

**THE EFFECT OF LIVE PLANTS AND WINDOW VIEWS OF GREEN SPACES ON  
EMPLOYEE PERCEPTIONS OF JOB SATISFACTION**

**THESIS**

**Presented to the Graduate Council  
of Texas State University-San Marcos  
in Partial Fulfillment  
of the Requirements**

**for the Degree**

**Master of EDUCATION**

**by**

**Andrea C. Dravigne, B.S.A.G.**

**San Marcos, Texas  
December, 2006**

## **ACKNOWLEDGEMENTS**

I would like to thank everyone, including family, past teachers, and professors that have contributed to my education. I would like to especially thank my parents, John and Barbara Moses and my husband, Reed Dravigne, who has shown me so much support and have helped provide the opportunity for me to pursue my educational goals. I would also like to thank God for all of the blessings I have received in my life.

I wish to thank my committee members, Dr. Deborah Stedman and Dr. Gregory Pollard for all of their time, guidance and support. I would like to especially thank Dr. Tina Marie Cade for all that she has done for me throughout my time at Texas State University-San Marcos. She has served as a mentor to me and has showed so much patience and belief in my abilities to succeed. I wish to express so much gratitude to her for granting me this wonderful opportunity. I would like to also thank Dr. C. Hardin Rahe for giving me the opportunity and courage to undergo such a daunting task. Finally, I would like to give a special thank you to Dr. Dan Lineberger and Dr. Jayne Zajicek of Texas A&M University whose contributions to this project ensured its success.

## TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS.....	iii
TABLE OF CONTENTS.....	iv
LIST OF TABLES.....	v
ABSTRACT.....	vii
CHAPTER	
I. INTRODUCTION.....	1
II. REVIEW OF LITERATURE.....	8
III. METHODOLOGY.....	29
IV. FINDINGS AND DISCUSSION.....	34
V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS.....	76
LITERATURE CITED.....	102
APPENDIX A: WORKPLACE ENVIRONMENTS SURVEY.....	111

## LIST OF TABLES

Table	Page
1. Descriptive statistics: Demographic analysis of the overall sample of the four treatment groups by age, gender, ethnicity, salary and education in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	36
2. ANOVA test comparing mean scores on the Environmental Preference Assessment <sup>z</sup> of the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	38
3. ANOVA test comparing mean scores on the Job Satisfaction Survey <sup>z</sup> of the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	41
4. Subcategories and individual statements of the Job Satisfaction Survey <sup>z</sup> used in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	42
5. ANOVA test comparing mean subcategory scores on the Job Satisfaction Inventory <sup>z</sup> of the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	46
6. ANOVA test comparing mean physical environment response scores of the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	51
7. ANOVA test comparing individual statement response mean scores of the four treatment groups in the Job Satisfaction Inventory <sup>z</sup> in the study of the influence of live plants and window views of employee perceptions of job satisfaction.....	55
8. ANOVA test comparing individual statement response means of the four treatment group scores on the statements concerning overall life quality in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	64

9. ANOVA test comparing mean job satisfaction scores of males and females on the Job Satisfaction Inventory <sup>z</sup> of the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	66
10. ANOVA test comparing mean subcategory Job Satisfaction Inventory <sup>z</sup> scores of males in the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	67
11. ANOVA test comparing mean subcategory Job Satisfaction Inventory <sup>z</sup> scores of females in the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	69
12. Multivariate analysis of variance tests comparing different age groups within the four treatment groups on mean Job Satisfaction Inventory <sup>z</sup> overall score and subcategory scores in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	71
13. Multivariate analysis of variance tests comparing different ethnic groups within the four treatment groups on mean Job Satisfaction Inventory <sup>z</sup> overall score and subcategory scores in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	72
14. Multivariate analysis of variance tests comparing different salary levels within the four treatment groups on mean Job Satisfaction Inventory <sup>z</sup> overall score and subcategory scores in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	73
15. Multivariate analysis of variance tests comparing education levels within the four treatment groups on mean Job Satisfaction Inventory <sup>z</sup> overall score and subcategory scores in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	74
16. Multivariate analysis of variance tests comparing position levels within the four treatment groups on mean Job Satisfaction Inventory <sup>z</sup> overall score subcategory scores in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.....	75

## **ABSTRACT**

# **THE EFFECT OF LIVE PLANTS AND WINDOW VIEWS OF GREEN SPACES ON EMPLOYEE PERCEPTIONS OF JOB SATISFACTION**

by

Andrea C. Dravigne, B.S.A.G.

Texas State University-San Marcos

December 2006

**SUPERVISING PROFESSOR: TINA MARIE CADE**

The purpose of this study was to determine the effect of the presence of live interior plants or window views of exterior green spaces on perceptions of employee job satisfaction. The survey was posted on the Aggie Horticulture Web page (<http://floriculture.tamu.edu:7998/workplaceenvironment/>) for six months. The survey included questions regarding physical work environment, the presence or absence of live interior plants, windows, exterior green spaces, environmental preferences, job satisfaction, life quality and demographic information. Over 600 office workers from primarily Texas and Kansas responded to the on-line survey, and 449 complete responses were included in the sample. Data was analyzed to compare levels of job satisfaction of employees that worked in office spaces that included live interior plants or window views

of exterior green spaces and employees that worked in office environments without live plants or windows. Demographic information collected allowed researchers to compare results based on salary, occupational level, educational level, age group, gender and ethnicity. No statistically significant differences were found regarding environmental perception ( $P=0.330$ ), indicating that all four groups preferred newer, open architecture. Statistically significant differences were found regarding perceptions of overall life quality ( $P=0.000$ ) and ( $P=0.001$ ), indicating that the “no plants/no windows” group was different from the other three groups. Statistically significant differences were also found on overall perceptions of job satisfaction ( $P=0.041$ ), and within the job satisfaction subcategories of “nature of work” ( $P=0.006$ ), “supervision” ( $P=0.029$ ), and “coworkers” ( $P=0.041$ ), indicating that the two groups that had plants in the office space had higher mean scores when compared to the two groups that did not have plants in their office space. Individual job satisfaction statements were also analyzed, and statistically significant differences were found in the subcategories of “physical work environment,” “pay,” “coworkers,” “nature of work.” MANOVA analyses of demographics indicated that there were statistically significant differences between males and females in perceptions of overall job satisfaction and in the subcategory “nature of work.” Multivariate analyses indicated that there were no statistically significant differences among the categories of “age,” “ethnicity,” “salary,” “education levels,” and “position.”

## **CHAPTER I**

### **INTRODUCTION**

With a steady increase in urban development, communities have started to see the negative impacts of over expansion, greater commercial land use, and decreasing areas of undisturbed parcels of land (Westphal, 2003). Moreover, a greater number of people are working and spending more time indoors, and research has shown that people are experiencing potential negative effects due to decreasing amounts of time spent in natural surroundings (Kaplan, 1992). Additionally, urban lifestyles that include longer hours at the office, time constraints and a subconscious separation from nature, can have detrimental effects on communal and personal health and happiness (Kaplan, 1992; Lewis, 1994).

Observations of workplace environments have also indicated that employee satisfaction and productivity have decreased with high employee turnover rates becoming commonplace (Goodrich, 1986; Bowen and Radhakrishna, 1991). Studies have suggested that physical workplace environments influence psychological and physiological factors of employees, specifically job satisfaction, and that people benefit from interactions with plants and nature (Goodrich, 1986).

The benefits of plants, trees and naturalized areas to individuals and society have been substantiated through scientific research since the early 1980s (Ulrich, 1984;



Wolverton et al., 1989), with positive benefits of plants to interior and exterior physical environments being recognized since the early 1970s (Ulrich, 1979). Plants and trees not only detoxify chemicals from the environment and potentially reduce air pollution, but they also reduce noise pollution, the accumulation of dust and air-borne particles and provide visual and physical aesthetic enjoyment to people in densely populated areas (Wolverton et al., 1989; Lohr, 1996a). Because of the ability of plants in interior settings to minimize dust accumulation, and reduce pollutants, plants have been known to minimize the harmful effects of sick building syndrome (Wolverton et al., 1989). People also receive benefits from plants in both active and passive interactions with nature and vegetative surroundings. (Kaplan, 1992; Ulrich and Parsons, 1992; Honeyman, 1992; Lewis, 1993; Lohr, 2000; Chang and Chen, 2005).

A study was conducted (Waliczek et al., 2005), using a survey based on the Life Satisfaction Inventory A (LSIA), to determine gardeners' and nongardeners' perception of life satisfaction. Results indicated statistically significant differences in comparisons of the overall life satisfaction scores with gardeners receiving higher mean scores, indicating more positive results on the LSIA. Another study was conducted (Barnhart et al., 1998) to investigate staff and patient preferences for outdoor settings at a psychiatric hospital in Ontario, Canada. A survey was distributed among 74 subjects that asked participants to rank preferential settings for outdoor behaviors, such as walking, relaxing or visiting in groups. The second component of the survey asked the participants to rank images based upon setting types, such as "built/enclosed" or "natural/open" (Barnhart et al., 1998, p. 151). "Both staff and patients selected natural-open settings for passive behaviors such as sitting and viewing scenery, and natural-enclosed settings for active

behaviors such as walking and talking to others” (Barnhart et al., 1998, p. 147).

Additionally, in 1996, a study was conducted (Lohr et al., 1996) to assess the influence that interior plants have on worker productivity and stress reduction in windowless office environments. The study concluded that the presence of plants reduced mental fatigue, increased attentiveness, lowered blood pressure and increased productivity.

According to the United States Census Bureau (1990), many people spend an average of fifty hours per week at the office and most of that time is spent at a desk or workstation. External factors aside, long hours and increased time spent in office environments can lead to reduced job satisfaction (Spector, 1997) and increased levels of stress (Parker, 1992). Social sciences have provided theories and methods of determining how a person’s environment impacts their attitudes and perceptions and found that employees have a tendency to feel more satisfied with their job when in environments that promote well being and comfort (Parker, 1992). Corporate developers, architects and designers have researched what factors contribute to a positive environment and how these factors can improve business productivity, employee retention and job satisfaction (Zadik, 1994).

Many studies have shown that the presence of live plants, windows and views of natural surroundings can have a positive influence on individuals’ perceptions of their environment and personal well being (Lohr et al., 1996). Research articles have provided anecdotal evidence that plants have a calming, pleasing effect on individuals (Lohr, 1994). Being that urban green spaces and interior plants have been shown to influence the individual, as well as, sociological aspects of employee attitudes (Ulrich and Parsons, 1992), a comparative study was conducted to determine perceptions of job satisfaction

between employees that had access to either live interior plants or window views of exterior green spaces and those that did not.

### *Problem Statement*

The intent of this study was to examine the effects of live interior plants and window views of exterior green spaces on perceptions of employee job satisfaction.

### *Purpose and Objectives*

The main objective of this study was to investigate the impact of interior plants and window views of green spaces on employee perceptions of job satisfaction.

Comparisons were made on measurements of employee job satisfaction of those who worked in office spaces that had live interior plants or window views of green spaces and those that did not.

The specific objectives of this study included the following:

1. To determine if an individual's environmental perception favored the presence of plants or window views of green spaces, natural lighting and newer, open architecture.
2. To compare perceptions of job satisfaction of employees that had live interior plants in their workspace or a common area, or windows and window views of exterior green spaces to employees that did not have live interior plants in their workspace or common area, or windows and window views of exterior green spaces.
3. To compare perceptions of overall life quality of employees that had live interior plants in their workspace or a common area, or windows and window views of exterior green spaces to employees that did not have live interior plants in their

workspace or common area, or windows and window views of exterior green spaces.

4. To evaluate specific demographic groups to determine if any particular group appeared to benefit more in terms of perceptions of job satisfaction from the presence of plants or windows in office environments.

### *Hypotheses*

H<sub>1</sub>: Employees that work in office environments with live interior plants experienced more positive perceptions of job satisfaction when compared to those employees in office environments without live interior plants.

H<sub>2</sub>: Employees that work in office environments with window views of exterior green spaces experienced more positive perceptions of job satisfaction when compared to those employees in office environments without window views of exterior green spaces.

### *Definition of Terms*

For the purpose of this study, the following terms were defined as such:

Atrium: A large, airy indoor space enclosed by windows that was historically a central room open to the sky, that generally serves as a building entrance or foyer, and commonly houses containerized and bedded plantings (The Random House College Dictionary, 1966). A generic building form of both urban and suburban architecture that provides space for indoor gardens (Parker, 1992).

Garden: A place for public enjoyment planted with trees and flowers that often has special displays of plant life (Webster's Ninth New Collegiate Dictionary, 1985).

Green space: Exterior landscapes that remain natural and undisturbed, or man-made development that includes blooming and foliage plants, shrubs and trees.

Horticultural therapy: Therapy and rehabilitation of physical and mental health through the use of plants (Chung et al., 1999).

Job satisfaction: An employee's general fulfillment with his/her's employment and place of business (Spector, 1997).

Live plants: Any living foliage or flowering plants placed in containers or indoor gardens.

Nature: "Nearby nature includes one plant or many plants, and also the place created by them. It includes a plant on the windowsill, a street tree, as well as, trees in an atrium. We also include in this concept nearby fields and woods and land that has not yet been turned to development" (Kaplan, 1992, p. 126).

Office: A place where a particular kind of business is transacted or a service is supplied (Webster's Ninth New Collegiate Dictionary, 1985).

Urban: A densely settled area containing at least 50,000 people (U.S. Census Bureau, 2003).

Window: "An opening in a wall or the like for the admission of light, air or both, or for the purpose of looking in or out" (The Random House College Dictionary, 1966, p. 1508).

### *Limitations*

The limitations of the study included the following:

1. Any research conducted on humans has extraneous factors that can influence the outcomes of the study.
2. Non-experimental research that is based on "real-life" scenarios cannot completely neutralize all controls.

3. The population sample was limited to 600 employees and may have been potentially too small to generalize to all employees of office environments.
4. The study was limited to employees from the United States and the majority of the respondents were from Texas and the Midwest.
5. The study was limited to those participants that voluntarily agreed to participate and were willing to take the time to complete the survey in exchange for the incentive provided.
6. The study was limited to employees that owned or had access to computers and internet service.
7. The components of job satisfaction was defined by and limited to one survey.

#### *Basic Assumptions*

1. It was assumed that participants answered the survey questionnaire honestly, and were not informed or biased based on the information provided in the survey.
2. It was assumed that participants responded to the survey only once.
3. It was assumed that the population sample was representative of the target population.
4. It was assumed that participants were representative of typical office employees across America.
5. It was assumed that participants were full-time office employees.

## CHAPTER II

### REVIEW OF LITERATURE

In America's constant pursuit for happiness, studies have determined that, on average, only 69% are happy and only 54% of the time (Seligman, 2002). Studies have also shown that approximately 25% of Americans suffer from mild depression (Seligman, 1994). Long-term happiness, a pleasant feeling experienced over a prolonged period, has been linked to individuals' perceptions of overall life satisfaction (Heylighen, 1992).

There have been further studies that show that there is a reciprocal relationship between life and job satisfaction (Dolan and Gosselin, 2000; Oswald, 2002). Reciprocity is often referred to as spillover, and can be defined as being when "attitudes and practices developed in one sphere of life can spill over into another" (Wilensky, 1960, p.545).

#### *Job Satisfaction*

Since 1957, when Herzberg developed his Motivator-Hygiene Theory, many research studies had been conducted to determine the factors that contribute to job satisfaction. It was Herzberg's premise that factors contributing to employee job satisfaction could be divided into two categories: motivators and hygiene. He believed that the motivator factors (salary, recognition and promotion) were more important than the hygiene factors of supervision, working conditions and the work itself. Many additional studies have been conducted in the private sector, and further research has

shown that there are combinations of factors that, in fact, contribute to employee job satisfaction (Maslow, 1943; Vroom, 1964).

Newer studies have categorized the components of job satisfaction into six facets: satisfaction with work on present job, pay, supervision, opportunities for promotion, co-workers, and satisfaction with the job in general (Spector, 1997). Further research studies have shown that employee motivation, productivity and job satisfaction have been steadily declining. “While there is growth in the size of the office-based sector of our society, there is declining productivity and job satisfaction” (Zadik, 1994, p. 276). Studies have also shown that females, in general, tend to be significantly more satisfied with their jobs than males (Wilensky, 1960).

#### *A. Job Satisfaction and the Work Environment*

Recent studies have begun to link the physical workplace to psychological well-being, performance, employee retention and satisfaction (Parker, 1992). The London design firm, Morgan Lovell, conducted an environmental survey of 2,000 office staff. One in three of the respondents stated that they “felt no pride in their workplace,” and that it “added stress.” Additionally, 25% of the respondents stated that they would “feel more committed to their employer if improvements were made to their workplace,” specifically “comfortable chairs and desks,” and “natural air and light.” The report found that “even simple things such as adequate daylight can reduce absenteeism by 15% and increase productivity by up to 20%” (Bradley, 2005, on-line).

Anecdotal evidence has shown that physical work environments are a contributing factor to employee job satisfaction. Although there are many variables that contribute to job satisfaction, a pleasing work environment has been directly linked to improving job



satisfaction (Asmus, 2004). Working conditions, as defined by Herzberg, are the physical working conditions, facilities, and quality of work as related to job satisfaction.

Although research studies have provided supporting evidence of Herzberg's theory that hygiene factors (pay, job security, working conditions, policy and administration, and relationships with peers and supervisors) are not as important as the motivational factors, newer research has shown that the hygiene factors were of equal or greater importance (Bowen and Radhakrishna, 1991). In 1980, Bowen reported that the Herzberg's Motivator-Hygiene Theory did not apply to agriculture education teachers, and that his research supported evidence that, in fact, all ten factors contributed to job satisfaction of the study's participants and that the "five hygiene factors explained a higher proportion of the job satisfaction score variance than the five satisfier factors" (Bowen, 1980, p. 107).

In 1999, William M. Mercer Inc. conducted a survey on 25,000 employees that asked participants what factors would most influence their choice of employer. A "comfortable, attractive workspace" was listed by 47% of the respondents. Additionally, 86% of the respondents stated that a "comfortable, attractive workspace" would most influence their productivity (Smith, 1999, on-line). Self-reports from employees have shown that job conditions are directly related to employee attitudes, including job satisfaction, frustration, anxiety on the job, and turnover rates (Spector, 1997). Market research has also shown that successful companies follow the PRIDE model to improve motivation and performance among their employees; the "P" in PRIDE standing for "provide a positive working environment", which includes "a comfortable, attractive workspace" (Smith, 2000, on-line).

In 1998, Lindner described ten motivating factors as important. Of the ten motivating factors, “good working conditions” was included; good working conditions included building design and architecture, openness or airiness, colors and artwork, and plants and windows. The research study showed that “good working conditions” ranked number five of ten (Lindner, 1998). Additionally, a study was conducted among mental health workers in a community center to determine the effect that the physical work environment had on the participants’ job satisfaction. A group of employees was moved to a new facility that was brighter, had more natural light and a more open design. The control group remained working at the “old, drab” clinic. The treatment group exhibited a significant increase in satisfaction with the physical environment and overall job satisfaction compared to the group that remained at the original facility (Folkins et al., 1977). Another study was conducted in 1989 to determine if an employee’s physical office environment influenced their psychological well-being. Factors studied included adverse environmental conditions, including poor air quality, noise and ergonomics, and lack of privacy. The study provided evidence that workers made distinctions between their physical work environment and their general working conditions (workload, coworkers, etc.) and that their physical work environment did have an effect on employee satisfaction and mental health (Klitzman and Stellman, 1989).

The importance of providing a comfortable, safe and aesthetically pleasing work environment is becoming more prevalent and is an important consideration in building and interior design. “The workplace is now being linked to psychological needs, performance, and well being” (Parker, 1992, p. 28). The concept of quality-of-work-life (QWL) includes targeting and providing solutions to enhance employee well-being and

productivity (Shareef, 1992). “Many QWL approaches target worker environmental concerns that hamper job satisfaction” (Shareef, 1992, p. 110). In her best-selling book on employee retention, *Love ‘Em or Lose ‘Em*, (2002), Jordan-Evans ranked the top reasons employees remain where they are, and a great work environment ranked number fourteen out of eighteen factors.

### *B. Job Satisfaction and Employee Performance*

The “happy-productive worker” hypothesis relates employee job satisfaction to employee performance and psychological well-being (Wright and Cropanzano, 2000). When employees are more satisfied, they are inherently more motivated and, therefore, more productive. Employees work harder and perform better when they are satisfied with their jobs. According to Larkin (1996), “job satisfaction affects the physical and mental well-being of an individual, and because it may affect job-related behaviors, also influences productivity and profitability in organizations” (p. 102). Thus, knowing what factors contribute to employee job satisfaction can help prevent frustration, low morale and decreased productivity (Grossnickle and Thiel, 1988; Beder, 1990). Productive employees keep businesses thriving (Lindner, 1998) and exhibit greater organizational commitment.

### *People/Plant Interactions*

Throughout history, people have been fascinated with plants and nature. Theories developed to explain the rejuvenating effects of natural areas to human beings have been based on our genetic programming to biological rhythms due to our evolution in natural environs (Orians and Heerwagen, 1992). Kaplan (1992) defined nature to include “one plant or many plants, and also the place created by them. It includes a street tree as well

as trees in an atrium. We also include in this concept nearby fields, woods and land that have not yet been turned to development” (p. 126). Whether consciously or unconsciously, people have been intrigued by the plant kingdom enough to incorporate plants into their surroundings.

People interact with plants in different ways, but predominantly as either observers or participants. Observers are engaged in a passive interaction that is visual, for example, seeing trees along a street or plants in a park or other surroundings. Participants are engaged in an active interaction where they are “intimately involved with the plants being grown and directly responsible for the well-being of the plants” (Lewis, 1992, p. 57). Both are sensory experiences that illicit a wide range of responses that are often different among different people (Lewis, 1992).

