy.
- ◆ Colourful six foot long benches are large enough to hold a family of five and are covered by giant shade umbrellas. The benches can be wheeled to privacy or grouped.
- ◆ The ground plane consists of grass and rings of coloured concrete in shades of teal, green and blue - intended to resemble the ocean.
- ◆ Sensory stimulating elements include: the sound of a splashing fountain, shadows cast on walls, whimsical features, textures of palm trees and bird of paradise plants, bright colours.

Table 1 below quantifies the features of the garden most enjoyed by garden users (Whitehouse et al. *Evaluating a Children's Hospital Garden Environment* 307).

**Table 1**  
**Leichtag Family Healing Garden Evaluation**  
**Features of Garden Most Enjoyed by Garden Users**

	Adults	Children
Feature	Percent reporting*	Percent reporting*
Fountain – sound of running water	33	83
Bright colours	25	17
Being outside in a garden	23	33
Flowers, trees, plants, greenery	19	33
Artwork (windmill, shadow wall, constellation wall, dinosaur, animal tiles)	14	83
Fresh air, sunshine, breezes	12	-
Sense of enclosure provided by the walls	12	-
Multi-sensory stimulation	8	-

\* Many participants mentioned more than one aspect of the garden as helpful.

Table 1 above and the following information is the result of a Post-Occupancy Evaluation (POE) conducted and published by Whitehouse et al (301-314).<sup>19</sup> The POE is based on behavioral observations, surveys and interviews. The garden users interviewed were asked how they used the garden, what improvements they could suggest and whether or not the garden had any impact on their mood. The following is a list of the comments received from the garden users:

- ◆ The garden is perceived as a place of restoration and healing.
- ◆ The garden is not used as often or as effectively as intended. Eighty percent of the family members throughout the hospital did not know the garden existed. Several nurses suggested that there needed to be more staff to take patients out to the garden and that there was insufficient time to direct families to the garden. "Most of the children

<sup>19</sup> Sandra Whitehouse PhD, Center for Child Health Outcomes at Children's Hospital and Health Center, San Diego, California, United States.

observed were healthy siblings of the patients, or outpatients,” (Whitehouse et al 310). The results suggest that use of the garden needs to be encouraged by educating patients, families, and staff about its location and benefits.

- ◆ Use of the garden is accompanied by an increase in patient and user satisfaction.
- ◆ Users suggested more interactive play opportunities for active children (i.e. patients, siblings and visitors).
- ◆ Adult family members of the patients relaxed and visited while their children played in the garden.
- ◆ Staff get together to spend their lunch and coffee breaks in the garden or they sit alone and read.
- ◆ The garden is the setting for many special events ceremonies.
- ◆ One garden user stated “this is a better place to wait than the waiting room, we couldn’t stand being in there, wondering if she’d make it. This is quiet and peaceful, the greenery, the colourful flowers, the sound of water” (Whitehouse et al 306).
- ◆ Ninety percent of the survey respondents reported a positive change in mood after visiting the garden (Whitehouse et al 310).
- ◆ Mood changes were attributed to the following combinations of garden features: “being outdoors in an enclosed natural space, hearing the sounds of running water, seeing the trees, plants and flowers; and enjoying the colours and artwork” (Whitehouse et al 306).
- ◆ The most occupied areas of the garden are the covered benches. The grass areas had no benches and were only used occasionally.
- ◆ Eighty percent of the garden users reported that the garden increased their overall satisfaction with the hospital.
- ◆ Garden users reported that they used the garden to relax and rest, to get away from the stressful environment inside the hospital, to enjoy it and be engaged by it, to help them cope with worries (Whitehouse et al 306).
- ◆ Fifty percent of the adult garden users recommended that the garden include more “trees, vegetation, and greenery.”
- ◆ Staff working directly with emotionally disturbed children and bereaved families suggested that the garden needed privacy and refuge. Staff suggested there is a need to improve wheelchair access for more fragile patients and include intravenous electrical outlets (for those that have recently had surgery or are receiving chemotherapy).
- ◆ Children said they would like more things to do in the garden. More opportunities for manipulative play (such as digging in the sand, moving and piling up blocks and rocks) could engage children for longer periods of time.
- ◆ Jayne Hamlet, case manager and hematology oncology nurse in the cancer care center, claims the garden aids treatment as elements in the garden generate storytelling opportunities which gently distracts<sup>20</sup> the patients helping them to relax and alleviate their pain without medication.

---

<sup>20</sup> An article by William H. Redd, PhD (professor in the program for cancer prevention and control at the Mount Sinai School of Medicine) suggests that tactics such as storytelling, guided imagery, and relaxation can mitigate the side effects of cancer treatment and that these “behavioral interventions” are effective at reducing anxiety, some types of nausea, and even pain.

<<http://www.cancer.org/common/images/shim.gif>\*>. Apr. 2004.

Whitehouse et al, concluded that future research could specifically investigate the needs and preference of hospitalized children, particularly those of children with severe developmental disabilities and chronic health conditions. While eighty percent of the hospitalized children in their study were not aware the healing garden existed, most expressed a strong interest to go there.

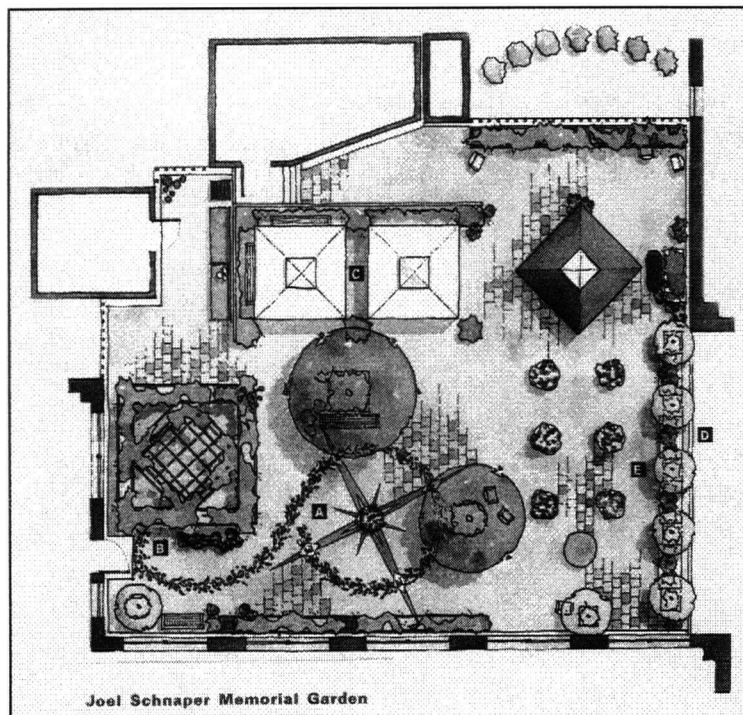
#### **4.2 Joel Schnaper Memorial Garden, Manhattan, New York (AIDS Patients)**

David Kamp<sup>21</sup> is an internationally recognized and award-winning American landscape architect and the founding principal of Dirtworks, P.C. Kamp's work focuses on enhancing the restorative quality of the natural environment.

Joel Schnaper Memorial Garden is located in the Terence Cardinal Cooke Health Center, in Manhattan, New York, United States. Completed nearly twenty years ago, the garden is three thousand square foot and located on the rooftop adjacent to the AIDS unit. The Center cares for one hundred and fifty-six terminally ill patients with HIV and AIDS (see figure 4.5).

---

<sup>21</sup> David Kamp was a contributing member of the steering committee that developed Green Guidelines for Healthcare Construction, a tool for evaluating the health and sustainability of building design, construction, maintenance and operation for the healthcare industry. In 1996, Kamp co-founded Meristem, Inc. an educational not-for-profit organization dedicated to promoting nature's role in the improvement of health and well-being.



**Figure 4.5 Plan of Joel Schnaper Memorial Garden**

#### Guiding Principles:

- ◆ Provide patients with a therapeutic outdoor environment.
- ◆ Provide patients with an opportunity to “experience a sense of nurturing and a connection with nature” (McCormick 62).
- ◆ Provide patients with an opportunity to gain a sense of control and independence, thus reversing the pattern of being cared for, by caring for something else.
- ◆ Provide patients with a distraction from plaguing physical and emotional concerns, thus increasing their sense of well-being.
- ◆ Stimulate the senses by developing a garden rich with desirable multisensory experiences.
- ◆ Respond to the physical and emotional needs of the residents.
- ◆ Ensure opportunities for residents to experience a sense of independence and control.
- ◆ Provide opportunities for residents to contribute positively to their surroundings and experience the restorative benefits of the garden and gardening.
- ◆ Many complex symptoms typify the HIV and AIDS illness (e.g. varying abilities from one day to the next) and patients are often overwhelmed with a sense of individual crisis and feelings of vulnerability. Typically, patients with HIV and AIDS experience the following symptoms during their illness: varying degrees of strength and stamina; limited sensory functioning; sunlight sensitivity due to drug treatment; diminished level of environmental awareness; diminished orientation abilities. A Healing Garden for this



patient population will need to include: universally designed<sup>22</sup> flexible spaces for social interaction, privacy, activity and contemplation (see figure 4.6).

