VALUE LITERACY IN THE LANDSCAPE:

RESIDENTIAL PERCEPTIONS OF LANDSCAPE TREE VALUE

by

JOSEPH MICHAEL PERLOFF

(Under the Direction of Katherine Melcher)

ABSTRACT

This thesis uses a non-conventional environmental value elicitation technique adapted from Satterfield (2001) to help householders in the Wakefield/Snapfinger community subdivision of east Athens, Georgia to better verbalize what non-utilitarian, non-cost, intrinsic values they attribute to residential landscape amenity trees in the residential landscape setting. 74 of the 312 single family homes in the community were sampled through survey method to reveal from Satterfield (2001)'s 25 intrinsic environmental values, which value typologies residents attributed strongest and least, to their personal residential landscape trees. Overall, householders in the Wakefield/Snapfinger community placed highest emphasis on the belief that their trees are attractive, have a natural right to exist, are important "just because," that they contribute to a local/regional "sense of place," and add biological richness and species diversity to their personal, residential landscapes.

INDEX WORDS: Residential, Neighborhood, Urban, Landscape, Amenity, Tree, Non-Cost, Non-Utilitarian, Value, Environmental Psychology, Urban Forestry, Arboriculture, Urban Planning, Human-Environmental Value, Valuation, Value Elicitation, Value Literacy

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PREFACE:

THE TREEKEEPER'S DILEMMA

Several years before applying to graduate school, I was working full-time as a commercial arborist for a private tree expert company in the heart of Washington, D.C. As a member of an urban tree maintenance and removal crew at a well-known and respected tree care company, I had regular interaction with residential landscape trees on a near-daily basis.

Most days our duties involved regular, routine maintenance pruning: thinning, raising, and reduction of tree canopies, and dead limb removal to keep our clients' landscape trees healthy, safe, and looking in top-shape. Boasting a short list of clients including the Vice President's mansion, multiple foreign embassies, Beatrix Farrand's Dumbarton Oaks, the neighboring Oak Hill Cemetery (a literal who's who burial grounds for many of Washington's late, social elite, nestled along Rock Creek Park), and the stunning historical private event space of The Evermay Society, every tree we touched had to look perfect when we were finished. Generally our clients gave only slight, if any acknowledgement of our arrival on-site allowing us to perform our duties with minimal bother - perhaps a small question about a certain limb here or there, but for the most part we were left alone to do our work. However, some days were much more involved. These were the days we performed complete tree removals.

Part of our job as arborists was to assess trees for signs of pests, disease, decay, decline, and weakness. Structural or health issues in a tree can pose human safety and liability issues if a tree or large limb were to fall down and hurt someone. A pest or disease outbreak on a landscape

could put other landscape trees in jeopardy if not identified and treated properly. Staying on top of pests and disease and spotting at-risk trees was a full-time, year-round job for us, and so most of our business consisted of preventive treatments and routine maintenance pruning. Occasionally though, we arrived too late to save an unfortunate victim - a dying tree. In cases such as these, there was generally only one option.

Tree removals were referred to as "take-downs" in the business, and required adherence to a very specific set of safety standards and procedures performed with a very high level of competency, skill, and precision. Take-downs were by far the most exciting, dangerous, adventuresome, and dramatic part of our job. Multiple trucks were needed. We brought in the big chainsaws. Enormous cranes were sometimes brought in to lift large, heavy pieces of trees out of tight, confined spaces. These were the days we lived for because the job required every ounce of concentration, technique, and training we had. It truly was incredible, watching these aging behemoths come down piece by piece; a choreographed ballet of physics and spatial ability combined with the brute, sheer force of the chainsaw cutting through old and storied wood. These days were very different from regular other days for a very different reason, too: *Other people actually cared about what we were doing*.

The client almost always asked to be there on-site during tree removal jobs. Often they could be seen watching intently, with an unwavering gaze from the kitchen window or from across the street, mouth agape in child-like wonder as the elder giants were brought down to the ground. "That was always such a *nice* tree," or "I really wish we could have saved it," they would almost always remark. Their far-off gaze hinting at some hidden, subconscious reverence for the old tree not truly understood or fathomed until it was gone. Surprisingly, oftentimes even the neighbors from several houses down would come over to our work area asking, even

demanding to speak with the crew foreman about why the tree was being removed. Even despite the tree being in apparent decline, many of these neighbors were very adamant in their positions about us letting the tree stay. “It’s such a nice tree, why would you want to cut it down?” they would plead. Although they had no legal or physical “rights” to the tree, or any direct, physical interaction with it, it became very apparent that these people had formed deep, indescribable connections to the landscape trees in their surroundings.

After several years of this, it became clear to me that people in landscapes attribute a very unique personal value to the trees in their immediate residential landscape surroundings. However, this personal “value,” when thought about for some time, becomes extremely difficult to describe, measure, or quantify in any conventional or utilitarian sense of the word. A very wise and strict English grammar teacher once instructed me never to use the word, “nice,” as an adjective because it carries only vague descriptive weight and is essentially a meaningless phrase beyond the obvious superfluous, colloquial pleasantries. But those clients’ and outraged neighbors’ words hung in my ears with such impassioned, meaningful emphasis, *“It’s such a nice tree!”* There had to be a better way for people to vocalize the personal importance of their trees: *but how?*

CHAPTER 1

INTRODUCTION

Introduction

Just about every accredited landscape architecture and design program will emphasize the importance of trees and plant material in good design throughout its curricula. Landscape architecture students are often told that in every good design, nothing is included arbitrarily; every detail must be created with *intention*. Contained in every shrub and every tree there is a purpose. And so we create for color, for shade, for texture, for character, for emphasis; to draw the user's eye towards the natural architectural structure contained within these growing design elements to make the user *feel* something. Landscape architects are expert social scientists when it comes to designing with intent.

But what happens afterwards when the design is complete, when all the trees have been planted and people move into the space, is not quite as well understood. Sure, there are post-occupancy evaluations in place, but we rarely think about how some of the most basic elements in our designs, trees, affect the people who live in our landscapes; how users look at, interact with, become attached to, and create their own meanings for these living design elements as they grow. Research shows people hold a very unique appreciation for residential landscape amenity trees, especially large ones growing on their properties (Ulrich 1985, Barro et al. 1997). However, beyond the basic appreciation for their largeness, the relationship between people and trees is not very well understood. The inherent, intrinsic values people hold for residential

landscape trees especially, are strong, and often cited in the landscape architectural literature (Dwyer 1991, Barro et al. 1997). However, beyond a very basic understanding of intrinsic importance, these values held for landscape amenity trees are still relatively undefined.

Professionals in similar fields, such as arborists, foresters, ecologists, environmental psychologists, and city planners who are also deeply invested in the importance of trees and urban forests, have been hypothesizing, researching, and developing a multitude of theories and methodologies to test and describe the value of urban landscape amenity trees to people since the late 1970's and early 1980's (Harris, et al. 2004, 102). Indeed, to develop a way to show direct correlation between trees and human health, economic, and environmental benefits is paramount in justification for planting or preserving trees in the urban landscape in the first place, for a variety of stakeholders in a whole plethora of enviro-political, academic, and commercial settings and situations.

Key Points Literature Review

Several decades of research in a number of fields have produced myriad ways to view and value trees in the urban and residential landscape environment from a variety of standpoints, scales, and specializations. These methodologies range from single-tree specimen evaluations to entire urban tree populated environments, collectively referred to as the "Urban Forest."

First attempts at describing the benefits of trees to people and the environment focused mostly on shade and screening properties, using, "pen and ink graphics of a rather rudimentary nature" (Harris et al. 2004, 102). These pioneer representations of the 1970's were largely the work of USDA Forest Service ecologist, Rowan A. Rowntree and his colleague E. Gregory

McPherson, who together developed the concept of the "urban forest," as the, "composition, structure, and function," of an assemblage of trees (Harris et al. 2004, 102).

Current research, most notably through the USDA and U.S. Forest Service's i-Tree software suite, has elaborated considerably on Rowntree and McPherson's initial research on the benefits of urban forests. Today's methods include a substantial amount of tree appraisal methodologies, economic valuation and willingness-to-pay studies, and complex satellite imaging and computer mapping technology contained in the i-Tree software suite which can calculate a plethora of environmental and economic benefit data for entire cities' urban forests. But despite all the advances in tree valuation techniques and technologies which can pinpoint the exact monetary value of both individual specimens and collective urban stands of trees, as well as calculate all desirable environmental benefits such as amount of stormwater runoff mitigation, atmospheric carbon sequestration, and heat island index reduction, what inherent benefits humans value most personally and intrinsically about trees in the landscape are less calculable and not as well understood.

In the field of environmental psychology, researchers such as Roger Ulrich, Stephen and Rachel Kaplan, and William Sullivan and Frances Kuo have tackled some complex studies which aimed to isolate and quantify the direct benefits to the human psyche as a result of human interaction with tree populated environments. Using a pairing of standardized psychological testing procedures in combination with unique environmental classification scales, these researchers developed a range of experiments which tested humans' relationships to the urban forest in a variety of ways including hospital patient recovery times, student work productivity, professional job satisfaction, and cognitive function in inner-city youth living in urban

subsidized housing projects, as functions of the availability of views to urban landscape amenity trees.

Sommer et al. 1989 and Schroeder and Ruffolo 1996 have attempted with some success to generate a starting point for us to systematically categorize residential householders' personal qualitative value evaluations for residential landscape amenity trees. These two studies are unique in the fact that they ask householders directly, what appeals most to them about neighborhood street trees, and then categorize the pros and cons for individual species of common street trees for specific, individual regions. Through ranking and statistical analysis of homeowner responses, Sommer et al. 1989 and Schroeder and Ruffolo 1996 were able to produce regional recommendations for future street tree plantings for local municipalities and regional planning offices to use in their tree implementation guidelines and specifications, based on residential homeowners' perceptions of tree benefits and annoyances. The importance of these studies is they not only bring to account monetary and environmental benefits of their street tree recommendations, but they include a testable, repeatable human social element to their valuation techniques which this thesis hopes to elaborate upon.

Problem Statement

Despite the plethora of data on the environmental and economic benefits derived from urban forests, in combination with environmental-psychological research which describes psychological benefits humans derive from interacting with trees, the unique human-social beneficial value of trees, that is, the less tangible benefits people value most about their personal landscape amenity trees, most notably in the residential landscape setting, is still very difficult to quantify or describe. Research has suggested some of the more esoteric, symbolic, spiritual, and

emotional qualities people hold dear for trees (Barro et al. 1997), however the subject has received far less attention in terms of systematically documenting these qualities and benefits through testable research. The author once took a course on the principles of urban tree management with The University of Georgia's renowned Warnell School of Forestry professor, Dr. Kim Coder where, at one point during the semester, we covered a section on tree valuation and appraisal techniques. When asked by one of the other Master of Landscape Architecture students (not me), about methods for valuing the social benefit of trees, the famous professor responded, "We don't do that, for the simple fact that it is impossible."

The problem, then, to be addressed in this thesis becomes two-fold: One, as Dr. Coder relayed in his teachings, pinpointing and addressing in any valuable sense the "social value" of trees is for all intents and purposes, probably impossible. When it comes to social values, there is no magic quantity; indeed, a tool or technique for measuring or quantifying the social values of trees is a vague, conceptual, expansive, and broad-reaching idea, and as such, creating a scale with which to measure it by would be nearly impossible.

And two: Sommer et al. 1989 and Schroeder and Ruffolo 1996's methodologies attempting to do so thus far, have been concerned mainly with the apparent surface values of only the most physical, tangible benefits and annoyances of street trees. Additionally, these two studies have been narrow and species-specific in scope and therefore regionally limited in applicability. Sommer et al. 1989 and Schroeder & Ruffolo 1996's studies have also relied on the assumption of a homeowner's basic understanding of tree identification skill and knowledge, thereby potentially limiting the accessibility and applicability to layperson scenarios in further research requiring tree identification on the part of survey participants.

Because of these factors, a systematic methodology of value appraisal must therefore be created or adapted in order to address the more complex personal intrinsic value systems humans hold for residential landscape amenity trees, while remaining easy to relate to layperson scenarios involving a broad range of regional tree species through repeatable studies.

Thesis Proposal Statement

In order to address these problems, it may be possible to apply value elicitation techniques from other research disciplines to attempt to better describe, or elicit more focused descriptions of the distinct and personalized value systems humans attribute to landscape trees in their own personal surroundings. Theresa Satterfield, a British researcher involved in value elicitation techniques and environmental philosophy, has developed a concept called "value literacy" which attempts to allow study participants in various arenas to better "verbalise the nonutilitarian qualities and values that best express why nature matters" (Satterfield 2001, 332). Satterfield's 2001 study, "In Search of Value Literacy: Suggestions for the Elicitation of Environmental Values" outlines a unique methodology which attempts to allow humans to describe the personal, intrinsic, non-utilitarian value held for environmental goods using a 25-point value typology scale. It is the hopes of this research, that Satterfield 2001's 25-point value typology scale might be utilized and applied to a residential neighborhood setting to help householders better describe what intrinsic, non-cost values they hold most for their personal, residential landscape amenity trees in the residential landscape setting.

Key Terms and Delimitations of the Research

While many types of professionals in a variety of fields use different terms for trees in each of their unique disciplines such as urban trees, green infrastructure, urban forests, city trees, landscape trees, amenity trees, neighborhood trees, and street trees to describe trees which occur in the urban landscape within close proximity to populations of people, this thesis will be concerned with what the author has termed, *residential landscape amenity trees*. (The author should note here, the use of "urban" is not meant to be mistaken narrowly as only the large, densely populated urban metropolises we tend to think of in the context of the word, but more inclusively as areas of reasonable human population with roads, housing, and populations of amenity trees). Therefore, for the purposes of this research, use of the term "residential landscape amenity trees" framed within the context of this thesis shall include all neighborhood street trees, ornamental landscape trees, and shade trees occurring on a householder's property in the residential, community subdivision setting.

This thesis, then, seeks to better understand the qualitative, more deeply held intrinsic values neighborhood home occupants in the Wakefield/Snapfinger development community in suburban Athens, Georgia, attribute to their residential landscape amenity trees, utilizing the environmental value elicitation techniques outlined in Satterfield's "In Search of Value Literacy: Suggestions for the Elicitation of Environmental Values" (Satterfield 2001). The hope of this research is that utilizing value systems and scales from enviro-ethical and environmental philosophy research may ultimately yield more meaningful research and understanding of human-environmental value systems for residential landscape amenity trees than has been possible thus far utilizing current methodologies.

The focus of this research shall be limited only to the 312 rental and homeowner properties within the Wakefield/Snapfinger community, and shall only be concerned with those values most deeply held, intrinsically in the conscience of householders in the Wakefield/Snapfinger community subdivision. Because Sommer et al. 1989 and Schroeder and Ruffolo 1996's studies have already covered, in-depth, the many surface values of basic benefits and annoyances, questions relating these types of values shall be avoided, if possible, in this research.

Preview Statement for Structure and Organization of Thesis

Following this introduction, [Chapter Two] of this thesis will comprise a literature review on valuation techniques for assessing and quantifying benefits of trees, first as singular specimens, and then as collections of trees in urban environments, collectively referred to as the "urban forest." This review will discuss past and current techniques and methodologies designed to assess tree value through a variety of lenses and specialties, both monetary and environmental in scope. [Chapter Three] will cover a review of the literature of the early environmental psychologists of the 1980's up to the present day, primarily examining their processes and methodologies in developing factors for assessment in linking the psychological benefits of the natural environment to the human psyche. [Chapter 4] will examine human-nature value systems and delve into the works of Holmes Rolston III and Theresa Satterfield, specifically examining how their work in writing about and categorizing natural-environmental value may contribute to earlier designed studies aimed at developing neighborhood residential street tree survey methodology such as those performed by Sommer et al. 1989 and Schroeder and Ruffolo 1996. [Chapter 5] will focus on the survey design inquiry process which was used in generating the

survey questionnaire to be used in this particular thesis research - Value Literacy in the Landscape: Residential Perceptions of Landscape Tree Value. Results of the survey will be provided, and supported with visual info-graphics from the analysis. [Chapter 6] will discuss the results of the survey in-depth, covering statistical analysis and [Chapter 7] will explore further possible implications of the research, including suggestions and recommendations for future uses and possible target populations for future surveys.

CHAPTER 2

BENEFITS OF TREES

Introduction

Following the earliest shade tree studies conducted by Rowan A. Rowntree and E. Gregory McPherson, there have been many advances in the understanding of the environmental, economic, and socio-economic benefits relayed back to humans as a result of the inclusion of trees in the urban landscape. These advances have come as a result of a confluence of understanding, from a variety of professional standpoints and scientific reasoning. I begin here, with a brief review of the Council of Tree and Landscape Appraisers (CTLA) methodology for single tree specimen appraisal and valuation techniques, followed by a review of some of the key literature which has focused on the environmental and socio-economic benefits provided by trees in urban areas. Finally, I arrive at some of the most technologically impressive advances in the

study of tree benefits, as provided by the USDA Forest Services's UFORE, STRATUM, and i-Tree software, which has combined aerial satellite imaging capability with U.S. climate data and city energy usage data to provide comprehensive environmental and economic benefit data as it relates to energy savings, city climate, and atmospheric air quality improvement.

While these benefits tell us little about the personal, intrinsic values people hold specifically for residential landscape amenity trees, the data provides an important perspective on the physical qualities of trees which improve our livelihood as a whole on a large-scale level. Additionally, as some researchers (Lopez-Mosquera and Sanchez 2011) postulate, the more laypeople come to understand these comprehensive benefits as reflected by landscape amenity trees in urban environments, the more these benefits may come to inform their importance in the minds of humans as they gain an increased appreciation for the benefits of trees.

CTLA and Monetary Valuation Techniques

The Council of Tree and Landscape Appraisers, commonly referred to as simply, CTLA are a council of tree and landscape professionals supported by the International Society of Arboriculture in creating guidelines for assigning monetary value to trees. The very first attempt at a formal tree valuation guide, entitled "*Shade Tree Evaluation,"* was a collaboration between the National Arborist Association (NAA) and the National Shade Tree Conference (NSTC), and was published in 1957 (Cullen 2007). After several revisions, CTLA took over publication in 1975. The most recent guide, the CTLA Guide for Plant Appraisal, 9th edition, published in 2000, is widely considered by green industry professionals as one of the most useful tools for considering the idea of assigning a quantitative, monetary value to "green" infrastructure such as trees. The Guide, as it is referred to, "describes the appraisal or valuation process, field

procedures and record keeping, the three traditional approaches to value, various considerations that frame valuations, and professional practice issues" (Cullen 2007, 23).

One of the greatest benefits of the Guide that is sorely missing from much of urban neighborhood and landscape tree-related research is it defines a very specific type of urban landscape amenity tree for appraisal straight from the outset, rather than attempting to vaguely describe a wide range of tree types which might exist in a variety of different landscape environments. The CTLA Guide therefore is only focused on what it refers to as, "amenity trees." Amenity trees, as defined by the Guide, are trees "that are not grown or managed for their value as a timber or other crop and that provide other benefits or values. They are also distinguished from crop trees or forests that may provide secondary amenity values in addition to harvestable products…arboriculturalists and urban foresters are primarily concerned with non-crop amenity trees found in parks and other open spaces, or lining the sides of our streets, railways, rivers, and canals. They also include all the trees in our own gardens" (Cullen 2007, 27).