The significance of plants on people’s well-being is not bound by demographics; people of all cultures, ethnicities, ages, place of residence and occupation level value plants, flowers and trees and relate them to many special occasions and places (Kaplan, 1992). Not only are plants essential to our very survival by cleaning our air, providing sustenance, resources and fuels, but they are a part of our daily lives. “Their presence improves the quality of our lives in many ways: environmentally, economically, socially, culturally and physically through our health and well-being” (Zampini, 1994, p. 185).

In 1983, Kaplan surveyed over 4000 members of the American Horticulture Society to determine the types of benefits the respondents listed. Over 80% of the respondents rated “peacefulness and tranquility” as either number one or two on a five-point Likert scale, with one being the highest rating. In 1983, Tukey stated, “it is long past time horticulturists should combine forces with the psychologist, the artist, and the

landscape architect to quantify in scientific terms the effects that plants have on humans in addition to providing food and substance (p. 14).”

Research studies have been conducted that provide evidence of the calming and healing benefits of both passive and active interaction with nature. Human interaction with plants has positive results and passive and active interactions with natural areas have rejuvenating mental and physical effects for people (Lewis, 1994). MacKay (1992) found that:

“Two important levels of interaction between user and environment may be identified. First, the user interacts subconsciously with the landscape when using or moving within its masses and spaces. At the second level, the user relates directly to plants in the landscape; this involves a process of recognition and appreciation leading to some action relating to that plant (p. 113).”

More than 75% of Americans are living in urban areas with continued, rapid expansion equating to 3,500 acres daily (USDA, 1993). Thus, the possibility for even a small parcel of natural land or man-made green space to positively impact the viewer or visitor, improve quality of life and potentially improve employee perceptions of job satisfaction is likely, as the average American spends 50 hours per week at their place of employment (U.S. Census Bureau, 1990). Studies of passive interactions with nature including criminals in prison and hospital patients have shown that window views of natural green spaces resulted in less reports of illness due to improved well-being (Ulrich, 1984). Additional research on active interactions with nature, such as gardening, has shown that such activity provides psychological and physiological benefits, including

increased self-esteem, reduced stress levels and increased social interaction (Kaplan, 1973; Lewis, 1978; Waliczek et al., 2005; Cammack et al., 2002).

#### *A. Passive Interaction with Plants*

##### 1. Physiological Benefits

Studies have provided evidence that plants have physiological benefits to individuals. Prevalent studies have included research in stress and anxiety reduction (Waliczek et al., 1996), improved health (Ulrich and Parsons, 1992) and the reduction of asthma and allergies (Wolverton et al., 1989). A previous study conducted by Ulrich (1984) provided evidence that window views of plants can reduce stress in ailing patients and can expedite recovery. “Generally, research has revealed that urban forests provide many benefits for city residents, including improved environmental quality and more satisfying quality of life” (Wolf, 1996, p. 27).

##### 2. Psychological Benefits

Another important facet in human-plant relationships is the psychological benefits that are perceived when individuals are in contact with plants and green spaces. These psychological benefits have been studied in more detail, and are further supported by general public opinion that people perceive improved feelings of happiness and health (Ulrich and Parsons, 1992) when among plants and natural surroundings. Ulrich also stated in 1990 “a study framed explicitly as a test of Olmsted’s ‘tranquility hypothesis’ has yielded direct evidence of the restorative effects of merely viewing vegetation” (p. 98). In 1979, Ulrich evaluated the stress levels of two groups of university students after each group viewed urban settings with plants and nature and urban settings without plants and nature. His findings supported Olmsted’s ‘tranquility hypothesis’ in that the stress

levels of students were reduced and positive feelings were increased after viewing the pictures of urban settings that contained plants and nature.

In 1992, Ulrich and Parsons stated:

“That people may not have to be consciously aware of the presence of plants in homes, workplaces, or other settings for the plants to have positive influences on emotional states and physiological indicators. Another implication of these physiological studies is that research approaches based on verbal ratings or evaluations of physical settings having plants...may sometimes not reveal the effects of plants on overall well being” (p. 100).

### 3. Urban Environments

Evidence has shown that ancient civilizations prioritized nature as an essential part of their living space (Shepard, 1967). Throughout history, there has been documentation that people prefer surroundings that include plants and nature. The Egyptians, Greeks, Romans, and the English established elaborate gardens, some of which are still thriving today. Additionally, during the Renaissance period formal gardens were found throughout Europe, most notably at the Palace of Versailles (Janick, 1992).

The 19<sup>th</sup> century landscape architect, Frederick Law Olmsted, the “Father of Landscape Architecture,” was known for creating tranquil landscapes that represent some of the most visited parks and landscapes in America. His design principles were based on creating therapeutic sceneries that counteracted poor working conditions, and overcrowded and congesting living and working environments (Olmsted, 1870). He sought to design landscapes that were “horticulturally therapeutic.” Although, urban

conditions have improved greatly since the 19<sup>th</sup> century, much has stayed the same.

“Therapeutic landscapes are settings where healthful circumstances are obtained to promote emotional, social, and physiological health.” These are natural settings or “have been naturalized through interior design of constructed places, and plants figure prominently to emblemize health” (Etkin, 1994, p. 62). Olmsted’s principles have been guidelines for many landscape architects since. “Not only is vegetation itself preferred, but the ways in which it is arranged also creates a hierarchy of preference” (Lewis, 1994, p. 247).

“Most people today recognize climate control and outdoor engineering values including improving air and water quality, preventing erosion, saving energy through shade and wind barriers, reducing noise pollution, creating wildlife habitats and adding beauty” (Waliczek et al., 2005, p. 1364). Developers, architects, and city planners recognize that plants contribute to environmental quality and provide physiological benefits to humans, but more qualitative data is needed to quantify the psychological benefits of plants (Ulrich and Parsons, 1992).

Humankind arose in a very natural world, without concrete, overdeveloped cities and high-rises. Research conducted by environmental psychologists and geographers has shown that there is a strong preference for “green” in urban settings, and that this preference extends to people of all cultures, economic levels and geographic location (Lewis, 1994). Lewis goes on to infer that, due to our evolutionary relationship with plants and nature, our very survival depends upon theirs. Furthermore, it is possible that we have a symbiotic relationship with plants, and we have a subconscious awareness and need for plants and nature, that is “locked in our genes” (Lewis, 1994, p. 241).



Preference, how much someone likes something, can provide information as to how different individuals perceive, categorize or place importance on something. “Thus the preference judgments are not only useful in their own right, as an indication of the kinds of things or settings that people favor, but also as a way to understand how the things or settings are experienced” (Kaplan, 1992, p. 126). Nature is a critical part of our environmental preferences.

In 1983, Kaplan conducted a study on neighborhood satisfaction. The study provided evidence that residents were more satisfied when they had views of gardens, trees or woods from their residence. In 1985, Rachel Kaplan conducted a study that showed that the presence of trees and vegetation increased residents’ satisfaction with their neighborhood. Further research through 1990 showed that wide, undisturbed, open spaces were highly preferred in urban environments (Kaplan, 1992).

Another study was conducted, “Vegetation and Stress,” that used a pre- and post-test for stress using the Zuckerman Inventory of Personal Reactions (ZIPERS), a ten-question test that measures emotional and anxiety levels. An experiment was conducted on over 200 college students after taking an exam, in which the students were divided into three “visual” groups of “countryside,” “urban with vegetation,” and “urban” (no plants or vegetation). Each group was shown a series of slides within their respective category and then asked to complete the post ZIPERS test. The results showed statistically significant differences between the urban and countryside groups. The countryside and urban with vegetation groups exhibited less fear and anger than the urban group (Honeyman, 1992).

From these results, it can be concluded that merely viewing vegetation or pictures of vegetation can effectively reduce levels of stress. “The results of this experiment support the inclusion of vegetation and green space in urban design to contribute to the psychological well-being of the general public” (Honeyman, 1992, p. 145). Additionally, Lohr (1996b) stated, “people reported feeling more positive emotions, such as happiness and friendliness, when looking at urban scenes with a tree of any form than when looking at the same scenes with an inanimate object” (p. 99).

Another study (Ulrich, 1974) used the survey method to determine the preference of two routes to a local shopping mall. The quickest route was not scenic while the longer route was landscaped and was surrounded by nature. The results showed that the participants took the scenic route 56% of the time (Ulrich, 1974).

#### 4. Office Environments

Due to the large amount of time individuals spend indoors, especially at the workplace, a positive, comfortable work environment is increasingly important. The physical environment affects employees’ ability and desire to work (Parker, 1992). Due to high employee turnover rates, increasing health costs, high absenteeism, corporations are seeking new ways to improve the work environment and provide amenities to their employees as incentives (Goodrich, 1986; Parker, 1992; Lohr et al., 1996; Jackson, 2003).

“Architects, builders, landscapers, and planners shape not only our buildings and streetscapes- but also our well-being” (Jackson, 2003, on-line). It would be reasonable to assume that, according to Jackson (2003) and other experts, buildings can be designed so

that they promote “mental refreshment,” exercise and improved working conditions that ultimately contribute to employee job satisfaction.

In another study conducted by the American Institute of Architects (AIA), a group of researchers reworked their “office building concept” to include the surrounding urban setting, the culture of the workplace, and the building’s response to the environment (Mayne, 2003; Jackson, 2003). They surmised that all three concepts are integrated and should include open common places, natural ventilation, windows and specifically “plentiful natural light and views of green space” (Mayne, 2003, on-line). Mayne also has stated, “protecting green space not only has environmental benefits, but it also promotes good mental health (Mayne, 2003, on-line).” He reports that psychological studies have determined that interactions with nature have positive influences on moods and attitudes and that employees of office environments tend to be more productive and exhibit increased job satisfaction (Mayne, 2003).

Studies have shown that adverse environmental conditions such as poor air quality, noise, lack of privacy and ergonomic conditions can have negative effects on employee perceptions of job satisfaction and overall well-being (Klitzman and Stellman, 1989). The National Real Estate Investor (Poltrack, 2003) sent out an on-line survey that was designed to provide anecdotal evidence in support of scientific research studies in the areas of environmental conditions as they relate to overall well being. Results showed that out of a random sampling of 25 respondents, all supported the value of a health-enhancing design, which incorporates natural lighting and a comfortable workspace that integrates the outdoors for maximum environmental indoor and outdoor quality. New trends in building design include the green movement, which involves “the use of fresh

air, daylight, plants, and window views and other design aspects to improve worker productivity” (Kozlowski, 2004, on-line)

Additional findings supported that work-related stress can be affected by physical work environments (Klitzman and Stellman, 1989), which backed up a study that showed employees reported decreased ailments and headaches when having a view of nature (Kaplan 1992). “A great deal of satisfaction derived from nature does not involve being in the natural setting, but rather having a view of it” (Kaplan, 1992, p.128). Verderber (1986) suggested that windowless settings, that often include classrooms, hospital rooms and offices, are “unpreferred.”

Another study was conducted to determine preferences for office arrangements. Participants were asked to rate photographs of an office with several desk arrangements, with and without art, and with and without plants and an aquarium. The results of the study showed that people responded positively to the presence of plants and other living things (Campbell, 1979). Although a simple flower arrangement, potted plant or plants in an atrium are not as expansive as a park, natural landscape or open countryside, the benefits that people experience from the interaction or proximity to natural elements are very similar (Kaplan, 1992).

Additionally, many office buildings harbor toxic chemicals (volatile organic compounds) and other pollutants that are harmful to human health. Medical conditions, ranging from minor illness to life-threatening disease, have had a heavy impact on productivity, absenteeism and profitability (Shareef, 1992). The EPA reported in 1988 that almost 30% of office pollutants are contaminated with toxic chemicals that classify the building as a “sick” building. Studies pertaining to the environmental benefits of

plants in interior settings have been prevalent since NASA provided evidence that plants improve air quality by removing chemical toxins from the air (Lohr, 1992).

Numerous studies have since shown that there are definite indoor environmental hazards that can be minimized if not reduced by including flowering and foliage plants in commercial design. “Dust accumulation on horizontal surfaces in interiors can be reduced by as much as 20% by adding foliage plants, mirroring what has been shown for exterior plants” (Lohr, 1996a, p. 151). According to Asmus, “there are many benefits to having live plants in this kind of environment... plants are able to absorb and transform toxins that can come from things like particleboard in the desks, fibers in the carpets or chemicals in the cleaning products” (2004, on-line). Additional benefits can extend to increased employee satisfaction, motivation and productivity. “Working in less than optimal conditions or in the extreme, working in a building labeled as “sick,” will negatively affect productivity” (Wood, 1996, p. 141).

In 1996, Lohr and other researchers conducted a study that provided evidence that the presence of live plants in office environments was shown to reduce stress and increase productivity among workers. Previous studies have been conducted that show that employees that work in plantless and/or windowless office environments experience increased stress and lower job satisfaction (Randall and Shoemaker, 1992; Ulrich and Parsons, 1992). In Lohr’s study, a group of college students was divided into two areas: one with plants and one without plants. Blood pressure and psychological attitudes were measured while the participants completed a computer exercise. The participants in the room with the plants reported that they felt more attentive, felt less stressed and were more productive based on response time to individual assigned tasks (Lohr et al., 1996).

A study was conducted (Aitken and Palmer, 1989) to determine how plants placed in an office environment affected the participants' perception of the overall environment. Communication students were asked to agree or disagree with statements about the presence of the plants. When asked to answer the question "An office neatly decorated with live plants gives me the impression of a well-organized and well-staffed institution," 70% agreed or strongly agreed, while only 10% disagreed and 20% felt neutral about the statement (Lohr, 1994, p. 229).

In 2005, a study was conducted to determine the effects of window views and indoor plants on individual's psychophysiological responses in the workplace. Six office environments were simulated: a window with a view of a city, a window with a view of a city that included indoor plants, a window with a view of nature, a window with a view of nature that included indoor plants, an office without a window view, and an office without a window view that included indoor plants. Participants' electromyography (EMG), electroencephalography (EEG), blood volume pulse (BVP), and state-anxiety were measured before and after exposure to the stimuli. The results concluded that participants were less nervous and anxious when they had a view of nature or when indoor plants were present. The results also showed that participants exhibited the highest degree of anxiety when neither a window nor indoor plants were present. (Chang and Chen, 2005).

## 5. Corporate Gardens

"To this end of establishing correspondence between the tranquility of the garden and the tranquility of the inner self, a stroll through the garden landscape became a metaphysical journey of instruction in how one might, by "imitating" the garden terrain,

achieve a comparable inner joy and satisfaction (Rosenfield, 1992, p. 34). Corporations are recognizing that gardens, landscapes and parcels of undisturbed land provide benefits to the company (Parker, 1992). It has been found that “well-groomed” landscapes and parks “enhance the corporate image, increase business and reflect positive images” (Parker, 1992). “Other roles for the corporate garden are aesthetic enhancement, amenity or service, public relations tool, educational or cultural asset, and recreational or social setting” (Parker, 1992, p. 30).

The John Deere Company in Moline, Illinois attests that their “high quality design and their landscape are their most important recruiting tools” (Parker, 1992, p. 30). Parker states that the Deere atrium is one of the “best for enhancing the work environment.” “Construction of atriums is now considered to provide economic returns, because atriums can be relatively inexpensive to build and can recycle older buildings, provide increased earning power, and raise productivity” (Parker, 1992, p. 30).

### *B. Active Interactions with Plants*

#### *1. Psychological Benefits*

Individuals associate plants and nature to holidays, celebrations and human events, including times of loss; nature, plants, and flowers are symbolic and provide “environmental familiarity.” Active interactions with plants through gardening are a nurturing process and have been shown to increase self-esteem, improve motor skills, and inherently elicit well-being. Plants and nature also minimize the anxiety and tension that inherently comes with life by showing us that there are long-term, stable patterns in life (Lewis, 1993).

Plants and gardening activities used as a form of therapy have also been shown to have restorative and rehabilitative effects on the handicapped, mentally and physically ill, and the elderly. In 1978, the Meninger Foundation detailed the functions of horticulture therapy and defined the science as “gardening activities conducted with psychiatric patients” (Mattson, 1992, p. 162). Benefits include behavioral control, development of fine and gross motor skills, intellectual stimulation and independence (Mattson, 1992, p. 164). Another result of horticulture therapy is “frustration tolerance- learning to live with the unexpected” (Mattson, 1992, p. 163), such as pests or adverse weather, which can be useful in other aspects of life.

The term has since been expanded to include the use of plants and gardening as not only therapeutic tools for mentally and physically disabled persons, but for the public as a whole. Studies have shown that active involvement with plants (planting, care) can reduce anxiety and tension through physical labor. Leisurely gardening can also be considered a form of horticultural therapy (Lewis, 1992).

## 2. Communal Benefits

A community is a group of people who live in some spatial relationship to one another and who share interests and values (Carey, 1970). A community can be a neighborhood, school or workplace. The opinions, attitudes and perceptions of all individuals create a collective view, which could be positive or negative. “The physical condition of a community, therefore, plays a double role; for the community, it is a measure of itself; for outsiders driving through the community, its physical condition creates an impression of its quality and character” (Lewis, 1992, p. 56).



Community gardening and personal interaction creates a sense of ownership and gives confidence among members (Lewis, 1992). Being actively involved with plants, especially as a group, improves leadership skills, organizational capacity, develops relationships, and instills pride and ownership with surroundings (Bonham Jr., 1992). The American Community Gardening Association (ACGA), in a research agenda panel, organized priority areas of research into major categories, including the individual, the group, and the ecology. The highest priority was given to “effect on reduction of stress,” “individual empowerment,” and “sense of place” (Francis and Cordts, 1990, p. 73).

#### *Benefits of Plants and Employee Perceptions of Job Satisfaction*

Research has provided evidence that people prefer plants in indoor settings (Randall and Shoemaker, 1990). In 1988, a study found that “workers with a view of natural elements, such as trees and flowers, experienced less job pressure and were more satisfied with their jobs than others who had no outside view or who could see only built elements from their window” (Kaplan, 1992, p. 129).

In 1990, over thirty employees participated in a study to determine the effects that plants in an office environment had on employee job satisfaction. The site was located in northern Virginia and conducted on two of eleven floors. One floor was a traditional office area with cubicles and the other floor had an open layout. Plants were installed and then removed over several periods. A survey instrument was developed to address whether or not the presence of interior plants had a positive impact on employee job satisfaction. Forty-one questions addressed demographics, environmental preference and employee appreciation of plants. Statistical analysis showed that there was a positive correlation between job satisfaction and the presence of interior plants (Randall and

Shoemaker, 1992). Further evidence from employee surveys regarding work environments suggests that there are “important restorative effects of nature in stressful interior environments...especially in high technology habitats” (Ulrich and Parsons, 1992, p. 99).

“Some benefits of green space that accrue to individuals have clear benefits to organizations as well” (Westphal, 2003, p. 139). In 2001, Kaplan provided evidence to support that “there are numerous benefits available to individuals, organizations, and communities from green spaces, including improved worker productivity” (1990, p. 524). McDonough and Braungart had provided further support in 1987 that a physical environment that incorporates “whimsical sculptures and thriving plants” has shown to “enhance the well-being of workers” and increase productivity. “At the same time, both office and manufacturing staff reported a higher degree of job satisfaction than they had at their previous workplace” (p. 21-22). In conclusion, findings from this study provided evidence that working in office environments with plants will decrease absenteeism and increase productivity (Asmus, 2004).

Employee retention and motivational factors can be associated with job satisfaction, which can be contributed to many factors including the presence of plants and windows in the workplace. Marquis believed that amenities to employees can include outdoor sitting areas, indoor atriums and gardens, and art (1970). Additionally, results from several surveys provided evidence that the room with “colorful, non-plant objects” was interesting to users, but that the room with plants had greater perceived benefits by users (Lohr, 2000).

Although not always recognizable or quantifiable, the benefits of artwork, gardens and nature provide employees with improved working conditions that can be an equal incentive to recognition and fringe benefits (Parker, 1992). However, qualitative benefits are more easily measured and “the provision of artwork, plantings, and physical fitness opportunities are not just efficiency measures, but recognition that company success is based on mutual respect” (Parker, 1992, p. 28).

This research study is considered a valuable study in terms of employee retention, productivity and perceptions of job satisfaction. Although many studies have shown that typical office environments (building architecture, colors and artwork, and interior plants and windows) are the “least” motivating, passive interaction with plants and nature is often subconscious and even unnoticeable (Ulrich and Parsons, 1992), and therefore may not be consciously recognized when evaluating the factors that lead to an employee’s perception of job satisfaction. Additional studies have also shown that plants, windows and views of green spaces at least indirectly contribute to better working conditions and, thus, could improve employee job satisfaction, at least at the basic level.

## CHAPTER III

### METHODOLOGY

The intent of this study was to examine the effects of live interior plants and window views of exterior green spaces on employee perceptions of job satisfaction.

#### *Instrumentation*

The assessment tool used in this study was composed of several sections that asked employees about demographics, environmental preferences, physical workplace, and elements of job satisfaction, as well as overall life quality statements. The section of the questionnaire that specifically pertains to the presence or absence of live plants within office spaces and window views of green spaces was developed and validated by researchers of the horticultural sciences (Appendix A).

The demographic and work environment section of the instrument was modeled after similar instruments (Waliczek et al., 1996), and reviewed by other researchers for content validity (Appendix A). The demographic section of the instrument contained questions that included gender, age, education level and salary range. Demographic questions also included those that related to occupation level, salary range, work schedule, commute time and number of co-workers. The workplace environment section asked the participants to rate their overall physical work environment, what they liked best about their work environment, including location, design and architecture of building, the outside landscaping, co-workers and job duties and how they felt their

physical environment influenced their mood, productivity, motivation and job satisfaction. Other questions asked about overall life quality- “When all things in your life are considered, how do you feel today?” and “Overall how would you rank the quality of your life?”