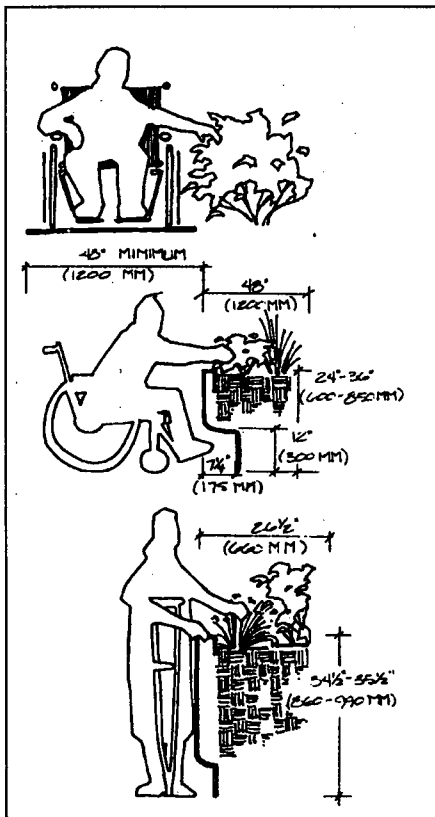


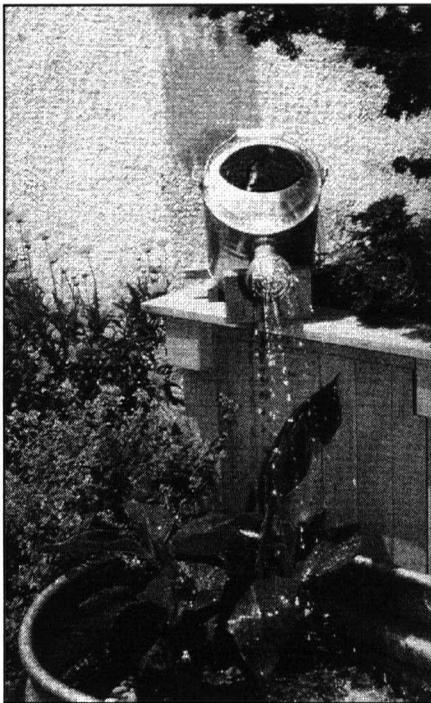
Figure 4.6 Universal design guidelines

The desire to create a garden to elicit a variety of sensory responses was realized within the space constraints of the Joel Schnaper Memorial Garden by ensuring the garden elements played a multi-functional role. Several of the key design features and a description of their role and function follow:

- ◆ Plants - with varying colours and textures of the plant palette are intended to inspire a tactile response from patients in the garden and to provide beauty and a pleasant view when residents are only able to experience the garden through the window of their room. The leaf textures include: soft, rough, hairy, smooth and silky.

<sup>22</sup> Universal design is environmental design intended to be useable by all people to the greatest extent possible. "The goal of universal design is to create a product, place, or service that can be used by the widest possible range of individuals. It is intended to be inclusive and not exclusive," (Covington & Hannah 1996: three cited in Mooney, Mount Pleasant Wellness Walkways). In a hospital setting outdoor spaces need to be designed for people with a wide range of abilities including children, the elderly, people using wheelchairs, walkers and intravenous trollies, and people with limited vision.

- ◆ Orientation and wayfinding cues include running water and wind chimes providing sound to assist patients needing reference points. A compass stencil and brightly coloured pots of flowers, while adding beauty to the garden, also act as an orientation devices (see figure 4.7).
- ◆ Kinetic wind sculpture provides a distraction and a conversation piece.
- ◆ Birds and butterflies are attracted to specifically selected plant material; small pets provide distraction and amusement for residents and their visitors.
- ◆ Planter size and location selected to ensure residents can comfortably tend plants (see figure 4.8).
- ◆ A number of outdoor rooms within the garden offer a range of microclimates and intimacy levels, accommodating individual choice and varying preferences depending on the time of day, weather conditions, and the mood of the resident and their visitors.
- ◆ Overhead trellises covered in vines and canvas awnings soften the effects of sunshine (ensuring shade and cooler temperatures) while providing a sense of enclosure and intimacy thus accommodating residents wishing to recoil into a comfortable secluded corner to meet privately with friends and relatives (see figure 4.9).



**Figure 4.7 Sound of water provides sensory stimulation and wayfinding clues**



**Figure 4.8 Planter height suitable for tending by patients**

Universal design guidelines were adopted during the planning phase to accommodate independent movement throughout the garden.



**Figure 4.9 Overhead trellis provides shade on rooftop in Joel Schnaper Memorial Garden**

Design Features of the Joel Schnaper Memorial Garden

### Design Features of the Joel Schnaper Memorial Garden

- ◆ The Joel Schnaper Memorial Garden acts as the center for the hospital's horticulture therapy program and provides a place for patients, families, and staff to gather, visit, recreate, celebrate and meditate.
- ◆ The garden is a key component of residents' daily therapy.
- ◆ Sufficiently flexible to permit special events to be held in the garden.
- ◆ Facilitates daily physical care of the garden by residents.
- ◆ Permits ease of movement throughout the space.
- ◆ Contains a number of garden features, accomplishing the designer's wish to create a multi-sensory garden.
- ◆ Those who know the garden believe the fragrant plants, delightful sounds and cheerful colours help to elevate the patients' spirits and increase their sense of well-being (see figure 4.10).
- ◆ The hospital's vice-president for operation and nursing facility administration, Peter Karow, notes that "the garden has been received fantastically," describing it as a "morale booster for both patients and staff" (McCormick 62).
- ◆ The centre's director of therapeutic recreation, Mimi Fierle, claims "nurturing this garden has increased the patients' self-esteem and well-being; people have the chance to see the ebb and flow of nature and that has a very calming effect" (McCormick 62).
- ◆ Barbara Crisp, faculty associate in the School of Architecture at Arizona State University and author of Human Spaces, suggests that "the design for the Joel Schnaper Memorial Garden responds to the human heart and stimulates the senses, creating a life-enhancing experience for all who visit. The project reflects the cycles of life, offering a symbolic sense of hope" (182).
- ◆ Nancy Chambers, horticultural therapist at the Rusk Institute of Rehabilitation Medicine in New York City, considers the Joel Schnaper Memorial Garden an AIDS-care model.
- ◆ The garden has inspired the initiation of other gardens in the Terence Cardinal Cooke Health Care Centre.

In summary, the guiding principles and design features presented in this chapter represent a patient-centred approach to the design of healing gardens in healthcare facilities. These design features were extrapolated from multiple sources including surveys, direct observation, user group feedback, scientific studies, designers, hospital administrators and patients. The features of a healing garden common to both patient populations of the Leichtag Family Healing Garden and the Joel Schnaper Memorial Garden were greenery, sensory stimulation, fresh air, sunlight, beauty and views to nature from patient rooms. These basic and essential features of a healing garden are noted and referenced throughout the literature.

The following chapter synthesizes, in the form of a matrix, the experience and findings of the designers and researchers presented in this and the previous chapter to help guide the programming and design of a healing garden suitable for a particular patient population in a healthcare facility.



**Figure 4.10** Bright flowers, wayfinding elements and a visual connection from the patients' rooms to the garden at the Joel Schnaper Memorial Garden

## **CHAPTER 5 - Linking Healing Garden Design Features, Restorative Value, and Healthcare Facility Populations**

In this concluding chapter I have attempted to synthesize the material presented in the preceding chapters by collating the most general and consistently referenced design features of healing gardens in healthcare facilities and by assigning a relative value to each. This synthesis takes the form of a matrix and suggests a restorative value for each design feature listed -- dependent upon the healthcare facility population type.

I have used four rating categories for restorative value: essential, high, medium and low importance/benefit. Although somewhat subjective, I have attempted to apply the ratings as I interpret, to the extent possible, the importance inferred by the authors from the case studies, post-occupancy evaluations, and research material presented in the preceding chapters.