The Guide takes note that amenity trees may have some, "intrinsic value in and of themselves irrespective of any human preferences" (Cullen 2007, 28), and that there is substantial debate on whether these conceptual, philosophical values have a place in the public decision-making process. The Guide, however, states that these concepts are beyond the scope of the CTLA methods and guidance. CTLA is careful to note too, though, "value is not a physical characteristic of the thing we are valuing; it cannot be touched nor directly measured…values are socially constructed and contextual" (Cullen 2007, 28). Because amenity trees "may provide a wide range of benefits and values…a valuation must specify which of them are being considered,

and that a suitable valuation method must be sensitive to those specified values" (Cullen 2007, 31).

According to the Guide, therefore, "valuation," of trees has 4 basic characteristics. [1] It is an *estimate* of monetary value, [2] it is a systematic process, [3] it is an aid to decision makers, and [4] it is independent and impartial, created without advocacy or bias (Cullen 2007, 25). Because CTLA focuses primarily on monetary value, the Guide follows a similar approach to those used by professional asset and property value appraisers. These three methods include [1] The Sales Comparison Approach, [2] The Income Capitalization Approach, and [3] The Cost Approach. The Sales Comparison Approach, or "Market Approach," compares "exchanges or sales prices…of similar properties, goods, or services" (Cullen 2007, 32). The Income Capitalization Approach considers revenue and expenses of goods to ascertain a "calculation of worth" (Cullen 2007, 32). The Cost Approach is simply the cost of replacement, minus depreciation.

The Guide makes very clear that amenity trees are not "market goods" in a traditional sense, because they are "not exchanged or traded and there are no market prices" (Cullen 2007, 33). Therefore, CTLA relies upon four main, accepted methodologies for tree valuation and appraisal: [1] Replacement Cost Method (RCM), [2] Trunk Formula Method (TFM), [3] Cost of Cure Method (CoC), and [4] Cost of Repair Method (CoR).

According to The Guide, Replacement Cost Method (RCM) "is based on the cost of replacing a plant of the same or a comparable species and size in the same place" (CTLA 9th ed. 2000, 60). Trunk Formula Method (TFM) uses the "trunk cross-sectional area 4.5 ft. above the ground…to appraise the monetary value of trees considered too large to be replaced with nursery or field-grown stock. Determination of the value of a tree is based on the cost of the largest

commonly available transplantable tree and its cost of installation, plus the increase in value due to the larger size of the tree being appraised" (CTLA 9th ed. 2000, 70). Cost of Cure Method (CoC) covers the cost of "treatment to return the property to a reasonable approximation of its original condition…[including] the cost of the replacement and/or repairing of plants and restoration of property to near its precasualty condition" (CTLA 9th ed. 2000, 76). Cost of Repair Method (CoR) is simply the cost of "repairing a damaged plant in a timely and satisfactory manner [to] help return the plant to near its former condition…Treatments could include – but are not limited to – wound treatment, cabling, bracing, pruning, amending soil, stump sprout management, irrigation, insect and disease management, improving compacted soil, and follow-up care" (CTLA 9th ed. 2000, 76).

It should be noted that many of these practices and standards are expected to change somewhat drastically following the 2015 International Society of Arboriculture (ISA) annual conference and the introduction of the CTLA 10th edition, expected for release in or around the year 2016.

Environmental and Socio-Economic Benefits of Trees

Although the CTLA methods are useful in ascribing a unique monetary value for urban landscape amenity trees, they are also limited in their objective of providing local tree authorities and public decision-makers the entire picture of what benefits amenity trees contribute back to humans in the urban landscape. The author should note here, the use of "urban trees" in this chapter shall refer to the previously aforementioned definition describing specifically, amenity trees situated in the urban landscape.

In 1992, John F. Dwyer, E. Gregory McPherson, Herbert W. Schroeder, and Rowan A. Rowntree – all accomplished authors of arboriculture and urban forestry-related issues in their own right, collaborated on a landmark article entitled simply, "Assessing the Benefits and Costs of the Urban Forest," which was published in the Journal of Arboriculture. The article suggested that while some benefits of amenity trees could be expressed in dollars, other types of benefits are more difficult to quantify but, "in aggregate…are highly significant to urbanites" (Dwyer et al. 1992, 227). The authors furthermore suggested that "we have vastly underestimated the many ways that the urban forest touches the lives of urbanites, as well as the deep significance that many people attach to trees" (Dwyer et al. 1992, 227). The article explored in-depth, the multitude of ways amenity trees in the urban landscape influence "the physical and biological environment" in a positive manner, as well as the, "socio-economic importance of urban trees" (Dwyer et al. 1992, 227). Similarly, in Chapter 5 of the text, Arboriculture, 4th edition, (2003), authors Richard W. Harris, James R. Clark, and Nelda P. Matheny outlined a host of studies and methodologies aimed at describing non-market benefits derived from urban amenity trees.

In combination, Dwyer et al. (1992) and Harris et al. (2003) substantiate a wide range of non-market environmental benefits and cost-benefit savings which can be attributed to amenity trees in the urban forest. In previous literature, these benefits have been roughly divided into what was considered *direct* benefits and *indirect* benefits, but a more recent understanding of the most current literature actually produces *three* distinct ways to view the benefits of urban landscape amenity trees. These benefits can be divided into: [1] Benefits to Human/Physical Environment, [2] Benefits to Biological/Ecological Environment, and [3] Socio-Economic Benefits.

Benefits to Human/Physical Environment

Some of the most basic and easily comprehended benefits of urban landscape amenity trees to humans are those affecting the human/physical environment. These relatively direct benefits are measured in terms of building energy savings, noise reduction, wind reduction, reduction/mitigation of the urban heat island effect, and reduction of sun reflectivity (albedo) back into structures.

Harris, et al. (2003) outline in their text that deciduous trees, when planted on the east, northwest, and west sides of a structure, reduce structural energy demands by shading in the summer and allowing light to penetrate in the winter. Evergreen trees have also been shown to have mild noise attenuating properties when planted in dense, wide clumps close to a noise source (Harris 2003, 110). Additionally, evergreen trees, when planted perpendicular to wind-flow can contribute significantly to wind-reduction, thereby even further increasing building heating energy savings (Kuhns 2014).

Figure 2.1. Harris et al. (2003): Beneficial Placement of Trees Around Buildings

Akbari describes the urban heat island effect as the tendency for urban areas "to have higher air temperatures than their rural surroundings as a result of …replacing the natural vegetation with buildings and roads" (S. Konopacki and H. Akbari 2002, 16). Therefore, through simple re-inclusion of urban amenity trees in neighborhoods and cities, we can effectively reduce urban heat island load by considerable margins. Additionally, he relates that tree canopies are

excellent blockers of sun reflectivity back into buildings from lighter urban surfaces with higher albedo such as concrete sidewalks.

Benefits to Biological/Ecological Environment

Urban landscape amenity trees also provide significant benefits to the biological and ecological environment around us, which in-turn, have significant implications for humans and our impact on the environment at-large. These benefits can be summarized through measures of air quality and pollution reduction, urban hydrology and stormwater runoff mitigation, and creation of wildlife habitat.

With regard to urban air quality, urban trees and forests have been shown to remove many of the hazardous primary atmospheric contaminants such as ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter smaller than 10 microns in diameter (PM_{10}) through cell openings in their stomata. Additionally, trees are able to offset our human carbon output by both storing and sequestering atmospheric carbon (CO_2) in their above and below ground biomass.

Urban landscape amenity trees can also "play an important role in urban hydrologic processes by reducing the rate and volume of stormwater runoff, flooding damage, stormwater treatment costs, and water quality problems" (Dwyer et al. 1992, 229), contributing significant economic savings to humans and reducing our overall developmental impact on urban ecosystems. This stormwater mitigation potential has serious ecological implications for local aquatic wildlife as well, which transitions us to our point about wildlife habitat creation and preservation.

In addition to air quality and stormwater hydrology, urban forests provide much needed biological habitat for displaced local flora and fauna. Dwyer et al. (1992) cites that "restoration of urban riparian corridors and their linkages to surrounding natural areas have facilitated the movement of wildlife and dispersal of flora" (229). Preservation of urban forest ecosystems has also been instrumental in creating wildlife habitat for many species, including many species of migratory birds (Lerman 2014).

Socio-Economic Benefits

Finally, there exist a multitude of socio-economic benefits attributable to urban amenity trees and forests. For example, the hedonic price method (the concept that environmental amenities such as trees can affect housing market value) has demonstrated that amenity trees in residential landscapes increase property value when situated in close proximity to homes. Anderson and Cordell (1988) in their famous Athens, Georgia study found that trees in front of a residence contributed between a 3.5 and 4.5% increase in home sales prices during a two year study period. Tyrvainen and Miettinen (2000) found that in Salo, Finland, views to a forest increased housing prices by 4.9%, and the sale price of homes actually decreased by 5.9% for every 1km increase in distance the home was from a forested area. More recently, Geoffrey H. Donovan and David T. Butry (2010) found that street trees within 100 ft. of single-family homes in Portland, Oregon increased sales prices on average, by $8870, while reducing time-on-market by 1.7 days.

Contingent valuation studies have examined peoples' willingness to pay for various aspects of tree use and interaction, such as visitation/use of, proximity to, and preservation of their city and neighborhood urban forests. For example, in Zhuhai, China, Chen and Jim (2008)

found that city residents on average were willing to pay an additional RMB 161.84 (about $22 USD) per year to help fund an ambitious new urban greenspace project. This amount combined per year was RMB 12.3 million, or about $1.67 million USD. In Savannah, Georgia, a recent study found that tourists were willing to pay "an amount greater or equal to $2.10" (Majumdar, et al. 2011, 279) simply to walk the beautiful public squares, parks, and gardens throughout the old, historic port city, contributing back approximately $11.5 million annually to the city of Savannah. In a survey of household residents living in the Mandeville suburb of New Orleans, Lorenzo et al. (2000) found that approximately 70% of survey participants were willing to pay additional taxes ranging between $6-12 per year to fund additional city tree maintenance, protection, and preservation work.

In another study, this time looking at street trees in the historic central business district of downtown Athens, Georgia, Wolf hypothesized that "if consumers do not find the street environment appealing, or infer negative traits from the streetscape, they may not spend time in the stores that compose the district" (Wolf 2004, 341). Her findings noted that shoppers associated greater amounts of tree canopy presence near storefronts with higher storefront amenity benefits. These amenity benefits have profound implications for shoppers' perceptions of retail stores, restaurants, and businesses, which ultimately affect consumer spending, business operations, and overall company profits. In congruency with many of these findings, Lopez-Mosquera and Sanchez have suggested that "the greater the perceived environmental values and the higher their subsequent monetary valuation, the more effective environmental protection and conservation policies are likely to be" (Lopez-Mosquera and Sanchez 2011, 875).

New research is emerging now which is showing positive correlations of human health and safety when compared with proximity to urban forests and street trees. For example, Lovasi

(2008) and Lovasi (2014) have examined the potential attributes of New York City's urban trees and forests to help reduce incidences of asthma occurring in young children. A study conducted in Portland, Oregon, comparing urban tree canopy cover and risk of poor birth outcomes showed that a "10% increase in tree-canopy cover within 50m of a house reduced the number of small-for-gestational-age births by 1.42 per 1000 births…suggest[ing] that the natural environment may affect pregnancy outcomes" (Donovan et al. 2011, 390). Another recent study by Donovan, which was conducted in areas with extreme deforestation as a result of emerald ash borer infestation, found that the loss of trees resulting from the insect infestation correlated significantly with increased instances of human cardiovascular-related mortality for those areas. The findings show that loss of ash trees in the study area were statistically correlated with an additional 16.7 deaths per year per 100,000 adults, for a total of 15,080 excess deaths from 2002-2007 (Donovan et al. 2013, 143). Finally, Kadir and Othman (2011) point to the more practical and tangible health and human safety benefits of street trees in terms of traffic calming effects and increased pedestrian safety.

UFORE, STRATUM, and i-Tree Software Suite

The studies mentioned in the previous section are useful to us in that they show strong correlational values and direct, tangible benefits of landscape amenity trees to humans, beyond our psychological functioning and well-being. However, as technology continues to advance, we find each approach is merely a singular facet in an ever-growing bigger picture of benefits reflected back to humans and the environment as a result of the existence of urban landscape amenity trees. The need for a more comprehensive approach to urban tree benefit research has informed much of David J. Nowak and E. Gregory McPherson's work, as demonstrated in the

following section of this chapter, and has very recently begun to come to fruition as a reality through the use of computer mapping technology in combination with complex climate and species data and city municipal statistical datasets regarding energy usage and city expenditures over time.

Following the lead of Dwyer, et al. (1992) and Harris et al. (2003), teams of urban forestry researchers have begun mapping urban forest canopies of many large, major cities to derive quantitative, non-market-based benefits for some of the world's largest urban forests. Using Geographic Information Systems (GIS) and satellite and aerial land imaging technology in combination with computer modeling software such as the USDA Forest Service's UFORE model, the Center for Urban Forest Research branch of the U.S. Forest Service's STRATUM software tool, and most recently the USDA Forest Service's i-Tree Software Suite, urban foresters are now able to map with great precision, the urban forest canopies of large, urban areas and generate numerically specific cost-benefit analyses for much of the environmental and socio-economic related benefits, specific to those areas.

The Urban Forest Effects Model (UFORE) was developed in the late 1990's by David J. Nowak and a team of researchers at the USDA Forest Service's Northern Research Station in Syracuse, New York. According to the Forest Service, the UFORE model "is designed to use standardized field data from randomly located plots, and local hourly air pollution and meteorological data to quantify urban forest structure and numerous urban forest effects for cities across the world" (USDA Forest Service Urban Forest Effects Model – UFORE). Although the model requires a substantial amount of field data collection and ground-truthing, it offers an impressive host of forest composition and tree health data, as well as objective data calculations for urban forest environmental service functions such as "air quality, building energy,

greenhouse gas emissions, and carbon storage and sequestration (Center for Neighborhood Technology 2010, 64).

STRATUM, the Street Tree Resource Analysis Tool for Urban Forest Managers, was developed at the U.S. Forest Service's Pacific Southwest Research Station as an improvement upon the input-data heavy UFORE model. To combat the amount of ground-truthing and aerial land dataset collection, the STRATUM tool instead, relies on U.S. Forest Service climate data and species-specific tree-growth modeling curves for each of the 17 national climate zones. While the UFORE model was designed to assess entire urban forest canopies, STRATUM focuses specifically on community and city street trees. As a result of this simplification, users need only to collect and input minimal data such as tree species and diameter at breast height (DBH) for just a sample of trees or an entire street tree survey. Users then have the option to input community specific information such as program management costs, city population, and price of residential electricity to customize the benefit-cost data even further. With these two steps complete, STRATUM uses regional data for climate, building construction and energy use patterns, fuel mix for energy production, and air pollutant concentrations to calculate quantitative benefits as well as actual dollar values of annual environmental and aesthetic benefits. These benefits include energy conservation, air quality improvement, CO_2 reduction, stormwater control, and property value increase (U.S. Forest Service Pacific Southwest Research Station Center for Urban Forest Research, www.fs.fed.us/psw/programs/cufr/stratum.shtml). By these means, urban foresters, planners, contractors, arborists and city officials can compare direct and projected cost-benefit scenarios for the inclusion and management of city urban tree infrastructure.

The i-Tree software suite is the USDA Forest Service's latest, and most comprehensive tree benefits modelling software and includes the latest urban forestry analysis and benefits assessment tools (http://www.itreetools.org/). i-Tree was developed by synthesizing the UFORE model and the STRATUM tool to generate comprehensive benefit modeling software capable of calculating benefits from the single tree specimen level to entire, state-wide urban forests. As adapted to the new software, UFORE becomes i-Tree Eco and STRATUM becomes i-Tree Streets. In addition to these services, i-Tree introduces several new user-friendly applications aimed at providing more comprehensive ways to view urban forest structure and function. Among these programs are i-Tree Hydro (beta), i-Tree Vue, i-Tree Design, and i-Tree Canopy. For municipality specialists and public resource managers, the software also introduces i-Tree Species, i-Tree Pest Detection Module, and i-Tree Storm which are designed to target various aspects of urban tree care and management. From these programs, the suite is able to calculate specific quantitative values for environmental impact reduction and economic cost savings for energy conservation, air quality improvement, CO_2 reduction, stormwater control, and property value increase data for trees of a variety of size, species, and scale. Recently, David J. Nowak, E. Gregory McPherson and others have been using UFORE (i-Tree Eco) and STRATUM (i-Tree Streets) to tackle some comprehensive urban forest benefits research both in the U.S. and abroad.

David J. Nowak and the UFORE model (i-Tree Eco)

In 2006, David J. Nowak in cooperation with USDA, the U.S. Forest Service, and the Casey Trees Endowment Fund, completed a tree-benefits analysis for the entire urban forest of Washington, D.C. Using the UFORE model, the project revealed approximately 1,928,000 trees in the city, with a tree canopy coverage (TCC) area of about 28.6 percent. The benefits

associated with Nowak's research are astounding when revealed in aggregate. According to the report, in 2006 Washington, D.C.'s urban forest stored "about 526,000 tons of carbon valued at $9.7 million. Additionally, the trees sequestered about 16,200 tons of carbon per year valued at $299,000 per year, and removed about 540 tons of primary atmospheric contaminant pollution per year which was valued at $2.5 million per year. Building energy reductions were valued at $2.653 million per year and avoided carbon emissions was valued at $96,000 per year. Overall, the "structural, or compensatory value [was] estimated at 3.6 billion" (Nowak 2006, 2).

In 2009, Nowak completed another urban forest benefits project, this time examining the total benefits for urban forests across the entire state of Tennessee. Using i-Tree Eco (UFORE), Nowak's team looked at urban forests surrounding Memphis, Nashville, Chattanooga, Knoxville, and the Tri-Cities. The i-Tree Eco software was able to produce substantially more detailed urban forest composition data than the previous UFORE model, including information on species composition, tree health, and exotic invasive pest management.

Overall, the Tennessee study revealed an estimated 284 million trees across the five urban areas with tree canopy coverage (TCC) of 37.7 percent. According to i-Tree Eco data analysis, in 2009 Tennessee's urban forests stored approximately 16.9 million tons of carbon which was valued at $350 million. An additional 890,000 tons of carbon sequestration was valued at $18.4 million per year. 27,100 tons of primary atmospheric contaminants were removed from the air, which were valued at $203.9 million per year, and the software estimated annual building energy reduction benefits to be around $66 million per year. The overall structural, compensatory value for Tennessee's urban forests was estimated at $79 billion (Nowak 2009, 28). Nowak's reported benefits for Tennessee's urban forests are equally astounding when compared with Washington, D.C.'s statistics.

E. Gregory McPherson and the i-Tree Software Suite

Following Nowak's UFORE studies produced throughout the mid-late 2000's, McPherson and others in 2011 generated studies utilizing the i-Tree software suite to describe an impressive array of urban forest benefits described in great detail through the use of the freshly updated software package. In the *Million Trees Los Angeles Canopy Cover and Benefit Assessment* produced by McPherson et al. (2011), the researchers prepared a comprehensive urban forest benefits assessment for the City of Los Angeles million trees initiative. Dubbed Million Trees LA (MTLA) by then mayor, Antonio Villaraigosa, the initiative sought to find out whether the city had room to plant one million more trees, and if so, what benefits those trees might provide back to the City of Los Angeles over the course of a 35 year period.

The study assumed that 1 million trees could be planted over the first 5 years, and then provided two benefit scenarios, "low-mortality" and "high mortality," to account for the unknown survival rate of the tree plantings over the next 35 years. Urban forest benefits were monetized using local municipal control or damage costs and presented in terms of [1] energy savings, [2] atmospheric carbon dioxide reductions, [3] air quality benefits, [4] stormwater runoff reductions, and [5] aesthetics and other benefits, as reflected through hedonic pricing methods for property sales data (McPherson et al. 2011, 44).