The Environmental Preference Assessment (Richmond and McCroskey, 1995) asked the participants to respond to a series of questions about their workplace environment and perceptions and attitudes toward architecture and lighting. Each question had a Likert-scale (Likert, 1967) response range from 1 = “Strongly Disagree” to 5 = “Strongly Agree.” The instrument reliability was determined to be 0.85 by the original authors of the instrument (Richmond and McCroskey, 1995) (Appendix A).

To score the Environmental Preference Assessment instrument, more positive answers to the statements were allocated more points. A calculation supplied by the authors of the instrument (Richmond and McCroskey, 1995) was applied to particular statement answers for each respondent, which resulted in a total score for the survey. Scores for the environmental preference component ranged between 16 and 80. Scores greater than 58 indicated a preference for older architecture, and scores less than 38 indicated a preference for newer architecture; scores between 38 and 58 indicated no preference.

The final section of the questionnaire included a Job Satisfaction Survey (Spector, 1985) that asked the participants to respond to a series of questions related to employee job satisfaction. Each question had a Likert-scale (Likert, 1967) response range from 1 = “Strongly Disagree” to 5 = “Strongly Agree.” The survey included 36 statements relating to nine subcategories including pay, promotion, supervision, fringe benefits, contingent

rewards, operating procedures, coworkers, nature of work and communication. The instrument reliability was 0.91 (Spector, 1985) (Appendix A).

The Job Satisfaction Survey was scored by allocating one point for the most negative answer for each statement and five points for the most positive answer to each statement. The negatively worded questions were reversed scored by substituting the most positive rating for the most negative so that all responses were rated on the same scale with 1 = "Strongly disagree" and 5 = "Strongly agree." Points were summed for an overall score that ranged from 36 through 180. Scores less than 108 indicated less job satisfaction and scores greater than 108 indicated more job satisfaction. Groups of four statements that related to one of the subcategories of pay, promotion, supervision, fringe benefits, contingent rewards, operating procedures, coworkers, nature of work and communication were also summed to determine subcategory scores. A score of 20 was the highest score possible for each subcategory.

### *Sample*

Over 600 respondents accessed the survey on the Aggie Horticulture Web page (<http://floriculture.tamu.edu:7998/workplaceenvironment/>). However, only 552 respondents were included in the sample since these respondents answered the survey completely. Once logged on, the respondent agreed to participate in the study and acknowledged that he/she understood that participation in the study was voluntary. A financial incentive of a \$5.00 gift certificate to Lowe's Home Improvement<sup>®</sup> stores were mailed once the survey was received. The survey was posted for approximately six months.

All participants remained anonymous, with demographic information being

collected for analytical and comparative analysis only. All questionnaires remained confidential. Only the faculty and student researcher had access to the responses, and the data was stored in a secure room in the Agriculture Building at Texas State University-San Marcos.

### *Office Settings*

Specific participating sites included Freescale Semiconductor of Austin, Sanmina-SCI-Austin and Corporate Woods Office Park in Shawnee Mission, Kansas. Based on these site selections and the environmental variables of each office setting, a stratified, equal sample was sought of employees who worked in office settings that had live interior plants, window views of green spaces or both, and those that worked in office settings that had neither live interior plants or window views of green spaces.

### *Treatment*

Participants in the study were exposed to variables or treatments in their daily work settings. Treatment variables included the presence of live interior plants in an office or common area, or the presence of windows and window views of exterior green spaces. Those that were not exposed were considered the control group.

### *Data Collection and Analysis*

The on-line survey was posted on the Texas A&M University Horticulture web site (<http://floriculture.tamu.edu:7998/workplaceenvironment/>). The survey was voluntarily accessed by participants from companies that agreed to distribute the web address to their employees. To improve the accuracy of the data and analyses, addresses were monitored to ensure that only one response was given per person.

Data was automatically downloaded into a Microsoft Excel<sup>TM</sup> file (Seattle, WA) and then analyzed using the Statistical Package for the Social Sciences (SPSS<sup>®</sup>) Version 11.5 (Chicago, IL). The groups were then compared using analysis of variance tests to see if they differed demographically. Because statistically significant differences were found on variables including the work schedule, salary, ethnicity and gender of respondents that had either live plants or window views versus those that did not have live plants or window views, the groups were balanced by sorting and randomly weighing the groups. A subsample of 449 of the original 552 respondents was drawn to overcome any initial differences within the groups. The subsample was then analyzed and no statistically significant differences were found between groups on any of the demographic variables, with the exception of “gender” ( $P=0.000$ ).

Mean scores for job satisfaction and environmental preferences were analyzed using ANOVA methods to compare scores for offices that contained plants and had windows versus those that did not.



## **CHAPTER IV**

### **FINDINGS AND DISCUSSION**

The main objective of this study was to investigate the impact of interior plants and window views of green spaces on employee perceptions of job satisfaction.

Comparisons were made on measurements of employee job satisfaction of those who worked in office spaces that had live interior plants or window views of green spaces and those that did not. Demographic information was collected from the participants for comparisons between the four groups. This chapter contains the descriptive statistics and data analyses concerning employee perceptions of job satisfaction. The specific objectives of this study included the following:

1. To determine if an individual's environmental perception favored the presence of plants or window views of green spaces, natural lighting and newer, open architecture.
2. To compare perceptions of job satisfaction of employees that had live interior plants in their workspace or a common area, or windows and window views of exterior green spaces to employees that did not have live interior plants in their workspace or common area, or windows and window views of exterior green spaces.
3. To compare perceptions of overall life quality of employees that had live interior plants in their workspace or a common area, or windows and window views of

exterior green spaces to employees that did not have live interior plants in their workspace or common area, or windows and window views of exterior green spaces.

4. To evaluate specific demographic groups to determine if any particular group appeared to benefit more in terms of perceptions of job satisfaction from the presence of plants or windows in office environments.

### *Descriptive Statistics*

#### *Demographics*

Over 600 respondents accessed the on-line survey. However, only 552 respondents were included in the sample since these respondents answered the survey completely. The entire sample was then sorted into four groups including “no plants/no windows,” “plants/no windows,” “no plants/windows,” and “plants/windows.” The groups were then compared using analysis of variance tests to see if they differed demographically. Because statistically significant differences were found on variables including the work schedule, salary, ethnicity and gender of respondents that had either live plants or window views versus those that did not have live plants or window views, the groups were balanced by sorting and randomly weighing the groups. A subsample of 449 of the original 552 respondents was drawn to overcome any initial differences within the groups. The subsample was then analyzed and no statistically significant differences were found between groups on any of the demographic variables, with the exception of “gender” ( $P=0.000$ ).

Treatment groups included respondents from offices that had “no plants/no windows” (50.6%), “plants/no windows” (18.2%), “no plants/windows” (13%), and “plants/windows” (18.2%) (Table 1). The “no plants/no windows” group was 49.8%

female and 50.2% male, the “no plants/windows” group was 46.4% female and 53.6% male, the “plants/no windows” group was 73.2% female and 26.8% male and the “plants/windows” group was 71.4% female and 28.6% male (Table 1).

**Table 1. Descriptive statistics: Demographic analysis of the overall sample of the four treatment groups by age, gender, ethnicity, salary and education in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

Variable	NP/NW <sup>z</sup>		NP/W <sup>y</sup>		P/NW <sup>x</sup>		P/W <sup>w</sup>	
	No. Sample	% Sample	No. Sample	% Sample	No. Sample	% Sample	No. Sample	% Sample
<b>Gender</b>	235		56		71		84	
Males	118	50.2	30	53.6	19	26.8	24	28.6
Females	117	49.8	26	46.4	52	73.2	60	71.4
<b>Age</b>	236		56		71		86	
under 20 years	15	6.4	9	16.1	5	7.0	8	9.3
21-30 years	57	24.2	9	16.1	22	31.0	18	20.9
31-40 years	82	34.7	13	23.2	15	21.1	24	27.9
41-50 years	62	26.3	13	23.2	19	26.8	20	23.3
51-60 years	17	7.2	7	12.5	9	12.7	13	15.1
over 60 years	3	1.3	5	8.9	1	1.4	3	3.5
<b>Ethnicity</b>	233		56		70		85	
Caucasian	142	60.9	40	71.4	50	71.4	68	80.0
African American	17	7.3	0	0.0	2	2.9	2	2.4
American Indian	3	1.3	0	0.0	1	1.4	0	0.0
Hispanic	37	15.9	4	7.1	9	12.9	8	9.4
Asian American	29	12.4	11	19.6	7	10.0	6	7.1
Other	5	2.1	1	1.8	1	1.4	1	1.2
<b>Salary</b>	232		55		71		86	
Less than \$20,000	28	12.1	11	20.0	7	9.9	17	19.8
\$20-30,000	24	10.3	6	10.9	11	15.5	13	15.1
\$30-40,000	53	22.8	2	3.6	10	14.1	20	23.3
\$40-50,000	28	12.1	11	20.0	19	26.8	13	15.1
\$50-75,000	56	24.1	8	14.5	16	22.5	11	12.8
\$75-100,000	27	11.6	11	20.0	6	8.5	8	9.3

Variable	NP/NW <sup>z</sup>		NP/W <sup>y</sup>		P/NW <sup>x</sup>		P/W <sup>w</sup>	
	No. Sample	% Sample	No. Sample	% Sample	No. Sample	% Sample	No. Sample	% Sample
over \$100,000	16	6.9	6	10.9	2	2.8	4	4.7
<b>Education</b>	234		56		71		86	
Some high school	2	0.9	2	3.6	0		0	0.0
High school graduate	24	10.3	5	8.9	3	4.2	12	14.0
Some college	63	26.9	11	19.6	21	29.6	23	26.7
College graduate	84	35.9	17	30.4	24	33.8	29	33.7
Some graduate school	15	6.4	7	12.5	9	12.7	11	12.8
Completed graduate school	33	14.1	13	23.2	11	15.5	11	12.8
Trade school	13	5.6	1	1.8	3	4.2	0	0.0
<b>Total Sample Population</b>	449	100.0						

<sup>z</sup>No Plants/No Windows

<sup>y</sup>No Plants/Windows

<sup>x</sup>Plants/No Windows

<sup>w</sup>Plants/Windows

### *Findings Related to Objective 1*

The first objective of the study was to determine if an individual's environmental perception favored the presence of plants or window views of green spaces, natural lighting and newer, open architecture.

### *Data Analysis*

The Environmental Preference Assessment (Richmond and McCroskey, 1995) asked participants to respond to a series of questions about their workplace environment, and perceptions and attitudes toward architecture and lighting. Each question had a Likert-scale (Likert, 1967) response range from 1 = "Strongly Disagree" to 5 = "Strongly

Agree.” Scores for the environmental preference component ranged from 16 to 80.

Scores greater than 58 indicated a preference for older architecture, and scores less than 38 indicated a preference for newer architecture; scores between 38 and 58 indicated no preference for any particular type of architecture.

An analysis of variance test compared the four treatment groups' scores concerning environmental preference. No statistically significant differences ( $P=0.330$ ) were found on comparisons of environmental preference scores between the four treatment groups (Table 2). Scores for the Environmental Assessment scores test indicated that all participants preferred newer architecture, which generally has more windows, and is more open and airy, compared to older architecture, which generally has fewer windows and is “darker.” While there were no differences, descriptive statistics indicated that the participants that worked in offices without plants and windows had the strongest preference for newer architecture (mean score = 30.13) compared to those without either plants or windows (mean score = 27.77) (Table 2). This finding helped show that all participants preferred similar office conditions.

**Table 2. ANOVA test comparing mean scores on the Environmental Preference Assessment<sup>z</sup> of the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

<b>Participant group</b>	<b>Sample size (no.)</b>	<b>Mean Score<sup>y</sup></b>	<b>Standard Deviation</b>	<b>df</b>	<b>F</b>	<b>P</b>
No Plants/No Windows	263	30.13	15.512	3	1.146	0.330
No Plants/Windows	68	29.87	6.572			
Plants/No Windows	95	28.40	6.218			
Plants/Windows	95	27.77	7.873			

<sup>z</sup>Richmond, V. P. & McCroskey, J. C. (1995). *Nonverbal behavior in interpersonal relations*. Boston, MA: Allyn & Bacon.

<sup>y</sup>Scores ranged from 16 to 80. Scores greater than 58 indicated a preference for older architecture, while scores less than 38 indicated a preference for newer architecture; scores between 38 and 58 indicated no preference.

### *Findings Related to Objective 2*

The second objective of the study was to compare perceptions of job satisfaction of employees that had live interior plants in their workspace or a common area, or windows and window views of exterior green spaces to employees that did not have live interior plants in their workspace or common area, or windows and window views of exterior green spaces.

### *Data Analysis*

The participants were asked to respond to a series of questions related to employee job satisfaction. Each question on the Job Satisfaction Survey (Spector, 1985) had a Likert-scale (Likert, 1967) response range from 1 = “Strongly disagree” to 5 = “Strongly agree.” The survey included 36 statements relating to nine subcategories including pay, promotion, supervision, fringe benefits, contingent rewards, operating procedures, coworkers, nature of work and communication. The survey was scored by allocating 1 point for the most negative answer for each statement and 5 points for the most positive answer to each statement. The negatively worded questions were reversed scored by substituting the most positive rating for the most negative so that all responses were rated on the same scale. Points were summed for an overall score that ranged from 36 through 180. Scores less than 108 indicated less job satisfaction and scores greater than 108 indicated more job satisfaction.

### *Descriptive Statistics*

An analysis of variance compared the four treatment groups’ scores concerning overall job satisfaction. There was a statistically significant difference ( $P=0.041$ ) on the ANOVA test comparing overall perceptions of job satisfaction among groups. The post

hoc analysis (LSD) indicated that the “plants/windows” group scored similarly to the “plants/no windows” group, and the “no plants/windows” group score was statistically the same as the “no plants/no windows” group score. Descriptive statistics showed that respondents in offices with plants and windows rated their overall job satisfaction high (mean score =115.16), as well as participants with plants but no windows (mean score =112.52). Participants with windows but no plants rated their overall job satisfaction lower (mean score =105.56), as well as participants without both windows and plants (mean score =106.47). The results of this study provided evidence that the two groups without plants in their offices rated their job satisfaction below 108, which indicated less job satisfaction. Additionally, both groups with plants rated their job satisfaction higher than 108, which indicated more job satisfaction.

These findings support previous research of self-reports from employees that have shown that job conditions are directly related to employee attitudes, including job satisfaction, frustration, anxiety on the job, and turnover rates (Siu et al., 2001). These findings are interesting because they provide evidence that people that worked in offices with plants rated their job satisfaction higher than employees that worked in offices without plants. Throughout history, people have been fascinated with plants and nature. Theories developed to explain the rejuvenating effects of natural areas to human beings have been based on our genetic programming to biological rhythms due to our evolution in natural environs (Orians and Heerwagen, 1992). “Their presence improves the quality of our lives in many ways: environmentally, economically, socially, culturally and physically through our health and well-being” (Zampini, 1994, p.185).

**Table 3. ANOVA test comparing mean scores on the Job Satisfaction Survey<sup>z</sup> of the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

Participant group	Sample size (no.)	Mean Score <sup>y</sup>	Standard Deviation	df	F	P
<b>Overall job satisfaction score</b>						
No Plants/No Windows	264	106.47	30.913	3	2.768	0.041*
No Plants/Windows	68	105.56	33.270			
Plants/No Windows	95	112.52	29.586			
Plants/Windows	95	115.16	22.089			

<sup>z</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

<sup>y</sup>Scores ranged from 36 through 180. Scores greater than 108 indicated more job satisfaction and scores less than 108 indicated less job satisfaction.

\*Statistically significant at the 0.05 level.

### *Subcategory Score Analyses*

Since overall job satisfaction scores indicated differences, subcategory scores within the instrument were also analyzed using analysis of variance tests. Groups of four statements that related to each of the subcategories of “pay,” “promotion,” “supervision,” “fringe benefits,” “contingent rewards,” “operating procedures,” “coworkers,” “nature of work” and “communication” were summed to determine subcategory scores (Table 4). Subcategory scores ranged from 4 to 20. Higher scores indicated more positive attitudes for that subcategory. Analysis of variance tests indicated statistically significant differences in the subcategories of “nature of work” ( $P=0.006$ ), “supervision” ( $P=0.029$ ) and “coworkers” ( $P=0.041$ ). There were no statistically significant differences in the subcategories of “pay,” “promotion,” “fringe benefits,” “contingent rewards,” “operating conditions,” or “communication.”



**Table 4. Subcategories and individual statements of the Job Satisfaction Survey<sup>z</sup> used in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

<b>Subcategory and Individual Statements</b>
<b>Pay</b>
I feel I am being paid a fair amount for the work I do.
Raises are too few and far between.
I feel unappreciated by the organization when I think about what they pay me.
I feel satisfied with my chances for salary increases.
<b>Promotion</b>
There is really too little chance for promotion on my job.
Those who do well on the job stand a fair chance of being promoted.
People get ahead as fast here as they do in other places.
I am satisfied with my chances for promotion.
<b>Supervision</b>
My supervisor is quite competent in doing his/her job.
My supervisor is unfair to me.
My supervisor shows too little interest in the feelings of subordinates.
I like my supervisor.
<b>Fringe Benefits</b>
I am not satisfied with the benefits I receive.
The benefits we receive are as good as most other organizations offer.
The benefit package we have is equitable.
There are benefits we do not have which we should have.
<b>Contingent rewards</b>
When I do a good job, I receive the recognition for it that I should receive.
I do not feel that the work I do is appreciated.
There are few rewards for those who work here.
I do not feel my efforts are rewarded the way they should be.
<b>Operating conditions</b>
Many of our rules and procedures make doing a good job difficult.
My efforts to do a good job are seldom blocked by red tape.
I have too much to do at work.
I have too much paperwork.
<b>Coworkers</b>
I like the people I work with.
I find I have to work harder at my job because of the incompetence of people I work with.
I enjoy my coworkers.
There is too much bickering and fighting at work.

<b>Subcategory and Individual Statements</b>
<b>Nature of work</b>
I sometimes feel my job is meaningless.
I like doing the things I do at work.
I feel a sense of pride in doing my job.
My job is enjoyable.
<b>Communication</b>
Communications seem good within this organization.
The goals of this organization are not clear to me.
I often feel that I do not know what is going on with the organization.
Work assignments are not fully explained.

<sup>z</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

There were statistically significant differences ( $P=0.006$ ) on the ANOVA comparisons on the subcategory statements concerning “nature of work” (Table 5). The post hoc analyses (LSD) indicated that the “plants/windows” group score was the same as the “plants/no windows” group score, but both of these scores were different from the “no plants/no windows” and the “no plants/windows” group scores. People in offices with plants and windows and people in office with plants and no windows rated their “nature of work” (job duties, regular tasks) the highest (mean scores =14.27 and 13.57) when compared to participants without plants and windows, or windows and no plants which had the lowest ratings (mean scores =12.74 and 12.87) (Table 5).

An employee’s perception of their job duties can be directly related to and monitored by their performance and completion of tasks. In general, findings from this study indicated that those that worked in offices with plants felt better about their job. Previous studies have been conducted that show that employees that work in plantless and/or windowless office environments experience increased stress, lower job satisfaction and personal productivity (Randall and Shoemaker, 1992; Ulrich and Parsons, 1992).

High employee turnover rates, increasing health costs, and high absenteeism have encouraged corporations to seek new ways to improve the work environment and provide amenities to their employees as incentives (Goodrich, 1986; Parker, 1992; Lohr et al., 1996; Jackson, 2003). Additional studies have shown that adverse environmental conditions such as poor air quality, noise, lack of privacy and ergonomic conditions can have negative effects on employee perceptions of job satisfaction and overall well-being (Klitzman and Stellman, 1989), thus, effecting how employees rate their work duties and responsibilities, as a whole.

There were statistically significant differences ( $P=0.029$ ) in ANOVA comparisons on scores from statements related to the subcategory “supervision” (likeability, fairness, competency, interest in subordinates) (Table 5). The post hoc analyses (LSD) indicated that the “plants/windows” group score was the same as the “plants/no windows” group score, but both of these scores were different than the “no plants/no windows” and the “no plants/windows” group scores. Descriptive statistics showed that people in offices with plants and windows, and plants and no windows rated “supervision” statements the most positively (mean scores =14.71 and 14.18). Participants without both windows and plants, and windows but no plants also had lower ratings (mean scores =13.53 and 12.99). Results provided evidence that the presence of plants helped to influence employee perceptions of supervision, and that participants with plants rated “supervision” higher.

These findings support previous research by the London design firm, Morgan Lovell, who conducted an environmental survey of 2,000 office staff. Twenty-five percent of the respondents stated that they would “feel more committed to their employer

if improvements were made to their workplace,” specifically “comfortable chairs and desks,” and “natural air and light.” The report found that “even simple things such as adequate daylight can reduce absenteeism by 15% and increase productivity by up to 20%” (Bradley, 2005, on-line). “Humanizing the workplace with green plants is a highly effective method to promote employee satisfaction” (Gilhooley, 2002, p. 3). Top managers and personnel directors are now setting new trends in employee supervision to promote satisfaction and retention by focusing on and incorporating personal interests (such as gardening and time spent in nature) of employees into the workplace (Gilhooley, 2002, p. 3).

In subcategory statement mean scores for “coworkers” (likeability, competency, communication, teamwork), there were statistically significant differences ( $P=0.041$ ) in ANOVA comparisons. The post hoc analyses (LSD) indicated that the “plants/windows” group score was the same as the “plants/no windows” group score, but both of these scores were different from the “no plants/no windows” and the “no plants/windows” group scores. Descriptive statistics indicated that people in offices with plants and windows, and plants and no windows rated “coworkers” statements the most positively (mean scores =14.17 and 14.37). Participants with windows but no plants, and those without plants or windows rated statements related to “coworkers” lower (mean scores =13.00 and 13.22). Results showed evidence that the presence of plants influenced employee perceptions of their coworkers (Table 5).