The Healing Garden Matrix following illustrates the varying degrees to which a number of healing garden design features benefit or are important to the various patient populations and user groups identified. The matrix demonstrates that the essential features of healing gardens common to all garden users are: beauty, sensory stimulation, lush greenery and deciduous trees, fresh air, sunlight, and views from patient rooms to nature. (See Table 2.)

The matrix may be useful in determining priorities in the design process, particularly for facilities and healing gardens with either size or budget constraints. While the matrix is not an exhaustive list of design features for healing gardens in healthcare facilities, it could be a tool that could be expanded upon in the future.

## 5.1 Healing Garden Matrix

**Table 2 Matrix of Restorative Value of Design Features versus Healthcare Facility Population**

**Legend:**

E=essential; H=high importance/benefit; M=moderate importance/benefit; L=low importance/benefit

Healing Garden Features	Special Patient Population	Dementia/ Alzheimer's	Children	Terminal /AIDS	Visitors/ Staff
<b>EXPERIENTIAL FEATURES</b>					
Water (i.e. moving water, fish ponds, bird baths)	L	H	H	H	H
Aesthetically pleasing/beauty	E	E	E	E	E
Stimulates the senses	E	E	E	E	E
Plants and flowers attracting birds and butterflies	M	H	H	H	H
and flowers with a variety of colours and textures	H	H	H	H	H
Plants and flowers with seasonal variation	H	H	H	H	M
Plants and flowers with fragrance	H	H	H	H	H
Lush greenery and deciduous trees	E	E	E	E	E
Fresh air	E	E	E	E	E
Sunlight	E	E	E	E	E
Shade	E	M	M	M	M
Peaceful and calm	E	M	E	H	H
Soothing sounds	H	M	H	H	H
Sense of enclosure (prospect/refuge)	H	H	H	H	H
Elements that stimulate long-term memory (i.e. clothes line and old fashion/style plants)	H	L	M	L	L
Small animals (i.e. kittens and rabbits)	M	H	H	M	M
Art	M	H	M	M	M
<b>FUNCTIONAL FEATURES</b>					
Safe	E	E	E	E	E
Unimpeded access/carefully designed ramps	H	H	H	H	H
Meets universal design standards	H	H	H	H	H
Suitable for horticulture therapy programs	H	H	H	L	L
Adequate, moveable, comfortable sitting and eating areas	H	M	H	H	H
Privacy within the garden	M	M	E	E	E
Flexibility of seating locations	H	M	H	H	H
Places for quiet contemplation	M	L	H	H	H
Places supporting social interaction	H	H	H	M	M
Non-glare surfaces	H	M	H	L	L
Planters of various heights and vertical planting elements	E	M	E	L	L
Non-slip walking surfaces	H	H	H	M	M
Mitigates climate (provides shade and wind protection)	H	H	H	H	H
Pathways wide enough for 2 wheelchairs side by side	E	E	E	E	E
Distinct from indoor environment	H	H	H	H	H
Play opportunities	L	E	L	M	M
Focal point/landmarks within the garden	H	H	H	M	M
Drinking fountain	L	M	M	M	M
Smooth pathway surfaces	H	H	H	M	M
Enclosure/Security	E	E	L	L	L

Smooth ground plane transition from indoors to outdoors	H	H	H	M
Lighting (i.e. inside a gazebo)	H	M	H	H
Continuous looping pathways	E	M	M	L
Wayfinding and orientation devices	E	L	H	L
Nontoxic plants	E	E	L	L
Shelter from rain	H	H	H	H
Handrails along pathways	H	L	M	L
<b>CONTEXTUAL FEATURES</b>				
Visible from facility entrance	L	M	L	H
Views from patient rooms to garden	E	E	E	H
Suitability of rooftop space	L	L	H	H
Privacy from interior of hospital	L	L	H	H
Close proximity to patient rooms or dining areas	M	H	H	H
Microclimate supporting maximum year round comfort	H	H	H	H
Easily supervised from nursing station	E	H	M	L
Close proximity to restrooms	H	H	H	M

## 5.2 Synthesis

The Healing Garden Matrix is intended to stimulate discussion and awareness during the preliminary healthcare facility program development about the value of incorporating a healing garden into the facility's program and an understanding that the program requirements of the garden could vary depending on the patient population. The matrix could be used as a checklist of pre-design considerations to help establish priorities and, as such, begin to inform the initial design processes from which site and client-specific programming and considerations could develop.

The following two local and contemporary examples, Mount Saint Joseph's Hospital and St. Paul's Hospital, both in Vancouver, British Columbia, Canada will be used as test studies for the use of the matrix.<sup>23</sup> It is hoped that this exercise will help illuminate the potential of the matrix to guide and inform the preliminary programming phase of a healthcare facility development project, as well as highlight any limitations to its use.

Mount Saint Joseph Hospital on Kingsway at Prince Edward Street is a community hospital with a multi-cultural approach to service delivery, clinical programs, and community services. Mount Saint Joseph's Hospital is a two hundred and thirteen bed acute and extended care

<sup>23</sup> Information regarding Mount Saint Joseph's Hospital and Dr. Peter Day Center and Residence at St. Paul's Hospital obtains from their websites: <<http://www.providencehealthcare.org/patient/mtstjoesp.htm>> and <<http://www.drpeter.org/>>, respectively.



facility whose residents have a range of mobility and health restrictions. The hospital has undergone four additions since it was founded in 1946, the most recent of which was the addition of a fourth floor for the pediatric unit in 1991.

Mount Saint Joseph's Hospital exemplifies facility programming that did not adequately address the needs of patients, staff and visitors to have contact with nature in an outdoor setting. The program for Mount St. Joseph's Hospital allowed for a small outdoor seating area for the facility's patients, staff, and visitors, however, the success of the area was severely compromised by a number of physical factors. I will demonstrate that had the Healing Garden Matrix been referred to at the outset of the program development, the current site of the outdoor seating area would not have been selected.

An outdoor space for a garden was not considered in the original facility program at Mount Saint Joseph's Hospital. As a result, only left over spaces around the outside of the building remained for the facility's population wishing to go outside. The administration subsequently installed a gazebo in an attempt to address the desire of patients and staff to have a comfortable place on the hospital site to be outdoors. It appears that the architectural design of the hospital had not addressed the possibility of an outdoor seating area as being important in the healing process and the potential for the seating area to be located with a southern exposure was negated by the presence of the physical plant on the building's sunny south side. This left only a small area on the north side of the four-storey building adjacent to a parking lot and a major traffic arterial route, as a possible site for access to the outdoors. However, the traffic noise and lack of sunlight, needed for both plant growth and human comfort, meant that this space was rarely occupied. As a consequence, the hospital staff, patients, and visitors were required to leave the hospital site in order to find a quiet place to sit outdoors comfortably and reconnect with the natural environment.

The failure of the architectural design of this healthcare facility to provide outdoor space to satisfy the therapeutic needs of the hospital population resulted in the hospital administration requesting that the City of Vancouver make changes to the streetscape between Mount Saint Joseph's Hospital and Main Street. To explore and accommodate the need for the patients at

Mount Saint Joseph's Hospital to have exposure to a therapeutic milieu to practice essential life skills in a safe, challenging and realistic environment, the City of Vancouver commissioned the Mount Pleasant Wellness Walkway Design Study in 1999.<sup>24</sup>

One of the goals of the Wellness Walkway was to identify design solutions to accommodate a barrier-free connection between the hospital and the shopping area of Main Street. Since the implementation of the Wellness Walkway Street improvements, negotiating the four blocks to the shops on Main Street from the hospital has enabled the patients to practice and prepare for "returning home" in a safe and comfortable environment. The Wellness Walkway also provides opportunities for the hospital population to come in contact with plants with scent, color and a variety of textures.

As many of the patients at Mount Saint Joseph's Hospital suffer from arthritis and are recovering from strokes and other physically debilitating conditions, a program of rehabilitation and therapy is part of their daily care regime. The design provisions of the Wellness Walkway made it possible for patients, often with the help of staff or visitors, to increase their physical mobility through the exercise of walking outdoors, and down the street to the shopping area on Main Street. (Mooney and Luymes 1-21)

The Mount Pleasant Wellness Walkway Design Study recommended that the existing city sidewalks be widened and upgraded, smoothing the surface treatment to minimize any unevenness and bumps that would result in physical discomfort and excess noise, which could make it difficult to carry on a conversation as patients move along the route with their walkers and wheelchairs. Specially designed benches were located at intervals considered appropriate for individuals needing to take a rest on route, between the hospital and the shops. The boulevard was planted with flowers, shrubs, and trees intended to stimulate the senses and a public park at the midway point of the walkway provides a comfortable place for family and friends of the patients to visit quietly in a natural setting.