The study found the existing urban forest tree canopy coverage (TCC) to be about 21%: accounting for approximately 10.8 million existing trees in the City of Los Angeles. Using a combination of aerial imagery, GIS data, and ground-truthing of selected sample sites, the team estimated that approximately 2.47 million more trees could be planted within Los Angeles, bringing the technical potential tree canopy coverage to 33%. Low and high mortality scenarios estimated between 444,889 and 828,924 surviving trees after the 35 year period, contributing

anywhere from $1.33 to $1.95 billion back to the city. These estimates equate to between "$1328 and $1951 per tree planted, or $38 and $56 per tree per year" (McPherson et al. 2011, 46).

Based on residential heating and cooling costs, the added tree plantings were expected to reduce energy demands by 917,000 MWh, yielding net energy savings ranging from $76 to $117 million for the high- and low-mortality scenarios over the 35 year period. The trees were projected to reduce atmospheric CO_2 by between 693,000 tons and 2.1 million tons, saving the city between $5.1 and $8.5 million over the 35 year period. Reductions in primary atmospheric contaminants such as ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and PM_{10}, were valued between $53.3 and $83.4 million over the study period. The addition of the trees was projected to reduce stormwater runoff in the city by approximately 51 to 80 million cubic meters, providing stormwater treatment savings valued between $97 and $153 million. Aesthetic and other benefits, as reflected through property sales prices, were valued between "$1.1 [and] $1.6 billion, or $31 to $45 per tree per year for the high- and low-mortality scenarios" (McPherson et al. 2011, 47).

That same year, other teams abroad were utilizing McPherson's methodology in concert with the i-Tree software to examine urban forests of varying scales in other countries with relatively good success. Andrew A. Milward and Senna Sabir replicated the MTLA methodology using i-Tree Streets to assess the current yearly environmental and economic benefits of the small, but very popular local urban park, Allan Gardens, in downtown Toronto, Canada (Millward and Sabir 2011). Another study performed by Soares, Rego, McPherson, Simpson, Peper, and Xiao, used i-Tree Streets to assess current benefits and costs of street trees in Libson, Portugal (Soares et al. 2011). Because these studies occurred in foreign countries, climate data and species specific tree growth modeling data as provided by the U.S. Forest Service's U.S.

national climate zone database had to be adapted or replicated for locally specific tree species and climate. Although the data was not perfect, the studies were able to generate accurate portrayals of environmental and economic benefits for these areas outside of the U.S.

Studies using the i-Tree software, such as McPherson's 2011 *Million Trees Los Angeles Canopy Cover and Benefits Assessment*, are extremely useful because they provide a comprehensive picture of the environmental benefits reflected back upon urban areas as a result of urban forest populations, and provide hard, numerical evidence for economic cost savings to city municipalities, businesses, and residents as a result of those environmental benefits. Studies such as these using the i-Tree software, therefore, are particularly useful to urban foresters, city arborists, landscape professionals, urban planners, and city officials who require this type of data to support city-funded decisions with regard to cities' green infrastructure including urban landscape amenity trees.

Most recently, Casey Trees and the Davey Tree Expert Company, in cooperation with i-Tree Streets, have developed the National Tree Benefit Calculator (beta) which is aimed at residential homeowners and laypersons curious about the potential benefits provided by their own, personal landscape trees in their surroundings. The software is designed to be simple, easy to use, and easily accessible to anyone with a computer. At the i-Tree National Tree Benefits Calculator website, (National Tree Benefits Calculator), users input simple data such as zip code, tree species, stem diameter at breast height (4.5 feet), and land use classification type, and are then provided unique, quantitative numerical and economic data regarding stormwater capture, property value increase, energy conservation value, air quality improvement, and atmospheric carbon dioxide reduction provided by their trees.

Although still in the beta testing stage, programs like these, aimed at laypersons, are useful and important for a number of reasons. As Ulrich (1985) stated regarding community design input, groups of laypersons can provide unique and useful opinions in lieu of relying completely upon the opinions of experts and design professionals in crafting design parameters for public projects. In the community advocacy realm of public decision making, as Lopez-Mosquera and Sanchez (2011) state, the greater the perceived environmental values and subsequent monetary valuation, the more people are willing to advocate and pay for amenities such as urban landscape amenity trees in decisions of municipal budget expenditure.

Summary

Chapter 2 discusses some accepted monetary valuation techniques for trees in the urban landscape, first as single-tree specimens, followed by some current research regarding the environmental and socio-economic benefits of urban trees comprising the entire urban forest as a whole. Three perspectives for considering urban landscape amenity tree and forest value are introduced, including [1] Benefits to Human/Physical Environment, [2] Benefits to Biological/Ecological Environment, and [3] Socio-Economic Benefits. Following a discussion of these benefits and techniques, some newer, more technologically advanced and comprehensive valuation techniques contained in the i-Tree suite are discussed that are redefining the ways we have come to understand the environmental and economic value of urban trees.

Benefits like these are most useful to professionals such as urban planners, city municipal arborists, environmental economists, landscape appraisers, and city officials who require hard, economic and environmental data for use and justification for tree planting, maintenance, and planning in the realm of public decision-making and budget expenditure.

However, other benefits provided by urban landscape amenity trees are less tangible, data oriented, or easily comprehended through simple tree evaluation and computer-aided data collection. While the data and studies presented in Chapter 2 are useful in demonstrating how trees benefit humans monetarily and through the environment, the environmental psychologists approach the assessment of tree benefits to humans through a very different lens. By isolating singular facets of the human psyche, such as human stress and the ability to sustain prolonged attentional focus, the environmental psychologists aim to prove how trees in landscape settings benefit humans psychologically.

The environmental-psychological research is especially important to this thesis in that it introduces a human-oriented component which gets us closer to how humans think and feel around landscape amenity trees in their surroundings. Chapter 3 therefore, will explore some of the pertinent literature regarding the environmental-psychological benefits of trees to humans, and extract from their methodologies some usable hints and suggestions for use in this thesis research. Chapter 3 is titled simply then, The Environmental Psychologists.

CHAPTER 3

THE ENVIRONMENTAL PSYCHOLOGISTS

A Brief History of Wilderness

Throughout time, we humans have derived all kinds of creative, personal, and spiritual inspiration from nature. We often talk about natural beauty and splendor, or fantasize of a simpler life, somewhere in a cabin in the woods surrounded by tall trees and smoke wafting quaintly, dreamingly out of the chimney. In the mid-1800's Henry David Thoreau and John Muir wrote of their experiences living harmoniously with nature, securing its significance permanently into the annals of great American literature. In 1872, Thomas Moran affixed his experiences directly to the wall in the galleries our collective minds with his series of sprawling landscape oil paintings; *The Grand Canyon of Yellowstone*, depicting two explorers as small as dust specks, being literally swallowed by the limitless, vast expanse of the canyon's natural splendor. By

August of 1916, President Woodrow Wilson confirmed the American peoples' desire to protect natural wilderness in the United States through the creation of the National Park Service.

Throughout the 1950's, 60's, and 70's, millions of Americans (NPS Stats, www.irma.nps.gov) flocked to places such as Yosemite National Park and The Grand Canyon to take in the view; presumably because these places held some kind of personal significance or because they fulfilled some innate desire within us to enjoy them. By the very nature of our own manifest destiny, we imbue a sense of the natural world as critical to our very essence of being.

The late 1960's and 1970's saw a surge in environmental preference studies describing strong human preference for natural landscape settings, thus re-affirming what the last century of art, writings, and political decision-making in the United States had already suggested. Despite these breakthroughs in environmental protectionism and proliferation of environmental ideologies throughout the last century, it wasn't until the early-mid 1980's that we, as humans, really began to explore *why* nature is so important to us, though; and *how*.

Trees and Stress Reduction

In the early 1980's, Ernest (EO) Moore, a professor of architecture and urban planning at the University of Michigan made a unique and startling discovery. In studying the design and layout of prisons, he noticed that prisoners with whose cell blocks and window views were in closer proximity to natural tree-like settings, made far fewer visits to the prison sick clinic than those not in proximity to natural views (Moore 1981). He published his findings in a 1981 paper entitled "A Prison Environment's Effect on Health Care Service Demands."

Drawing on Moore's 1981 findings, Roger Ulrich, a behavioral science researcher from the University of Michigan, began to examine whether the same theories might hold true for hospital patients recovering from surgery. Ulrich's study, entitled "View Through a Window May Influence Recovery from Surgery," compared recovery times of cholecystectomy (gallbladder removal) patients in hospital recovery rooms with window views facing natural outdoor scenery, to the recovery times of patients in rooms with window views facing the outer brick walls of the building. Ulrich hypothesized that because hospital stays limit patients', "access to outdoor environments almost entirely to views through windows…it [was] possible that a hospital window view could influence a patient's emotional state and might accordingly affect recovery" (Ulrich 1984, 420).

Over a six year period, Ulrich recorded recovery data from cholecystectomy patients using five indicators: "[1] number of days of hospitalization, [2] number and strength of analgesics (pain medication) each day, [3] number and strength of doses for anxiety, including tranquilizers and barbiturates, each day, [4] minor complications, such as persistent headache and nausea requiring medication – symptoms which are considered to result frequently from conversion reactions, and [5] all nurses' notes relating to a patient's condition or course of recovery" (Ulrich 1984, 420).

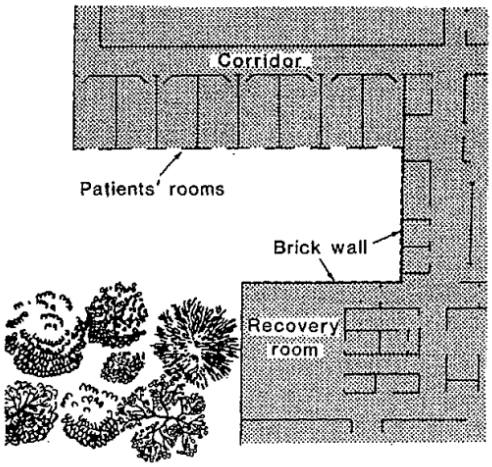


Fig. 1. Plan of the second floor of the study hospital showing the trees versus wall window views of patients. Data were also collected for patients assigned to third-floor rooms. One room on each floor was excluded because portions of both the trees and wall were visible from the windows. Architectural dimensions are not precisely to scale.

Figure 3.1. Ulrich's Hospital Patient Recovery Study

Figure 3.1 shows a plan-view layout of Ulrich's experimental study area within the hospital.

Interestingly, patients with window views to trees were able to leave the hospital nearly a full day earlier than those with views facing the wall. During days 2 through 5 of the recovery period, tree-view patients took far "fewer moderate and strong pain doses than did the wall-view group and more doses in the weak category" (Ulrich 1984, 421). A weighted comparison of postsurgical complications for patients in each group found that tree view patients had fewer incidences of postsurgical complications than those in the wall-view group. However, these weighted scores were not statistically significant. In the comparison of nurses' notes for each patient during the recovery period, "more negative notes were made on patients with the brick wall view…Although more positive comments were recorded for the tree view patients, the difference was not statistically significant" (Ulrich 1984, 421).

Though some areas of the study proved to be weak indicators of statistical significance, indicators such as overall length of hospitalization stay and strength and dosage of pain medication were highly statistically significant. Overall, patients facing the tree view had shorter, less painful recovery times than those with window views facing the outer hospital walls. Even more importantly, however, was Ulrich's use of a pointed, methodological approach analyzing specific indicators to prove a much larger possibility of human preference for naturalistic landscape settings as shown thorough direct, tangible, scientific data evidence backed by statistical analysis.

The results of Ulrich's study and others which followed (Verderber 1986, West 1986, Ulrich 1985), led to new theories in patient health care and hospital design; in particular, Ulrich's Theory of Evidence-Based Design (EBD). Similar to the creed of the landscape architect who must "design with intention," Ulrich's theory ultimately suggested that any decisions with regard

to health care facility design be grounded in thorough and thoughtful research and scientific study (Ulrich et al. 2010).

Ulrich's research put in place a new type of methodology for measuring cause-and-effect relationships for environment-related stress which proved useful for an entire generation of environmental psychologists to come. It also hinted towards the further exploration of a new human value typology of nature as *healing*, or *restorative*, which proved significant in the creation of a methodology for this thesis research analyzing home occupants' perceptions of qualitative residential landscape tree value.

In 1985, Ulrich published another paper; this time a review on current literature and practices in an attempt to catalogue the large, growing body of empirical research on human response to urban and natural visual landscapes. His article, entitled, "Human Responses to Vegetation and Landscapes," highlighted some of the human preference findings for naturalistic landscapes, including some significant findings specifically related to residential landscape trees. Ulrich used findings from these studies to suggest further applications for the ongoing environmental-psychological research, testing psychological and physiological effects of urban versus natural scenes in the fields of urban planning and urban forestry, as well as the, "influences of urban vegetation on aesthetic preferences" in the built environment (Ulrich 1985, 29).

Ulrich's first point to be made was the notion of "stress," and, "passive contemplation," with regard to human preference. The current research at that time showed that humans preferred naturalistic landscapes, especially if they contained trees, and as such, there would be implications for including trees in built, urban environments. Ulrich contended "the passive

contemplation of a stand of trees in a city is quite adaptive if it provides a breather from prolonged stress" (Ulrich 1985, 30).

Elaborating upon his point about trees, he then continued, citing recent forestry research on human aesthetic preferences for stands of forest trees. Current research at the time was showing that humans tended to exhibit much stronger preference for larger trees rather than smaller ones. (It should be noted, however, that beyond relative human perception comparisons, distinct measurements of trees were not provided.) Interestingly, when participants were shown pictures of stands of forest trees there also existed preference for stands exhibiting a well-managed, curated influence from the human hand over those which were overgrown and contained uneven growth and dead limbs (Ulrich 1985, 35).

Citing Clare Cooper-Marcus (1982), he related that in residential neighborhood preference studies, "residents tended to judge the attractiveness of their neighborhoods largely by what they saw from their windows – and that the vast majority of residents preferred views that included vegetation as opposed to, for instance, buildings or parking lots devoid of greenery"(Ulrich 1985, 39).

In research similar to the earlier forest stand studies, neighborhood preference studies also showed similar results for humans' tree preference. In studies conducted by both Brush and Palmer (1979), and Nasar (1983), "residential scenes tend to be especially favored when they contain prominent trees" (Ulrich 1985, 39). Among the positive physical characteristics associated with, "prominent trees," were, "total area of a view depicting vegetation, basal area per tree stem and amount of tree crown enclosure" (Ulrich 1985, 40). Though size and visual area of a tree were considered positive variable attributes, more trees or tree area were not necessarily considered better. To a point, large, prominent trees were preferred, but after a

certain tree density, trees were actually considered to *lose* prominence, delving the scene into visual monotony, especially with groups of smaller trees.

It should also be noted however, that while neighborhood studies showed human preference for landscapes with vegetation, residents still, "respond with moderately low preference to neighborhood scenes consisting of empty grass-covered expanses lacking trees and shrubs" (Ulrich 1985, 40).

Ulrich concluded with the suggestion that these studies examining the influence of urban vegetation on humans in built environments are of key importance to the fields of urban planning and urban forestry. He cautioned us, however, to be inclusive in soliciting subject input from a variety of public user groups and not just experienced design professionals or environmental-psychological experts. "Studies based on the aesthetic responses of groups of laypersons can constitute an important form of public participation in decision-making, whether the setting is wilderness or urban" (Ulrich 1985, 31). Finally, he encouraged researchers to become more specific in the types of vegetation they investigate. "Very little work has compared preferences for different tree species, and studies of liking responses to smaller types of vegetation such as shrubs and herbaceous flowering plants are virtually non-existent" (Ulrich 1985, 41).

In his closing remarks, he cited the "lack of empirical studies documenting social…values of visual quality" (Ulrich 1985, 42). Echoing the very sentiments which brought this particular thesis about in the first place, he lobbies for future studies to consider "an especially important direction for future research concerns the tangible valuation of the aesthetic and psychological benefits of attractive visual landscapes" (Ulrich 1985, 42). Much of the findings about residential landscape tree preference proved invaluable in the creation of a survey methodology for this thesis; in particular the classification and ranking of trees for survey

questions, the scope of visual reference to be used, and types of persons to be asked to participate as research subjects in the survey questionnaire.

Throughout the 1980's, Ulrich and others continued to produce studies researching the effects of environmental influence on human stress recovery, utilizing standardized physiological monitoring procedures and psychological testing measures to demonstrate the benefits of nature to humans, both physically and mentally (Ulrich 1991).

A New Perspective – Attention Restoration Theory

By 1995, even more new, exciting, and relevant research was pouring out from the University of Michigan, this time headed by a professor by the name of Stephen Kaplan. Kaplan, a joint professor of psychology, electrical engineering, and computer science, was bringing a new perspective to the emerging field of environmental psychology. In his landmark article entitled, "The Restorative Benefits of Nature: Towards an Integrative Framework," Kaplan highlighted the ever-growing body of research exploring the potential psychological benefits of nature which had by this point, "accumulated at a remarkable rate in a relatively short period of time" (Kaplan 1995, 169).

Citing Hartig and Evans' (1993) recent literature review on the subject, Kaplan bisected the emerging body of research into two main areas: those utilizing Ulrich's methodology emphasizing the stress reduction benefits of nature, and those within his own field of study, exploring the effects of nature on humans' capacity to recover and focus attention in the face of distraction. Although he maintained early on that, "there is no disagreement over the point that stress is a meaningful concept and that stress reduction is aided by natural environment experience" (Kaplan 1995, 169), he argued if future research was to become more relevant and

cohesive, environmental psychological research could not be framed simply within the context of stress – there had to be an attentional component as well.

Kaplan began with a discussion on the concept of human "focus" as having component requirements of both voluntary effort and willpower in, "supporting difficult mental activity in the face of potential distraction" (Kaplan 1995, 170). His critical argument of human focus then, was the notion that humans' voluntary attention mechanism is susceptible to fatigue. Drawing parallels to the field of landscape architectural research, Kaplan cited Frederick Law Olmsted, who in his writings from 1865 alluded to the idea that humans' attentional capacity to focus could become fatigued, and therefore, "recognized the need for urban dwellers to recover this capacity in the context of nature" (Kaplan 1995, 170).

At this point, Kaplan introduced his concept of, "Directed Attention." Directed attention, he elaborated, is comprised of five properties: "[1] it requires effort, [2] plays a central role in achieving focus, [3] is under voluntary control (at least some of the time), [4] is susceptible to fatigue, and [5] controls distraction through the use of inhibition"(Kaplan 1995, 170). To address human directed attention fatigue, Kaplan proposed a concept that 'Restorative Environments,' such as those found in nature, can provide, "opportunities for reducing the fatigue of directed attention" (Kaplan 1995, 172). Four component requirements were then suggested for environments to be considered restorative to human directed attention: [1] Being away, [2] Fascination, [3] Extent, and [4] Compatibility. These four components laid the essential groundwork for Kaplan's later development of his important concept of Attention Restoration Theory (ART). They can be summarized as such:

Being Away – although not necessarily intended in a literal sense, humans crave the concept of escaping to naturalistic places in order to recharge. Kaplan emphasized however, that

this does not necessarily have to be a physical change of place. “An old environment viewed in a new way can provide the necessary conceptual shift” just as easily as a completely new setting might provide (Kaplan 1995, 173).

Fascination – more specifically described as “soft fascination,” Kaplan held that certain experiences found in natural settings such as sunsets, clouds, and leaves in a breeze can hold our attention without directed effort, providing the mind with opportunities for reflection, “which can further enhance the benefits of recovering from directed attention fatigue” (Kaplan 1995, 172).