These findings support previous studies that showed being in environments with plants, such as community gardens helped create a place for social interaction (Waliczek et al., 1996). Shoemaker (1982) found that many gardeners participated in community

and other group gardening efforts for the “higher level social benefits” (p. 205). Recent studies have shown that natural vegetation and open spaces are preferred to “unplanted” or bare areas for their aesthetics, but more importantly, for their physical, mental and spiritual benefits to individuals and the community. “Generally, research has revealed that urban forests provide many benefits for city residents, including improved environmental quality and more satisfying quality of life” (Wolf, 1996, p. 27).

**Table 5. ANOVA test comparing mean subcategory scores on the Job Satisfaction Inventory<sup>z</sup> of the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

Subcategory and Participant group	Sample size (no.)	Mean Score <sup>y</sup>	Standard Deviation	df	F	P
<b>Pay<sup>x</sup></b>						
No Plants/No Windows	264	9.36	3.534	3	2.577	0.053
No Plants/Windows	68	9.18	3.644			
Plants/No Windows	95	9.81	3.532			
Plants/Windows	95	10.43	3.575			
<b>Promotion<sup>w</sup></b>						
No Plants/No Windows	264	10.81	3.675	3	2.439	0.064
No Plants/Windows	68	11.25	3.735			
Plants/No Windows	95	11.45	3.457			
Plants/Windows	95	11.91	3.262			
<b>Supervision<sup>v</sup></b>						
No Plants/No Windows	264	13.53	4.371	3	3.031	0.029*
No Plants/Windows	68	12.99	4.524			
Plants/No Windows	95	14.18	3.770			
Plants/Windows	95	14.71	3.439			
<b>Fringe benefits<sup>u</sup></b>						
No Plants/No Windows	264	11.38	3.761	3	1.699	0.166
No Plants/Windows	68	10.76	3.868			
Plants/No Windows	95	11.95	3.677			
Plants/Windows	95	11.81	3.197			
<b>Contingent rewards<sup>t</sup></b>						
No Plants/No Windows	264	11.49	4.285	3	1.365	0.253
No Plants/Windows	68	11.65	4.350			

<b>Subcategory and Participant group</b>	<b>Sample size (no.)</b>	<b>Mean Score<sup>y</sup></b>	<b>Standard Deviation</b>	<b>df</b>	<b>F</b>	<b>P</b>
Plants/No Windows	95	11.92	3.792			
Plants/Windows	95	12.44	3.270			
<b>Operating conditions<sup>s</sup></b>						
No Plants/No Windows	264	12.2	3.630	3	0.981	0.401
No Plants/Windows	68	12.01	4.159			
Plants/No Windows	95	12.81	3.668			
Plants/Windows	95	12.57	3.076			
<b>Coworkers<sup>r</sup></b>						
No Plants/No Windows	264	13.22	4.108	3	2.780	0.041*
No Plants/Windows	68	13.00	4.452			
Plants/No Windows	95	14.37	5.255			
Plants/Windows	95	14.17	3.013			
<b>Nature of work<sup>q</sup></b>						
No Plants/No Windows	264	12.74	3.997	3	4.236	0.006*
No Plants/Windows	68	12.87	4.253			
Plants/No Windows	95	13.57	3.729			
Plants/Windows	95	14.27	3.030			
<b>Communication<sup>p</sup></b>						
No Plants/No Windows	264	11.74	4.731	3	1.672	0.172
No Plants/Windows	68	11.85	5.091			
Plants/No Windows	95	12.46	4.405			
Plants/Windows	95	12.85	3.843			

<sup>z</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

<sup>y</sup>Scores range from 1 to 20 with 4 being the lowest possible score and 20 being the highest possible score for each subcategory.

<sup>x</sup>Statements relating to "Pay" subcategory include:

"I feel I am being paid a fair amount for the work I do."

"Raises are too few and far between."

"I feel unappreciated by the organization when I think about what they pay me."

"I feel satisfied with my chances for salary increases."

<sup>w</sup>Statements relating to "Promotion" subcategory include:

"There is really too little chance for promotion on my job."

"Those who do well on the job stand a fair chance of being promoted."

"People get ahead as fast here as they do in other places."

"I am satisfied with my chances for promotion."

<sup>v</sup>Statements relating to "Supervision" subcategory include:

"My supervisor is quite competent in doing his/her job."

"My supervisor is unfair to me."

- “My supervisor shows too little interest in the feelings of subordinates.”
- “I like my supervisor.”
- <sup>h</sup>Statements relating to “Fringe benefits” subcategory include:
- “I am not satisfied with the benefits I receive.”
- “The benefits we receive are as good as most other organizations offer.”
- “The benefits package we have is equitable.”
- “There are benefits we do not have which we should have.”
- <sup>i</sup>Statements relating to “Contingent rewards” subcategory include:
- “When I do a good job, I receive the recognition for it that I should receive.”
- “I do not feel that the work I do is appreciated.”
- “There are few rewards for those who work here.”
- “I do not feel my efforts are rewarded the way they should be.”
- <sup>s</sup>Statements relating to “Operating conditions” subcategory include:
- “Many of rules and procedures make doing a good job difficult.”
- “My efforts to do a good job are seldom blocked by red tape.”
- “I have too much to do at work.”
- “I have too much paperwork.”
- <sup>r</sup>Statements relating to “Coworkers” subcategory include:
- “I like the people I work with.”
- “I find I have to work harder at my job because of the incompetence of people I work with.”
- “I enjoy my coworkers.”
- “There is too much bickering and fighting at work.”
- <sup>q</sup>Statements relating to “Nature of work” subcategory include:
- “I sometimes feel my job is meaningless.”
- “I like doing the things I do at work.”
- “I feel a sense of pride in doing my job.”
- “My job is enjoyable.”
- <sup>p</sup>Statements relating to “Communication” subcategory include:
- “Communications seem good within this organization.”
- “The goals of this organization are not clear to me.”
- “I often feel that I do not know what is going on with the organization.”
- “Work assignments are not fully explained.”
- \*Statistically significant at the 0.05 level.

### *Individual Statement Comparisons*

Because overall job satisfaction scores and subcategory comparisons indicated differences between the four treatment groups, individual job satisfaction statements were analyzed to determine if differences occurred as well. There were statistically significant differences in statements in the subcategories of “physical work environment,” “pay,”

“coworkers,” and “nature of work.” There were no statistical differences found in statements in the subcategories of “promotion,” “supervision,” “fringe benefits,” “contingent rewards,” “operating conditions,” or “communication.”

#### *Physical Work Environment Statement Comparisons*

Of two statements related to “physical work environment,” one was statistically significant. When participants were asked, “How would you rate your overall physical work environment on a scale from 1 to 5?” there was a statistically significant difference ( $P=0.000$ ) on the ANOVA test (Table 6). The post hoc (LSD) analysis indicated that the “no plants/no windows” group score was different from all other group scores.

Descriptive statistics found that 24% of the group that had plants and windows in their offices rated their physical work environment as a “5” compared to only 8.7% of participants that worked in an office without plants and windows, 12% of participants that worked in an office that had plants but no windows, and 11.8% of participants that worked in an office that had windows but no plants. Differences were not distinguished between professionally interiorscaped plantings and plants brought from individuals’ homes. Overall, the participants that had plants or windows in their offices felt better about their physical work environment (Table 6).

These findings support previous studies that have provided evidence that plants have physiological benefits to individuals. Prevalent studies have included research in stress and anxiety reduction (Waliczek et al., 1996), improved health (Ulrich and Parsons, 1992) and the reduction of asthma and allergies (Wolverton et al., 1989). A study conducted by Ulrich (1984) provided evidence that window views of plants can reduce stress in ailing patients and can expedite recovery. These benefits have been studied in



more detail, and are further supported by general public opinion that people perceive improved feelings of happiness and health (Ulrich and Parsons, 1992) when among plants and natural surroundings.

The physical environment affects employees' ability and desire to work (Parker, 1992). Due to high employee turnover rates, increasing health costs, and high absenteeism, corporations are seeking new ways to improve the work environment and provide amenities to their employees as incentives (Goodrich, 1986; Parker, 1992; Lohr et al., 1996; Jackson, 2003). Additional findings supported that work-related stress can be affected by physical work environments (Klitzman and Stellman, 1989), which backed up a study that showed employees reported decreased stress-related ailments such as headaches when having a view of nature (Kaplan, 1992).

**Table 6. ANOVA test comparing mean physical environment response scores of the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

Subcategory and Participant group	Sample size (no.)	Mean Score <sup>y</sup>	Standard Deviation	df	F	P
<b>Physical environment</b>						
How would you rate your overall physical work environment on a scale from 1-5?						
No Plants/No Windows	264	3.20	1.021	3	9.543	0.000*
No Plants/Windows	68	3.53	0.889			
Plants/No Windows	94	3.55	0.838			
Plants/Windows	95	3.77	0.973			
What do you like best about your work environment?						
No Plants/No Windows	263	2.53	1.482	3	2.517	0.058
No Plants/Windows	67	2.91	1.612			
Plants/No Windows	95	2.96	1.630			
Plants/Windows	93	2.80	1.543			

<sup>y</sup>Statements were rated on a 1 to 5-point scale with 5 being the most positive response and 1 being the most negative response.

\*Statistically significant at the 0.05 level.

#### *Subcategory "Pay" Statement Comparisons*

Of four statements in the subcategory of "pay," one was statistically significant.

When participants were asked to respond to the statement, "Raises are too few and far between" there was a statistically significant difference ( $P=0.014$ ) on the ANOVA test (Table 7). Post hoc analyses (LSD) indicated that the "no plants/no windows" group score was different from the other three groups. Descriptive statistics indicated that only 13.1 % of the "no plants/no windows" group "Disagreed" or "Strongly disagreed" with the statement, while 28.3% of the "plants/windows" group "Disagreed" or "Strongly disagreed," 34% of the "no plants/windows" group "Disagreed" or "Strongly disagreed"

and 45% of the “plants/no windows” group “Disagreed” or “Strongly disagreed” (Table 7). Overall, employees that lacked office plants or windows felt less satisfied with the rate of increases in salary.

These findings support previous studies that, although not always recognizable or quantifiable, the benefits of artwork, gardens and nature provide employees with improved working conditions that can be an equal incentive to recognition and fringe benefits (Parker, 1990). Further studies have shown that employees with a higher pay structure have better perceptions of job satisfaction (Yang et al., 2005). Although not statistically linked, employees that generally have live indoor plants and windows tend to have a higher salary and position within the company when compared to those that do not.

#### *Subcategory “Coworkers” Statement Comparisons*

Of four statements in the subcategory of “coworkers,” one was statistically significant. When participants were asked to respond to the statement, “I find that I have to work harder because of the incompetence of the people I work with” there was a statistically significant difference ( $P=0.008$ ) on the ANOVA test (Table 7). The post hoc analysis (LSD) indicated that the “plants/no windows” group score was different from all other groups. Descriptive statistics indicated that 66.3% of the “plants/no windows” group “Disagreed,” or “Strongly disagreed,” and 53% of the “no plants/no windows” group “Disagreed” or “Strongly disagreed.” Descriptive statistics also indicated that 48% of the “plants/windows” group “Disagreed,” or “Strongly disagreed,” and 48% of the “no plants/windows” group “Disagreed,” or “Strongly disagreed” (Table 7). Overall,

participants that had plants or windows in their workspace appeared to exhibit more tolerance for their coworkers.

These findings support a study that was conducted (Aitken and Palmer, 1989) to determine how plants placed in an office environment affected the participants' perception of the overall environment. Communication students were asked to agree or disagree with statements about the presence of the plants. When asked to answer the question "An office neatly decorated with live plants gives me the impression of a well-organized and well-staffed institution," 70% agreed or strongly agreed, while only 10% disagreed and 20% felt neutral about the statement (Lohr, 1994, p. 229).

#### *Subcategory "Nature of Work" Statement Comparisons*

Of four statements in the subcategory of "nature of work," two were statistically significant. When participants were asked to respond to the statement, "I feel a sense of pride in doing my job" there was a statistically significant difference ( $P=0.032$ ) on the ANOVA test (Table 7). Post hoc analyses (LSD) indicated that the "plants/windows" group score was the same as the "plants/no windows" group, and that both of these group scores were different from the "no plants/no windows" group and the "no plants/windows" group. Descriptive statistics indicated that 77% of the "plants/windows" group and 82% of the "plants/no windows" group "Agreed" or "Strongly agreed" with the statement, while only 73.7% of the "no plants/windows" group and 69.6% of the "no plants/no windows" group "Agreed" or "Strongly agreed" with the statement.

When participants were asked to respond to the statement, "My job is enjoyable" there was a statistically significant difference ( $P=0.001$ ) on the ANOVA test (Table 7).

The post hoc analysis (LSD) indicated that the “plants/windows” group was different from the other three groups. Descriptive statistics indicated that only 61.4% of the “no plants/no windows” group “Agreed” or “Strongly agreed” that their job was enjoyable, and almost 83% of the “plants/windows” group, 75.4% of the “no plants/windows” group and 72% of the “plants/no windows” group “Agreed” or “Strongly agreed.” In general, participants that had live plants and windows in their workspace exhibited significantly more feelings of enjoyment for their work when compared to those that did not have plants or windows in their office environments.

These findings support previous research that has provided evidence that people prefer plants and views of nature (Randall and Shoemaker, 1992). In 1988, a study found that “workers with a view of natural elements, such as trees and flowers, experienced less job pressure and were more satisfied with their jobs than others who had no outside view or who could see only built elements from their window” (Kaplan, 1992, p. 129). Further evidence from employee surveys regarding work environments suggested that there were “important restorative effects of nature in stressful interior environments...especially in high technology habitats” (Ulrich and Parsons, 1992, p. 99).

Previous studies have been conducted that show that employees that work in plantless and/or windowless office environments experienced increased stress and lower job satisfaction (Randall and Shoemaker, 1992; Ulrich and Parsons, 1992). In Lohr’s study (1996), a group of college students was divided into two areas: one with plants and one without plants. Blood pressure and psychological attitudes were measured while the participants completed a computer exercise. The participants in the room with the plants

reported that they felt more attentive, felt less stressed and were more productive based on response time to individual assigned tasks (Lohr, 1996).

**Table 7. ANOVA test comparing individual statement response mean scores of the four treatment groups in the Job Satisfaction Inventory<sup>z</sup> in the study of the influence of live plants and window views of employee perceptions of job satisfaction.**

Subcategory and Participant group	Sample size (no.)	Mean Score <sup>y</sup>	Standard Deviation	df	F	P
<b>Pay</b>						
I feel I am being paid a fair amount for the work I do.						
No Plants/No Windows	253	1.94	0.772	3	1.925	0.125
No Plants/Windows	64	1.86	0.852			
Plants/No Windows	93	1.81	0.770			
Plants/Windows	94	1.73	0.675			
Raises are too few and far between.						
No Plants/No Windows	244	2.21	1.059	3	3.578	0.014*
No Plants/Windows	62	2.16	0.909			
Plants/No Windows	89	2.40	0.985			
Plants/Windows	92	2.60	1.258			
I feel unappreciated by the organization when I think about what they pay me.						
No Plants/No Windows	244	3.30	1.118	3	1.019	0.384
No Plants/Windows	61	3.36	1.081			
Plants/No Windows	89	3.47	1.149			
Plants/Windows	92	3.51	1.084			
I feel satisfied with my chances for salary increases.						
No Plants/No Windows	243	2.61	1.135	3	1.732	0.159
No Plants/Windows	61	2.72	1.097			
Plants/No Windows	89	2.71	1.079			
Plants/Windows	91	2.92	1.157			
<b>Promotion</b>						
There is really too little chance for promotion on my job.						

<b>Subcategory and Participant group</b>	<b>Sample size (no.)</b>	<b>Mean Score<sup>y</sup></b>	<b>Standard Deviation</b>	<b>df</b>	<b>F</b>	<b>P</b>
No Plants/No Windows	255	3.61	1.005	3	1.568	0.196
No Plants/Windows	65	3.77	1.086			
Plants/No Windows	93	3.57	1.146			
Plants/Windows	94	3.84	1.091			
Those who do well on the job stand a fair chance of being promoted.						
No Plants/No Windows	243	2.70	1.051	3	1.889	0.130
No Plants/Windows	62	2.95	0.931			
Plants/No Windows	89	2.91	1.030			
Plants/Windows	92	2.91	1.065			
People get ahead as fast here as they do in other places.						
No Plants/No Windows	244	2.70	0.968	3	1.442	0.230
No Plants/Windows	61	2.90	0.851			
Plants/No Windows	89	2.85	0.833			
Plants/Windows	92	2.66	0.964			
I am satisfied with my chances for promotion.						
No Plants/No Windows	242	2.56	1.050	3	1.227	0.299
No Plants/Windows	61	2.62	1.003			
Plants/No Windows	89	2.73	1.185			
Plants/Windows	92	2.79	1.153			
<b>Supervision</b>						
My supervisor is quite competent in doing his/her job.						
No Plants/No Windows	254	2.97	1.027	3	2.196	0.088
No Plants/Windows	65	2.69	0.917			
Plants/No Windows	93	2.94	0.976			
Plants/Windows	95	3.09	0.946			
My supervisor is unfair to me.						
No Plants/No Windows	244	4.00	0.998	3	1.015	0.386
No Plants/Windows	62	4.06	0.939			
Plants/No Windows	89	4.18	0.820			
Plants/Windows	92	4.14	0.933			

<b>Subcategory and Participant group</b>	<b>Sample size (no.)</b>	<b>Mean Score<sup>y</sup></b>	<b>Standard Deviation</b>	<b>df</b>	<b>F</b>	<b>P</b>
My supervisor shows too little interest in the feelings of subordinates.						
No Plants/No Windows	244	3.66	1.123	3	0.646	0.585
No Plants/Windows	61	3.66	1.078			
Plants/No Windows	89	3.83	1.014			
Plants/Windows	92	3.77	1.140			
I like my supervisor						
No Plants/No Windows	244	3.89	0.975	3	1.681	0.170
No Plants/Windows	61	3.82	1.190			
Plants/No Windows	89	4.06	0.680			
Plants/Windows	92	4.08	0.905			
<b>Fringe Benefits</b>						
I am not satisfied with the benefits I receive.						
No Plants/No Windows	254	2.65	0.723	3	1.053	0.369
No Plants/Windows	64	2.72	0.845			
Plants/No Windows	93	2.62	0.793			
Plants/Windows	95	2.52	0.742			
The benefits we receive are as good as most other organizations offer.						
No Plants/No Windows	242	3.36	1.049	3	1.796	0.147
No Plants/Windows	62	3.19	0.955			
Plants/No Windows	89	3.57	0.952			
Plants/Windows	92	3.41	1.091			
The benefit package we have is equitable.						
No Plants/No Windows	244	3.45	0.913	3	1.903	0.128
No Plants/Windows	61	3.23	0.920			
Plants/No Windows	89	3.52	0.906			
Plants/Windows	92	3.28	0.976			
There are benefits we do not have which we should have.						
No Plants/No Windows	244	2.78	0.989	3	0.668	0.572
No Plants/Windows	59	2.76	1.040			
Plants/No Windows	89	2.92	1.003			



<b>Subcategory and Participant group</b>	<b>Sample size (no.)</b>	<b>Mean Score<sup>y</sup></b>	<b>Standard Deviation</b>	<b>df</b>	<b>F</b>	<b>P</b>
Plants/Windows	92	2.90	1.038			
<b>Contingent rewards</b>						
When I do a good job, I receive the recognition for it that I should receive.						
No Plants/No Windows	252	3.08	1.108	3	1.392	0.244
No Plants/Windows	65	3.25	0.985			
Plants/No Windows	93	2.97	1.058			
Plants/Windows	95	2.93	1.044			
I do not feel that the work I do is appreciated.						
No Plants/No Windows	244	3.28	1.125	3	1.335	0.262
No Plants/Windows	62	3.32	1.113			
Plants/No Windows	89	3.36	1.100			
Plants/Windows	92	3.55	1.113			
There are few rewards for those who work here.						
No Plants/No Windows	244	3.03	1.061	3	1.588	0.191
No Plants/Windows	60	3.27	0.918			
Plants/No Windows	89	3.27	1.063			
Plants/Windows	92	3.10	1.049			
I do not feel my efforts are rewarded the way they should be.						
No Plants/No Windows	243	2.95	1.110	3	1.056	0.367
No Plants/Windows	61	2.93	1.109			
Plants/No Windows	89	2.99	1.039			
Plants/Windows	92	3.17	1.055			
<b>Operating conditions</b>						
Many of our rules and procedures make doing a good job difficult.						
No Plants/No Windows	255	3.89	0.891	3	0.262	0.853
No Plants/Windows	65	3.95	0.891			
Plants/No Windows	93	3.97	0.902			
Plants/Windows	95	3.88	0.944			