---

<sup>24</sup> Based on interview with Alan Duncan, City of Vancouver Planner. May 2nd, 2004.

The Mount Saint Joseph's Hospital example illustrates that when patients' needs and their requirement for an outdoor space as a setting for rehabilitation, sensory stimulation and social exchange is not considered in the initial facility programming and design phase, the ability of the healthcare facility to provide a future venue for the healing process is compromised. In this instance the patient's needs were addressed in the public realm on the Wellness Walkway.

The Healing Garden Matrix identifies a number of essential garden features for every patient population group as well as visitors and staff. The unsuccessful result of siting the existing outdoor gazebo at Mount Saint Joseph's Hospital would have been easy to predict had the matrix been reviewed during the pre-design phase.

Further, if the features listed on the Healing Garden Matrix as *essential* were applied during consideration of the program requirements for this facility, the designers would have been aware of, for example, the need for *sunlight and a microclimate supporting year round comfort*. The existing north facing outdoor space does not provide the essential light requirements to foster the *lush growth of plants* or the warmth of a *microclimate supporting maximum year round comfort*.

Secondly, if the experiential features *peaceful and calm* and *fresh air* had been considered as essential in benefiting patients (as noted on the matrix), the current Gazebo location adjacent to a busy and noisy road would have been considered inappropriate for a healing garden. The inability of the current Gazebo site to provide for the four features mentioned above would have eliminated this location as a suitable site for a healing garden. At a minimum, all the features identified as *essential* on the matrix (e.g. sunlight, fresh air and lush greenery) need to be accommodated when considering the program for a healing garden.

As Mount Saint Joseph's Hospital accommodates a variety of patient groups, including long-term-residential, pediatrics, and acute care patients, reference to the matrix would highlight that there are some features of the healing garden which are considered essential for one patient group but not for another.

An example of a feature that is essential for one patient group but rated as moderate for another is *continuous looping pathways*. This feature is considered essential for patients suffering from dementia, as dead ends often trigger confusion and aggressive behavior in patients with this illness. Children, however, may have no adverse reactions to a path that ends at a sand box, for instance. Conversely, while children's play features are rated as essential for pediatric patients, this feature is not essential in a garden designed for dementia patients. An awareness of the needs of specific patient population groups could lead designers and administrators to consider the inclusion of more than one garden, if space permitted, or at least to accommodate the special needs of particular patient groups within one garden.

To fully appreciate the features listed on the matrix and the rating that has been applied to each feature, it may be necessary for the designer/user to have a general understanding of the various illness symptoms of the healthcare facility populations referenced on the matrix as well as an awareness of the significance of the relationship between human need for contact with nature and healing. Without this background knowledge, a group or individual could, for example, capriciously decide that *sunlight* could be sacrificed for a space adequately large to allow for a greater number of the design features to be incorporated into the garden. For example, in an effort to provide a number of spaces that would allow for *privacy* within the garden and be suitable for *horticulture therapy programs* the programmer may opt to allocate a sizeable space along the north side of the building. As the Mount Saint Joseph's Hospital case exemplifies, the existing space, complete with a private area and room for horticulture therapy, is functionally and experientially unsuitable for a healing garden. Its usefulness is very limited and is not used as intended because of the unsuitable microclimatic temperatures and inability to sustain healthy plant life, both due to a lack of sunlight.

In summary, the matrix is a tool to help prioritize and identify the features that need to be considered in healthcare facility programming to ensure that patients benefit from the healing power of access to nature in an outdoor setting. The specific design elements and their relative size and form have not been articulated in this matrix as the success of a healing garden design is also dependant upon the spatial arrangement and creative insightfulness of a designer and

cannot be collated in a matrix. The matrix simply suggests that there are features of a healing garden for a healthcare facility that are important to consider and incorporate, and that these features may or may not be the same for all the user groups in a specific healthcare facility.

The second contemporary, local example selected to test the matrix is St. Paul's Hospital, located at Burrard and Comox Street in downtown Vancouver. St. Paul's Hospital was founded over one hundred years ago and has undergone eight renovations and additions during this period. Currently, St. Paul's accommodates four hundred and forty-five acute care patients and, besides being a teaching facility and general hospital, is the province's main healthcare facility for the treatment of HIV/AIDS.

The recent addition of the Dr. Peter Day Centre and Residence opened in 2003 is the first sub-acute care facility for HIV/AIDS in Canada. This recent addition to St. Paul's Hospital eases the pressure on the acute care beds in the main hospital as the Dr. Peter Centre offers a day health program and a twenty-four hour assisted-living residence for twenty-four inpatients. The Dr. Peter Centre is located one block off a major traffic route in a quiet residential neighbourhood to the west and rear of the main hospital building. This facility was selected to test the matrix as it exclusively accommodates one of the patient populations referenced on the matrix—AIDS patients.

In imagining that at the preliminary programming phase of this project's development, those charged with writing a terms of reference for the Dr. Peter Centre consulted the Healing Garden Matrix, how would the matrix be utilized? Firstly, the matrix would draw attention to the fact that the healing process for patients with HIV/AIDS is benefited by access to nature both visually, physically, passively, and interactively. The matrix also suggests that AIDS patients would use an outdoor space as both a venue for social interaction and quiet reflection. The matrix highlights that a visual connection from the residents' rooms to natural scenery outdoors is essential. The terms of reference and preliminary program for the facility would therefore acknowledge the requirement of well considered outdoor spaces, suitably sited to accommodate

the symptoms of the illness and the patients' healing process, as well as the need for an outdoor space suitable for a horticulture therapy program.

Secondly, referencing the matrix could confirm the importance of taking advantage of the preexisting site conditions and context, particularly with respect to views from patients' rooms, as the program of the Dr. Peter Centre includes residential suites. Reference to the matrix would highlight that views to nature are an essential feature of a healing environment and a component of the healing process. The existing opportunities for views of nature through the windows of the facility could be realized and the windows could be oriented towards the adjacent park site and long range vistas of the North Shore Mountains.

The view down the back lane of a neighbourhood greenway and community gardens also provides an opportunity to borrow views, providing visual access to nature from the surrounding context of the site. In fact, the current facility has taken advantage of the views of the neighbourhood parks, trees and gardens as well as the distance views to the natural scenery of the North Shore Mountains. The existing centre is four stories in height and includes a terraced balcony with nature views and direct access outdoors from the community dining area. The centre provides one of the *contextual* features rated as *essential* on the Healing Garden Matrix – *views from patients rooms to the garden* as well as two of the features rated as highly beneficial – *close proximity to patient rooms or dining areas* and *suitability of rooftop space* (see figure 5.1).



**Figure 5.1** Example of dining area with views to nature --- St. Michael Rehabilitation Hospital, Texarkana, Arkansas, United States

The new Dr. Peter Centre has a residential non-institutional ambiance. The clinic is on the main floor and is reserved for recreational activities. The second floor accommodates the clinic, counseling centre and library. The top two floors are reserved for the inpatient residents' suites and dining and living areas. The residents' floor benefits from long views out over the neighbouring gardens and to the North Shore Mountains beyond. One of the centre's stated "*Comfort Care*" missions includes "recognizing the broad determinants of health and quality of life, and providing innovative, integrated, flexible, community-based care. An on-site healing garden at this facility would support the goal of enhancing quality of life. As the site itself is limited in terms of space for providing a number of the features listed on the Healing Garden Matrix, fortunately many of the features have been provided in the immediate context of the facility. For example, *continuous looping paths* are rated as moderately important for patients with AIDS and while the facility's site does not accommodate this feature, the lanes and sidewalks around the facility do provide a pleasant, lushly planted green space for the residents and out-patients to benefit from exposure to nature while addressing the physical requirements of their healing process. In addition, while the site constraints make it difficult to provide for *horticulture therapy programs*, which are rated as highly beneficial for patients with AIDS, the community gardens in the adjacent greenway are suitably close for this activity.

Finally, while there is opportunity for privacy inside the facility for the residents and patients to discuss their health and concerns with friends or loved ones, the Healing Garden Matrix suggests that it is *essential* that space be provided in the garden context for this purpose. This may have been accomplished within the space constraints of this site if flexible seating was included on the terraced outdoor patio or if a bench had been provided at grade in a quiet, lushly planted corner of the site. While the architectural design of the Dr. Peter Centre provides well for, and enhances, the quality of life of, the inpatients and out-patients, without the benefit of its rich context in terms of views and access to nearby nature off site, the extent of the existing health benefits would not have been realized.