Extent – Kaplan’s concept of “extent” implied the sense that the human mind is experiencing a, “whole other world” (Kaplan 1995, 173). As with ‘Being Away,’ the feeling provided is more conceptual than physical. Feelings of extent can be provided through networks of trails which make, “small areas seem much larger” (Kaplan 1995, 174), views from a tall mountaintop, or Japanese bonsai gardens which utilize miniaturization to create a feeling of “whole other worldliness.” Finally, settings which “include historic artifacts can promote a sense of being connected to past eras and past environments and thus to a larger world” (Kaplan 1995, 174).

Compatibility – The compatibility component assumed that each person delves into nature with unique purposes and intentions; peoples’ preferences for activities while interacting with nature are wide and varied. By these means, there must be compatibility between what the specific natural setting contains, and the “purposes and inclinations” of the user (Kaplan 1995, 173).

Kaplan concluded his treatise on environmental-psychological research with a set of parameters and recommendations to keep the body of research focused and cohesive. Without such discourse, he warned us of the possibility of becoming “so broad and diffuse as to cover

everything and explain nothing" (Kaplan 1995, 178). Kaplan maintained that "although the contributions of directed attention and stress are distinct" (Kaplan 1995, 178), they are not mutually exclusive, and further research should recognize the significance and importance of their interaction in choosing research parameters for future experimentation.

Most importantly, he cautioned, are the temporal differences between the two psychological measures. "Attentional fatigue is slower to develop than is stress. It is also slower to recover…While stress recovery occurs more rapidly, it also dissipates more rapidly" (Kaplan 1995, 178). Therefore, he recommended, "care [must be] taken to select manipulations that are relatively pure with respect to their impact on either directed attention fatigue or stress, [and] the duration of the manipulation must be carefully chosen to keep the attentional fatigue from becoming stressful or vice versa" (Kaplan 1995, 178). In summary, he concluded that future research should recognize the idea that exposure to natural environments, "can not only help mitigate stress; it can also prevent it through aiding in the recovery of [directed attention]" (Kaplan 1995, 180).

Window Views to Nature

Following Kaplan's lead, that same year in 1995, researchers Carolyn M. Tennessen and Bernadine Cimprich published their study, "Views to Nature: Effects on Attention." In this study, the researchers sought to emphasize the growing importance of windows in environmental-psychological research testing human reactions to different kinds of environmental exposure. Windows in this type of research could possibly provide "micro restorative" experiences for people in their personal indoor living and working environments. Citing their predecessors, Tennessen and Cimprich theorized that, "If exposure to nature has a

restorative effect on the capacity to direct attention, then such an effect may, at least in part, explain the beneficial effects of windows, and in particular windows with a view to nature" (Tennessen and Cimprich 1995, 78).

To test their hypothesis, the researchers conducted a study of university dormitory residents to examine "whether there was a relationship between the degree of naturalness in the view from university dormitory residents' windows and their capacity to direct attention" (Tennessen and Cimprich 1995, 77). They hypothesized that students with more natural window views would test higher on measures of directed attention than those students with less natural, more built window views.

During the study, 72 undergraduate subjects living in three different dormitories with window views to varying degrees of natural outdoor landscapes were given a battery of standard neurocognitive measures to test their capacity to direct attention. From their dormitory rooms, students were tested on their "speed, accuracy, or ability to sustain activity on measures requiring inhibition of competing or distracting stimuli" (Tennessen and Cimprich 1995, 79). Testing procedures included neurocognitive tests such as the Digit Span Forward and Backward (DSF and DSB), the Symbol Digit Modalities Test (SDMT), the Necker Cube Pattern Control Test (NCPC), and the Attentional Function Index (AFI), as well as the Profile of Mood States Test (POMS). Window views were then classified into four window view category groups: All Natural View, Mostly Natural View, Mostly Built View, and All Built View (Tennessen and Cimprich 1995, 81).

When the four view groups were compared individually, students in the All Natural View category scored higher on nearly every measure, but only significantly so, on the SDMT test. However, when the All Natural View group was compared against the other three groups

combined, the results were significant on the SDMT, the NCPC, and the AFI. From these results, the researchers were able to conclude that, "dormitory residents with more natural views from their windows [had] stronger capacity to direct attention than those with less natural or built views" (Tennessen and Cimprich 1995, 83).

This study is widely considered one of the first successful syntheses of Ulrich and Kaplan's two schools of thought, combining the effects of stress, environmental exposure, and attentional restoration into unified, meaningful research with statistically significant results. It is furthermore considered a landmark study because it set in place an easily replicable research methodology and utilized a subject type which is widely accessible to researchers at universities everywhere. The idea of window view studies had "considerable implications for the placement and design of dormitories" (Tennessen and Cimprich 1995, 84), and could be additionally applicable in an entire array of realms in the built environment including the home and the workplace.

This research is particularly important to the development of this present thesis in that it took a large degree of variability in views to outdoor environments and categorized them into four smaller, more manageable, and most importantly, testable groups. This idea of breaking highly complex environments with multiple varying degrees of tree cover and views, into smaller, more manageable groups became a standard for future environmental-psychological testing procedures which required simpler evaluation and categorization of different types of green environments.

With Ulrich's hospital patient recovery study and Tennessen and Cimprich's dormitory window study now in place, researchers were becoming more and more aware of the significance and testability of window view studies. Around the same time, Stephen Kaplan's wife and

research partner, Rachel Kaplan, was developing her own notions about window studies and how the view from an office window might have an effect on office workers' job satisfaction, productivity, and mental well-being. In her paper, "The Role of Nature in the Context of the Workplace," published in 1993, she summarized two such studies aimed at addressing just that – productivity in the workplace and employee well-being (R. Kaplan 1993, 193).

Kaplan began with the old adage that a healthy, happy employee is a productive employee – indeed, most employers recognize the benefit of investing in employee health and well-being with the expectation that employees will remain productive, continuing to earn profit for the company. The problem, she suggested, is that employers often budget large amounts of money towards employee health promotion programs such as gyms, health insurance coverage, nutritional education, stress management, and alcohol and tobacco counseling, but, "80% of corporations that offer health promotion programs have established them without quantifiable proof that the programs actually save money" (R. Kaplan 1993, 194). That being said, there *was* emerging research at the time, showing quantifiable evidence that window views to nature could reduce stress and restore attentional capacity – both important factors in worker productivity and well-being. There was also substantial anecdotal evidence: everyone wants an, "office with a view." And larger offices with more windows to the best views are often, "work-perks" left delegated to the highest of management positions (R. Kaplan 1993, 196). Despite the available research, Kaplan lamented, "there has been surprisingly little research on the psychological benefits of a windowed work setting" (R. Kaplan 1993, 196).

Kaplan summarized two pertinent studies which provided thoughtful methodology and meaningful results to the development of her theoretical framework. The first such study, *Coping with Daily Hassles: The Impact of Nearby Nature on the Work Environment (1988)*, surveyed

168 corporate and public agency workers with varying views to the outdoors from their place of employment. The survey questioned employees about their, "perceived job stresses, perceived effectiveness of various restorative opportunities, life satisfaction, physical health, and about some job setting characteristics" (R. Kaplan 1993, 197). Workers with views to nature reported statistically higher overall job satisfaction and fewer reported ailments than those without access to natural views.

The second study was a much more substantial endeavor surveying 615 participants on, "health, psychological functioning, life satisfaction, job environment, satisfaction with job and its setting, recreational activities and home setting, as well as demographic questions" (R. Kaplan 1993, 198). Employees were asked to self-report on the presence and quantity of, "built" and "natural," elements within their workplace views, and to rate their ease of accessibility to, restorativeness of, and overall satisfaction with those views. Again, the results showed strong preference for views with more natural elements. Additionally, "those with a view of nature felt less frustrated and more patient, found their job more challenging, expressed greater enthusiasm for it, and reported higher life satisfaction as well as overall health" (R. Kaplan 1993, 199).

Kaplan takes note that in the overall design of workplace settings, most fall on either end of a spectrum. They are either completely devoid of any natural landscaping or natural scenery, or they are developed with the sole purpose of creating an oasis-like effect, such as the corporate park designs pioneered by landscape architect Hideo Sasaki. Although the ability to place a definitive, "economic value on the view from work in terms of work productivity" (R. Kaplan 1993, 199), is still unanswered, she calls to the research community to continue to build upon the growing empirical work demonstrating the substantial benefits of nature-availability in the work-

place to further demonstrate the possibility for a relatively low cost/high benefit ratio workplace solution.

With window view studies now firmly cemented into place, researchers were finding new and varied ways to test hypotheses on a variety of facets of human attention, stress, and well-being to prove the benefits of nature exposure in small doses via windows. In response to previous studies, researchers began tackling ways to test the behavioral and attentional benefits of nature to children through window view studies, and in particular, low-income or at-risk children in subsidized urban housing projects.

Nancy M. Wells, in her 2000 study entitled, "At Home with Nature: Effects of 'Greenness' on Children's Cognitive Functioning," explored whether children in low-income housing projects would show improvement in tests of cognitive functioning when relocated to identical low-income housing with more naturalistic surroundings. In this study, 17 children in subsidized housing were followed for a period of two years. The first year, the children lived in housing with fewer natural amenities surrounding the home, and the second year they were relocated to housing with more. A 10-item "naturalness scale" was adapted from a previously established Objective Housing Quality Scale (Evans, Wells, Chan, and Saltzman 2000) to assess the amount of nature contained within each window view, both pre, and post-move (Wells 784). *T*-tests confirmed the second housing situation did have significantly, "more natural character than the original housing" (Wells 2000, 787).

To assess the children's cognitive functioning, the Attention Deficit Disorders Evaluation Scale (ADDES) was employed as the most effective tool for measuring children's "power of concentration" (Wells 2000, 787). The ADDES was also ruled most effective because of its

built-in age component, which allowed the researchers to account for the fact that the children were one year older in the second year of assessment in the new housing.

After the second year of testing was complete, regression analysis showed a significant correlation between increased naturalness of the home and improvement in attentional capacity, post-move. In fact, the children with the most dramatic increases in home naturalness settings yielded the highest improvement scores on the ADDES. Wells' study continued to emphasize the power of nature and its cognitive benefits to the human psyche, and added the component of nature as important in childhood development and early brain function. She concluded with a finding from Sebba 1991, which related that, "when asked to name the most significant place from their childhood, adults consistently named an outdoor place" (Wells 2000, 791). Wells' findings relate the obvious implications to school design, and offer future researchers the possibility that window views might benefit humans not just in their restorative properties, but the idea that they might draw, or encourage people to be outside. The idea that outdoor vegetation might encourage one to be outside more was also an important testable factor in this current thesis research. As implicated by Satterfield 2001's research findings, one possible value for testing in this thesis might be that residential landscape trees could possibly encourage householders to get out of the house more often to enjoy the naturalness provided by their residential landscape amenity trees.

By 2002, Andrea Faber Taylor, Frances E. Kuo, and William C. Sullivan had finished conducting their own research on the effects of window views to natural settings on inner city children's cognitive attentional capabilities. Like Wells, their study, "Views of Nature and Self-Discipline: Evidence from Inner City Children," focused on economically disadvantaged children living in a Chicago inner city housing project. Relying on Kuo's theory that, "the mental

mechanism that underlies self-discipline and the mental mechanism that underlies directed attention are one and the same" (Taylor et al. 2002, 51), the researchers chose to examine whether the naturalness of the children's window views had any effect on performance in three measures of self-discipline: Concentration, Impulse Inhibition, and Delay of Gratification.

The naturalness, or "near home nature" of the residential setting was rated on a 5 point scale, asking participants how much of the window view was nature and how much was man-made (Taylor et al. 2002, 53). Concentration was assessed utilizing measures taken from Tennessen and Cimprich 1995, including the Symbol Digit Modalities Test (SDM), Digit Span Backwards (DSB), Alphabet Backwards (ABK), and Necker Cube Pattern Control (NCPC). Inhibition of Initial Impulses was measured using the Matching Familiar Figures Test (MFF), Stroop Color-Word Test (Stroop), and Category Matching (CM). And finally, Delay of Gratification was assessed with the highly sophisticated measure of showing the child a bag of candy and asking them to wait for it in hopes of receiving a larger bag of candy.

Interestingly, the girls outperformed the boys on all three measures, and almost exceedingly so. The differences between boys and girls on tests of concentration and delay of gratification were highly significant, while differences in scores for impulse inhibition were only marginally so. "Whereas girls show consistent and often strong links between near-home nature and various forms of self-discipline, boys show only the barest hint of such a link" (Taylor et al. 2002, 58).

Although the boys seemed to have been left behind in this study, the results and implications are quite significant for girls growing up in low-income, subsidized housing projects. The greener a girl's view from home, the better her performance on the three measures of self-discipline (Taylor et al. 2002, 61). The research is important to the collective body of

environmental psychology for other reasons as well. While most previous research focused only on the Concentration aspect of directed attention, this study introduces two, less cognitive, but potentially new benefits of nature: Impulse Inhibition and Delay of Gratification (Taylor et al. 2002, 60). Finally, the study has strong implications for residential housing design, be it subsidized or private, concerning the qualitative benefits and consequences for inclusion or exclusion of residential landscape trees in those developments.

By 2001, Rachel Kaplan was expanding her window view research into the at-home benefits of natural views through windows, and how those views might affect peoples' satisfaction with their neighborhood as well as their feelings of personal well-being. Her article, "The Nature of the View from Home – Psychological Benefits," posed the question: "Does the effect of windows go beyond the fact that people like them? Are there other benefits that windows afford?" (R. Kaplan 2001, 508). She cited previous research placing the importance of window views in the residential context as reflected through rent, price of housing, and even hotel rate structures (R. Kaplan 2001, 510), but lamented that research on human benefits in residential neighborhood related research was lacking. Citing the importance of residential trees from another of her own previous research endeavors, she reported that apartment residents' neighborhood satisfaction rates were, "far greater when residents could see even a few trees" (R. Kaplan 1983).

Thus, for this research Kaplan chose to focus on the natural content of window views in an apartment complex setting, and to distinguish how the residents of those apartment complexes associated views to natural content with their own feelings of personal well-being and residential satisfaction" (Kaplan 509). In short, she summarized, "the study focuses on the psychological benefits of the view from the window" (R. Kaplan 2001, 513).

Utilizing methodologies similar to those employed in the studies on children in low-income housing, Kaplan's survey asked residents to rank the natural and built content of their window views using a 17-item descriptive tool, provide personal preference ratings for each item, and then liken the similarity of their own window views to a series of photographs showing a variety of sample views with varying amounts of built, man-made elements and natural ones. P-HiSim analysis was used to collect the mean preference ratings for each of the scenes that participants indicated as high (R. Kaplan 2001, 521).

From the P-HiSim analysis, nature items were strongly correlated with the residents' Satisfaction with Neighborhood response categories. Residents with views to trees reported being "*at peace*" and "*not distracted*," feeling restored, and having one's directed attention intact, whereas views of landscaped areas, flowers, and gardens supported feelings of "*effective functioning*" (R. Kaplan 2001, 533). Busy street views and views to man-made structures showed low ratings of neighborhood satisfaction, while, interestingly, feelings of neighborhood satisfaction also declined when views contained a park. When views contained "park-like settings," residents reported feeling a low sense of "*security and community*." "The most preferred scenes for the sample as a whole were the nature scenes showing relatively unmanaged woods" (R. Kaplan 2001, 528).

Most significantly however, was those natural elements residents would have most preferred in their window views were also the elements least likely to appear in the view actually afforded them in the apartment complex. This disconnect points to a greater need for more informed apartment complex design, and has multiple implications for residential housing design guidelines in general. With the inclusion of a few simple, natural elements such as trees, residents presented an increased sense of well-being and greater neighborhood satisfaction.

Summary

Since the early 1980's environmental psychologists have been developing methodologies in hopes of demonstrating measurable ways to communicate the value of nature to the human psyche. From Moore and Ulrich's early studies on patient health and health care facility design, we learned of the ultimately profound stress reduction benefits afforded us by views to natural elements such as trees. Ulrich's further writings on tree preference describe residential preference for "prominent trees" as trees with large, spreading crowns and large stem diameter. Stephen Kaplan's introduction of Attention Restoration Theory elaborates on the benefits of natural exposure, pointing not only to stress reduction but to our renewed capacity to focus concentrated attention following time spent in natural, restorative environmental settings. His warnings of synthesized research combining Ulrich's stress reduction benefits with the attentional restorative properties of nature were heeded, and reflected in the research of Tennessen and Cimprich. Their research began to show us further the benefits of natural exposure to humans, this time through the "micro-restorative" properties of windows in college dormitories. Kaplan's wife and research partner Rachel, took us one step further in her explorations of window views; this time in office workplace settings. Her research showed that employees in offices with window views to natural elements reported greater job satisfaction, higher effectiveness in the workplace, more patience, and fewer health ailments than those without views to nature. Wells, and Taylor, Sullivan, and Kuo took window view studies to a new realm of residential research, demonstrating better concentration and self-discipline in low-income children in subsidized housing projects. Finally, Rachel Kaplan demonstrated the benefits of natural exposure to humans again, this time in a residential window-view study

looking at how views to nature positively affect apartment residents' neighborhood satisfaction and feelings of personal well-being.

Nature and Social Value

Because arborists, urban foresters, planners, and ecologists, as well as economists and city officials view urban trees through a very specific lens, Chapter 2 was concerned with the most easily demonstrable, data-specific environmental and economic benefits trees yield in the context of urban and municipal settings. While these data are useful for those involved in decisions of public municipality where hard, tangible evidence and monetary justification are required in providing the bottom-line justification for public budget expenditure, the research hardly conveys the multitude of benefits that humans derive from trees on a more cognitive, psychological, psycho-socioal level.

Chapter 3 therefore, covered many of the ways that naturalistic, tree-populated environments can be beneficial to humans psychologically. The environmental psychologists focused on the cognitive, emotional, and physical benefits humans derive from views to nature and trees based on experiments of stress reduction and renewed attentional capacity. These precursor studies help us to better understand what humans have long wondered: why do we like to be in and around nature? The benefits in terms of stress reduction and ability to clear our minds to concentrate, as demonstrated by these profound studies, are quite apparent. But as with many of these studies, it seems Rachel Kaplan has summarized it best – "*Nature* here is used to encompass vegetation in many forms including trees, residential landscaping, gardens, and even mowed areas…In popular usage and especially in the urban context, nature is a very inclusive concept" (R. Kaplan 2001, 536). These studies offer some effective methodologies, but in the

end, this thesis research is concerned not just with the qualitative benefits of nature as a whole, but specifically with those of residential landscape amenity trees.