<b>Subcategory and Participant group</b>	<b>Sample size (no.)</b>	<b>Mean Score<sup>y</sup></b>	<b>Standard Deviation</b>	<b>df</b>	<b>F</b>	<b>P</b>
My efforts to do a good job are seldom blocked by red tape.						
No Plants/No Windows	244	2.91	1.077	3	2.195	0.088
No Plants/Windows	62	2.97	1.024			
Plants/No Windows	89	3.25	1.058			
Plants/Windows	91	3.04	1.134			
I have too much to do at work.						
No Plants/No Windows	244	2.88	1.043	3	0.363	0.780
No Plants/Windows	60	2.85	1.162			
Plants/No Windows	89	2.99	1.039			
Plants/Windows	92	2.96	1.078			
I have too much paperwork.						
No Plants/No Windows	244	3.35	1.076	3	1.954	0.120
No Plants/Windows	61	3.36	1.049			
Plants/No Windows	89	3.29	1.047			
Plants/Windows	91	3.03	1.242			
<b>Coworkers</b>						
I like the people I work with.						
No Plants/No Windows	253	3.62	0.738	3	0.915	0.433
No Plants/Windows	65	3.55	0.685			
Plants/No Windows	93	3.72	0.757			
Plants/Windows	94	3.71	0.875			
I find I have to work harder at my job because of the incompetence of people I work with.						
No Plants/No Windows	244	3.22	1.207	3	3.975	0.008*
No Plants/Windows	62	3.37	1.163			
Plants/No Windows	89	3.97	3.284			
Plants/Windows	92	3.33	1.091			
I enjoy my coworkers.						
No Plants/No Windows	243	3.97	0.867	3	0.929	0.427
No Plants/Windows	61	3.90	1.028			
Plants/No Windows	89	4.07	0.823			
Plants/Windows	92	4.10	0.839			

<b>Subcategory and Participant group</b>	<b>Sample size (no.)</b>	<b>Mean Score<sup>y</sup></b>	<b>Standard Deviation</b>	<b>df</b>	<b>F</b>	<b>P</b>
There is too much bickering and fighting at work.						
No Plants/No Windows	243	3.39	1.189	3	0.028	0.994
No Plants/Windows	60	3.43	1.294			
Plants/No Windows	89	3.42	1.031			
Plants/Windows	92	3.41	1.131			
<b>Nature of work</b>						
I sometimes feel my job is meaningless.						
No Plants/No Windows	255	2.68	1.057	3	1.182	0.316
No Plants/Windows	65	2.74	0.940			
Plants/No Windows	93	2.90	1.001			
Plants/Windows	95	2.79	0.955			
I like doing the things I do at work.						
No Plants/No Windows	244	3.75	0.937	3	0.463	0.708
No Plants/Windows	62	3.82	0.820			
Plants/No Windows	89	3.80	0.800			
Plants/Windows	92	3.88	0.947			
I feel a sense of pride in doing my job.						
No Plants/No Windows	244	3.69	0.938	3	2.968	0.032*
No Plants/Windows	61	3.84	1.052			
Plants/No Windows	89	3.92	0.815			
Plants/Windows	92	3.99	0.845			
My job is enjoyable.						
No Plants/No Windows	243	3.55	0.984	3	5.240	0.001*
No Plants/Windows	61	3.70	0.919			
Plants/No Windows	89	3.73	0.836			
Plants/Windows	92	3.99	0.763			
<b>Communication</b>						
Communications seem good within this organization.						
No Plants/No Windows	244	2.77	1.193	3	1.625	0.183
No Plants/Windows	62	2.79	1.189			
Plants/No Windows	89	3.07	1.116			

<b>Subcategory and Participant group</b>	<b>Sample size (no.)</b>	<b>Mean Score<sup>y</sup></b>	<b>Standard Deviation</b>	<b>df</b>	<b>F</b>	<b>P</b>
Plants/Windows	92	2.93	1.193			
The goals of this organization are not clear to me.						
No Plants/No Windows	243	3.50	1.118	3	0.932	0.425
No Plants/Windows	62	3.58	1.095			
Plants/No Windows	89	3.52	1.001			
Plants/Windows	90	3.71	0.927			
I often feel that I do not know what is going on with the organization.						
No Plants/No Windows	243	3.00	1.128	3	1.125	0.338
No Plants/Windows	60	3.08	1.139			
Plants/No Windows	89	3.15	1.006			
Plants/Windows	92	3.23	0.996			
Work assignments are not fully explained.						
No Plants/No Windows	243	3.48	1.069	3	0.847	0.469
No Plants/Windows	61	3.70	0.937			
Plants/No Windows	89	3.57	1.010			
Plants/Windows	91	3.52	1.026			

<sup>z</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

### *Findings Related to Objective 3*

The third objective of the study was to compare perceptions of overall life quality of employees that had live interior plants in their workspace or a common area or windows and window views of exterior green spaces to employees that did not have live interior plants in their workspace or common area, or windows and window views of exterior green spaces.

### *Data Analysis*

The participants were asked to respond to two questions regarding their perceptions of overall life quality. The participants were asked, “When all things in your life are considered, how do you feel today?” and “Overall how would you rank the quality of your life?” Both questions had a Likert-scale (Likert, 1967) response range. The first question had responses that ranged from 1 = “Miserable,” 2 = “Not very happy,” 3 = “OK,” 4 = “Content” and 5 = “Very happy.” The second question had responses that ranged from 1 = “Dissatisfied,” 2 = “Mostly dissatisfied,” 3 = “Satisfied,” 4 = “Mostly satisfied” and 5 = “Very satisfied”. An analysis of variance compared the four groups’ overall scores concerning perceptions of life quality.

### *Descriptive Statistics*

When participants were asked, “When all things in your life are considered, how do you feel today?” there was a statistically significant difference ( $P=0.000$ ) on the ANOVA test (Table 8). The post hoc analysis (LSD) indicated that the “no plants/no windows” group score was different from the other three groups, and that this was the only group that had stated that they felt “Miserable” (0.8%). Descriptive statistics

showed that 82% of the “plants/windows” group stated that they felt “Content” or “Very happy” compared to only 58% of the “no plants/no windows” group.

When participants were asked, “Overall, how would you rank your overall quality of life?” statistically significant differences ( $P=0.001$ ) were found on the ANOVA test between group scores on the statement (Table 8). The post hoc analysis (LSD) indicated that the “no plants/no windows” group score was different from the other three groups. In general, participants in the “no plants/no windows” group were not experiencing good quality of life. Descriptive statistics indicated that 80% of the “plants/windows” group stated that they were “Mostly” or “Very satisfied” and none were “Dissatisfied”. Sixty-nine percent of the “plants/no windows” group and 67% of the “no plants/windows” group stated that they were “Mostly” or “Very satisfied,” while only 60.8% of the “no plants/no windows” group stated that they were “Mostly” or “Very satisfied.” Additionally, this was the only group that stated they were “Dissatisfied” (1.1%).

These findings support previous studies that provided evidence that not only are plants essential to our very survival by cleaning our air, providing sustenance, resources and fuels, but they are an essential part of our emotional well being and daily lives. Employees experienced perceptions of increased quality-of-life when working in areas with open architecture, windows and live interior plants. “Their presence improves the quality of our lives in many ways: environmentally, economically, socially, culturally and physically through our health and well-being” (Zampini, 1994, p. 185). Passive and active interactions with plants/greenery and natural areas have rejuvenating mental and physical effects on people (Lewis, 1994).

**Table 8. ANOVA test comparing individual statement response means of the four treatment group scores on the statements concerning overall life quality in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

Subcategory and Participant group	Sample size (no.)	Mean Score <sup>z</sup>	Standard Deviation	df	F	P
<b>Life quality</b>						
When all things in your life are considered, how do you feel today?						
No Plants/No Windows	264	3.64	0.815	3	7.984	0.000*
No Plants/Windows	68	3.72	0.789			
Plants/No Windows	95	3.88	0.784			
Plants/Windows	95	4.08	0.724			
Overall, how would you rank the quality of your life?						
No Plants/No Windows	263	3.76	0.857	3	5.681	0.001*
No Plants/Windows	67	3.78	0.755			
Plants/No Windows	92	4.03	0.733			
Plants/Windows	95	4.09	0.787			

<sup>z</sup>Statements were rated on a 1 to 5-point scale with 5 being the most positive response and 1 being the most negative response.

\*Statistically significant at the 0.05 level.

#### *Findings Related to Objective 4*

The fourth objective of the study was to determine if any particular demographic group appeared to benefit more in terms of perceptions of job satisfaction from the presence of plants or windows in office environments.

#### *Overall Gender Comparisons*

Scores of males and females were compared to see if males or females appeared to benefit differently from the presence of plants or windows in the office place.

Analysis of variance test comparisons indicated that there were no statistically significant differences in the job satisfaction mean scores or any of the subcategory statement mean

scores of female responses within the four groups, but there were statistically significant differences in the mean job satisfaction scores ( $P=0.028$ ) and statement mean scores of male responses in the subcategory “nature of work” ( $P=0.000$ ) (Table 9). The post hoc analyses (LSD) indicated that “plants/no windows” group score was the same as the “plants/windows” group score, but both of these scores were different from the “no plants/no windows” group score and the “no plants/windows” group score. Descriptive statistics indicated that male participants in offices with plants but no windows, and plants and windows had the highest mean job satisfaction scores (mean scores = 120.98 and 118.25) (Table 9). Male participants with windows but no plants, and those without both windows and plants had mean job satisfaction scores that were lower (mean scores = 112.12 and 114.98) (Table 9). All groups had scores that were higher than 108, which indicated favorable levels of job satisfaction.

ANOVA analyses indicated that there were no differences in job satisfaction scores among females within the four treatment groups, and that all treatment groups scored above 108, which indicated higher job satisfaction. Previous studies confirm that women generally report feeling more satisfied with their jobs than men (Clark, 1997; Bender et al., 2005;), but some studies have shown that female job satisfaction has been declining, despite greater workplace equality and flexibility (Berry, 2005). It was thought that women participants would have responded more positively to the presence of plants and windows in the workplace, and that their presence might influence their perceptions of job satisfaction. However, it is important to note that it was the men that appeared to be influenced by the presence of plants (higher mean scores), but that, generally, although there were no statistically significant differences, females responded



more to the presence of windows when compared to plants (higher mean scores and lower standard deviations).

**Table 9. ANOVA test comparing mean job satisfaction scores of males and females on the Job Satisfaction Inventory<sup>z</sup> of the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

Subcategory and Participant group	Sample size (no.)	Mean Score <sup>y</sup>	Standard Deviation	df	F	P
<b>Overall job satisfaction score</b>						
<b>Males</b>						
No Plants/No Windows	117	114.98	15.101	3	3.077	0.028*
No Plants/Windows	26	112.12	15.971			
Plants/No Windows	56	120.98	13.196			
Plants/Windows	61	118.25	15.717			
<b>Females</b>						
No Plants/No Windows	105	112.60	19.368	3	0.623	0.601
No Plants/Windows	26	116.62	13.712			
Plants/No Windows	19	114.95	20.348			
Plants/Windows	25	116.88	13.519			

<sup>z</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

<sup>y</sup>Statements were rated on a 1 to 5-point scale with 5 being the most positive response and 1 being the most negative response.

\*Statistically significant at the 0.05 level.

#### *Subcategory "Nature of Work" Statement Comparisons*

Analysis of variance results indicated that there were statistically significant differences ( $P=0.000$ ) in male responses in the "nature of work" subcategory scores. The post hoc analyses (LSD) indicated that the "plants/windows" group scores were the same as the "plants/no windows" group, and that both of these groups were different from the "no plants/windows" group and the "no plants/no windows" group. Descriptive statistics showed that male participants in offices with plants and windows, and in offices with

plants but no windows rated “nature of work” the highest (mean scores = 15.03 and 14.93), and that male participants with windows but no plants, and no plants or windows rated “nature of work” had scores that were lower (mean scores = 13.77 and 13.82) (Table 10).

Analysis of variance results indicated that there were no statistically significant differences ( $P=0.546$ ) in female responses in any of the subcategory scores (Table 11). The two sample groups that had plants in their office were mostly women: the “plants/no windows” group was 73% female and only 27% male, and the “plants/windows” group was 71% female and 29% male. It was thought that women participants would have been more influenced by the presence of plants and windows in the workplace, and that they might have affected how they rated their “nature of work” subcategory.

**Table 10. ANOVA test comparing mean subcategory Job Satisfaction Inventory<sup>z</sup> scores of males in the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

Subcategory and Participant group	Sample size (no.)	Mean Score <sup>y</sup>	Standard Deviation	df	F	P
<b>Pay<sup>x</sup></b>						
No Plants/No Windows	117	9.99	2.673	3	1.459	0.226
No Plants/Windows	26	9.81	2.315			
Plants/No Windows	56	10.61	2.890			
Plants/Windows	61	10.77	3.403			
<b>Promotion<sup>w</sup></b>						
No Plants/No Windows	117	11.24	2.635	3	2.244	0.084
No Plants/Windows	26	11.46	2.533			
Plants/No Windows	56	12.29	2.325			
Plants/Windows	61	11.95	3.143			
<b>Supervision<sup>v</sup></b>						
No Plants/No Windows	117	14.73	2.744	3	1.427	0.235
No Plants/Windows	26	14.19	2.173			
Plants/No Windows	56	15.18	2.167			

Subcategory and Participant group	Sample size (no.)	Mean Score <sup>y</sup>	Standard Deviation	df	F	P
Plants/Windows	61	15.28	2.950			
<b>Fringe benefits<sup>u</sup></b>						
No Plants/No Windows	117	12.58	2.461	3	2.220	0.086
No Plants/Windows	26	11.46	2.121			
Plants/No Windows	56	12.95	2.438			
Plants/Windows	61	12.38	2.678			
<b>Contingent rewards<sup>t</sup></b>						
No Plants/No Windows	117	12.38	3.274	3	0.522	0.668
No Plants/Windows	26	12.31	2.990			
Plants/No Windows	56	12.96	2.783			
Plants/Windows	61	12.49	2.779			
<b>Operating conditions<sup>s</sup></b>						
No Plants/No Windows	117	13.14	2.308	3	0.908	0.438
No Plants/Windows	26	13.04	2.553			
Plants/No Windows	56	13.39	2.278			
Plants/Windows	61	12.67	2.712			
<b>Coworkers<sup>r</sup></b>						
No Plants/No Windows	117	14.24	2.572	3	1.979	0.118
No Plants/Windows	26	13.46	3.301			
Plants/No Windows	56	14.95	2.511			
Plants/Windows	61	14.31	2.643			
<b>Nature of work<sup>q</sup></b>						
No Plants/No Windows	117	13.82	2.242	3	6.239	0.000*
No Plants/Windows	26	13.77	2.930			
Plants/No Windows	56	14.93	1.559			
Plants/Windows	61	15.03	2.168			
<b>Communication<sup>p</sup></b>						
No Plants/No Windows	117	12.86	3.464	3	1.182	0.317
No Plants/Windows	26	12.62	3.336			
Plants/No Windows	56	13.73	2.901			
Plants/Windows	61	13.36	3.322			

<sup>z</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

<sup>y</sup>Scores range from 1 to 20 with 4 being the lowest possible score and 20 being the highest possible score for each subcategory.

\*Statistically significant at the 0.05 level.

**Table 11. ANOVA test comparing mean subcategory Job Satisfaction Inventory<sup>z</sup> scores of females in the four treatment groups in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

<b>Subcategory and Participant group</b>	<b>Sample size (no.)</b>	<b>Mean Score<sup>y</sup></b>	<b>Standard Deviation</b>	<b>df</b>	<b>F</b>	<b>P</b>
<b>Pay<sup>x</sup></b>						
No Plants/No Windows	105	9.90	3.009	3	0.618	0.604
No Plants/Windows	26	10.58	2.730			
Plants/No Windows	19	9.58	2.293			
Plants/Windows	25	10.28	2.654			
<b>Promotion<sup>w</sup></b>						
No Plants/No Windows	105	11.74	2.825	3	1.469	0.225
No Plants/Windows	26	12.73	2.127			
Plants/No Windows	19	11.16	2.930			
Plants/Windows	25	12.16	2.656			
<b>Supervision<sup>v</sup></b>						
No Plants/No Windows	105	14.18	3.177	3	0.502	0.682
No Plants/Windows	26	13.92	3.346			
Plants/No Windows	19	14.11	2.105			
Plants/Windows	25	14.88	2.333			
<b>Fringe benefits<sup>u</sup></b>						
No Plants/No Windows	105	11.70	2.815	3	0.696	0.556
No Plants/Windows	26	11.92	2.813			
Plants/No Windows	19	12.47	2.091			
Plants/Windows	25	11.32	2.750			
<b>Contingent rewards<sup>t</sup></b>						
No Plants/No Windows	105	12.13	3.459	3	1.749	0.159
No Plants/Windows	26	13.00	3.046			
Plants/No Windows	19	11.32	2.689			
Plants/Windows	25	13.20	2.582			
<b>Operating conditions<sup>s</sup></b>						
No Plants/No Windows	105	12.80	2.532	3	0.863	0.461
No Plants/Windows	26	13.00	2.828			
Plants/No Windows	19	13.47	2.836			
Plants/Windows	25	13.60	2.398			
<b>Coworkers<sup>r</sup></b>						
No Plants/No Windows	105	13.98	2.794	3	1.909	0.130
No Plants/Windows	26	14.23	1.818			

<b>Subcategory and Participant group</b>	<b>Sample size (no.)</b>	<b>Mean Score<sup>y</sup></b>	<b>Standard Deviation</b>	<b>df</b>	<b>F</b>	<b>P</b>
Plants/No Windows	19	16.00	8.083			
Plants/Windows	25	14.88	2.242			
<b>Nature of work<sup>q</sup></b>						
No Plants/No Windows	105	13.41	2.937	3	0.713	0.546
No Plants/Windows	26	14.15	1.759			
Plants/No Windows	19	14.00	2.449			
Plants/Windows	25	13.44	2.518			
<b>Communication<sup>p</sup></b>						
No Plants/No Windows	105	12.76	3.615	3	0.110	0.954
No Plants/Windows	26	13.08	3.520			
Plants/No Windows	19	12.84	3.321			
Plants/Windows	25	13.12	2.651			

<sup>z</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

<sup>y</sup>Scores range from 1 to 20 with 4 being the lowest possible score and 20 being the highest possible score for each subcategory.

\*Statistically significant at the 0.05 level.

### *Comparisons of Age Categories*

#### *Data Analysis*

Multivariate analysis of variance tests were conducted to compare mean job satisfaction scores among age groups within the four office environments and no statistically significant differences were found (Table 12). Age categories were “under 20 years,” “21-30 years,” “31-40 years,” “41-50 years,” “51-60 years,” and “over 60 years” (Table 1). All age groups had similar overall job satisfaction scores; thus, plants and windows did not appear to affect any particular age group differently from another. A previous study found that older workers were generally more satisfied with their jobs when compared to younger employees while (Kelleberg and Loscocco, 1983) other studies have shown that the oldest and youngest employees report higher job satisfaction (Clark et al., 1996). However, other studies have determined that is difficult to determine

how age affects job satisfaction (Bernal et al., 1998), or if certain age groups prefer specific environments.

**Table 12. Multivariate analysis of variance tests comparing different age groups within the four treatment groups on mean Job Satisfaction Inventory<sup>2</sup> overall score and subcategory scores in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

Demographic Group and Subcategory	Type III Sum of Squares	df	Mean Square	F	P
Age					
Overall job satisfaction score	3884.104	15	258.940	0.994	0.461
Pay	115.908		7.727	0.933	0.528
Promotion	97.943		6.530	0.875	0.593
Supervision	136.435		9.096	1.199	0.269
Fringe benefits	78.200		5.213	0.759	0.723
Contingent rewards	96.002		6.400	0.649	0.833
Operating conditions	135.012		9.001	1.504	0.100
Coworkers	189.533		12.636	1.382	0.152
Nature of work	116.428		7.762	1.359	0.164
Communication	151.738		10.116	0.940	0.520

<sup>2</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

\*Statistically significant at the 0.05 level.

### *Comparisons of Ethnicity Categories*

#### *Data Analysis*

Multivariate analysis of variance tests were conducted to compare mean job satisfaction scores among ethnic groups within the four office environments and no statistically significant differences were found (Table 13). Ethnic groups included "Caucasian," "African American," "American Indian," "Hispanic," "Asian American," and "other" (Table 1). All ethnic groups had similar job satisfaction scores; thus, plants and windows did not appear to affect any particular ethnic group more than another.

Studies have shown that, generally, non-Hispanic white employees are more satisfied with their jobs when compared to other minority groups (Firebaugh and Harley, 1995).

**Table 13. Multivariate analysis of variance tests comparing different ethnic groups within the four treatment groups on mean Job Satisfaction Inventory<sup>2</sup> overall score and subcategory scores in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

Demographic Group and Subcategory	Type III Sum of Squares	df	Mean Square	F	P
<b>Ethnicity</b>					
Overall job satisfaction score	2192.732	11	199.339	0.757	0.683
Pay	58.842		5.349	0.643	0.792
Promotion	105.238		9.567	1.341	0.199
Supervision	66.134		6.012	0.769	0.671
Fringe benefits	93.967		8.542	1.303	0.220
Contingent rewards	56.193		5.108	0.520	0.890
Operating conditions	80.832		7.348	1.192	0.290
Coworkers	124.178		11.289	1.214	0.275
Nature of work	75.472		6.861	1.165	0.310
Communication	50.817		4.620	0.415	0.950

<sup>2</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

\*Statistically significant at the 0.05 level.

### *Comparisons of Salary Levels*

#### *Data Analysis*

Multivariate analysis of variance tests were conducted to compare mean job satisfaction scores among salary groups within the four office environments and no statistically significant differences were found (Table 14). Salary categories were “less than \$20,000,” “\$20-30,000,” “\$30-40,000,” “\$40-50,000,” “\$50-75,000,” “\$75-100,000,” and “over \$100,000” (Table 1). All salary groups had similar job satisfaction scores; thus, plants and windows did not appear to affect any particular salary group more

than another. Previous studies have provided evidence that salary and job satisfaction are directly linked (Cable and Judge, 1994). However, this study found no influence.