If a Healing Garden Matrix was referred to at the outset of the Dr. Peter Centre project's programming, the importance of views to nature would have been addressed in the architectural orientation of the facility and large windows to the views of nature would have been considered. As the success of the facility reflects, it appears that the essential features for enhancing quality of life, well-being and promoting healing were considered and implemented on the adjacent public realm during the facility's preliminary programming phase.

Based on the two test studies discussed above, it appears most beneficial that a multi-disciplinary design team consisting of architects, landscape architects, interior designers, hospital administrators, staff and patients participate in the program development of future new, and renovated healthcare facilities. In order for healing gardens to provide maximum benefits to patients, staff, and visitors, appropriate space location and allocation is crucial.



### 5.3 Conclusion

Through the literature review I discovered that up until the turn of the previous century there was considerable support for exposure to outdoor environments, gardens and gardening as part of patient care regimes. As a consequence, the design of healthcare facilities in Western Europe and North America often reflected this approach to patient care. The medieval monasteries, for example, with their cloister gardens filled with therapeutic herbs and sunlight were believed to benefit the healing process and care for the patients needs.

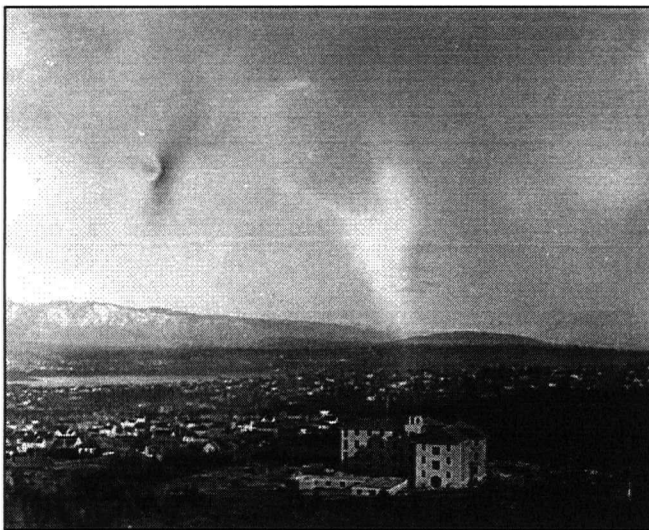
For most of the previous century, however, the program and design of healthcare facilities supported the currently dominant cure-based medical model of illness treatment. As I noted in my preface, apart from the inherent emotional stresses associated with illness and emergency care, modern hospital environments often include unfamiliar technology and apparatus, unusual and unpleasant smells, artificial light, visual disconnection with the outside world, and a lack of privacy and personal control.

In the closing decades of the twentieth century an increasing interest in a holistic approach to patient care that acknowledges a connection between mind, body and spirit began to emerge. This holistic approach to patient care supports the inclusion of healing gardens in healthcare facilities.

While this trend potentially raises a number of questions for environmental designers, I considered the design implications of the following. If space in healthcare facilities is to be programmed for outdoor use, what design features of this setting cares for patients, both psychologically and emotionally while supporting their physiological needs? Further, does the therapeutic benefit and significance of discrete garden features vary depending on the illness and healing processes of particular patient populations and are there any constraints that limit the use of the garden?

To find answers to these questions I began by reviewing Western European historical precedents for gardens in healthcare facilities. While gardens today are most commonly intended to be aesthetically pleasing, specifically designed to please the visual sense, I realized that various cultures throughout history have created gardens to engage and satisfy all the senses. While traditionally gardens have also been created for pragmatic outcomes including sustenance, medicine and climatic mitigation, a common theme that emerged from the literature review was that gardens are created to enhance human well-being.

For example, the siting and design of the typical nineteenth century pavilion hospital ensured views from patient rooms onto a courtyard and beyond to the expansive grounds and surrounding rural and often picturesque landscape. It appears this design approach reflected a belief in the benefit of fresh air, sunlight, and views of nature in promoting recovery (see figure 5.2).



**Figure 5.2 View from Heather Pavilion  
Vancouver General Hospital 1905**

The early photographs of the Heather Pavilion at Vancouver's General Hospital exemplify the described nineteenth century approach to the siting and design of healthcare facilities, while the recent aerial photograph of the same site reflects not only contemporary urban space constraints, but perhaps as well, a lack of appreciation for the significance a connection with nature has on

the hospitalized patients' physical and emotional sense of well-being as well as the beneficial effect that it appears to have on the healing process (see figure 5.3 and 5.4).



**Figure 5.3 Heather Pavilion Vancouver General Hospital 1928**



**Figure 5.4 Aerial Photo of Heather Pavilion  
Vancouver General Hospital 2002**

In reviewing the scientific-based evidence suggesting that nature is beneficial for the healing and recovery process, I noted that over the past thirty years a number of researchers from a variety of disciplines including environmental psychology, behavioural science, horticulture, biology and landscape architecture have documented the restorative benefits of nature. Environmental preference studies conducted in the United States by environmental psychologists Doctors Stephen and Rachel Kaplan reveal that a great diversity of natural settings are beneficial to human well-being. As noted in Chapter Two, the Kaplans define nature as almost any outdoor setting including parks, vacant lots, street trees, open spaces, backyards, fields and forest varying in size from tiny to expansive from highly maintained to virtually neglected. The Kaplans contend that the quintessential microrestorative environment, the one that most closely brings together the multiple themes of the restorative experience into a single, small, intensely meaningful space, is the garden.

By evaluating and synthesizing the documented empirical evidence and anecdotal support for healing gardens in healthcare facilities for three patient groups (children, Alzheimer's Disease and AIDS patients) I compiled a list of the design features consistently referred to as beneficial

to the patients, staff and visitors at the healthcare facilities reviewed. It appeared to me that the design features recommended for each population group fell into one of three categories: functional, experiential, and contextual. Based on comparing and considering the written and design work of the leading experts in this area, I inferred a restorative value or relative benefit for each of the design features listed -- dependant upon the patient group or disease process.

The Healing Garden Matrix above organizes and synthesizes my interpretation of the material extrapolated from the literature review and is a result of exploring the link between the restorative value of design features in a healing garden and specific patient populations. While somewhat subjective, the value I assigned to each design feature listed on the matrix (either as essential, high, moderate or low in terms of benefit and or importance), illustrates variations depending on the population group, which highlights the need for designers to understand the particularities of the patient group and the disease or illness.

The matrix also illustrates a consistency in terms of the essential design features of a healing garden needed for all patient population groups as well as visitors and staff. These essential design features for healing gardens fall mainly in the experiential category and include: lush greenery, fresh air, sunlight, views to nature from patients' rooms, sensory stimulation, and beauty.

I gleaned from this investigative process that even when a disease is deemed incurable, garden fragrances and lush green spaces can evoke pleasant memories and can lend patients the motivation to experience the sensory stimulus of nature, whether alone or with loved ones. Also, that key to effective therapeutic or healing garden design is an appreciation for the relative value or importance of design features, as they relate to the illness or disease process of a specific patient group.

While the Healing Garden Matrix is not an exhaustive list of design features and considerations, it is my hope that it could be used as a check list or to guide the preliminary programming or pre-design stage of a healthcare facility development process. The matrix could also be useful for

those charged with setting out a terms of reference or a call for proposals for a healthcare facility, thereby increasing the awareness of the importance of the healing benefit of access to nature. Further, the matrix is intended to provide an overview of some of the design considerations for a healing garden in order to begin to achieve a successful therapeutic and restorative connection between the healthcare facility population and the outdoor setting.

In addition, by reviewing during the pre-design stage the features listed on the matrix and noting that the relative importance of individual features varies between healthcare facility population groups and diseases, there is an opportunity for the facility's program to be developed at the outset with the intention of providing meaningful outdoor spaces that accommodate the specific needs of the garden users in a setting that can provide another dimension to their therapy regime and healing process.

This exploration demonstrates that visual and physical access to nature can positively affect a patient's spirit, sense of well-being and quality of life -- perhaps even facilitate recovery -- and that restorative and therapeutic healing garden design responds to specific patient limitations while also responding to the disease's process and progression.