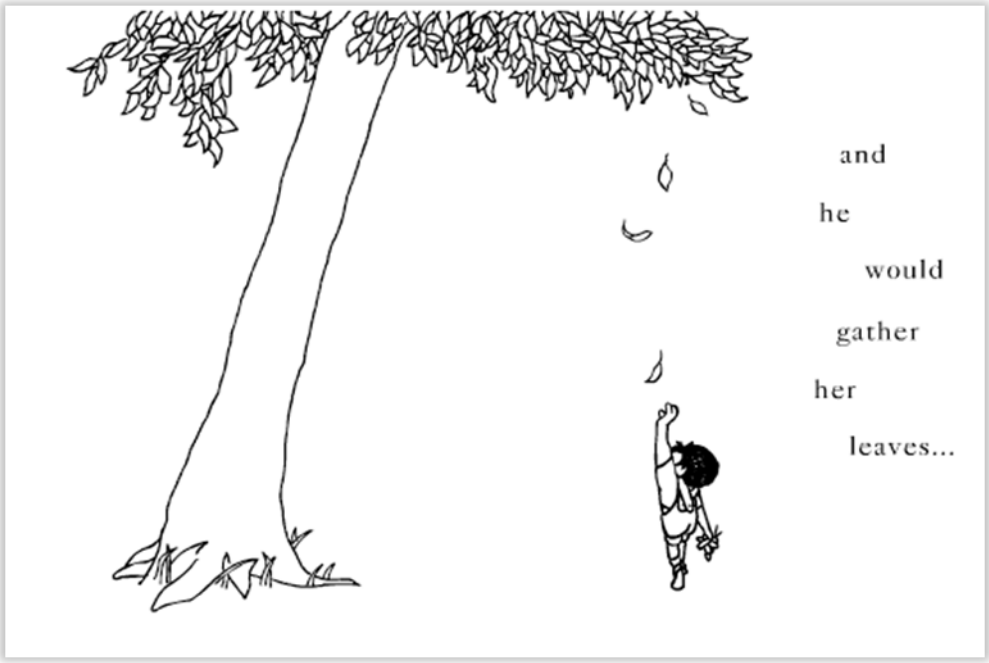
There are pertinent methodologies encompassed in these studies which relate directly to the current research for this thesis. For example, the methods used to assess and synthesize nearby nature from a very broad context to more usable contextual categories through the use of self-reporting and photographs will be inherently useful in deciphering and categorizing the natural content surrounding the multitude of residential homes in the Wakefield/Snapfinger neighborhood community which will undoubtedly contain varying types and sizes of landscape trees.

However, while these survey methodologies can provide useful in the creation of a research methodology for this thesis, we need to review what research has been done specifically regarding the categorization of, and value elicitation techniques designed specifically for, urban landscape amenity trees. Without this decidedly tree-specific social research, we are, as Stephen and Rachel Kaplan throw caution to, simply messing about in nature in the broadest sense. The following chapter therefore, shall explore the literature researching some of the more intangible values humans hold, specifically for landscape amenity trees. By researching specific tree evaluation methodologies designed to convey human preference for tree benefits, this thesis comes closer to its goal of eliciting and describing those intrinsic qualities of landscape amenity trees which matter to us most, as humans.

CHAPTER 4

PEOPLE, TREES, AND VALUES:

DEFINING THE INTANGIBLE



Introduction

While Chapter 3 covered some of the methodologies environmental psychologists have used to isolate singular measures of neurocognitive-environmental benefits within the human psyche, these approaches are somewhat narrow in focus, and do not provide the multi-faceted perspective required to fully understand the larger realm of environmental appreciation and intangible qualities which make the human mind thrive when in nature. Since our goal in this thesis research is to derive greater understanding of the deeper, intrinsically held values people experience when surrounded by their residential landscape amenity trees, we must delve deeper

into the research which seeks to uncover the psychological and natural value systems the human mind creates for natural environmental spaces.

This chapter then, will re-examine human-environmental value as related specifically to human-nature value systems and provide some supplemental perspective in the contexts of natural resource management policy and attitudes towards urban landscape amenity trees. Some pertinent, early methodologies examining householder preferences towards street trees will then be introduced, followed by a review of Satterfield's 2001 study entitled "In Search of Value Literacy: Suggestions for the Elicitation of Environmental Values," which includes her 25-category human value elicitation typologies for expressing intrinsic, non-use value for environmental resources.

Human-Nature Value Systems

While Chapter 3 related some of the earliest research on environmental psychology as specific to the cognitive benefits of natural experience and environmental exposure, the research on humans and the environment goes far beyond these simple statistically oriented, singular benefits. Many texts on environment and human behavior have been written which seek to express exactly how the human mind accounts for the natural environment and what, exactly, our natural world surroundings mean to the human psyche.

J. Douglas Porteous, a professor of geography at the University of Victoria, Canada, has explored some of these concepts in-depth. In his book *Environmental Aesthetics: Ideas, Politics, and Planning*, outlines human-natural experience into 4 intangible groups of thought with relation to human-environmental value. These include [1] aesthetics (landscape), [2] ethics (environment), [3] spirituality (sacred place), and [4] attachment (home). These ideals in concert,

he says, may contribute to "sense of place and perhaps a deep love for particular places" (Porteous 1996, 9). In examining householder perceptions for landscape amenity tree value in the neighborhood setting, these broad categories ma provide a basis for insight into what people value most about their personal landscape amenity trees.

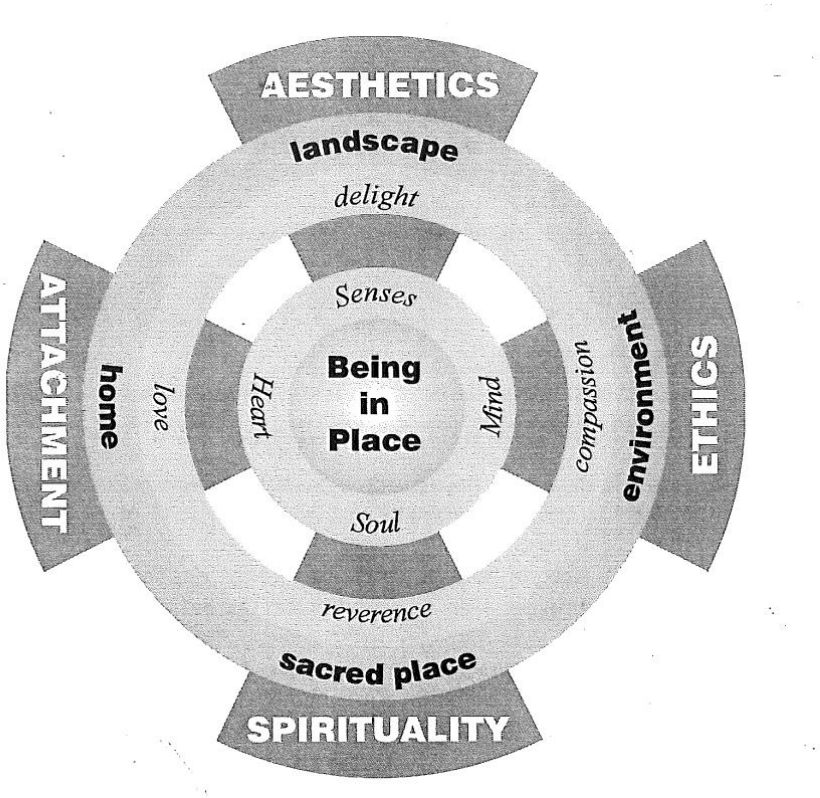


Figure 4.1. Porteous (1996): Intangible Relationships with the Environment

In 2003, E.A. O'Brien published "Human Values and their Importance to the Development of Forestry Policy in Britain: A Literature Review" which helps to hone the definition of environmental value as it relates to trees and forest infrastructure near residential communities. Values, O'Brien describes, are "an enduring concept of worth; they are formed out of a social process of dialogue and debate and influenced by the social, cultural, historical, and

geographical relationships between society and the individual" (O'Brien 2003, 5). The connections people form with trees and forests include, therefore, the "spiritual, recreational, cultural, economic, environmental, aesthetic, and artistic" (O'Brien 2003, 5). As evident in the preface of this thesis, O'Brien warns that "conflicts could arise if management practices affected the strong views that people hold about trees" (O'Brien 2003, 5).

O'Brien is particularly critical of many of the methodologies presented in Chapters 2 and 3 of this thesis, establishing that "the research disciplines of economics and psychology have been dominated by the positivistic philosophy" (O'Brien 2003, 8), and have little place in socio-environmental research regarding human values for natural forest infrastructure. Positivist research, he explains, hones in on testable, observable, isolated research criteria, and in doing so disregards the whole picture, ignoring the possibility of outside influences or other subjective criteria on outcome data regarding human values. He questions whether "social phenomena can be subjected to the same kinds of explanatory goals as physical phenomena," and points out that "this type of research reveals little about the cultural and social aspects of values and how they are formed or shaped" (O'Brien 2003, 10).

Laying the Foundation for Intrinsic Tree Value

Dwyer (1991), in his article "The Significance of Urban Trees and Forests: Toward a Deeper Understanding of Values" mirrors O'Brien's lamentations in that "the strong ties between people and trees cannot be explained by increased property values, reductions in air pollutants, and moderations in temperature" (Dwyer 1991, 276). Rhetorically, Dwyer asks the reader "how many remember a big tree in front of their parents' or grandparents' home, and the deep sense of loss when it was removed? How many individuals have planted a tree as a child

and watched it mature as they did?" (Dwyer 1991, 277). Dwyer cites the sensory, relaxing effect trees have on humans, who describe feeling "serene, peaceful, and restful" when surrounded by trees (Dwyer 1991, 278), and wonders aloud why we consistently name our streets and subdivisions after tall oaks, elms, and the like.

Throughout the article, Dwyer reveals a number of anecdotal experiences and personal revelations which have been provided through survey responses from visitors to the Morton Arboretum in Chicago. From these experiences he assigns some associated experiential categories to help better understand and organize the many ways landscape amenity trees appeal to peoples' personal value systems. These value typologies specific to amenity landscape trees are described as: [1] acute sensory and calming effects, [2] the value of trees as symbols, reminders, and memorials of people, [3] trees as religious symbols, [4] the embedded evolutionary perspective of trees as innate in human preference for forest/savannah landscapes, and [5] the emotional benefits involved when planting trees for the future.

Picking up where Dwyer (1991) left off, Barro et al. (1997) describe some of the "aesthetic and functional values, and symbolic and emotional meanings" as reported through neighborhood survey methodologies in the Chicagoland Tremendous Trees Program. Elaborating upon the initial findings of positivist research, Barro et al. describe the emotional values of trees as complex, hard to define, and "a greater challenge to identify and explain" (Barro et al. 1997, 239). Barro et al.'s research focuses specifically on the overwhelming reported significance of larger trees in local regions, and the increased values people report as associated with those trees. "The deeper values and meanings of trees are especially evident with respect to big trees. There is something about a big tree that evokes strong feelings in many people" (Barro et al. 1997, 239).

By coding the responses of survey respondents, Barro's research team came up with 5 major theme categories and 18 subcategories for things people viewed as important in nominating large trees for consideration in the Tremendous Trees program. The 5 major categories organized responses by [1] the reported physical characteristics of the trees, [2] aesthetic and functional values associated with the trees, [3] symbolic and emotional meanings, [4] questions about the Tremendous Trees program, and [5] advocacy/special interest questions.

In reporting about the physical characteristics of the trees in question, survey respondents were concerned with the condition and health of the trees, expressed deep interest in the life history of the trees, shared notable characteristics and unique features and attributes about the trees, and consistently remarked on the overall impressive size of the trees. In describing aesthetic and functional values, most reports were overwhelmingly positive, remarking mostly on the trees' beauty, size, and shading properties. Reported symbolic and emotional meanings associated with the trees emphasized ties to individuals and family members, ties to the general history of the site and region, strong emotional connections to the trees, personification of the trees, and emphasis on caring for or protecting the trees. In general, people were enthusiastic about Chicago's Tremendous Trees Program, and many respondents made efforts to promote their tree, even when it was not requested of them. Others expressed interest in following up on the trees' progress throughout the nomination process and said that they thought the program was a good idea to help people recognize the value of trees (Barro et al. 1997, 241).

Householder Evaluations of Neighborhood Street Trees

While Dwyer (1991) and Barro et al. (1997) establish some useful categories of benefits and values people associate with unique specimen trees such as champion trees or those found in

arboretums, other research focuses specifically on householder opinions of more generalized neighborhood street trees, factoring in a subset of urban landscape amenity trees occurring more closely to the home. It is this type of research which becomes important to the thesis of this study, in that they examine ways to ask householders, specifically, what they value about trees in the residential landscape.

One of the earliest and most cited pieces of research involving householder opinions of street trees was conducted by Sommer et al. in 1989. Focusing mostly on generalized benefits and annoyances, "Householder Evaluation of Two Street Tree Species" sought to provide an alternative methodology to survey studies which asked respondents to make evaluations based on generic photographs of landscape trees. By asking participants to provide comments on the specific street tree situated directly in front of their homes, the study hoped to capture "the opinions of street trees held by city residents who experience the tangible reality of street trees as a multi-sensory, changing aspect" specifically in the residential setting (Sommer et al. 1989, 99).

There were two important limitations to the study: One being that the study was limited only to two species of street trees local to the California region, and two, that it focused specifically on just the most basic benefits and annoyances to the human/physical environment. Benefits were described in terms of shade, showiness, attractiveness, wind and noise reduction, seasonal change, and privacy, while annoyances were described in terms of leaf, seed pod, and sap drop, allergies, root annoyance and sidewalk damage, suckers and epicormic shoots, and blocking of views. Although the reported benefits and annoyances express little about the perceived intrinsic value of the trees, this was also not the objective of the researchers. The importance of the study to this particular thesis research lies in the methodology of surveying neighborhood residents specifically about trees occurring near the household. Sommer et al.

suggested through their study that surveying householders about their personal trees is indeed possible. In many instances, even, "a majority of respondents provided additional, [unprompted] comments at the end of the questionnaire [which were] overwhelmingly positive" (Sommer et al. 1989, 101), demonstrating the enthusiasm held by many of the survey participants. If a study similar in scope was to be presented to a neighborhood for research purposes, there is evidence in this study that participants would be more than willing and eager to share opinions regarding the value of their trees.

A second neighborhood tree study conducted by Schroeder and Ruffolo in 1996, "used Sommer's survey approach to assess residents' satisfaction with street trees in the Chicago suburb of Downer's Grove, Illinois" (Schroeder and Ruffolo 1996, 36). Because Schroeder and Ruffolo's research occurred in a completely different region of the United States, other, completely different tree species, eight in all, were selected for householder evaluation. As with Sommer's study, reported benefits were again mostly restricted to the physical, tangible, human/physical environment. However, other deeper, more meaningful benefits emerged with this study as well, including "bringing nature closer, increasing property values, and increasing sense of community" (Schroeder and Ruffolo 1996, 36). Annoyances reported by survey participants "were rated as being much less significant than benefits of individual street trees. [They included] falling leaves in autumn, other falling debris, suckers, insect problems, and diseases" (Schroeder and Ruffolo 1996, 38). Other components were added to the study to assess householder opinions of natural wildlife associated with the trees, as well as opinions on size, shape, and growth rate.

The highest reported benefits all fell into the "visual" category, and overall, participants rated satisfaction with neighborhood trees as either "good" or "very good" (Schroeder and

Ruffolo 1996, 39). The survey results again, like Sommer 1989's study, captured a distinct enthusiasm held by householders for trees occurring near the home (See Fig. 4.2 below)

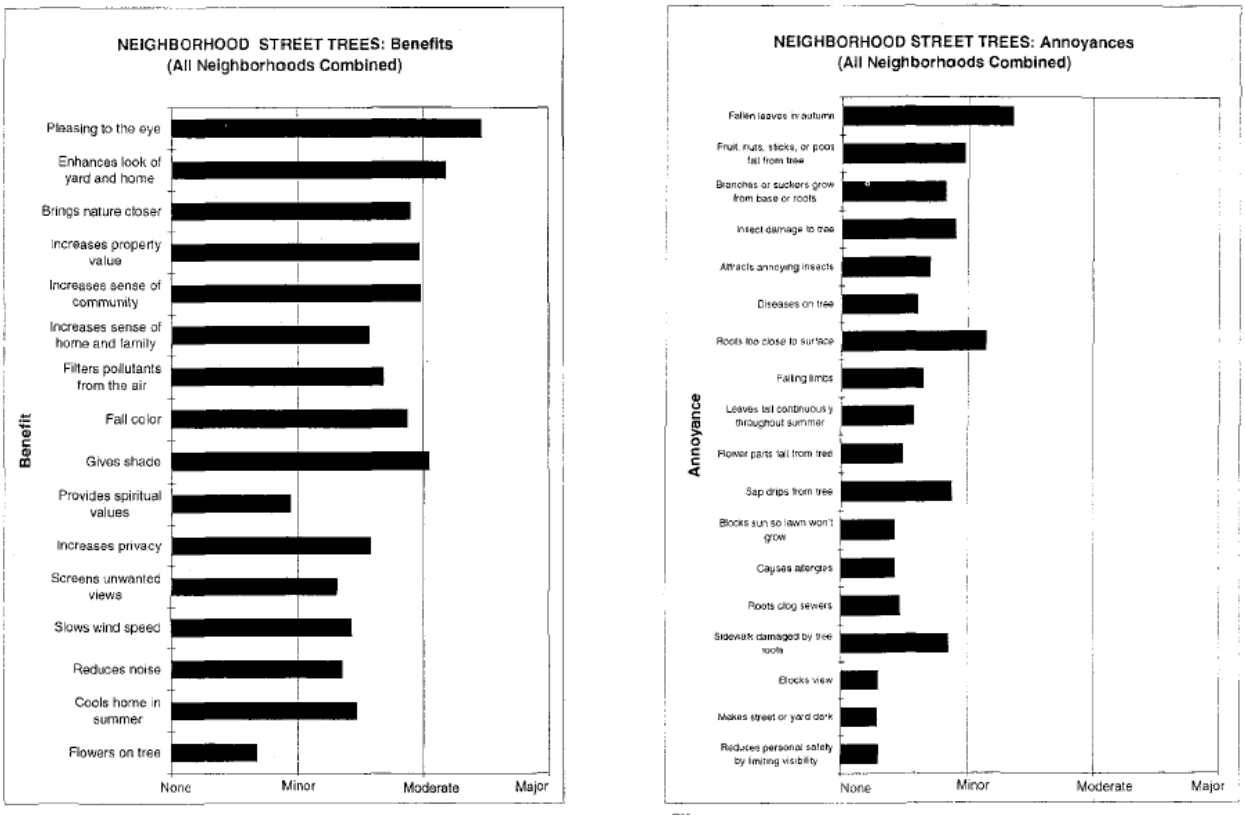


Figure 4.2. Schroeder and Ruffolo (1996): Neighborhood Street Tree Benefits and Annoyances

The results of these two highly regarded studies are mostly useful to municipal arborists, tree nursery personnel, and city planners in describing what most basic, physical tree qualities neighborhood residents value most, and which qualities householders find most annoying. For these types of professionals, this information is useful in specifying and selecting species criteria for future tree plantings in and around residential developments. However, the methodology presented in these two studies has the potential to reveal much more socially relevant information regarding the value of neighborhood trees to than was initially requested of the

householders in the previous research. Particularly in the latter study, there are glimmers of more deeply meaningful benefits held by householders that merit some further discussion and discovery.

Using what Dwyer (1991) and Barro et al. (1997) laid out in the aforementioned studies, it could be possible to posit a research approach similar to those of Sommer et al. (1989) and Schroeder and Ruffolo (1996), but instead ask survey participants to relate, more specifically, the deeply held intrinsic values held for neighborhood residential landscape amenity trees surrounding the home. While these types of values are, as Barro et al. (1997) describes, harder to define, more emotional and complex, and even more of a challenge to identify and explain, there is one researcher in the UK who has been developing just such a value scale to account for these complex, hard to define value systems. Theresa Satterfield's methodology uses non-cost and non-utilitarian value system categories to pose such questions to the public regarding the intrinsic values people hold for "nature (broadly construed), specific environmental goods, or cherished places" (Satterfield 2001, 331).

Theresa Satterfield: In Search of Value Literacy

The basis for Satterfield's research relies upon two premises regarding the existing research on human-environmental value studies. One being that, as O'Brien (2003) and Dwyer (1997) relate, cost-based approaches and psycho-social environmental evaluations are insufficient indicators of the deeply complex intrinsic values humans hold for nature. Secondly, the existing studies which do attempt to account for these values use simple survey methods which are, generally speaking, ineffective. As Satterfield explains, simply asking a survey

participant broadly and directly, "What does nature mean to you" is a futile endeavor (Satterfield 2001, 339).