**Table 14. Multivariate analysis of variance tests comparing different salary levels within the four treatment groups on mean Job Satisfaction Inventory<sup>2</sup> overall score and subcategory scores in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

Demographic Group and Subcategory	Type III Sum of Squares	df	Mean Square	F	P
<b>Salary</b>					
Overall job satisfaction score	2406.387	18	133.688	0.495	0.960
Pay	93.573		5.198	0.633	0.874
Promotion	108.687		6.038	0.817	0.680
Supervision	51.704		2.872	0.363	0.993
Fringe benefits	173.489		9.638	1.491	0.089
Contingent rewards	84.392		4.688	0.470	0.969
Operating conditions	115.521		6.418	1.045	0.407
Coworkers	101.050		5.614	0.601	0.899
Nature of work	98.174		5.454	0.939	0.531
Communication	141.570		7.865	0.704	0.808

<sup>2</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

\*Statistically significant at the 0.05 level.

### *Comparisons of Education Levels*

#### *Data Analysis*

Multivariate analysis of variance tests were conducted to compare mean job satisfaction scores among different education levels within the four office environments and no statistically significant differences were found (Table 15). Education levels included “some high school,” “high school graduate,” “some college,” “college graduate,” “some graduate school,” “completed graduate school,” and “trade school” (Table 1). All education level groups had similar job satisfaction scores; thus, plants and



windows did not appear to affect any particular education level group scores. Previous studies have found that more educated employees are generally more satisfied when compared to employees that are less educated (DeVaney and Chen, 2003).

**Table 15. Multivariate analysis of variance tests comparing education levels within the four treatment groups on mean Job Satisfaction Inventory<sup>z</sup> overall score and subcategory scores in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

<b>Demographic Group and Subcategory</b>	<b>Type III Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>P</b>
<b>Education level</b>					
Overall job satisfaction score	3834.371	15	255.625	0.962	0.495
Pay	145.792		9.719	1.188	0.278
Promotion	115.508		7.701	1.059	0.393
Supervision	95.248		6.350	0.826	0.649
Fringe benefits	117.201		7.813	1.157	0.303
Contingent rewards	133.006		8.867	0.911	0.552
Operating conditions	72.792		4.853	0.778	0.702
Coworkers	142.994		9.533	1.032	0.421
Nature of work	64.179		4.279	0.728	0.757
Communication	117.409		7.827	0.699	0.786

<sup>z</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

\*Statistically significant at the 0.05 level.

### *Comparisons of Employment Positions*

#### *Data Analysis*

Multivariate analysis of variance tests were conducted to compare mean job satisfaction scores among employment positions within the four office environments and no statistically significant differences were found (Table 16). Company position categories included the following: “unskilled,” “semi-skilled,” “skilled,” “clerical,” “administration,” “management,” “executive,” “entrepreneur,” “other” (Table 1), and it

was required that all participants worked in an office environment. All employment position groups had similar job satisfaction scores; thus, plants and windows did not appear to affect any group within particular company positions more than others. These findings differ from previous studies that have shown that a person's employment position within a company affects their job satisfaction (Robie et al., 1998).

**Table 16. Multivariate analysis of variance tests comparing position levels within the four treatment groups on mean Job Satisfaction Inventory<sup>z</sup> overall score subcategory scores in the study of the influence of live plants and window views of green spaces on employee perceptions of job satisfaction.**

<b>Demographic Group and Subcategory</b>	<b>Type III Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>P</b>
<b>Position</b>					
Overall job satisfaction score	3137.507	19	165.132	0.602	0.905
Pay	111.931		5.891	0.706	0.813
Promotion	106.197		5.589	0.752	0.764
Supervision	223.452		11.761	1.548	0.066
Fringe benefits	149.004		7.842	1.159	0.290
Contingent rewards	159.557		8.398	0.848	0.648
Operating conditions	126.062		6.635	1.095	0.353
Coworkers	157.700		8.300	0.894	0.591
Nature of work	103.858		5.466	0.941	0.532
Communication	173.939		9.155	0.803	0.704

<sup>z</sup>Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, 13, 693-713.

\*Statistically significant at the 0.05 level.

## CHAPTER V

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

#### *Purpose of the Study*

The main objective of this study was to investigate the impact of interior plants and window views of green spaces on employee perceptions of job satisfaction. Specific objectives of this study were 1) to determine if an individual's environmental perception favored the presence of plants or window views of green spaces, natural lighting and newer, open architecture, 2) to compare perceptions of job satisfaction of employees that had live interior plants in their workspace or a common area, or windows and window views of exterior green spaces to employees that did not have live interior plants in their workspace or common area, or windows and window views of exterior green spaces, 3) to compare perceptions of overall life quality of employees that had live interior plants in their workspace or a common area, or windows and window views of exterior green spaces to employees that did not have live interior plants in their workspace or common area, or windows and window views of exterior green spaces and 4) to evaluate specific demographic groups to determine if any particular group appeared to benefit more in terms of perceptions of job satisfaction from the presence of plants or windows in office environments.

### *Summary of the Review of Literature*

Job satisfaction has been studied since 1935 (Larkin, 1996). Improving employee job satisfaction has become an important topic, due to a greater number of people working more and spending more time indoors. External factors aside, long hours and increased time spent in office environments can lead to reduced job satisfaction (Spector, 1997) and increased levels of stress (Parker, 1992). Research has shown that people can also experience potential negative effects due to decreased amounts of time spent in natural surroundings (Kaplan, 1992). Corporate developers, architects and designers have researched what factors contribute to a positive environment and how these factors can improve business productivity, employee retention and job satisfaction (Zadik, 1994). However, most research has been focused on residential settings or parks; “little is known about the perceived benefits and values of the urban forest in retail and commercial settings” (Wolf, 1996, p. 27).

Social sciences have provided theories and methods of determining how a person’s environment influences their attitude and perception. Research studies have provided evidence that employees have a tendency to feel more satisfied with their job when in environments that promote well being and comfort (Parker, 1992). Many studies have also shown that the presence of live plants, windows and views of natural surroundings can have a positive influence on these internal and external perceptions (Lohr et al., 1996). In 2005, a study was conducted to determine the effects of window views and indoor plants on individual’s psychophysiological responses in the workplace. Six office environments were simulated: an office with a window view of a city, an office with indoor plants and a window view of a city, an office with a window view of nature,

an office with indoor plants and a view of nature, an office without a window view of nature, and an office with indoor plants that did not have a window view. Participants' electromyography (EMG), electroencephalography (EEG), blood volume pulse (BVP), and state-anxiety were measured before and after exposure to the stimuli. The results concluded that participants were less nervous and anxious when they had a view of nature or when indoor plants were present. The results also showed that participants exhibited the highest degree of anxiety when neither a window nor indoor plants were present. (Chang and Chen, 2005). "Reports of the healing aspects of gardens, plants, and water have long been around. What is still in its infancy, however, is the ever-increasing collection of quantitative studies that substantiate the belief that environmental stimuli affect emotional, and often, physiological responses in individuals" (Grant, 1996, p. 88).

These findings support anecdotal evidence that has shown that physical work environments are a contributing factor to employee job satisfaction. Working conditions, as defined by Herzberg, are the physical working conditions, facilities, and quality of work as related to job satisfaction. Although there are many variables that contribute to job satisfaction, a pleasing work environment has been directly linked to improving job satisfaction (Asmus, 2004).

### *Methodology*

#### *Sample Group*

The sample used in this study came from a random selection of office workers throughout the United States, but predominately from Texas and the Midwest. Over 600 respondents accessed the survey, which was posted on the on the Aggie Horticulture Web page (<http://floriculture.tamu.edu:7998/workplaceenvironment/>). Once logged on, the

respondent agreed to participate in the study and acknowledged that he/she understood that participation in the study was voluntary. A financial incentive of a \$5.00 gift certificate to Lowe's Home Improvement® stores was mailed to each participant once the completed survey was received. Only the faculty and student researcher had access to the responses, and the data was stored in a secure room in the Agriculture Building at Texas State University-San Marcos.

Five hundred fifty-two respondents were included in the final sample since these were the respondents that answered the survey completely. The sample was then sorted into four groups including "no plants/no windows," "plants/no windows," "no plants/windows" and "plants/windows." The groups were then compared using analysis of variance tests to ensure that the groups were similar demographically and suitable for comparison. Because statistically significant differences were found on variables including "work schedule," "salary," "ethnicity," and "gender" of respondents that had either live plants or window views versus those that did not have live plants or window views, the groups were balanced by sorting and randomly weighing the groups. A subsample of 449 of the original 552 respondents was drawn to overcome any initial differences within the groups. The subsample was then analyzed and no statistically significant differences were found between groups on any of the demographic variables, with the exception of "gender" ( $P=0.000$ ).

### *Instrumentation*

The assessment tool used in this study was composed of several sections that asked employees about demographics, environmental preferences, physical workplace, and elements of job satisfaction, as well as overall life quality statements. The section of

the questionnaire that specifically pertained to the presence or absence of live plants within office spaces and window views of green spaces was developed and validated by researchers of the horticultural sciences (Appendix A).

The demographic and work environment section of the instrument was modeled after similar instruments (Waliczek et al., 1996), and reviewed by other researchers for content validity (Appendix A). The demographic section of the instrument contained questions that included gender, age, education level and salary range. Demographic questions also included those that related to occupation level, salary range, work schedule, commute time and number of co-workers. The work environment section asked the participants to rate their overall physical work environment, what they liked best about their work environment, including location, design and architecture of building, the outside landscaping, co-workers and job duties and how they felt their physical environment influenced their mood, productivity, motivation and job satisfaction. Other multiple choice questions asked about overall life quality such as, “When all things in your life are considered, how do you feel today?” and “Overall how would you rank the quality of your life?”

The Environmental Preference Assessment (Richmond and McCroskey, 1995) asked the participants to respond to a series of questions about their workplace environment and perceptions and attitudes toward architecture and lighting. Each question had a Likert-scale (Likert, 1967) response range from 1 = “Strongly Disagree” to 5 = “Strongly Agree.” The instrument reliability was determined to be 0.85 by the original authors of the instrument (Richmond and McCroskey, 1995) (Appendix A).

To score the Environmental Preference Assessment instrument, more positive

answers to the statements were allocated more points. A calculation supplied by the authors of the instrument (Richmond and McCroskey, 1995) was applied to particular statement answers for each respondent, which resulted in a total score for the survey. Scores for the environmental preference component ranged between 16 and 80. Scores greater than 58 indicated a preference for older architecture, and scores less than 38 indicated a preference for newer architecture; scores between 38 and 58 indicated no preference.

The final section of the questionnaire included a Job Satisfaction Survey (Spector, 1985) that asked the participants to respond to a series of questions related to employee job satisfaction. Each question had a Likert-scale (Likert, 1967) response range from 1 = "Strongly Disagree" to 5 = "Strongly Agree." The survey included 36 statements relating to nine subcategories including pay, promotion, supervision, fringe benefits, contingent rewards, operating procedures, coworkers, nature of work and communication. The instrument reliability was 0.91 (Spector, 1985) (Appendix A).

The Job Satisfaction Survey was scored by allocating one point for the most negative answer for each statement and five points for the most positive answer to each statement. The negatively worded questions were reversed scored by substituting the most positive rating for the most negative so that all responses were rated on the same scale with 1 = "Strongly disagree" and 5 = "Strongly agree." Points were summed for an overall score that ranged from 36 through 180. Scores less than 108 indicated less job satisfaction and scores greater than 108 indicated more job satisfaction. Groups of four statements that related to one of the subcategories of pay, promotion, supervision, fringe benefits, contingent rewards, operating procedures, coworkers, nature of work and



communication were also summed to determine subcategory scores. A score of 20 was the highest score possible for each subcategory.

### *Results*

Treatment groups included respondents from offices that had “no plants/no windows” (50.6%), “plants/no windows” (18.2%), “no plants/windows” (13%), and “plants/windows” (18.2%).

#### *Objective 1*

The first objective of the study was to determine if an individual’s environmental perception favored the presence of plants or window views of green spaces, natural lighting and newer, open architecture.

An analysis of variance test found no statistically significant differences ( $P=0.330$ ) in comparisons of environmental preference scores between the four treatment groups. Scores for the Environmental Assessment (Richmond and McCroskey, 1995) scores test indicated that all participants preferred newer architecture, which generally has more windows, and is more open and airy, compared to older architecture, which generally has fewer windows and is “darker.” This finding helped show that all participants preferred similar office conditions.

#### *Objective 2*

The second objective of the study was to compare perceptions of job satisfaction of employees that had live interior plants in their workspace or a common area, or windows and window views of exterior green spaces to employees that did not have live

interior plants in their workspace or common area, or windows and window views of exterior green spaces.

An analysis of variance test compared the four treatment groups' scores concerning overall job satisfaction and there was a statistically significant difference ( $P=0.041$ ) on the ANOVA test rating overall perceptions of job satisfaction among groups. Points were summed for an overall score that ranged from 36 through 180. Scores less than 108 indicated less job satisfaction and scores greater than 108 indicated more job satisfaction. Descriptive statistics showed that respondents in offices with plants and windows rated their overall job satisfaction high (mean score =115.16), as well as participants with plants but no windows (mean score =112.52). Participants with windows but no plants rated their overall job satisfaction lower (mean score =105.56), as well as participants without both windows and plants (mean score =106.47). The results of this study provided evidence that the two groups without plants rated their job satisfaction below 108, which indicated less job satisfaction. Additionally, both groups with plants rated their job satisfaction higher than 108, which indicated more job satisfaction.

The results of this study are important because they showed that employees who worked in areas with plants not only rated their job satisfaction higher but was at a suitable level in comparison to those without plants in terms of the Job Satisfaction Survey (Spector, 1985), and those that worked in areas that only had windows.

According to Larkin (1996), "job satisfaction affects the physical and mental well-being of an individual, and because it may affect job-related behaviors, also influences productivity and profitability in organizations" (p. 102). Thus, knowing what

factors contribute to employee job satisfaction can help prevent frustration, low morale and decreased productivity (Grossnickle and Thiel, 1988; Beder, 1990).

“The workplace is now being linked to psychological needs, performance, and well being” (Parker, 1992, p. 28). Quality-of-work-life (QWL) applications are organizational approaches that enhance employee well being and productivity, and often target worker environmental concerns that hamper job satisfaction” (Shareef, 1992, p. 110). Findings from this study supported self-reports from employees that job conditions are directly related to their attitudes, including job satisfaction, frustration, anxiety on the job, and turnover rates (Siu et al., 2001). Productive employees keep businesses thriving (Lindner, 1998) and exhibit greater organizational commitment.

### *Objective 3*

The third objective of the study was to compare perceptions of overall life quality of employees that had live interior plants in their workspace or a common area or windows and window views of exterior green spaces to employees that did not have live interior plants in their workspace or common area, or windows and window views of exterior green spaces.

An analysis of variance test was conducted to determine if there were differences in perceptions of overall life quality of employees among the four treatment groups. When participants were asked, “When all things in your life are considered, how do you feel today?” there was a statistically significant difference ( $P=0.000$ ) on the ANOVA test (Table 8). The post hoc analysis (LSD) indicated that the “no plants/no windows” mean group score was the same as the “no plants/windows” mean group score, but that both of these group scores were different from the “plants/windows” group score and the

“plants/no windows” mean group scores. Descriptive statistics showed that 82% of the “plants/windows” group and 69% of the “plants/no windows” group stated that they felt “Content” or “Very happy” compared to only 60% of the “no plants/windows” group and 58% of the “no plants/no windows” group. Additionally, the “no plants/no windows” group was the only group that had stated that they felt “Miserable” (0.8%).

When participants were asked, “Overall, how would you rank your overall quality of life?” statistically significant differences ( $P=0.001$ ) were found on the ANOVA test between groups on the statement (Table 8). The post hoc analysis (LSD) indicated that the “no plants/no windows” mean group score was different from the other three mean group scores. Descriptive statistics indicated that 80% of the “plants/windows” group stated that they were “Mostly” or “Very satisfied” and none was “Dissatisfied”. Sixty-nine percent of the “plants/no windows” group and 67% of the “no plants/windows” group stated that they were “Mostly” or “Very satisfied,” while only 60.8% of the “no plants/no windows” group stated that they were “Mostly” or “Very satisfied.” Additionally, the “no plants/no windows” group was the only group that stated they were “Dissatisfied” (1.1%).

These findings support previous studies have shown that adverse environmental conditions such as poor air quality, noise, lack of privacy and ergonomic conditions can have negative effects on employee perceptions of job satisfaction and overall well-being (Klitzman and Stellman, 1989). Studies conducted by England’s Oxford Brookes University determined that live indoor plants generally cost less than other types of building décor, and “offer a guarantee of positively enhancing perception and contributing to well being” (Gilhooley, 2002, p. 4). It has been long believed that visual

contact with plants and other nature is somehow good for people, and can help individuals cope with the stresses of urban living (Relf, 1994). This study provided evidence that employees experienced perceptions of increased quality-of-life when working in areas with open architecture, windows and live interior plants.

### *Subcategory Score Analyses*

Since overall job satisfaction scores indicated differences, subcategory scores within the instrument were also analyzed using analysis of variance tests. Analysis of variance tests indicated statistically significant differences in the subcategories of “nature of work” ( $P=0.006$ ), “supervision” ( $P=0.029$ ) and “coworkers” ( $P=0.041$ ). There were no statistically significant differences in the subcategories “promotion,” “fringe benefits,” “contingent rewards,” “operating conditions,” or “communication.”

An analysis of variance test was conducted and there were statistically significant differences ( $P=0.006$ ) on the subcategory statements concerning “nature of work” (Table 5). The post hoc analyses (LSD) indicated that the “plants/windows” mean group score was the same as the “plants/no windows” mean group score, but both of these mean group scores were different from the “no plants/no windows” mean group score and the “no plants/windows” mean group score. People in offices with plants and windows, and people in office with plants and no windows rated their “nature of work” (job duties, regular tasks) the highest (mean scores =14.27 and 13.57) compared to participants without plants and windows, or windows and no plants which had the lowest rating (mean scores =12.74 and 12.87) (Table 5). A score of 20 was the highest score possible for each subcategory.

New trends in building design have included “the use of fresh air, daylight, plants, and window views and other design aspects to enhance employee perceptions about their job and to improve worker productivity” (Kozlowski, 2004, on-line). A previous research study showed that “good working conditions” (building design and architecture, openness or airiness, colors and artwork, and plants and windows) ranked number five of ten motivating factors (Lindner, 1998), and that the importance of providing a comfortable, safe and aesthetically pleasing work environment is becoming more prevalent and is an important consideration in building and interior design. In general, findings from this study indicated that those that worked in offices with plants and windows felt better about their job and the work they perform.

Analysis of variance tests were conducted and there were statistically significant differences ( $P=0.029$ ) on scores from statements related to the subcategory “supervision” (likeability, fairness, competency, interest in subordinates) (Table 5). The post hoc analyses (LSD) indicated that the “plants/windows” mean group score was the same as the “plants/no windows” mean group score, but both of these mean group scores were different than the “no plants/no windows” mean group score and the “no plants/windows” mean group score. Descriptive statistics showed that people in offices with plants and windows, and plants and no windows rated “supervision” statements the most positively (mean scores =14.71 and 14.18). Participants without both windows and plants, and windows but no plants also had low ratings (mean scores =13.53 and 12.99) (Table 5). A score of 20 was the highest score possible for each subcategory.

Top managers and personnel directors are now setting new trends in employee supervision to promote satisfaction and retention by focusing on and incorporating

personal interests (such as gardening and time spent in nature) of employees into the workplace (Gilhooley, 2002, p. 3). A significant amount of research has provided evidence that the presence of plants, window views and green spaces are not only good for employees but also beneficial to employers (Wood and Burchett, 1996, p. 139).

Susan Odiseos, V.P. of Corporate Communications, stated, “We practice what we preach and find that our investment in interior plant services has had the expected outcome of improving indoor air quality, supporting a positive outlook in the workplace and increasing employee productivity” (Gilhooley, 2002, p. 2). Results from this study provided evidence that the presence of plants helped to influence employee perceptions of supervision, and that participants with plants rated “supervision” higher.

An analysis of variance test was conducted and there were statistically significant differences ( $P=0.041$ ) in the subcategory statement mean scores for “coworkers” (likeability, competency, communication, teamwork) (Table 5). Descriptive statistics indicated that people in offices with plants and windows, and plants and no windows rated “coworker” statements the most positively (mean scores =14.17 and 14.37). Participants with windows but no plants, and those without plants or windows rated statements related to “coworkers” low (mean scores =13.00 and 13.22) (Table 5). A score of 20 was the highest score possible for each subcategory.

#### *Individual Statement Comparisons*

Because overall job satisfaction scores and subcategory comparisons indicated differences among the four treatment groups, individual job satisfaction statements were analyzed to determine if differences occurred between the treatment groups. There were statistically significant differences in statements within the subcategories of “physical

work environment,” “pay,” “coworkers,” and “nature of work.” There were no statistical differences found in statements in the subcategories of “promotion,” “supervision,” “fringe benefits,” “contingent rewards,” “operating conditions,” or “communication.”

#### *Physical Work Environment Statement Comparisons*

Of two statements related to “physical work environment,” one was statistically significant. When participants were asked, “How would you rate your overall physical work environment on a scale from 1 to 5,” there was a statistically significant difference ( $P=0.000$ ) on the ANOVA test (Table 6). Descriptive statistics found that 24% of the group that had plants and windows in their offices rated their physical work environment as a “5” compared to only 8.7% of participants that worked in an office without plants and windows, 12% of participants that worked in an office that had plants but no windows, and 11.8% of participants that worked in an office that had windows but no plants.

These findings support a study that was conducted (Lohr, 1994) to determine how plants placed in an office environment affected the participants’ perception of the overall environment. Communication students were asked to agree or disagree with statements about the presence of the plants. When asked to answer the question “An office neatly decorated with live plants gives me the impression of a well-organized and well-staffed institution,” 70% agreed or strongly agreed, while only 10% disagreed and 20% felt neutral about the statement (Lohr, 1994, p. 229).