## BIBLIOGRAPHY

- Adolph, Val and Brenda Guild Gillespie. The Riverview Lands: Western Canada's First Botanical Garden. Port Moody BC: The Riverview Horticultural Centre Society, 1994.
- Alexander, Christopher, Sara Ishikawa, Murray Silverstein. A Pattern Language: Towns, Buildings, Construction. New York: Oxford University Press, 1977.
- American Cancer Society, Inc. "Healing Gardens Nurture the Spirit While Patients Get Treatment: Cancer Survivor Transforms Hospitals with Nature and Whimsy."  
24 July 2002  
<[http://www.cancer.org/docroot/FPS/content/FPS\\_1\\_Healing\\_Gardens\\_Nurture\\_the\\_Spirit\\_While\\_Patients\\_Get\\_Treatment.asp?SiteArea=>](http://www.cancer.org/docroot/FPS/content/FPS_1_Healing_Gardens_Nurture_the_Spirit_While_Patients_Get_Treatment.asp?SiteArea=>)
- Appleton, Jay, ed. The Aesthetics of Landscape. Oxford: Rural Planning Services Ltd., 1979.
- Ashmun, Barbara Blossom. "Turn Your Garden into a Restful Retreat." Fine Gardening Mar. – Apr. 2000: 80-85.
- Bardwell, L.V. "Nature Around the Corner: Preference and Use of Nearby Natural Areas in the Urban Setting." MLA thesis, University of Michigan, 1985.
- Brawley, Elizabeth C. Designing for Alzheimer's Disease: Strategies for Creating Better Care Environments. New York: Wiley, 1997.
- Burnett, James, D. "Therapeutic Effects of Landscape Architecture." Healthcare Design. Ed. Sara Marberry . New York: John Wiley & Sons, Inc. 1997. 255-274.
- Cawte, J.E. "Flight into the Wilderness as a Psychiatric Syndrome." 30 Psychiatry (1967):149-161.
- Cheng, Julie. Rev. of The Healing Garden, by David Squire. Into the Garden Jan. 2000. 20.
- Cimprich, B.E. "Attentional Fatigue Following Breast Cancer Surgery." Nursing and Health 15.3 (1992): 199-207.
- Cohen, U., and G. Weisman. Holding on to Home: Designing Environments for People with Dementia. Baltimore: Johns Hopkins University Press, 1991.
- Crisp, Barbara. Human Spaces: Life-Enhancing Designs for Healing, Working, and Living. - Massachusetts: Rockport Publishers Inc., 1998.
- Dannenmaier, Molly. "The Latest Research." Landscape Architecture 85 Jan.1995: 60.

- Day, Christopher. Places of the Soul: Architecture and Environmental Design as a Healing Art. Northamptonshire, England: The Aquarian Press, 1990.
- Diamond, Louise. "Creating Gardens of Peace." Peace Research Abstracts Journal 36 (Apr. 1999): 10-11. EBSCO Online Citations: [FDN4NRWX32GQ7V9JBKA1].
- Driver, Martha. The Medieval Woman, an Illuminated Calender. New York: Workman Publishing, 1994. 9.
- Francis, Mark and Randolph T. Hester, Jr. eds The Meaning of Gardens: Idea, Place, and Action. Cambridge, Massachusetts: The MIT Press, 1990.
- Frank, Lawrence D., Peter Engelke, and Thomas Schmid. Health and Community Design: The Impact of the Built Environment on Physical Activity. Washington DC: Island Press, 2003.
- Gallup, Joan Whaley. Wellness Centers: a Guide for the Design Professional. New York: John Wiley and Sons, Inc., 1999.
- Gora, Monika U. "Full Circle." Landscape Design. 257 Feb. 1997: 27-29.
- Gottlieb-Tanaka, Dalia. "Creativity, Dementia + The Therapeutic Environment." The Journal of the Architectural Institute of British Columbia 11 (Winter 2004): 10-15.
- Griffin, Corey. "An Introduction to Biophilia and the Built Environment." Apr. 2004. <<http://www.rmi.org/sitepages/pid1079.php>>
- Griswold, Mac. "The Therapeutic Garden." Landscape Architecture 85 Jan. 1995: 66-69.
- Hartig, T. M. Mang, and G.W. Evans. "Restorative Effects of Natural Environment Experiences." Environment and Behaviour 23 (1991): 3-36.
- Healy, Vince. "The Hospice Garden." The American Journal of Hospice Care (Sept./Oct. 1986): 18-23.
- Heerwagen, Judith H. and Gordon H. Orians. "Humans Habitats and Aesthetics." The Biophilia Hypothesis. Ed. S.R. Kellert and E.O. Wilson. Washington DC: Island Press, 1993. 142-146.
- Honeyman, M. "Vegetation and Stress: A Comparison Study of Varying Amounts of Vegetation in Countryside and Urban Scenes." MLA thesis, Kansas State University, 1987.
- Hosking S. and L. Haggard. Healing the Hospital Environment: Design, Management and Maintenance of Healthcare Premises. London: E&FN Spon, 1999.



- Hutton, J.D., and Richardson, L.D. "Healthscapes: The Role of the Facility and Physical Environment on Consumer Attitudes, Satisfaction, Quality Assessments, and Behaviours." Health Care Management Review 20 Feb.1995: 48-61.
- Jackson, Richard Joseph, MD. "What Olmsed Knew." Online Landscape Architecture NewsDigest. February 2001.  
<[www.asla.org/Members/ppl/what\\_olmsted\\_knew.html](http://www.asla.org/Members/ppl/what_olmsted_knew.html)>
- Kaplan, Rachel and Stephen. The Experience of Nature: A Psychological Perspective. New York: Cambridge University Press, 1989.
- . Humanscape: Environments for People. Ann Arbor, Michigan: Ulrich's Books, Inc., 1982.
- . "Restorative Experience: The Healing Power of Nearby Nature." Meaning of Gardens. Ed. Mark Francis and Randolph T. Hester, Jr. London: The MIT Press, 1993. 238-43.
- Kaplan, Rachel, Stephen Kaplan and Robert L. Ryan. With People in Mind: Design and Management of Everyday Nature. Washington DC: Island Press, 1998.
- Kaplan, Stephen, J. Talbot, and R. Kaplan. "Coping with Daily Hassles: The Impact of Nearby Nature on the Work Environment." North Central Forest Experiment Station Urban Forestry Unit Cooperative Agreement 23-85-08. Ed. USDA Forest Service. Washington, D.C., 1988.
- Kettlety, Karen. "Nature as Healer: Toward New Forms in Health Care Environments." Nature in the City; International Making Cities Livable Conferences. Carmel, California: IMCL Council 1990. 6-11.
- Kliment, Stephen A. Building Type Basics for Healthcare Facilities. New York: John Wiley & Sons Inc., 2000.
- Latham, A. "To a Stranger, Africa Feels Like Home." The New York Times 10 Nov.1991: B1.
- Leccese, Michael. "Nature Meets Nurture." Landscape Architecture 85 Jan. 1995: 68-71.
- Lewis, Charles A. "Gardening as Healing Process." The Meaning of Gardens. Ed. Mark Francis and Randolph T. Hester, Jr. London: MIT Press, 1993. 244-51.
- . Green Nature, Human Nature: The Meaning of Plants in Our Lives. Urbana, IL: University of Illinois Press, 1996.
- . "People-Plant Relations Past & Future." The Healing Dimensions of People-Plant Relations: Proceedings of a Research Symposium. Ed. Mark Francis, Pat Lindsey, and Jay Stone Rice. Davis, California: UC Davis Center for Design Research, 1994. 13-25.