Because "many study participants are not especially good at, or not given the chance of, giving voice to values that are ethically-charged, deeply held, privately defended or not available to consciousness at a moments' notice" (Satterfield 2001, 332), there exists a need for a more specialized, systematic methodology aimed at eliciting these values from survey participants. Satterfield calls this process, *value literacy*. Value literacy, as she explains, is "the ability for study participants to verbalise the nonutilitarian qualities and values that best express why nature matters" (Satterfield 2001, 332).

As Cullen (2007) describes in the CTLA methods and guidance, it is important to remember that "value is not a physical characteristic of the thing we are valuing; it cannot be touched nor directly measured…values are socially constructed and contextual" (Cullen 2007, 28). Satterfield is careful to elaborate though, "that is not to say that ecosystems, organisms, species, etcetera, are not morally good or possess certain kinds of value in and of themselves…[but that] only humans are moral agents (and thus can evaluate things)" (Satterfield 2001, 333). She continues, explaining that "value in nature is grounded in human feelings and projected onto the natural object that excites the value held" (Satterfield 2001, 336).

Satterfield's value typologies are based upon both a study involving the careful coding of survey participants' environmental response writings on forest preservation, and the enviro-ethical philosophical writings of Holmes Rolston, III's *Conserving Natural Value, (1994)*. According to Satterfield, using the combined results, "over 35 categories of value were generated, though some categories were eliminated due to overlap [or] nonmention by respondents. In the end, 25 categories of value remained pertinent" (Satterfield 2001, 340). Each

value category is designed to reflect a singular facet of environmental value held by humans, which ultimately, together form a complete picture of the 25 ways human beings may value the environment. These value categories are listed below in Table 4.1, with the brief associated definitions assigned by Satterfield (2001).

Table 4.1. Satterfield (2001)'s Value Typology Definitions

	Value Category	**Definition, as assigned by Satterfield 2001**
1.	Ecological Sustainability	Valuing development that does not compromise ecosystem integrity.
2.	Rights/Equity	Deliberations on the rights of nature including: a) basic idea that nature has rights, b) idea of balance between humans and natural rights, c) idea that rights of nature take priority over humans, d) idea that human rights take priority over nature.
3.	Recreational	Nature as provisioners of a physical challenge (e.g., mountaineering), as a show to be watched (e.g., bird watching), as a place to build skills (e.g., scouting organisations).
4.	Philosophical/ Spiritual/Religious	Nature as a philosophical and religious resource, as inspiration for religious/philosophical/spiritual thought and experience.
5.	Aesthetic	Beauty in life and landscape, admiring a rainbow/snow-capped mountain, etc.
6.	Life Support	Earth as a biological habitat/home. Biosphere as a source of climate, water cycles, photosynthesis, etc.
7.	Historical/ Evolutionary	Historical value of nature and landscapes as a record of past processes (geological formation of the earth) and as an evolving system.
8.	Future Generations	Recognition of the rights of future generations to a healthy environment.
9.	Population Stability	Concern about nature as it meets human needs. Concern for the equitable division of products of nature among Earth's citizens.
10.	Economic	Commodity value of extracted natural resources.
11.	Employment	Valuing resource-based jobs.
12.	Biodiversity	Valuing the preservation of biodiversity expressed as variety of species (number of species present), and rarity of species.
13.	Place Identification	Nationally recognised places: e.g., 'the prairies'.
14.	Pharmacy	Valuing resources in nature that can cure human illness or have the potential to cure human illness.
15.	Wilderness	Valuing the existence of wilderness or wild places.
16.	Intrinsic	Value inherent in nature in and of itself, not because it serves some human or biological or ecological need.
17.	Community	Recognition of humans as members of the biotic community and/or valuing the idea of a biotic community.
18.	Complexity	Valuing the complexity and intricacy of material systems.

19.	Scientific/ Intellectual/Creative	Valuing nature as a basis for creative or intellectual thought.
20.	Recovery	Valuing the ability of an ecosystem to heal itself, to recover from natural or anthropogenic devastation.
21.	Existence	Valuing the simple possibility that a natural place is out there and in good shape though one may never see it.
22.	Cultural Sustainability	Valuing the relationship between cultural and biological sustainability.
23.	Cultural Symbolisation	Wildlife as cultural symbols – e.g. bald eagle for the US; the maple leaf for Canada
24.	Charisma	No definition provided.
25.	Oppositional Forces	Valuing the struggle between destructive and life giving forces of nature.

E.A. O'Brien (2003) and Sharp et al. (2012) cite Satterfield's methodology as useful means for eliciting human values regarding forestry policy in Britain and community tree and shrub encroachment management decisions in south-eastern Australia, respectively. For example, Sharp et al. (2012)'s work highlights the use of Satterfield (2001)'s methods as key to determining how community members in central Australian farming communities felt about natural tree and shrub encroachment on native vegetation surrounding the community. According to community members, the top ten ranked value typologies associated with the new vegetation were [1] Aesthetic, [2] Biodiversity, [3] Cultural Sustainability, [4] Employment, [5] Economic, [6] Historical/Evolutionary, [7] Intrinsic, [8] Place Identification, [9] Recreation, and [10] Spiritual. While these values rank starkly, much differently than Satterfield's study examining deforestation in England, the idea remains constant that the methods are a useful tool in examining what deeply held environmental values people hold for environmental infrastructure such as shrubs or trees.

Because Satterfield's value methodology is designed to allow survey participants to give voice to those in-articulable values held intrinsically for natural resources, there is reason to believe that a study combining the neighborhood survey questionnaire methodologies provided

by Sommer et al. (1989) and Schroeder and Ruffolo (1996), with the value elicitation methodology of Satterfield (2001), may yield meaningful results about the intrinsic values held for residential landscape amenity trees by householders.

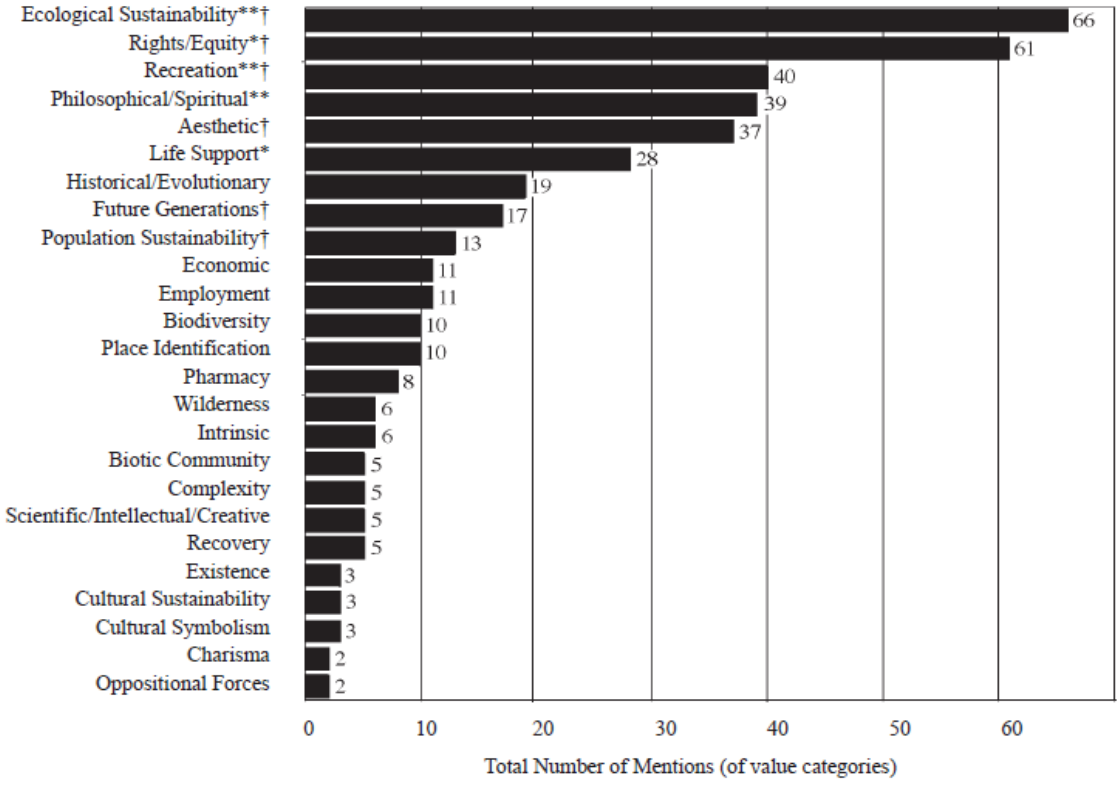


Figure 4.3. Satterfield (2001)'s Value Typology Study Results

Summary

Chapter 4 began with a definition for human value and provided some broadly construed ideologies for use in considering human-nature value systems as a whole. Values, as described by O'Brien (2003), are "an enduring concept of worth…influenced by the social, cultural, historical, and geographical relationships between society and the individual" (O'Brien 2003, 5). Dwyer (1991) and Barro, et al. (1997) further explored these socially held values as they related

to unique and interesting tree specimens, either located in arboretums or in communities as large, individual champion trees. The resulting value types held for these types of trees were broadly defined and less organized, but unique in revealing the intrinsic qualities held dear by study participants for large and interesting trees.

In an effort to methodically and systematically collect and describe householder values held specifically for neighborhood street trees occurring near the home, Sommer, et al. (1989) and Schroeder and Ruffolo (1996) developed householder evaluation survey techniques for several species of street tree in Sacramento, CA and Chicago, IL, respectively. While useful as a survey tool, the "values," per-se, were mostly simplistic, physical tree attributes and revealed little in the way of intrinsic, non-utilitarian values held for the trees. Both studies revealed strong enthusiasm from the survey participants, and provided reassurance that studies similar in scope could expect similar enthusiasm from householders when asked to provide opinions on residential landscape amenity trees.

Satterfield (2001)'s methods reveal a new way of looking at human-environmental values, both as a complete value spectrum scale and as a pointed value-elicitation technique. Value literacy, as she explains, is an alternative value elicitation technique which uses 25 natural human intrinsic value categories to allow survey participants to give voice to "the non-utilitarian qualities and values…that are important to the evaluator" (Satterfield 2001, 332). Tested by O'Brien (2003) and Sharp et al. (2012) in forest management applications, the value elicitation technique shows promise as a method for eliciting householder responses regarding the deeply held personal intrinsic value for landscape amenity trees surrounding the home.

Chapter 5 will cover the methodology for choosing a suitable neighborhood in east Athens, Georgia to survey householders on their opinions and values held for residential

landscape amenity trees. It will then cover the design and structure of the survey which was sent to residents of the Wakefield/Snapfinger community in the summer of 2013. Distribution methodology and limitations of the study will then be covered in brief.

CHAPTER 5

METHODOLOGY: VALUE LITERACY IN THE LANDSCAPE

Introduction

Chapter 5 will discuss the methodology and thought process for creating and conducting a survey of 312 residential homes in the Wakefield/Snapfinger residential subdivision community of east-Athens, Georgia, regarding householder perceptions of residential landscape amenity tree value. The survey method was chosen for its relative ease of collecting information within a short time frame, rather than time-intensive face-to-face interviewing procedures, or charrette-style information gathering which would require all of the householders to be present in one location at the same time. Because many of the questions in the study required deep thought and concentration, the survey method allowed for study participants to think about and create personalized answers to the questions regarding their personal residential landscape amenity trees, at their own pace and leisure, and on their own schedules.

A copy of the pen-and-paper version of the survey can be found in Appendix B of this thesis. The on-line version of the survey can be accessed via the World Wide Web using the link: http://tinyurl.com/ThesisStudy.

The Wakefield/Snapfinger Community

The Wakefield/Snapfinger community, constructed in the late 1980's/early 1990's, is located in east Athens, Georgia and was chosen because of its proximity to the University, its

reasonably manageable number of homes (312), and for its generally middle-class demographic characteristics. Residents are a mixture of short-term student renters, longer term tenants, and homeowners of varying tenure. The houses themselves are mostly single-family homes ranging from 1,100 sq. ft. to 2,000 sq. ft., have a wide-ranging selection of tree and shrub types in their surrounding landscapes. Average home sales at the time of the survey ranged from the low $90,000's to the middle $130,000's, although these figures do reflect deflated market recession prices. A base map of the neighborhood survey area with GIS overlays of housing structure locations and property lines can be found in Appendix A of this thesis. Below is a typical view from a neighborhood street in the survey study area, representing the general housing aesthetic and mix of trees occurring in the Wakefield/Snapfinger community.

Figure 5.1. Typical Street View of Wakefield/Snapfinger Neighborhood

(http://www.google.com/maps)

Designing the Survey

In designing the survey questionnaire, the question structure was broken down into five main sections: [1] Demographic Indicator Questions, [2] Descriptive Comparison Photographs, [3] Value Typology Questions, [4] a brief Willingness to Pay question, and [5] Open Ended Response Questions.

Demographic Indicator Questions

According to Porteous (1996), "the aesthetic judgments made by experimental subjects are not responses initiated by the environment alone. Subjects are clearly influenced in their responses by a complex array of personal characteristics and attributes…Socio-economic and demographic variables have received considerable attention from experimentalists" (Porteous 1996, 126). Similarly, Gifford (1997) in his chapter on Residential Environmental Psychology describes a resident's *purpose* which "emerges when we ask about the resident's relationship *to* the residence. Some feel as if they will live in the place forever, but others intend to move soon or are renting. This can make a huge difference in the resident's evaluation" (Gifford 1997, 200).

Therefore, in the first section of the survey questionnaire, participants were asked some simple demographic indicator questions, six in all, to gauge some of the personal and social variables influencing the survey respondents. The first three questions requested information regarding their age, gender, and highest degree of education completed. The next three questions were used to gain information regarding their relationship to the residence: Were they renting the household or did they own it? How long had they lived at the residence? And how many people were currently residing in the household? Each of these descriptors could then potentially be weighed against other criteria and survey information to gain meaningful new ideas and insights

about how residents valued certain aspects inherent in trees, and if there were correlations between demographics and value typologies.

Descriptive Comparison Photographs

To gauge the types of trees respondents were reporting about, a simple, standardized methodology had to be used which would be descriptive enough to reflect the range of unique size and type of trees occurring on householders' properties, but simple enough to classify into usable, descriptive categories for survey participants to choose from in a survey format. Zeisel (2006)'s survey creation methodology outlines an array of visual response techniques for eliciting "cognitive, expressive, and perceptual information about respondents' physical surroundings…such as freehand area maps, base-map additions, drawings, photographs taken by respondents, and games" (Zeisel 2006, 270). Although these techniques are useful for interview purposes and intensive charette-style settings, Zeisel also cautions survey researchers about maintaining a balance "between gathering a great deal of information and not tiring out the respondent" (Zeisel 2006, 262) throughout the survey.

Therefore, a compromise was achieved through the use of simplified photographs similar to those of the environmental psychologists' window studies and those used in E.A. O'Brien's 2003 human values and their importance to forestry policy study. The photographs used came from on-line housing listings for homes located in the southeastern United States, both structurally similar to those in the Wakefield/Snapfinger community, and surrounded by varying sizes and types of trees similar to those found in the Wakefield/Snapfinger community. By these means, survey participants were able choose from a sample of generic photographic scenes which best reflected the tree types surrounding the individual survey participant's homes.

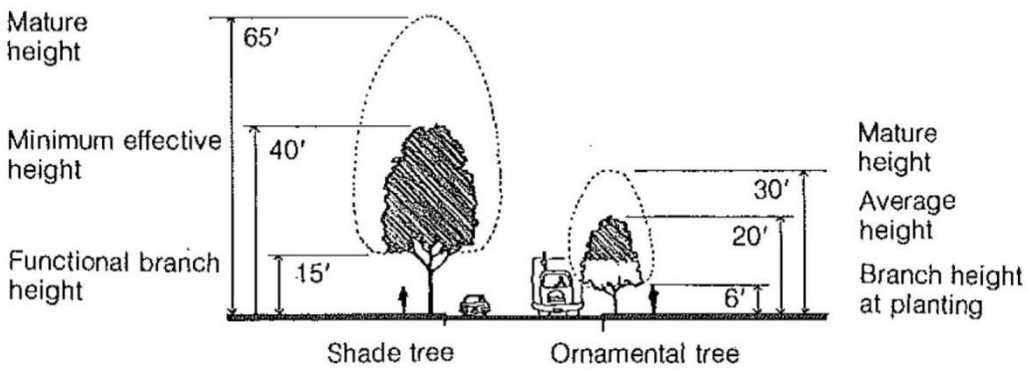


Figure 5.2. Arnold (1980)'s Shade and Ornamental Tree Categories

Tree types were derived from Arnold (1980), *Trees in Urban Design* and were concerned more with height and crown spread, rather than species. While Sommer, et al. 1989 and Schroeder and Ruffolo 1996's studies were concerned with assessing one or a few specific tree species types occurring near the household, the goal of this research was more concerned with assessing trees as design elements occurring in the residential landscape rather than a species-by-species diagnostic comparison. According to Arnold, "The height and spread of a tree are of more concern to the landscape architect than any other visual characteristics in choosing tree type. This scale requirement is immutably linked to human dimensions and space perception" (Arnold 1980, 81).

Therefore, Arnold's dimensions of shade and ornamental trees were used as a guideline for determining size categories of trees for survey participants to choose from. Six (6) categories were created in all, and included the following categories: [1] No landscaping, just lawn, [2] Shrubs only (up to 6-8'), *plus lawn*, [3] Ornamental (flowering/fruiting) landscape trees (12-25 ft), *plus shrubs and lawn*, [4] Small shade trees (25-40 ft), *plus ornamental flowering/fruiting trees, shrubs, and lawn*, [5] Large shade trees (40-65 ft), *plus small shade trees, ornamental*

flowering/fruting trees, shrubs, and lawn, and [6] Natural/forest mix, *plus large shade trees, small shade trees, ornamental flowering/fruiting trees, shrubs, and lawn*.

By these methods, survey participants were able to choose from six (6) visual, easily relatable tree type categories without having to identify certain, specific species of trees to report on. While there exist probably hundreds of species of tree and shrub within the Wakefield/Snapfinger community, restricting the survey data to six easily manageable categories meant much simpler surveying procedures and quicker data turnaround time in analyzing the results.

Value Typology Questions

From Satterfield's original 25 environmental value elicitation categories, 19 were chosen for use in the survey questionnaire for describing the inherent, intrinsic, non-utilitarian qualities of value householders attributed to their residential landscape amenity trees. Values were omitted if they received less than 5 "mentions" in Satterfield's study results, or if they were not applicable to the realm of a neighborhood study (such as the "Existence" value in which one must appreciate nature even though they cannot physically see or experience it in person). In other cases, values with closely similar meaning in the context of a neighborhood study were consolidated to form a singular value category which could be applied better to residential neighborhood landscape amenity trees.

With the 19 applicable value categories established, 19 value statement questions were developed; designed to convey the meaning of the value quality but posed in the form of a question statement which survey respondents would be able to answer with varying degrees of agreement or disagreement. Survey participants were asked to imagine only the trees

surrounding the home, directly on the householders' property. The survey questions are presented on the following page in Table 5.1, along with the associated value typology used from Satterfield (2001).