“Reports of the healing aspects of gardens, plants, and water have long been around. What is still in its infancy, however, is the ever-increasing collection of quantitative studies that substantiate the belief that environmental stimuli affect



emotional, and often, physiological responses in individuals” (Grant, 1996, p. 88). “Preference of environments is strongly related to one’s ability to function effectively in a space” (Messer, 1996, p. 106) Additionally, McDonough and Braungart provided further support in 1987 that a physical environment that incorporates “whimsical sculptures and thriving plants” has shown to “enhance the well-being of workers” and increase productivity. The majority of persons responsible for architectural design and management generally agree that indoor plants and interior plantscaping contribute to environmental quality” (Wood and Burchett, 1996, p. 139). Additionally, Verderber (1986) suggested that windowless settings, that often include classrooms, hospital rooms and offices, are “unpreferred.”

These findings also support studies that have provided evidence that plants have physiological benefits to individuals, as well. Additional findings supported that work-related stress can be affected by physical work environments (Klitzman and Stellman, 1989), which backed up a study that showed employees reported decreased ailments and headaches when having a view of nature (Kaplan, 1992). Prevalent studies have included research in stress and anxiety reduction (Waliczek et al., 1996), improved health (Ulrich and Parsons, 1992) and the reduction of asthma and allergies (Wolverton et al., 1989). These findings support previous studies that have been conducted that show that employees that work in plantless and/or windowless office environments experience increased stress and lower job satisfaction (Randall and Shoemaker, 1992; Ulrich and Parsons, 1992).

In order for employees to experience the full benefits of surrounding properties, work places, green spaces, “designers must plan for and make available these interactive

natural elements [light, temperature, sound, wind, moisture], making them comprehensible, experiential and reproducible” (Messer, 1996, p. 108).

“It is not possible to provide views of planted landscapes for every building user, occupant or visitor; it is possible, however, to provide indoor plants, that have been shown to contribute to all of these benefits, cost effectively” (Wood and Burchett, 1996, p. 141).

### *Subcategory Statement Comparisons*

#### *Subcategory “Pay” Statement Comparisons*

Of four statements in the subcategory of “pay,” one was statistically significant. When participants were asked to respond to the statement, “Raises are too few and far between” there was a statistically significant difference ( $P=0.014$ ) on the ANOVA test (Table 7). Descriptive statistics indicated that only 13.1 % of the “no plants/no windows” group “Disagreed” or “Strongly disagreed” with the statement. Twenty-eight percent of the “plants/windows” group “Disagreed” or “Strongly disagreed.” Descriptive statistics also indicated that 34% of the “no plants/windows” group “Disagreed” or “Strongly disagreed” and 45% of the “plants/no windows” group “Disagreed” or “Strongly disagreed” (Table 7). The “no plants/no windows” group was the most dissatisfied with their pay than the other three groups.

The physical environment affects employees’ ability and desire to work (Parker, 1992). Due to high employee turnover rates, increasing health costs, high absenteeism, corporations are seeking new ways to improve the work environment and provide amenities to their employees as incentives (Goodrich, 1986; Parker, 1992; Lohr et al., 1996; Jackson, 2003). These findings support previous studies that, although not always

recognizable or quantifiable, the benefits of artwork, gardens and nature provide employees with improved working conditions that can be an equal incentive to recognition and fringe benefits (Parker, 1992). These results indicated that open building design that incorporates interior plantings and outdoor green spaces could be perceived as incentives for employees and benefit employee retention rates and perceptions of job satisfaction.

#### *Subcategory "Nature of Work" Statement Comparisons*

Of four statements in the subcategory of "nature of work," two were statistically significant. When participants were asked to respond to the statement, "I feel a sense of pride in doing my job" there was a statistically significant difference ( $P=0.032$ ) on the ANOVA test (Table 7). Descriptive statistics indicated that 77% of the "plants/windows" group and 82% of the "plants/no windows" group "Agreed" or "Strongly agreed" with the statement, while only 73.7% of the "no plants/windows" group and 69.6% of the "no plants/no windows" group "Agreed" or "Strongly agreed" with the statement.

When participants were asked to respond to the statement, "My job is enjoyable" there was a statistically significant difference ( $P=0.001$ ) on the ANOVA test (Table 7). Descriptive statistics indicated that only 61.4% of the "no plants/no windows" group "Agreed" or "Strongly agreed" that their job was enjoyable, and almost 83% of the "plants/windows" group, 75.4% of the "no plants/windows" group and 72% of the "plants/no windows" group "Agreed" or "Strongly agreed."

These findings support previous research that has provided evidence that people prefer plants and windows in indoor settings (Randall and Shoemaker, 1992). In 1988, a study found that "workers with a view of natural elements, such as trees and flowers,

experienced less job pressure and were more satisfied with their jobs than others who had no outside view or who could see only built elements from their window” (Kaplan, 1992, p. 129). Further evidence from employee surveys regarding work environments suggested that there are “important restorative effects of nature in stressful interior environments...especially in high technology habitats” (Ulrich and Parsons, 1992, p. 99). In general, employees that worked in offices with plants or windows perceived that their job was more enjoyable, and took more pride in their work.

#### *Subcategory “Coworkers” Statement Comparisons*

Of four statements in the subcategory of “coworkers,” comparisons of mean response scores of the statement, “I find that I have to work harder because of the incompetence of the people I work with” was statistically significant ( $P=0.008$ ) (Table 7). Descriptive statistics indicated that 66% of the “plants/no windows” group “Disagreed,” or “Strongly disagreed,” 53% of the “no plants/no windows” group “Disagreed” or “Strongly disagreed,” and 48% of the “plants/windows” group and the “no plants/windows” group “Disagreed,” or “Strongly disagreed” (Table 7).

These findings supported a previous study (Waliczek, et al., 1996) that was conducted on community gardening to determine whether active interaction (gardening) could improve quality of life and provide social benefits to participants. Results concluded, “Experienced gardeners participated in community garden programs for the higher level social benefits” (p. 205). Additional studies have been conducted that provide evidence that people visit and use open areas more if they are planted with live plants or have views of open green space. Asakawa (1984) found that residents of large, urban areas would gather to maintain open green spaces in their neighborhoods to

provide a communal place for residents, and to improve the livability of the area and to increase human well-being. Results showed evidence that the presence of plants influenced employee perceptions of their coworkers (Table 5).

#### *Objective 4*

The fourth objective of the study was to determine whether a particular demographic group appeared to benefit more in terms of perceptions of overall job satisfaction from the presence of plants or windows in office environments.

ANOVA test comparisons indicated that there were no statistically significant differences in the overall job satisfaction scores or in any of the subcategory statement mean scores of female responses within the four groups, but that there were statistically significant differences in the overall job satisfaction scores ( $P=0.028$ ) and statement mean scores of male responses in the subcategory of “nature of work” ( $P=0.000$ ). The results of this study provided evidence that the two groups of male participants that had plants in their office spaces rated their job satisfaction higher than 108, which indicated more job satisfaction. Additionally, the two groups of male respondents without live plants rated their job satisfaction below 108, which indicated less job satisfaction.

#### *Overall Job Satisfaction Score Gender Statement Comparisons*

There were statistically significant differences ( $P=0.028$ ) in ANOVA comparisons on scores from statements related to overall job satisfaction (Table 9) among males. The post hoc analyses (LSD) indicated that “plants/no windows” mean group score was the same as the “plants/windows” mean group score, but both of these mean group scores were different from the “no plants/no windows” and the “no plants/windows” mean group scores. Descriptive statistics indicated that male

participants in offices with plants but no windows, and plants and windows rated statements the highest (mean scores =120.98 and 118.25). Male participants with windows but no plants, and those without both windows and plants rated statements the lowest (mean scores =112.12 and 114.98). Scores less than 108 indicated less job satisfaction and scores greater than 108 indicated more job satisfaction.

Descriptive statistics among female responses of overall job satisfaction indicated that there were no differences among female participants, and that none of the groups seemed to benefit more than others in the terms of job satisfaction (Table 9). Additionally, all four groups of females rated their job satisfaction lower than all four groups of male respondents.

#### *Subcategory "Nature of Work" Statement Comparisons*

Analysis of variance test results indicated that there were statistically significant differences ( $P=0.000$ ) in male responses in the "nature of work" subcategory scores. The post hoc analyses (LSD) indicated that the "plants/windows" group was the same as the "plants/no windows" group, but both of these groups were different than the "no plants/windows" group and the "no plants/no windows" group. Descriptive statistics showed that male participants with plants and windows, and plants but no windows rated "nature of work" the highest (mean scores = 15.03 and 14.93). Male participants with windows but no plants, and no plants or windows rated "nature of work" the lowest (mean scores = 13.77 and 13.82) (Table 10). Analysis of variance results indicated that there were no statistically significant differences ( $P=0.546$ ) in female responses in the "nature of work" subcategory scores (Table 11).

### *Multivariate Analyses Comparisons*

#### *Comparisons of Age Groups*

Multivariate analysis of variance tests were conducted to determine if a difference in mean job satisfaction scores existed between age groups within the four office environments and no statistically significant differences were found (Table 12). All age groups had similar job satisfaction scores; thus, plants and windows did not appear to affect any particular age group differently from another. Age categories included “under 20 years,” “21-30 years,” “31-40 years,” “41-50 years,” “51-60 years,” and “over 60 years” (Table 1).

#### *Comparisons of Ethnicity Groupings*

Multivariate analysis of variance tests were conducted to determine if a difference existed in mean job satisfaction scores between ethnic groups within the four office environments and no statistically significant differences were found (Table 13). All ethnic groups had similar job satisfaction scores; thus, plants and windows did not appear to affect any particular ethnic group differently from another. Ethnic groups included “Caucasian,” “African American,” “American Indian,” “Hispanic,” “Asian American,” and “other” (Table 1).

#### *Comparisons of Salary Levels*

Multivariate analysis of variance tests were conducted to determine if a difference existed in mean job satisfaction scores between salary range groups within the four office environments and no statistically significant differences were found (Table 14). All salary groups had similar job satisfaction scores; thus, plants and windows did not appear

to affect any particular salary group differently from another. Salary categories included “less than \$20,000,” “\$20-30,000,” “\$30-40,000,” “\$40-50,000,” “\$50-75,000,” “\$75-100,000,” and “over \$100,000” (Table 1).

#### *Comparisons of Education Levels*

Multivariate analysis of variance tests were conducted to determine if a difference existed in mean job satisfaction scores between education level group mean scores within the four office environments and no statistically significant differences were found (Table 15). All education levels had similar job satisfaction scores; thus, plants and windows did not appear to affect any particular education level differently from another. Education levels included the categories “some high school,” “high school graduate,” “some college,” “college graduate,” “some graduate school,” “completed graduate school,” and “trade school” (Table 1).

#### *Comparisons of Employment Positions*

Multivariate analysis of variance tests were conducted to determine if a difference existed in mean job satisfaction scores between employment position group mean scores within the four office environments and no statistically significant differences were found (Table 16). All employment position groups had similar job satisfaction scores; thus, plants and windows did not appear to affect any particular employment position group differently from another. Employment positions included the categories “unskilled,” “semi-skilled,” “skilled,” “clerical,” “administration,” “management,” “executive,” “entrepreneur,” “other” (Table 1), and it was required that all participants worked in an office environment.



### *Conclusions*

This study provided further evidence that the presence of plants and window views of green spaces had positive emotional effects on employees that included a higher perception of job satisfaction, specific subcategories of job satisfaction and overall life quality. This study supported previous research that found that plants can help reduce negative feelings (Ulrich, 1979), help enhance positive feelings (Ulrich and Parsons, 1992) and that employees prefer plants in the workplace (Vitiello, 2001). Human interaction with plants has positive results and passive and active interactions with natural areas have rejuvenating mental and physical effects for people (Lewis, 1994). This study also supported findings that “job satisfaction affects the physical and mental well being of an individual, and because it may affect job related behaviors, also influences productivity and profitability in organizations” (Cranny et al., 1992, p. 102). This research indicated that people may perceive to be more satisfied with their job, experience less stress and experience improved psychological and physiological benefits from the presence of live indoor plants, exterior green spaces and windows or natural light.

### *Programmatic Implications*

1. The overall results from this study indicated that employees preferred newer, architecture which generally has more windows, and is more open and airy, compared to older architecture, which generally has fewer windows and is “darker.”

2. The overall results from this study indicated that the participants that worked in offices without plants and windows had the strongest preference for newer architecture, and that all participants preferred similar office conditions.
3. Results from this study indicated that live interior plants and window views of green spaces appeared to positively influence employee perceptions of overall job satisfaction.
4. Results from this study indicated that live interior plants and window views of green spaces appeared to positively influence employee perceptions of the job satisfaction subcategories: “supervision,” “coworkers,” “nature of work.”
5. Results from this study seemed to indicate that employees appeared to respond to the presence of plants more than windows in terms of job satisfaction scores.
6. Results from this study indicated that live interior plants and window views of green spaces appeared to positively influence employee perceptions of their physical work environment.
7. Results from this study indicated that live interior plants and window views of green spaces appeared to positively influence employee perceptions of their overall life quality.
8. Results from this study indicated that live interior plants and window views of green spaces did not appear to benefit any particular demographic group more than others, with the exception of gender.
9. Results from this study indicated that live interior plants and window views of green spaces appeared to positively influence male employees’ perceptions of overall job satisfaction.

10. Results from this study indicated that live interior plants and window views of green spaces appeared to positively influence male employees' perceptions of the job satisfaction subcategory of "nature of work."
11. Results from this study indicated that males tended to respond more to the presence of plants, and females tended to respond more to the presence of windows (although not statistically significant).

### *Recommendations for Additional Research*

The following recommendations are made based on the findings of this research:

1. It is recommended that more studies be conducted in the areas of environmental preference for live plants and windows and its effect on employee job satisfaction.
2. It is recommended that more studies be conducted to determine the benefits of live plants and windows on people's perceptions of their physical office environment.
3. It is recommended that more studies be conducted on the effects of live plants and windows on people's perceptions of their overall life quality.
4. It is recommended that additional studies on gender and office environments be conducted to further explore the results indicated from this research.
5. It is recommended that a more evenly distributed sample size within each treatment group be used.
6. It is recommended that further studies be conducted on employees that work in office settings that are physically exactly the same to determine the effects of live plants and window views of green spaces on employees' perceptions of job satisfaction.

7. It is recommended that further studies be conducted that differentiate responses from office workers that are exposed to professionally interior landscaped environments, and personal house plants brought to the office space.
8. It is recommended that further studies be conducted that differentiate responses from office workers that are exposed to live plants compared to pictures of live plants, and also office workers that are exposed to windows and green spaces compared to pictures of windows and green spaces.

## LITERATURE CITED

- Aitken, J. E. and R. D. Palmer. 1989. The use of plants to promote warmth and caring in a business environment. EDRS: ED 303 843, CS 506 539.
- Asakawa, S. 1984. The effects of greenery on the feeling of residents toward residential neighborhoods. *Fac. Agr. Hokkaido Univ., Japan* 62:1:83-97
- Asmus, L. A. 2004. Cubicle landscaping. presented on gardening by the yard: Episode GBY-1107. Retrieved November 2004 from:  
[http://www.hgtv.com/hgtv/gl\\_design\\_other/article/0,1785,HGTV\\_3566\\_3305729,00.html](http://www.hgtv.com/hgtv/gl_design_other/article/0,1785,HGTV_3566_3305729,00.html)
- Barnhart, S. K., N. H. Perkins and J. Fitzsimonds. 1998. Behaviour and outdoor setting preferences at a psychiatric hospital. *Landscape and Urban Planning* 42:147-156.
- Beder, H. 1990. Reasons for nonparticipation in adult education. *Adult Education Quarterly* 40:207-218.
- Bender, K. A., S. M. Donohue and J. S. Heywood. 2005. Job satisfaction and gender segregation. *Oxford Economic Papers* 57:3:479-496.
- Bernal, D., D. Snyder and M. McDaniel. 1998. The age and job satisfaction relationship: Does its shape and strength still evade us? *J. Gerontology* 53:5:287-293.
- Berry, M. 2005. Job satisfaction for women in serious decline. *Personnel Today*. Retrieved June 2005 from:  
<http://www.personneltoday.com/Articles/2005/06/27/30521> .
- Bonham, Jr. J. B. 1992. Philadelphia green's greene countrie towne model as an agent for community development. In: D. Relf (ed.) *The role of horticulture in human well-being and social development: a national symposium*, 19-21 April 1990. 66-70. Portland, Oregon: Timber Press.
- Bowen, B. E. 1980. Job satisfaction of teacher educators in agriculture. Unpublished doctoral dissertation, Ohio State University, Columbus.
- Bowen, B. E. and R. B. Radhakrishna 1991. Job satisfaction of agricultural education faculty: A constant phenomenon. *J. Agricultural Education* 32:16-22.

- Bradley, A. 2005. Office design: room for improvement. Personal Computer World. Retrieved September 2004 from: <http://www.pcw.co.uk/accountancy/features/2142129/office-design-room-improvement> .
- Cable, D. M. and T. A. Judge. 1994. Pay preferences and job search decisions: a person-organization fit perspective. *Personnel Psychology* 47:317-348.
- Cammack, C., T. M. Waliczek and J. M. Zajicek. 2002. The Green Brigade: The effects of a community-based horticultural program on the self-development characteristics of juvenile offenders. *HortTechnology* 12:82-86.
- Campbell, D. E. 1979. Interior office design and visitor response. *J. Applied Psychology* 64:648-653.
- Carey, L. J. 1970. Community development as a process. University of Missouri Press, Columbia.
- Chang, C. and P. Chen. 2005. Human response to window views and indoor plants in the workplace. *HortScience* 40:5.
- Chung, S., P. D. Relf and W. Sim. 1999. Therapeutic effects of horticultural therapy and design guidelines for therapeutic gardens. In: M. D. Burchett and J. Tarran and R. A. Wood (eds.) *Towards a new millennium in people-plant relationships*, 282-291. University of Technology, Printing Services, Sydney, Australia.
- Clark, A. E. 1997. Job satisfaction and gender: why are women so happy at work? *Labour Economics* 4:341-72.
- Cranny, C. J., P. C. Smith and E. F. Stone. 1992. Job satisfaction: How people feel about their jobs and how it affects their performance. Lexington Books: New York.
- DeVaney, S. A. and Z. Chen. 2003. Job satisfaction of recent graduates in financial services. U.S. Department of Labor. Bureau of Labor Statistics. Retrieved May 2005 from: <http://www.bls.gov/opub/cwc/cm20030522ar01p1.htm>.
- Dolan, S. L. and E. Gosselin. 2000. Job satisfaction and life satisfaction: analysis of a reciprocal model with social demographic moderators. *J. Economics*. Retrieved March 2006 from: <http://www.econ.upf.edu/docs/papers/downloads/484.pdf> .
- Environmental Protection Agency. 1988. Indoor air facts-sick buildings. Report # 4. U.S. Government Printing Office, Washington, D.C.

- Etkin, N. L. 1994. Consuming a therapeutic landscape: A multicontextual framework for assessing the health significance of human-plant interactions. In: J. Flagler and R. Poincelot (eds.) *People-plant relationships: Setting research priorities*, 61-81. The Haworth Press, Binghamton, New York.
- Firebaugh, G. and B. Harley, 1995. Trends in job satisfaction in the United States by race, gender, and type of occupation. *Research in the Sociology of Work* 87-104.
- Folkins, C., C. O'Reilly, K. Roberts, and S. Miller. 1977. Physical environment and job satisfaction in a community mental health center. *Community Mental Health Journal* 13:1:24-30.
- Francis, M. and C. Cordts. 1992. A research agenda for the impact of urban greening. In: D. Relf (ed.) *The role of horticulture in human well-being and social development: a national symposium, 19-21 April 1990*, 71-74. Portland, Oregon: Timber Press.
- Gilhooley, M. J. 2002. *Grow with it: The role of plants in health care facilities*. Medical Group Management Association.
- Goodrich, R. 1986. The perceived office: The office environment as experienced by its users In: J. Wineman (ed.) *Behavioral issues in office design*, 109-134. New York, New York: Van Nostrand Reinhold.
- Grant, C. F. 1996. Gardens make us happy: Exposure to plants answers emotional needs in many individuals. In: P. Williams and J. Zajicek (ed.) *People-plant interactions in urban areas*, 88-91. College Station, Texas: Texas A&M University Press.
- Grossnickle, D. R. and W. B. Thiel. 1988. Promoting effective student motivation in schools and classroom: A practitioners perspective. Ohio State University library microfiche, Columbus.
- Heylighen, F. 1992. A cognitive-systemic reconstruction of Maslow's theory of self-actualization. *Behavioral Science* 37:39-58.
- Herzberg, F. 1957. *Job attitudes: Review of research and opinion*. Pittsburgh: Psychological Service of Pittsburgh.
- Honeyman, M. 1992. Vegetation and stress: A comparison study of varying amounts of vegetation in countryside and urban scenes. In: D. Relf (ed.) *The role of horticulture in human well-being and social development: a national symposium, 19-21 April 1990*, 143-145. Portland, Oregon: Timber Press.
- Jackson, R. J. 2003. Physical spaces, physical health. *AIA J. Architecture*, Retrieved April 2005 from: <http://develop2.aia.org/>.