- Malkin, J. Hospital Interior Architecture. New York: Van Nostrand Reinhold, 1992.
- Manco, Jean. The Spirit of Care: The Eight-Hundred-Year Story of St. John's Hospital, Bath. Bath England: St. John's Hospital, 1998.
- Marberry, Sara O. Healthcare Design. New York: John Wiley & Sons, Inc., 1997.
- Marcus, Clare Cooper and Marni Barnes. Gardens in Healthcare Facilities: Uses, Therapeutic Benefits, and Design Recommendations. Martinez, CA: Center for Healthcare Design, 1995.
- . Healing Gardens: Therapeutic Benefits and Design Recommendations. New York: Wiley, 1999.
- Marcus, Clare Cooper and Carolyn Francis. People Places: Design Guidelines for Urban Open Space. New York: Van Nostrand Reinhold, 1990.
- McCormick, Kathleen. "Realm of the Senses." Landscape Architecture 85 Jan. 1995: 61-63.
- Miller, Richard L. and Earl S. Swensson. Hospital and Healthcare Facility Design. New York: W.W. Norton, 2002.
- Mooney, P.F. "The Design, Planning, & Evaluation of Healing Landscapes." The Healing Dimensions of Plant Relations: Proceedings of a Research Symposium. Ed. Mark Francis, Pat Lindsey, and Jay Stone Rice. Davis, California: UC Davis Center for Design Research, 1994. 31.
- Mooney, Patrick F., and Mark C. Errett. Introduction to Horticultural Therapy. Vancouver: University of British Columbia, 1991. 4-6.
- Mooney, Patrick and Don Luymes. Mount Pleasant Wellness Walkways: Design Study Report. Vancouver: City of Vancouver, 1999.
- Mooney, P.F. and S.L. Milstein. "Assessing the Benefits of a Therapeutic Horticulture Program for Seniors in Intermediate Care." The Healing Dimensions of People-Plant Relations: Proceedings of a Research Symposium. Ed. Mark Francis, Pat Lindsey, and Jay Stone Rice. Davis, California: UC Davis Center for Design Research, 1994. 173-194.
- Mooney, P.F. & Nicell, L. "The Importance of Exterior Environment for Alzheimer Residents: Effective Care and Risk Management." Healthcare Management Forum 5.2 (1992): 23-29.
- Moore, Robin C. "Healing Gardens for Children." Healing Gardens: Therapeutic Benefits and Design Recommendations. Ed. C.C. Marcus & M. Barnes. New York: John Wiley & Sons, 1999. 323-384.

- . Plants for Play: A Plant Selection Guide for Children's Outdoor Environments. Berkeley, CA: MIG Communications, 1993.
- Moore, R. and H. Wong. Natural Learning: The Life History of an Environmental Schoolyard. Berkeley, CA: MIG Communications, 1997.
- Nightingale, Florence. Notes on Nursing. 1860. London: Balliere Tindall, 1996.
- Paine, R. and C. Francis. "Hospital Outdoor Spaces." People Places: Design Guidelines for Urban Open Spaces. Ed. C. C. Marcus & M. Francis. New York: Van Nostrand Reinhold, 1990. 263-290.
- Purves, Geoffrey. Healthy Living Centres: A Guide to Primary Health Care Design. Oxford: Architectural Press, 2002.
- Radley, Sue. "Healthcare Guidance." Landscape Design 257 Feb. 1997: 19-21.
- Rawlings, Romy. Healing Gardens. Minocqua WI: Willow Creek Press, 1998.
- Relf, Diane, ed. The Role of Horticulture in Human Well-Being and Social Development: A National Symposium. Portland, Oregon: Timber Press, 1992.
- Rubin, H.R., and A.J. Owens. Status Report: An Investigation to Determine Whether the Built Environment Affects Patients' Medical Outcomes. Martinez, CA: The Center for Health Design Inc., 1996.
- Ryan, Deborah E. "Nature in the City: Necessity or Luxury?" Nature in the City; International Making Cities Livable Conferences. Carmel, California: IMCL Council, 1990. 5-8.
- Scarfone, Scott C. "Fragrance and Texture in Public Garden Design." Public Garden 15 Apr./May/June 2000: 15-18.
- Schwarz, Benyamin and Ruth Brent. Aging, Autonomy, and Architecture: Advances in Assisted Living. Baltimore: The Johns Hopkins University Press, 1999.
- Shoemaker, Candice A. Interaction by Design, Bringing People and Plants Together for Health and Well-being, An International Symposium. Iowa State Press: Blackwell Publishing Company, 2002.
- Simson, Sharon Pastor and Martha C. Straus. Horticulture as Therapy: Principles and Practice. New York: Hawthorne Press, 1998.
- Spriggs, Nancy Gerlach. Restorative Gardens: The Healing Landscape. New Haven CT: Yale University Press, 1998.

- Stoneham, Jane. "Health Benefits." Landscape Design 257 Feb. 1997: 23-25.
- Talbot, J.F., L.V. Bardwell and R. Kaplan. "The Functions of Urban Nature: Uses and Values of Different Types of Urban Nature Settings." Journal of Architectural and Planning Research 4 (1987) 47-63.
- Tenon, Jacques. Journal d'Observations sur les Principaux Hopitaux et sur Quelques Prisons d'Angleterre (1787). Ed. Jacques Carre. Ce Clermont-Ferrand France: Association des Publications de la Faculte des lettres et Sciences Humaines, 1992.
- Thompson, William J. "Healing Words." Landscape Architecture 90 Jan. 2000: 55-57, 73-75.
- Ulrich, Roger S. "Biophilia, Biophobia, and Natural Landscapes" Ed. S.R. Kellert and E.O. Wilson. Washington D.C.: Island Press, 1993. 73-137.
- . "View Through Window May Influence Recovery From Surgery." Science, New Series 224 (Apr.1984): 420-421.
- Verderber, Stephen and David J. Fine. Healthcare Architecture: In an Era of Radical Transformation. Yale: Yale University Press, 2000.
- Ware, Cheryl E. "Designing and Building Healing Gardens at Health Care Facilities." The Healing Dimension of People-Plant Relations: Proceedings of a Research Symposium. Ed. Mark Francis, Pat Lindsey and Jay Stone Rice. Davis, CA: University of California, Davis Center for Design Research, 1994. 323-333.
- Warner, Sam Bass Jr. "The Periodic Rediscoveries of Restorative Gardens: 1100 to the Present." The Healing Dimension of People-Plant Relations: Proceedings of a Research Symposium. Ed. Mark Francis, Pat Lindsey and Jay Stone Rice. Davis, CA: University of California, Davis Center for Design Research, 1994:5-12.
- Weber, David O. "Life-Enhancing Design." Healthcare Forum Journal (Mar.-Apr. 1996):3-11.
- Wells, Nancy M. "At Home with Nature: Effects of "Greenness" on Children's Cognitive Functioning." Environment and Behavior, 32.6 (Nov. 2000). London: Sage Publications, 2000: 775-795.
- Whitehouse, Sandra L. "Healing Gardens and Coping with Stress at a Children's Hospital: A Multimethod Evaluation." Ph.D. Diss., University of Utah, 1999.
- Whitehouse, Sandra, James W. Varni, Michael Seid, Clare Cooper-Marcus, Mary Jane Ensberg, Jenifer R. Jacobs and Robyn S. Mehlenbeck. "Evaluating a Children's Hospital Garden Environment: Utilization and Consumer Satisfaction." Journal of Environmental Psychology 21 (2001): 301-314.

Wilson, Edward O. Biophilia. Cambridge: Harvard University Press, 1984.

## FIGURE CREDITS

- Figure 1-1. Parsons, Colette. "The Cloister Garden: Historic Exemplar." Landscapes. Winter 2004:5.
- Figure 1-2. Fox, Sally. The Medieval Women, An Illuminated Calendar. New York: Workman Publishing, 1994. [8]
- Figure 1-3. City of Vancouver Archives. Vancouver General Hospital.
- Figure 2-1. Marcus, Clare Cooper and Marni Barnes. Gardens in Healthcare Facilities: Uses, Therapeutic Benefits, and Design Recommendations. Martinez, CA: Center for Healthcare Design, 1995. 132-133.
- Figure 2-2.  
<<http://www.hospitalnews.com/modules/magazines/mag.asp?ID=3&IID=52&AID=629>>
- Figure 2-3. Marcus, Clare Cooper and Marni Barnes. Gardens in Healthcare Facilities: Uses, Therapeutic Benefits, and Design Recommendations. Martinez, CA: Center for Healthcare Design, 1995. 132-133.
- Figure 3-1. Marcus, Clare Cooper and Marni Barnes. Gardens in Healthcare Facilities: Uses, Therapeutic Benefits, and Design Recommendations. Martinez, CA: Center for Healthcare Design, 1995. 132-133.
- Figure 3-2. McCormick, Kathleen. "Realm of the Senses." Landscape Architecture 85.01 (1995): 62.
- Figure 3-3. Marcus, Clare Cooper and Marni Barnes. Gardens in Healthcare Facilities: Uses, Therapeutic Benefits, and Design Recommendations. Martinez, CA: Center for Healthcare Design, 1995. 132-133.
- Figure 4-1. Marcus, Clare Cooper and Marni Barnes. Gardens in Healthcare Facilities: Uses, Therapeutic Benefits, and Design Recommendations. Martinez, CA: Center for Healthcare Design, 1995. 132-133.
- Figure 4-2.  
<[http://www.cancer.org/docroot/FPS/content/FPS\\_1\\_Healing\\_Gardens\\_Nurture\\_the\\_Spirit\\_While\\_Patients\\_Get\\_Treatment.asp?SiteArea=>](http://www.cancer.org/docroot/FPS/content/FPS_1_Healing_Gardens_Nurture_the_Spirit_While_Patients_Get_Treatment.asp?SiteArea=>)  
Apr. 2004

Figure 4-3.