Table 5.1. Survey Questions Adapted from Satterfield (2001)'s Value Typologies

	Value Typology	**Survey Question**
1	Ecological Sustainability	Do the trees on your property contribute to sustainable development within the context of your landscape?
2	Rights/Equity	Do your trees have a natural "right" to be here?
3	Recreational	Do the trees on your property encourage you to be outside more?
4	Philosophical/ Spiritual/Religious	Do these trees provide inspiration for spiritual thought or experience?
5	Aesthetic	Do you find the trees on your property attractive?
6	Life Support	Are these trees critical to life-sustaining, ecological support systems within your landscape?
7	Historical/ Evolutionary	Do your trees hold any historical significance, personal or otherwise, to the landscape?
8	Future Generations	How important is it that future generations have access to these landscape trees?
9	Population Stability	*Consolidated into other value typology questions*
10	Economic	Do you think there is an economic benefit that can be derived from the trees on your property?
11	Employment	Do the trees on your property provide employment opportunities for people?
12	Biodiversity	Do these trees contribute to a greater biological richness or species diversity to the site?
13	Place Identification	Are these trees characteristic or typical of the local or regional "place" of the landscape?
14	Pharmacy	Are there natural healing or restorative effects that can be attributed to your trees?
15	Wilderness	Are your trees important as part of the natural wilderness?
16	Intrinsic	Even if these trees served no human, biological, or ecological purpose, would they still be important "Just because?"
17	Community	Do these trees make you feel more connected as a species, to the entire biotic community as a whole?
18	Complexity	Do the trees on your property make you appreciate the greater complexity of the biological/ecological systems around you?
19	Scientific/ Intellectual/Creative	Do you derive intellectual or creative inspiration from the trees in your landscape?
20	Recovery	Are these trees representative of the ability of nature to recover in the face of human development?
21	Existence	*Cannot be applied to a survey regarding householders' perspective*
22	Cultural Sustainability	*Too few mentions in Satterfield 2001*
23	Cultural Symbolisation	*Too few mentions in Satterfield 2001*
24	Charisma	*Not defined in Satterfield 2001*
25	Oppositional Forces	*Too few mentions in Satterfield 2001*

Value typology responses were reported through the use of a Likert scale to gauge agreement/disagreement with the value, with answers ranging from "Not at all," "Very little/Not Really," "Neutral/Don't Know," "Somewhat Yes," and "Very Much." By asking survey participants which values they agreed with and disagreed with, a clearer picture could be established to see which values the householders held most and least important. By weighing these values against demographic data, relationships might be able to be drawn between householder demographics and the values they agree are most important regarding the residential landscape trees occurring on their property.

Willingness to Pay Question

A single willingness to pay question was included in the survey as a means to create a simple monetary assessment for a householder's response to a diseased, infected, decaying, or dying tree on their property. In the hypothetical scenario question, the resident was asked to imagine that a Certified Arborist had come to the residence reporting to the householder that their favorite tree on the property had a disease and would die if it did not receive costly treatment. Respondents were then asked to choose from a list of four (4) price options to determine the highest monetary amount they would be willing to pay to save their favorite tree. Price options included: $100, $250, $500, $1000, or "Do nothing." From these choices, residents were asked to choose the highest amount they would be willing to pay to save their favorite tree. Only monetary amounts were presented in the willingness-to-pay question, though they were based on generalized pricing for tree-related services such as soil sampling, risk assessment consultation and analysis, fertilization, crown cleaning and/or thinning (pruning service), and

complete tree removal. The assessment included a "Do nothing" option for those who either had no means or any inclination or desire to treat the dying tree.

Although more extensive willingness-to-pay surveys for city tree maintenance do exist in the literature (Moskell and Allred 2013, Lorenzo et al. 2000, Flannigan 2012, Jones et al. 2012, Hull IV 1992), no such surveys were found which dealt specifically with a householder's favorite tree in the residential landscape setting, which could then be weighed against demographic factors such as highest degree of education, age, whether the householder rents or owns, or other information regarding the resident's relationship to the residence.

Open Ended Response Questions

The final section of the survey questionnaire included three (3) open-ended, "free write" response questions which allowed survey participants to include any information regarding their trees which may have been missed in the preceding sections. Questions in the open-ended response section asked survey participants what they valued most about their residential landscape amenity trees, in case certain other values had been missed in the 19 value typology questions. Other questions asked if survey respondents had a favorite tree on the property, what they liked most about their favorite tree, what descriptive qualities they would use to describe it, why the tree was their favorite, and what made it special to them personally.

There was a possibility that some value typologies existed which weren't covered in the 19 Satterfield-adapted value categories, and coding of these open-ended response questions might reveal some of these hidden values which hadn't been considered yet.

Distributing the Survey

The pen-and-paper survey was printed on two, double-sided 8.5"x11" pieces of paper and enclosed in a large manila envelope with the words "Graduate Research Survey Enclosed" printed in red ink above the survey respondent's address. One (1) copy of the pen-and-paper survey was mailed to each of the 312 homes in the Wakefield/Snapfinger community of east Athens, Georgia in the late spring/early summer of 2013. The survey questionnaire package included two (2) consent forms, a cover letter explaining the objective of the study, the survey procedures and expected discomforts regarding the questions, and one color copy of the four-page survey questionnaire. Additionally, an electronic, on-line version of the survey created using the University of Georgia's Qualtrics survey software was sent via email to the residents of the Wakefield/Snapfinger community through the neighborhood community listserv. The email specified the same information regarding the objective, procedures, and expected discomforts of the study. A follow-up email was sent two weeks later to remind community residents to submit their electronic on-line or pen-and-paper responses if they wished to participate in the study.

Limitations and Delimitations

There were several limitations to the study, some of which were obvious and others, not as readily apparent. First, being a completely self-funded endeavor, there were financial restrictions as to how many surveys could be mailed out, with respect to postage and printing costs. As a one-man research team, there were also limitations to how many surveys the author could realistically process, catalog, and analyze statistically in the amount of time before his thesis defense. In this regard, he elected to send surveys to just one neighborhood, locally accessible in Athens, Georgia. With 312 homes in the neighborhood, an estimated return of

approximately 100 responses was anticipated, which would be a manageable quantity over the course of a summer and one fall semester.

The relatively low survey population makes it difficult to confirm with any statistical certainty the validity of the incurred results. However, the small sample of responses does create an interesting initial picture of what inherent, intrinsic, non-utilitarian values householders attribute to their residential landscape amenity trees. Because the survey is easily replicable, it is possible that larger pools of data can be recorded in future studies to further enhance the statistical validity of the results and gain a clearer picture of what makes trees inherently special to householders. Therefore it is important to keep in mind that the results presented in this study are essentially merely a good start to an interesting study which will require much more data to confirm or refute any small conclusions derived from these results.

Another important limitation was the limit on what kinds of housing was chosen for the survey area. This particular study chose to focus on a relatively middle-class neighborhood in a somewhat rural college town. More diverse results might be yielded from surveying other types of neighborhoods such as Sullivan and Kuo's studies on urban housing projects; or perhaps a much higher-income neighborhood elsewhere. Porteous suggests that "conservation and landscape aesthetics are essentially upper-middle-class movements, with less appeal to working-class groups. Moreover, it is clear that sub-groups and individuals appraise landscapes in very different ways" (Porteous 1996, 207).

In considering the design of the survey questionnaire, there were limitations on the descriptive characteristic categories of all the different types of residential landscape trees within the survey area. Primarily, there was to be anticipated a significant disconnect in the descriptive language used by the plant-loving landscape architect/arborist and the presumably layperson

survey respondent, to describe the landscape trees in question. Had the survey been sent only to tree experts and gardeners, common and scientific names of all trees and plants could likely be used without major issue, but for the purposes of this study, broader categories of trees based mostly on canopy height (Arnold 1980, 83) were used in place of individual nomenclature for each species of plant and tree. Recalling that "the height and spread of a tree are of more concern to the landscape architect than any other visual characteristics in choosing tree type" (Arnold 1980, 81), and being that this is a landscape architecture thesis based on perceptions of laypersons rather than an arboriculture or horticulture study comprised of experts, the author chose to focus on trees primarily as groups of design elements rather than individual species for the purposes of comparison in this study.

This simplification of plant terminology was also used in-part, to address the issue of a realistically manageable load of raw data to process given the amount of time to write and defend this thesis. Had all species of trees occurring within the study area been documented, catalogued, and statistically analyzed, the author would require more time and assistance than realistically feasible for the purposes of this study.

Finally, there had to be limitations set in place for which trees the survey respondents should focus on in their responses. Although the view from a window or back patio may be host to a plethora of trees hundreds of feet away in some instances, respondents were asked to focus only on the residential landscape trees occurring directly within their personal property boundaries. Although this decision may have led to some imperfect responses (ie: a resident with only lawn, but with neighbors who own tall or flowering trees), it was designed to keep all the data well within the purposes of the study, which ultimately examines how residents feel about their own personal landscape trees. Although this does raise some very interesting ethical and

philosophical recourse on environmental “ownership” and who, or if we can indeed “own” nature, these topics should be saved for further discussion elsewhere.

Chapter 6 will present the results of the survey questionnaire, section-by-section, followed by analysis and discussion of those results.

CHAPTER 6

RESULTS AND ANALYSIS

Introduction

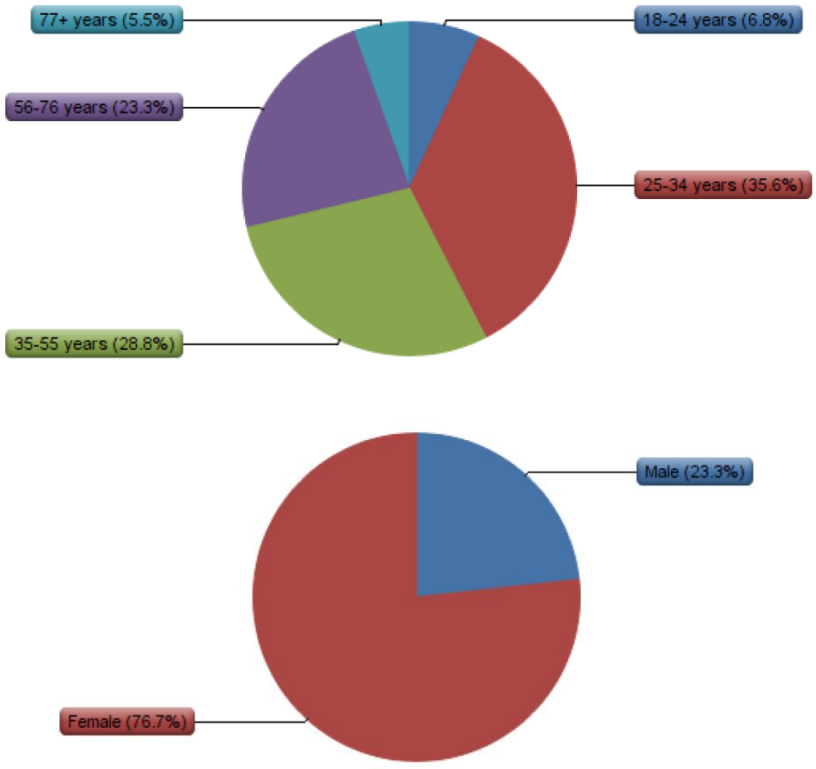
As Schroeder and Ruffolo (1996) state in their results regarding tree attribute preference studies, "sophisticated statistical tests, while desirable for scientific purposes, are not essential for interpreting the basic results" of these types of survey questionnaire studies (Schroeder and Ruffolo 1996, 43). Therefore, for the purposes of this thesis study, tabulated rankings of value typologies should be sufficient for interpretation of the survey data collected from the Wakefield/Snapfinger community. This chapter covers the basic survey response data including demographic information, neighborhood tree types, value typology rankings among householders, willingness to pay for preservation of a favorite tree, and open-ended response data. A copy of the full Qualtrics software report for the results of this study is included in Appendix C of this thesis.

Survey Response Data

Of the 312 surveys sent out to the residents of the Wakefield/Snapfinger community, 32 were returned unopened, marked vacant, 26 were completed as pen-and-paper response, and 48 were completed via the on-line Qualtrics survey link, for a total of 74 completed responses (24% return rate). All 74 responses were compiled electronically into UGA's Qualtrics survey software for easier analysis and interpretation.

Demographic Indicator Questions

According to the survey data, survey respondents were overwhelmingly female (77%) and homeowners (74%), as opposed to renters. 40 respondents, or 54% of the survey respondents, were both female and homeowners. Highest reported age and education were in the 18-24 year age range holding mostly bachelor's degrees. There were also significant numbers of 35-55 year old (21) and 56-76 year old (17) householder survey respondents. While bachelor's degrees accounted for most of the survey respondents highest level of education (48%), many other respondents reported holding master's degrees (24) while fewer participants in the study held either Ph. D's (7) or high school diplomas (7). No survey respondents reported having less than a high school education. Average respondents reported that they were living in mostly one or two-person households, and had been living there anywhere from 2 to 10+ years. All demographic data is represented below in the six (6) pie charts comprising Figure 6.1.



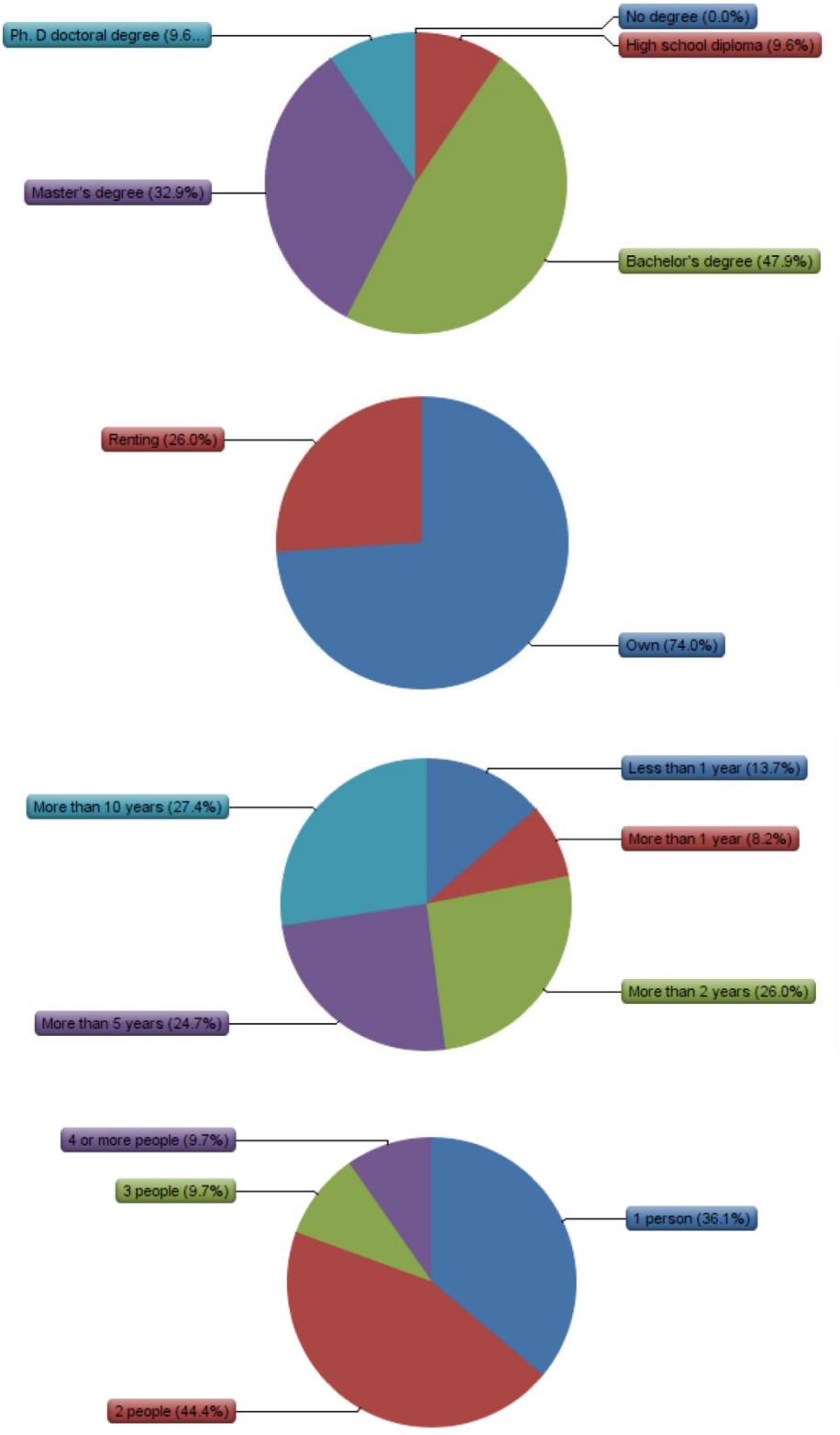


Figure 6.1. Householder Demographic Data: From top to bottom; Age, Gender, Highest level of Education, Rent vs. Own, Length of Residency, and Number in Household

From the demographic data, it appears that either, a majority (54%) of the residents of the Wakefield/Snapfinger community own their homes and are overwhelmingly female, or that those residents who cared most about their residential landscape amenity trees were mostly homeowners and female. It would make sense that a homeowner would have a much more vested interest in the trees on the property than a renter would, as they would have more than likely chosen or planted the tree themselves and had more time to become attached to the tree over the years looking at and interacting with it as opposed to renters who would have moved into the existing landscape with likely little-to-no say or interest in the overall landscape design. The fact that most respondents were female is interesting, but it seems there is less logical reasoning or speculation as to why this may have been so. Although there is less logical defensibility as to why females reported back in such higher quantities than males did for this particular study, these findings do recall the results of Taylor, Kuo, and Sullivan 2002 where girls displayed much better improvement in attentional capacity when placed in naturalistic settings than boys did. Beyond these correlations however, the disproportionate gender participation in this study is a relative mystery.

The fact that Athens, GA is largely a college town may account for the large number of study participants who reported as being young people ages 18-24 year old and the majority of respondents who reported as holding bachelor's degrees. Within the 18-24 year old age bracket, however, only 5 participants reported having bachelor's degrees. Most of the bachelor's degree holders fell within the 25-34 year old range (12 respondents) and 35-55 year old range (11 respondents). A cross tabulation of age and highest degree of education can be found in Table 6.1.

		What is your age?					
		18-24 years	25-34 years	35-55 years	56-76 years	77+ years	Total
What is the highest degree of education you have completed?	No degree	0	0	0	0	0	0
	High school diploma	0	2	1	3	1	7
	Bachelor's degree	5	12	11	7	0	35
	Master's degree	0	8	6	7	3	24
	Ph. D doctoral degree	0	4	3	0	0	7
	Total	5	26	21	17	4	73

		What is your age?
What is the highest degree of education you have completed?	Chi Square	16.44*
	Degrees of Freedom	16
	p-value	0.42

*Note: The Chi-Square approximation may be inaccurate - expected frequency less than 5.

Table 6.1. Age Compared with Highest Degree of Education Completed

In terms of homeownership, only 2 respondents in the 18-24 year old range reported as homeowners, while a majority of others (48 survey participants) reported within the ages of 25-76 years old. Cross tabulation of age and homeownership can be found in Table 6.2.

		What is your age?					
		18-24 years	25-34 years	35-55 years	56-76 years	77+ years	Total
Do you own this home or are you renting?	Own	2	13	19	16	4	54
	Renting	3	13	2	1	0	19
	Total	5	26	21	17	4	73

		What is your age?
Do you own this home or are you renting?	Chi Square	18.72*
	Degrees of Freedom	4
	p-value	0.00

*Note: The Chi-Square approximation may be inaccurate - expected frequency less than 5.

Table 6.2. Age Compared with Homeownership vs. Renting

While the demographic data in itself is interesting and provides insight into the types of residents concerned most about residential landscape amenity trees in the Wakefield/Snapfinger community, the other equally important component about this data is that is can be weighed

against other survey response criteria to gain insight about any of the other survey response components such as which types of people have highest willingness-to-pay, which types of people cared most about which value typologies, and so forth. Because of the relatively low number of survey responses, there are not enough data to be able to draw out any meaningful generalizations for further hypothesis generation. However, further exploration into these types of relationships in further studies could provide interesting new insights into the various types of householder residents and the things they value most about residential landscape amenity trees. In order to yield more statistically significant results, this study should be repeated in other neighborhoods to broaden the survey response pool.