- Janick, J. 1992. Horticulture and human culture. In: D. Relf (ed.) The role of horticulture in human well-being and social development, 19-21 April 1990. 19-27. Portland, Oregon: Timber Press.
- Jordan-Evans, S. 2002. Love 'em or lose 'em: Getting good people to stay, New York, New York: Berrett-Koehler Publishers.
- Kaplan, R. 1973. Some psychological benefits of gardening. *Environmental. Behavior* 5:145-162.
- Kaplan, R. 1983. The role of nature in the urban context. In: I. Altman and J.F. Wohlwill (eds.). *Behavior and the natural environment*. Plenum, New York.
- Kaplan, R. 1985. Nature at the doorstep. *J. Architectural Planning and Research* 2:115-127.
- Kaplan, R. 1992. The psychological benefits of nearby nature In: D. Relf (ed.) The role of horticulture in human well-being and social development, 19-21 April 1990. 125-133. Portland, Oregon: Timber Press.
- Kalleberg, A. L. and K. A. Loscocco. 1983. Aging, values, and rewards: Explaining age differences in job satisfaction. *American Sociological Review* 78-90.
- Klitzman S. and J. M. Stellman. 1989. The impact of the physical environment on the psychological well-being of office workers. *Social Science Medical* 29:6:733-42.
- Kozlowski, D. 2004. The facility factor. *Building operating management*. Retrieved March 2006 from: <http://www.facilitiesnet.com/bom/article.asp?id=1432> .
- Larkin, P. S. 1996. Job satisfaction in public horticulture In: P. Williams (ed.) *People-plant interactions in urban areas*, 102-104. College Station, Texas: Texas A&M University Press.
- Lewis, C. A. 1978. Comment: healing in the urban environment. *American Psychological Association Journal* 7:330-338.
- Lewis, C. A. 1992. Effects of plants and gardening in creating interpersonal and community well-being. In: D. Relf (ed.) The role of horticulture in human well-being and social development, 19-21 April 1990. 55-65. Portland, Oregon: Timber Press.
- Lewis, C. A. 1993. *Green nature, human nature*. Chicago, Illinois: University of Illinois Press.



- Lewis, C. A. 1994. The evolutionary importance of people-plant relationships. In: J. Flagler and R. Poincelot (eds.) *People-plant relationships: Setting research priorities*, 239-254. The Haworth Press, Binghamton, New York.
- Likert, R. 1967. The method of constructing an attitude scale In: M. Fishbein, M. (ed.) *Readings in attitude theory and measurement*, 90-95. New York, New York: John Wiley and Sons.
- Lindner, J. R. 1998. Understanding employee motivation. *J. Extension* 36, Retrieved January 2005 from: <http://www.joe.org/joe/1998june/rb3.html> .
- Lohr, V. I. 1992. The contribution of interior plants to relative humidity in an office In: D. Relf (ed.) *The role of horticulture in human well-being and social development*, 19-21 April 1990. 117-120. Timber Press, Portland, Oregon.
- Lohr, V. I. 1994. Plants and the individual: A recent history. In: J. Flagler and R. Poincelot (eds.) *People-plant relationships: Setting research priorities*, 225-230. The Haworth Press, Inc. Binghamton, New York.
- Lohr, V. I., C. H. Pearson-Mims and G. K. Goodwin. 1996. Interior plants may improve worker productivity and reduce stress in a windowless environment. *J. Environmental Horticulture* 14:97-100.
- Lohr, V. I. 1996a. The influence of foliage plants on dust accumulation in interiors In: Williams, P. and Zajicek, J. (ed.) *People-plant interactions in urban areas*, 149-157. College Station, Texas: Texas A&M University Press.
- Lohr, V. I. 1996b. The influence of tree form on human health and well-being In: P. Williams and J. Zajicek (ed.) *People-plant interactions in urban areas*, 98-102. College Station, Texas: Texas A&M University Press.
- Lohr, V. I. 2000. Physical discomfort may be reduced in the presence of interior plants. *HortTechnology* 10:53-58.
- MacKay, M. B. and D. J. Chalmers. 1992. A quantitative approach to the description of the qualities of ornamental plants, with particular preference to plant use in the rural environment In: D. Relf (ed.) *The role of horticulture in human well-being and social development*, 19-21 April 1990. 113-117. Portland, Oregon: Timber Press.
- Marquis, H. H. 1970. *The changing corporate image*. Washington, D.C.: American Management Association.
- Maslow, A. H. 1943. A theory of human motivation. *Psychological Review* 370-396.

- Mattson, R. H. 1992. Prescribing health benefits through horticultural activities. In: D. Relf (ed.) *The role of horticulture in human well-being and social development: a national symposium*, 19-21 April 1990. 161-168. Portland, Oregon: Timber Press.
- Mayne, T. 2003. Integration of context, office culture, and environment. *AIA Journal of Architecture*, Retrieved April 2005 from: <http://develop2.aia.org/>.
- McDonough, W. and M. Braungart. 1987. The extravagant gesture: nature, design, and the transformation of human industry, 21-22.
- Messer, E. R. 1996. The primary colors of nature In: P. Williams and J. Zajicek (eds.) *People-plant interactions in urban areas*, 106-108. College Station, TX: Texas A&M University Press.
- Microsoft Excel™, 2003, Microsoft Excel™ for Windows®. Seattle, Washington.
- Olmsted, F. L. 1870. Public parks and enlargement of towns. A paper presented as a contribution to the popular discussion of the requirements of Boston in respect to a public park; read at the request of the American Social Association at the Lowell Institute, February 25, 1870.
- Orians, G. and J. Heerwagen. 1992. Evolved responses to landscapes In: J. H. Barkow, L. Cosmides and J. Tooby (eds.). *The adapted mind: Evolutionary psychology and generation of culture*. Oxford Univ. Press, New York.
- Parker, D. C. 1992. The corporate garden In: D. Relf (ed.) *The role of horticulture in human well-being and social development*, 19-21 April 1990. 28-32. Portland, OR: Timber Press.
- Poltrack, T. 2003. Sustainability and health: a client's perspective. *AIA J. Architecture*, Retrieved April 2005 from: <http://develop2.aia.org/>.
- Randall, K. and C. A. Shoemaker. 1992. Effects of plantscapes in an office environment on worker satisfaction In: D. Relf (ed.) *The role of horticulture in human well-being and social development*, 19-21 April 1990. 106-109. Portland, Oregon: Timber Press.
- Random House Dictionary. 1966. Bantam Dell Publishing Group. New York City, New York.
- Relf, D. 1994. Foreward In: J. Flagler and R. Poincelot (eds.) *People-plant relationships: Setting research priorities*, 1-3. The Haworth Press, Binghamton, New York.
- Richmond, V. P. and J. C. McCroskey. 1995. *Nonverbal behavior in interpersonal relations*. Boston, Massachusetts: Allyn & Bacon.

- Robie, C., A. Ryan and R. A. Schmieder. 1998. The relation between job level and job satisfaction. *Group and Organization Management* 23:4:470-495.
- Rosenfield, L. W. 1992. Gardens and civic virtue in the Italian renaissance In: D. Relf (ed.) *The role of horticulture in human well-being and social development*, 19-21 April 1990. 32-37. Portland, Oregon: Timber Press.
- Seligman, M. E. P. 2002. *Authentic happiness*. Free Press, New York.
- Shareef, R. 1992. Clearing the air: horticulture as a quality-of-work-life intervention In: D. Relf (ed.) *The role of horticulture in human well-being and social development*, 19-21 April 1990. 110-112. Portland, Oregon: Timber Press.
- Shepard, P. 1967. *Man in the landscape: A historic view of the esthetics of nature*. Alfred A. Knopf, New York.
- Shoemaker, C. A. 1994. Plants and human culture In: J. Flagler and R. Poincelot (eds.) *People-plant relationships: Setting research priorities*, 3-7. The Hawthorn Press, Binghamton, New York.
- Spector, P. E. 1985. Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American J. Community Psychology* 13:693-713.
- Spector, P. E. 1997. *Job satisfaction: application, assessment, causes, and consequences*. Thousand Oaks, California: Sage.
- SPSS®. 2001. SPSS® 11.5 for Windows™. SPSS Inc., Chicago, Illinois.
- Siu, O., C. L. Cooper, P. E. Spector and I. Donald. 2001. Age differences in coping and locus of control: a study of managerial stress in Hong Kong. *Psychological Aging* 16:707-710.
- Tukey, H. 1983. HortScience 18:1:11-13 In: D. Relf (ed.) *The role of horticulture in human well-being and social development*, 19-21 April 1990. 13-15. Portland, Oregon: Timber Press.
- Ulrich, R. S. 1974. *Scenery and the shopping trip: The roadside environment as a factor in routine choice*. Michigan Geographical Publication No. 12. Department of Geography, University of Michigan, Ann Arbor, Michigan.
- Ulrich, R. S. 1979. Visual landscapes and psychological well well-being. *Landscape Research* 4:17-23.
- Ulrich, R. S. 1984. View through a window may influence recovery from surgery. *Science* 224:420-421.

- Ulrich, R. S. and R. Parsons. 1992. Influences of passive experiences with plants on individual well-being and health In: D. Relf (ed.) *The role of horticulture in human well-being and social development*, 19-21 April 1990. 93-105. Portland, Oregon: Timber Press.
- United States Census Bureau, 1990. Retrieved April 2005 from: <http://www.census.gov>.
- United States Census Bureau, 2003. Retrieved April 2005 from: <http://www.census.gov>.
- United States Department of Agriculture. 1993. An introductory guide to urban and community forestry programs. For. Serv. S. Reg. (Atlanta) For. Rpt. R8-FR16.
- Verderber, S. 1986. Dimensions of person-window transactions in the hospital environment. *Environment and Behavior* 18:450-466.
- Vroom, V. H. 1964. *Work and motivation*. New York, New York: Wiley.
- Waliczek, T. M., R. H. Mattson and J. M. Zajicek. 1996. Psychological benefits of community gardening. *J. Environmental Horticulture* 14:204-209.
- Waliczek, T. M., J. M. Zajicek and R. D. Lineberger. 2005. The influence of gardening activities on consumer perceptions of life satisfaction. *HortScience* 40:5:1360-1365.
- Webster's Ninth New Collegiate Dictionary. 1985. F. C. Mish. Merriam-Webster, Inc. Springfield, MA.
- Westphal, L. M. 2003. Urban greening and social benefits: A study of empowerment outcomes. *J. Arboriculture* 29:137-147.
- Wilensky, J. L. 1960. Work, careers and social integration. *International Social Science Journal* 12:543-560.
- Wolf, K. L. 1996. Psycho-social dynamics of the urban forest in business districts In: P. Williams and J. Zajicek (ed.) *People-plant interactions in urban areas*, 27-32. College Station, Texas: Texas A&M University Press.
- Wolverton, B. C., A. Johnson and K. Bounds. 1989. *Interior landscape plants for indoor air pollution abatement- final report*. NASA, Stennis Space Center.
- Wood, R. A. and M. D. Burchett. 1996. Developing interior foliage plants for the improvement of air quality In: P. Williams and J. Zajicek (ed.) *People-plant interactions in urban areas*, 139-145. College Station, Texas: Texas A&M University Press.

- Wright T. A. and R. Cropanzano. 2000. Psychological well-being and job satisfaction as predictors of job performance. *J. Occupational Health Psychology* 1:84-94.
- Yang, Y., K. Cannings and A. M. Konrad. 2005. Pay dispersion and job attitudes for women and men: A study of Swedish doctors. ASAC. Toronto, Ontario.
- Zadik, M. 1994. Studying the corporate garden. In: J. Flagler and R. Poincelot (ed.) *People-plant relationships: setting research priorities*, 275-282. Binghamton, New York: The Haworth Press, Inc.
- Zampini, J. W. 1994. Down to earth benefits of people-plant interactions in our community. In: J. Flagler and R. Poincelot (ed.) *People-plant relationships: setting research priorities*, 185-191. Binghamton, New York: The Haworth Press, Inc.

## **APPENDIX A:**

### **WORKPLACE ENVIRONMENTS SURVEY**

## APPENDIX A: WORKPLACE ENVIRONMENTS SURVEY

### To The Participant:

\_\_\_\_\_ has been selected to participate in a collaborative study between Texas State and Texas A & M Universities. This on-line survey will be used to determine the effect of physical office environments on employee perceptions of job satisfaction. This short questionnaire will require approximately 20 minutes of your time to complete. Participation in filling out this questionnaire is voluntary and there is no penalty for non-participation. However, a \$5.00 Lowe's certificate will be provided to those who participate. Your identity will remain anonymous and all answers are confidential. If you have any questions about participation please e-mail Dr. Tina Cade at Texas State University at [tc10@txstate.edu](mailto:tc10@txstate.edu).

Please do not leave any questions blank and respond to each question with only one answer.

By typing in your Access I.D. #, you are giving your informed consent to participate in the study.

I have read and understand the explanation provided to me.  
 I have had all questions answered to my satisfaction, and  
 I voluntarily agree to participate in this study.

Thank you for assisting us in our research.

### SURVEY QUESTIONS

Please complete the following information about different aspects of your life. If you are unsure about which response to give to a question, please select the one that seems most appropriate.

1. How would rate your overall **physical** work environment on a scale from one to five with one being the lowest rating and five being the highest.

1      2      3      4      5

2. What do you like best about your work environment?

Location  
 Design/ Architecture of building  
 Landscaping outside of office  
 Co-workers  
 Job duties

3. Do you feel that your **physical** work environment influences your (mark all that apply)

Mood  
 Productivity  
 Motivation  
 Job satisfaction  
 All of the above  
 None of the above

4. Do you work in:  
Your own office  
In a cubicle  
In a community area, i.e. reception area
5. Do you have live plants inside your immediate office or workspace?  
Yes  
No
6. Do you have a window?  
Yes  
No  
If the answer is no, proceed to question...
7. Do you have a window with a view of plants and/or trees?  
Yes  
No
8. Are there other windows in your overall office area?  
Yes  
No
9. Do any of the windows have views of plants and/or trees?  
Yes  
No
10. Are there other live plants in your building such as an indoor atrium, common spaces or lobby entranceway?  
Yes  
No
11. Do you have access to a common area outside with plants and/or trees where you can take breaks, such as lunch, smoking or coffee breaks?  
Yes  
No
12. When all things in your life are considered, how do you feel today?  
Very happy  
Content  
OK  
Not very happy  
Miserable
13. Overall how would you rank the quality of your life?  
Very satisfied  
Mostly satisfied  
Satisfied  
Mostly dissatisfied  
Dissatisfied



14. Do you have plants inside your residence?

Yes

No

If the answer is yes:

In all rooms

In most rooms

In 1 or 2 rooms

15. Do you have a patio or yard with plants and/or trees at your residence?

Yes

No

If the answer is yes,

Was this a determining factor in your decision to live there?

Yes

No

16. Which of the following would give you reason enough to leave your current position? Check all that apply:

\_\_\_\_\_ More money

\_\_\_\_\_ More power to make decisions

\_\_\_\_\_ More challenge in daily work

\_\_\_\_\_ More collegiality in workplace environment

\_\_\_\_\_ More prestige

\_\_\_\_\_ More benefits in benefits package

\_\_\_\_\_ Easier commute

\_\_\_\_\_ Better physical workplace environment (Please explain)

\_\_\_\_\_ Other (Please list)

\_\_\_\_\_ I would leave my current position if given any opportunity

\_\_\_\_\_ I would not leave my job for any reason. I really like my job.

**The following statements represent the different ways people view their environment. Please indicate how each statement applies to you by marking whether you:**

Strongly Disagree = 1; Disagree = 2; are Neutral = 3; Agree = 4; Strongly Agree = 5

- \_\_\_\_\_ 1. I really dislike dull, dark, heavy looking buildings.
- \_\_\_\_\_ 2. I like clear, open, airy buildings.
- \_\_\_\_\_ 3. I prefer old, dark, heavy buildings with a history.
- \_\_\_\_\_ 4. I perform at my best when there is a lot of sunlight coming into my work area.
- \_\_\_\_\_ 5. I really dislike open, airy, sunny architecture.
- \_\_\_\_\_ 6. I dislike new, modern architecture.
- \_\_\_\_\_ 7. I am very irritable when I have to work in a dark building.
- \_\_\_\_\_ 8. I am very alert in clean, clear, open buildings.
- \_\_\_\_\_ 9. I am very irritable when I have to work in new modern buildings with lots of windows.
- \_\_\_\_\_ 10. I am very alert when I am working in a building where there is little light.
- \_\_\_\_\_ 11. I rarely do well on assignments when I work in a setting where the environment is ugly.
- \_\_\_\_\_ 12. I usually do very well on assignments when I work in attractive buildings.
- \_\_\_\_\_ 13. Working in unattractive environments does not affect the outcome of my work.
- \_\_\_\_\_ 14. I do well on assignments when working where there are a lot of distractions.
- \_\_\_\_\_ 15. I like to do my assignments in attractive buildings.
- \_\_\_\_\_ 16. Doing my assignments in unattractive buildings does not impact my productivity.

Please circle the number that best represents how you feel about the question:

		Disagree very much	Disagree moderately	Disagree slightly	Agree slightly	Agree moderately	
1.	I feel I am being paid a fair amount for the work I do.	1	2	3	4	5	6
2.	There is really too little chance for promotion on my job.	1	2	3	4	5	6
3.	My supervisor is quite competent in doing his/her job.	1	2	3	4	5	6
4.	I am not satisfied with the benefits I receive.	1	2	3	4	5	6
5.	When I do a good job, I receive the recognition for it that I should receive.	1	2	3	4	5	6
6.	Many of our rules and procedures make doing a good job	1	2	3	4	5	6

	difficult.					
7.	I like the people I work with.	1	2	3	4	5 6
8.	I sometimes feel my job is meaningless.	1	2	3	4	5 6
9.	Communications seem good within this organization.	1	2	3	4	5 6
10.	Raises are too few and far between.	1	2	3	4	5 6
11.	Those who do well on the job stand a fair chance of being promoted.	1	2	3	4	5 6
12.	My supervisor is unfair to me.	1	2	3	4	5 6
13.	The benefits we receive are as good as most other organizations offer.	1	2	3	4	5 6
14.	I do not feel that the work I do is appreciated.	1	2	3	4	5 6
15.	My efforts to do a good job are seldom blocked by red tape.	1	2	3	4	5 6
16.	I find I have to work harder at my job because of the incompetence of people I work with.	1	2	3	4	5 6
17.	I like doing the things I do at work.	1	2	3	4	5 6
18.	The goals of this organization are not clear to me.	1	2	3	4	5 6
19.	I feel unappreciated by the organization when I think about what they pay me.	1	2	3	4	5 6
20.	People get ahead as fast here as they do in other places.	1	2	3	4	5 6
21.	My supervisor shows too little interest in the feelings of subordinates.	1	2	3	4	5 6
22.	The benefit package we have is equitable.	1	2	3	4	5 6
23.	There are few rewards for those who work here.	1	2	3	4	5 6
24.	I have too much to do at work.	1	2	3	4	5 6
25.	I enjoy my coworkers.	1	2	3	4	5 6
26.	I often feel that I do not know what is going on with the organization.	1	2	3	4	5 6
27.	I feel a sense of pride in doing my job.	1	2	3	4	5 6
28.	I feel satisfied with my chances for salary increases.	1	2	3	4	5 6
29.	There are benefits we do not have which we should have.	1	2	3	4	5 6
30.	I like my supervisor.	1	2	3	4	5 6
31.	I have too much paperwork.	1	2	3	4	5 6
32.	I do not feel my efforts are rewarded the way they should be.	1	2	3	4	5 6
33.	I am satisfied with my chances for promotion.	1	2	3	4	5 6

- |     |   |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|---|
| 34. | There is too much bickering and fighting at work. | 1 | 2 | 3 | 4 | 5 | 6 |
| 35. | My job is enjoyable.                              | 1 | 2 | 3 | 4 | 5 | 6 |
| 36. | Work assignments are not fully explained.         | 1 | 2 | 3 | 4 | 5 | 6 |

Please complete the following information about yourself:

1. What is your age?
  - Under 20
  - Between 21 and 30
  - Between 31 and 40
  - Between 41 and 50
  - Between 51 and 60
  - Over 60
2. What is your gender?
  - Male
  - Female
4. What is your ethnic group?
  - Caucasian
  - African American
  - American Indian
  - Hispanic
  - Asian American
  - Other (please specify) \_\_\_\_\_
5. What is your current marital status?
  - Single
  - Married
  - Widowed
  - Divorced
  - Partnered Collaboration
6. What is the highest grade of school that you have completed?
  - Less than eight years
  - Grade School (through eight grades)
  - Some high school
  - High School Graduate
  - Some college
  - College Graduate
  - Some Graduate/Professional School
  - Completed Graduate/Professional School
  - Trade/Technical/Vocational School
9. How many hours do you work per week?
  - Less than 20 hours
  - 20-40 hours

Over 40 hours

10. What is your current occupation level at this place of employment?

Unskilled employee, unskilled laborer  
Machine operator, semi-skilled employee  
Skilled manual employee  
Clerical or sales worker, technician  
Administrative personnel, minor professional  
Management personnel  
Executive professional  
Entrepreneur  
Other (specify) \_\_\_\_\_

11. What is your salary range?

Less than \$20,000 per year  
\$20,000 to \$30,000 per year  
\$30,000 to \$40,000 per year  
\$40,000 to \$50,000 per year  
\$50,000 to \$75,000 per year  
\$75,000 to \$100,000 per year  
Over \$100,000 per year

12. What is your primary work schedule?

Daytime, Monday through Friday  
Daytime, Weekend Shift  
After hours, Nighttime  
Changes regularly

13. What is your average commute to this place of employment?

Less than 15 minutes  
15 to 30 minutes  
30 minutes to 1 hour  
Over 1 hour

14. How many other employees do you primarily work with on a day-to-day basis at this place of employment?

None  
1-5  
6-10  
Over 10

15. Do you socialize with any co-workers/colleagues outside of your work environment?

Yes  
No

## **VITA**

Andrea Kathleen Clark was born in Bryan, Texas on April 30, 1972, the daughter of Barbara Ann Clark and Charles Richard Clark. After graduating from James Bowie High School, Austin, Texas, in 1990, she entered Austin Community College. During the following years, she attended classes part-time and pursued a career in horticulture. In August 2003, she received the degree of Bachelor of Science from Texas State University-San Marcos. In January 2004, she entered the Graduate College of Texas State University-San Marcos.

Permanent Address: 15130 Galena Drive

Austin, Texas 78717

This thesis was typed by Andrea Kathleen Dravigne.