<[http://www.cancer.org/docroot/FPS/content/FPS\\_1\\_Healing\\_Gardens\\_Nurture\\_the\\_Spirit\\_While\\_Patients\\_Get\\_Treatment.asp?SiteArea=>](http://www.cancer.org/docroot/FPS/content/FPS_1_Healing_Gardens_Nurture_the_Spirit_While_Patients_Get_Treatment.asp?SiteArea=>)  
Apr. 2004

Figure 4-4.

<[http://www.cancer.org/docroot/FPS/content/FPS\\_1\\_Healing\\_Gardens\\_Nurture\\_the\\_Spirit\\_While\\_Patients\\_Get\\_Treatment.asp?SiteArea=>](http://www.cancer.org/docroot/FPS/content/FPS_1_Healing_Gardens_Nurture_the_Spirit_While_Patients_Get_Treatment.asp?SiteArea=>) Apr. 2004

Figure 4-5. McCormick, Kathleen. "Realm of the Senses." Landscape Architecture 85.01 (1995): 62.

Figure 4-6. Crisp, Barbara. Human Spaces: Life-Enhancing Designs for Healing, Working, and Living. Massachusetts: Rockport Publishers Inc., 1998. (168-171).

Figure 4-7. Crisp, Barbara. Human Spaces: Life-Enhancing Designs for Healing, Working, and Living. Massachusetts: Rockport Publishers Inc., 1998. (168-171).

Figure 4-8. Crisp, Barbara. Human Spaces: Life-Enhancing Designs for Healing, Working, and Living. Massachusetts: Rockport Publishers Inc., 1998. (168-171).

Figure 4-9. Crisp, Barbara. Human Spaces: Life-Enhancing Designs for Healing, Working, and Living. Massachusetts: Rockport Publishers Inc., 1998. (168-171).

Figure 4-10. Crisp, Barbara. Human Spaces: Life-Enhancing Designs for Healing, Working, and Living. Massachusetts: Rockport Publishers Inc., 1998. (168-171).

Figure 5-1. Leccese, Michael. "Nature Meets Nurture." Landscape Architecture 85.01 (1995): 70.

Figure 5-2. City of Vancouver Archives.

Figure 5-3. City of Vancouver Archives.

Figure 5-4. City of Vancouver Archives.

## APPENDIX 1

### Toxic Plant List

#### G.8.4 Plant List

This list of plants can serve as a general guideline for identifying those plants which should be avoided in children's playspaces.

Although there are toxic elements in the fruit, foliage, and roots of about 700 documented plants found in North America, children are more likely to be attracted to brightly coloured fruits rather than to other parts. A general rule of thumb is to avoid any plants with white berries, whether or not they appear on the following list.

Botanical name	Common name(s), Type of plant
<b>Plants with poisonous fruits</b>	
Actea pachypoda	White Baneberry, Cohosh (Perennial)
Actea rubra	Red Baneberry, Red Cohosh (Perennial)
Actea spicata	Black Baneberry (Perennial)
Daphne mezereum	February Daphne (Shrub)
Euonymus americana	Strawberry bush, Wahoo (Shrub)

(Continued)



Botanical name	Common name(s), Type of plant
<b>Plants with poisonous fruits (Concluded)</b>	
<i>Euonymus atropurpurea</i>	Eastern Wahoo (Large shrub)
<i>Euonymus europaea</i>	Spindle Tree (Small tree, or bush)
<i>Hedera helix</i>	English Ivy (Vine)
<i>Hydrangea</i> sp.	Hydrangea (Shrub)
<i>Ilex</i> sp.	Holly (Shrub)
<i>Lathyrus</i> sp.	Sweet Pea (Annual or perennial)
<i>Leucothoe</i> sp.	Leucothoe (Shrub)
<i>Menispermum canadense</i>	Common Moonseed (Vine)
<i>Phoradendron serotinum</i>	American Mistletoe (Tree parasite)
<i>Phytolacca americana</i>	Pokeweed, Inkberry (Perennial)
<i>Podophyllum peltatum</i>	Mayapple, Mandrake (Perennial)
<i>Rhodotypos scandens</i>	Jetbead (Shrub)
<i>Ricinus communis</i>	Castor Bean (Annual)
<i>Robinia pseudoacacia</i>	Black Locust (Tree)
<i>Solanum dulcamara</i>	Deadly Nightshade (Vine)
<i>Symphoricarpos</i>	Snowberry, Waxberry (Shrub)
<i>Rhamnus</i> sp.	Buckthorn (Shrub or tree)
<i>Rhus radicans</i>	Poison Ivy (Vine)
<i>Rhus vernix</i>	Poison Sumac (Shrub)
<i>Taxus</i> sp.	Yews (Shrubs and small trees)
<i>Wisteria</i> sp.	Wisteria (Vines)
<b>Plants with poisonous foliage</b>	
<i>Aconitum</i> sp.	Aconite, Monkshood (Perennial)
<i>Anemone</i> sp.	Anemone (Perennial)
<i>Azalea</i> sp.	Azalea, Rhododendron (Shrub)
<i>Buxus</i> sp.	Box, Boxwood (Shrub)
<i>Cicuta maculata</i>	Water-hemlock (Perennial)
<i>Clematis</i> sp.	Clematis (Perennial vine)
<i>Conium maculatum</i>	Poison Hemlock (Biennial)
<i>Datura stramonium</i>	Jimson-weed, Thornapple (Annual)

(Continued)

Botanical name	Common name(s), Type of plant
<b>Plants with poisonous foliage (Concluded)</b>	
Delphinium sp.	Larkspur (Biennial)
Digitalis purpurea	Foxglove (Biennial)
Euphorbia cyparissias	Cypress Spurge (Perennial)
Euphorbia marginata	Snow-on-the-Mountain (Annual)
Helleborus sp.	Hellebore, Christmas-rose (Perennial)
Kalmia sp.	Lambkill, Mountain Laurel (Shrub)
Ligustrum sp.	Privet (Shrub)
Lobelia sp.	Lobelia (Annuals or Perennials)
Morus rubra	Red Mulberry (Tree)
Parthenocissus quinquefolia	Virginia Creeper (Vine)
Pieris sp.	Andromeda (Shrub)
Prunus serotina	Black Cherry, Rum Cherry (Tree)
Ranunculus sp.	Buttercup (Perennial)
Rheum rhubarbium	Rhubarb (Only leaves are toxic)
Rhus radicans	Poison Ivy (Vine)
Rhus vernix	Poison Sumac (Shrub)
Rudbeckia sp.	Coneflower, Black-eyed Susan (Perennial)
Sambucus canadensis	American Elder (Shrub)
Sanguinaria canadensis	Bloodroot (Perennial)
Shepherdia sp.	Buffalo-berry (Large shrub)
Solanum tuberosum	Potato (New shoots only)
Vinca sp.	Periwinkle (Ground cover)
<b>Plants with poisonous roots, stems, or seeds</b>	
Arisaema tryphyllum	Jack-in-the-pulpit (Perennial)
Camassia sp.	Death Camass (Bulb)
Colchicum autumnale	Autumn Crocus (Bulb)
Convallaria majalis	Lily-of-the-Valley (Perennial)
Dicentra sp.	Bleeding Heart (Perennial)
Endymion sp.	English Bluebell, Squill (Bulb)
Galanthus sp.	Snowdrop (Bulb)

(Continued)

Botanical name	Common name(s), Type of plant
<b>Plants with poisonous roots, stems, or seeds (Concluded)</b>	
<i>Gloriosa superba</i>	Glory-Lily (Perennial)
<i>Gymnocladus dioica</i>	Kentucky Coffee-Tree (Large tree)
<i>Hyacinth</i> sp.	Hyacinth (Bulb)
<i>Ipomoea</i> sp.	Morning Glory (Annual vine)
<i>Iris</i> sp.	Iris, Flag (Corm)
<i>Laburnum anagyroides</i>	Goldenchain (Tree)
<i>Narcissus</i> sp.	Narcissus, Daffodil (Bulb)
<i>Ornithogalum peltatum</i>	Star-of-Bethlehem (Bulb)
<i>Phytolacca americana</i>	Pokeweed (Perennial)
<i>Podophyllum peltatum</i>	Mayapple, Mandrake (Perennial)
<i>Scilla</i> sp.	Scilla, Bluebell (Bulb)