Descriptive Comparison Photographs

Most householder respondents (29 survey participants, or 40% of respondents) reported their surroundings as having mostly small shade trees (25-40 ft. tall), plus ornamental flowering/fruiting trees, shrubs, and lawn. Fewer others (20 participants, 27%) reported having taller, 45-65 ft. tall shade trees in addition to the small shade tree category, while even fewer (14 participants, 19%) reported having a completely natural forested mix. Only one (1) participant reported having no landscaping with just lawn, and four (4) reported only having shrubs but no trees on the property.

These results are fairly congruent with what would be expected for a residential neighborhood subdivision built in a surrounding pine-mix forest in the late 1980's. It is unclear whether the neighborhood was clear-cut and re-planted with new trees at time of construction, or if certain choice trees were marked and preserved from the existing forest. Ultimately, though, a

mix of tall, existing shade trees, and newer plantings of smaller, flowering or fruiting ornamental trees was to be expected in the results

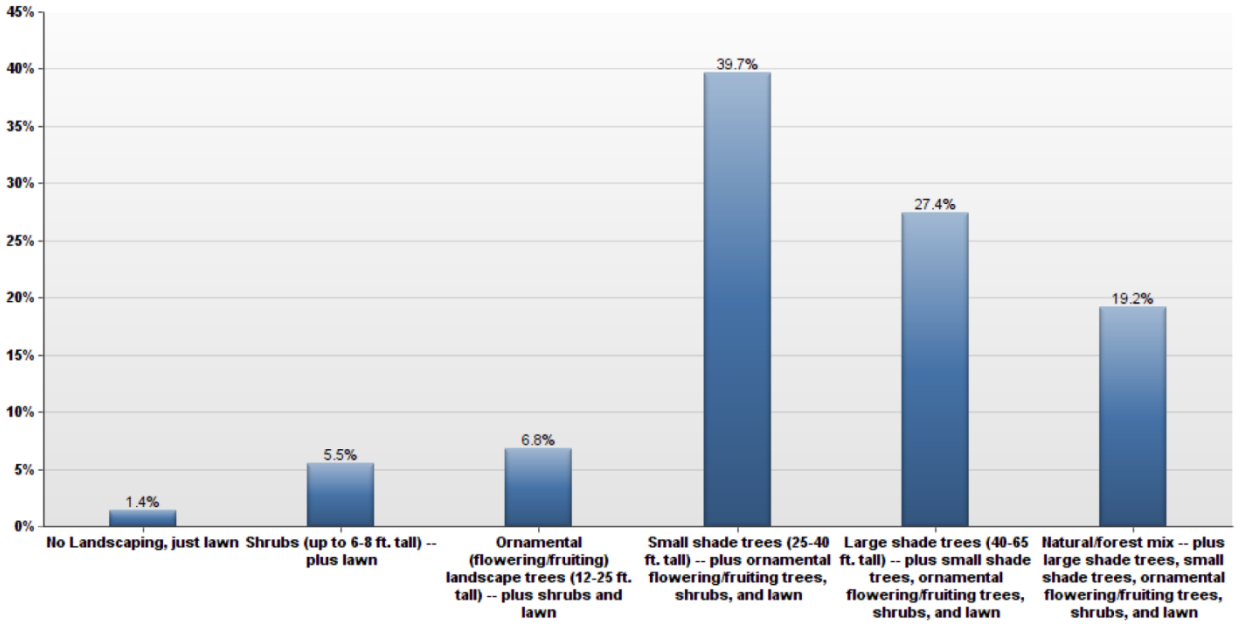


Figure 6.2. Tree Type Categories as Reported by Wakefield/Snapfinger Residents

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These results are also a good indicator that the descriptive comparison photographs were an effective representation of the different tree types, as adapted from Arnold 1980's shade and ornamental tree types. Problems, however, may occur in repeated studies where housing and tree types are visually significantly different from those used in the descriptive comparison photographs chosen for this study. For example, the housing listing photos from this study were taken from housing listings throughout the southeastern United States, but if another study was to be performed in the southwest, or the northeastern United States, there would be significant expected differences in housing types and tree types which may not translate as well to householders in these areas of the country.

Value Typology Questions

According to the analysis of value typology questions adapted from Satterfield 2001, residents of the Wakefield/Snapfinger community valued the aesthetic qualities of their trees the most, while valuing the historical/evolutionary qualities of their trees the least. The top five (5) values residents attributed to their personal landscape amenity trees were [1] Aesthetic, [2] Rights/Equity, [3] Intrinsic, [4] Place Identification, and [5] Biodiversity. By these rankings, we can postulate that householders in the Wakefield/Snapfinger community place highest emphasis on the belief that their trees are attractive, have a natural right to exist, are important "just because," that they contribute to a local/regional "sense of place," and add biological richness and species diversity to their personal, residential landscapes.

The five (5) least important values reported by residents of the Wakefield/Snapfinger community were [15] Scientific/Intellectual/Creative, [16] Philosophical/Spiritual/Religious, [17] Pharmacy, [18] Employment, and [19] Historical/Evolutionary.

Overall scores for value typologies were weighted as such: Not at all = -2, Very little/Not Really = -1, Neutral/Don't Know = 0, Somewhat Yes = +1, and Very Much = +2. The full range of intrinsic, non-utilitarian values, ranked most-to-least important by householders in the Wakefield/Snapfinger community for their residential landscape amenity trees can be found below in Table 6.3.

Table 6.3. Weighted Scores for Neighborhood Survey Respondents' Value Typologies

Rank	Value Typology	Associated Value Typology Question	Overall Score
1	Aesthetic	Do you find the trees on your property attractive?	1.38
2	Rights/Equity	Do your trees have a natural "right" to be here?	1.31
3	Intrinsic	Even if these trees served no human, biological, or ecological purpose, would they still be important "Just because?"	1.31
4	Place Identification	Are these trees characteristic or typical of the local or regional "place" of the landscape?	1.26
5	Biodiversity	Do these trees contribute to a greater biological richness or species diversity to the site?	1.04
6	Complexity	Do the trees on your property make you appreciate the greater complexity of the biological/ecological systems around you?	1.00
7	Future Generations	How important is it that future generations have access to these landscape trees?	0.97
8	Wilderness	Are your trees important as part of the natural wilderness?	0.94
9	Recovery	Are these trees representative of the ability of nature to recover in the face of human development?	0.94
10	Life Support	Are these trees critical to life-sustaining, ecological support systems within your landscape?	0.86
11	Economic	Do you think there is an economic benefit that can be derived from the trees on your property?	0.82
12	Community	Do these trees make you feel more connected as a species, to the entire biotic community as a whole?	0.78
13	Recreational	Do the trees on your property encourage you to be outside more?	0.76
14	Ecological Sustainability	Do the trees on your property contribute to sustainable development within the context of your landscape?	0.61
15	Scientific/Intellectual/ Creative	Do you derive intellectual or creative inspiration from the trees in your landscape?	0.44
16	Philosophical/Spiritual/ Religious	Do these trees provide inspiration for spiritual thought or experience?	0.43
17	Pharmacy	Are there natural healing or restorative effects that can be attributed to your trees?	0.18
18	Employment	Do the trees on your property provide employment opportunities for people?	-0.32
19	Historical/Evolutionary	Do your trees hold any historical significance, personal or otherwise, to the landscape?	-0.40

Again, with repeated testing of the survey study in more and diverse types of neighborhoods, more meaningful results may emerge, regarding the value typology data. As the pool of survey responses grows, this data will become more meaningful as it is cross-referenced through regression analysis with demographic data to obtain more detailed analysis results.

Willingness to Pay Question

Householders' willingness to pay was relatively inconclusive. While only three (3) people were willing to spend $1000 to save their favorite tree, there were nearly equal amounts of survey participants willing to spend $100 (19), $250 (20), $500 (15), or do nothing (14).

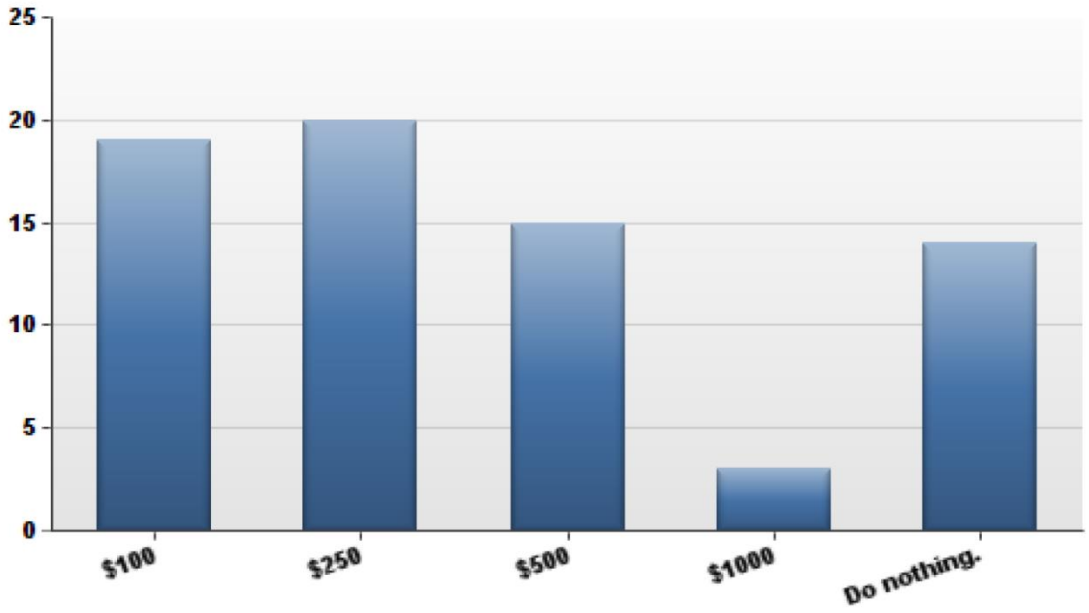

Figure 6.3. Householders' Willingness to Pay to Save a Favorite Tree

While these results are generally inconclusive, more responses are needed to further test the question. As stated earlier, only 74 responses were collected from 312 mailed surveys, so

only relative generalizations can be drawn from the small pool of results. There is also the possibility that the question is weak, and should be revised, re-written with further explanation to the survey participant for clarification, or omitted altogether. Because the question inquires about money people are willing to spend to solve a problem, and is designed to be weighed against other demographic criteria, the study should be presented to other types of neighborhoods with varying incomes and study participant demographics. Because of the low number of responses, further testing of this question is required before any meaningful conclusions can be drawn.

Open Ended Response Question

Open ended responses from the survey study were overall wide and varied, but several themes did emerge throughout the coding process. When asked if they had a favorite tree on the property, 57 of the 74 survey respondents reported that they did indeed have a favorite. Survey respondents described their favorite trees as being large, spreading, and beautiful, and that they liked how the trees provided privacy, had beautiful or showy flowers, attracted and provided habitat for birds and squirrels, and provided shade which helped in cooling the yard and reducing energy bills in the summertime. When asked to describe their favorite tree, most householder respondents, even though they were not arboricultural or landscape experts, were able to provide common or even species names for their favorite trees, while others just described the showy, colorful flowers or large, spreading canopies. One respondent even chose to include a picture of her favorite tree for reference.

Some of the “favorite tree” descriptions included the following open-ended responses:

- “The shade!! Lowers the bills/regulates the temp of the house very well. Love the rain on the leaves and the noise it makes and how it breaks up the visual when I pull in the driveway = not just a plain house.”
- “They provide shelter and nesting places to birds and other wildlife. It's very important to us that our backyard offers all our outdoor critters a place they can hang out and find safety, food, water, etc.”
- “My favorite tree is the maple in my front yard. It's grand and gorgeous. It's cooling in the summer and colorful in the fall. It's the perfect shade tree for my little garden below. My backyard and the trees that separate my home from my neighbors is my private world. It's where I stare and think when I'm in a meditated state.”

Preference for larger, older trees with wide-reaching, spreading canopies was consistent with Ulrich (1985)’s findings regarding human preference for what he called “prominent trees” which were described similarly, as large trees with spreading canopies. These findings were also consistent with Dwyer (1991) and Barro et al. (1997)’s research which also reflected widespread appreciation from the public for larger trees.

- “This tree has marked my life here. Each season, it has grown more colorful, broader and taller. As my roots in this neighborhood get stronger and more entrenched, so has my tree's. I wake up to its leaves dancing against my bedroom wall and I go to sleep with them blanketing my ceiling. I would feel lost and exposed without it.”

The other physical benefits reported by survey respondents in the Wakefield/Snapfinger community mirrored closely with the positive attributes reported by householders in Sommer, et al. (1989) and Schroeder and Ruffolo (1996)'s studies regarding the physical, tangible benefits of landscape amenity trees.

While several responses (17) stated directly that they did not have a favorite tree on the property, only two (2) respondents complained of annoyances such as leaf and seed case droppings. Some respondents, even though they answered "no," provided further explanation for why they did not have a favorite tree.

- "They provide shade, but they are FAR too close to the house -- this actually creates more problems than the benefit of shade provides. Keep in mind I did not plant these trees -- if I had, I would NOT have planted this type of tree (oak), nor would I have chosen their current location as a planting spot. Frankly, if I had the money, I'd have them cut down."
- "No (we've only lived there for 2 months and our old place had no trees, so honestly I'm just thrilled to have any trees!)"

Other complaints cited the visual monotony of the same few species of tree repeated over and over again in the neighborhood and city tree plantings.

While a few poetic and romanticized responses, such as the respondent who likened the tree's roots to their own, were collected through the survey, these deeper, more philosophical responses were few and far between. Those deeper-held, more meaningful, intrinsic values which this study was seeking to uncover were strikingly absent from most of the open-response,

free-write responses. Perhaps the questions were not worded correctly enough to elicit the desired types of deeply held, emotional responses, perhaps the survey method itself was too impersonal, or perhaps most people just care mostly about physical attributes such as shade, beauty, and wildlife.

It was the hope of this research that after answering a series of 19 questions on deeper, more intrinsically held values for trees, the survey respondents would be put into a "philosophical mood" of sorts, and would be inclined to write about more meaningful experiences gained from interaction with their personal, residential landscape amenity trees. This is not to say the responses were completely absent, however.

A few (3) open-ended response questions catalogued feeling closer to God and His creation by being outside in the yard among the trees.

- "Trees are not only necessary to humans to survive but they are God's creation. Animals of all kinds including insects and bugs depend on our trees. I understand we need to use them for building homes and land needs to be cleared for further development, however, we cannot continue to survive without them and I value my backyard which consists of mainly trees. I would not spend money to save one because it were sick because all living things have a circle of life, but I would not purposely knock them down."
- "Trees are essential to the present and future life of the planet Earth. They produce oxygen for all of God's creation and help sustain water and nutrients in the Earth. They provide protection and a nesting place for the diverse birds of our planet and other creatures that climb and seek nuts and berries. I personally enjoy standing and/or sitting in the yard to be one with nature."

Others appreciated the inherent natural beauty of the Earth and all of its magnificent creations. While these two types of responses would most categorically fit into the "Complexity" and "Philosophical/Spiritual/Religious" categories, perhaps there is room for another category which relates appreciation for the natural magnificence of Earthly creation.

One response which particularly stuck out was a survey respondent who had particularly negative opinion of the multiple-choice section of the survey which covered Satterfield 2001's 19 value categories. At one point, the question of, "even if these trees served no human, biological, or ecological purpose, would they still be important "Just because?" was scratched out and the response, "This question is stupid and I refuse to waste my time answering it" was scribbled into the margin.

However, in the open-ended response questions when asked if he/she had a favorite tree on his/her property, even this participant was able to include a touching story about his/her favorite tree which was a constant, living reminder of someone dear to him/her, who had given the tree as a present. "Yes, a Japanese maple, a gift. I'm quite fond of it and I monitor it closely. It is beautiful, atypical, and, like all gifts, reminds me of the giver." This particular response, while interesting in-and-of itself, also alludes to the possible creation of another intrinsic value category which covers trees as commemorative or symbolic reminders of special occasions or people who are dear to us. Others (3) wrote of similar experiences receiving trees as gifts, and being reminded of the person who gave it, on a constant basis. "It is important to me because of the person who gave it to me and the excitement of watching it grow from almost nothing to its present height of 2.5 to three feet."

Summary

When compared to Satterfield (2001)'s value typology rankings, value systems held for "Rights/Equity" and "Aesthetic" were consistently high-ranked among survey respondents in both studies. In the Wakefield/Snapfinger community, Rights/Equity was ranked second, as in Satterfield (2001) where it was also ranked second. Wakefield/Snapfinger community residents ranked "Aesthetic" values at the top of their list of values, where in Satterfield (2001), it was ranked still relatively high at fifth. Broadly-construed environmental values held for trees in the Wakefield/Snapfinger community were reflected through "Biodiversity" where householders believed strongly (ranked 3rd) that trees contribute to a greater biological richness or species diversity to the site. Although Biodiversity was ranked much lower (12th) in Satterfield (2001), environmental values were still present in Satterfield's results as reflected through the #1 ranking for Ecological Sustainability.

Similar to Biodiversity, "Place Identification" was ranked very high in the Wakefield/Snapfinger study (4th), but much lower (12th) in Satterfield (2001). This change is most likely a result of the fact that in the Satterfield study, participants did not live in the landscapes they were reporting on, while in the Wakefield/Snapfinger study, the survey specifically asked respondents about how they identify with the particular place of study. Also, biodiversity is generally a much more easily understood, tangible, and concrete concept than sustainability, which is more abstract.

Finally, "Intrinsic" values held for trees in the Wakefield/Snapfinger community ranked much higher (3rd), as well, than in the Satterfield study (13th). This is most likely also the result of the fact that the objective of the study was to ask householder participants which values they held, most intrinsically, for residential landscape trees.

Although there were hints of some new, intrinsic values not covered initially in the Satterfield-adapted methodology, such as the idea that trees can exist as "Reminders or Memorials of People," surprisingly, many of the responses were concerned with just the surface, physical, tangible benefits such as shade and natural beauty. This is perhaps a result of an impersonal methodology, revealed in the limitations of the brief, 4-page survey method. Satterfield's study involved a much lengthier value elicitation process which required a survey proctor to be present, and much longer and involved questions to be answered over the course of a longer study period.

However, despite these revealed limitations, many unique responses filled the open-ended survey questions. In the neighborhood scale methodology involving householders and residences, values such as "Intrinsic" and "Place Identification" rose to the top of the values rankings. Clearly, residents of the Wakefield/Snapfinger community believe their trees are important for intrinsic reasons that they cannot quite place other than that they are "important, just because." The Wakefield/Snapfinger residents also believe that the trees help to identify with the "sense of place" of the landscape. The idea that trees in the residential landscape help householders to identify with the place is extremely significant and important when thinking about trees in design for residential landscapes. In essence, the respondents' favorite trees made the home feel more like home for them.

Chapter 7 will offer some implications and further questions regarding this study, what it may cover in the future, and how this type of information may be incorporated into further research in the future. Finally, Chapter 7 will close with final thoughts and a conclusion about the study.

CHAPTER 7

SUMMARY, FURTHER QUESTIONS, AND CONCLUSION

Summary

This study was important because it helped residential neighborhood householders give voice to some of the harder to explain, more intrinsic values held for their personal residential landscape trees. Overall, survey respondents in the Wakefield/Snapfinger community valued the Aesthetic, Rights/Equity, Intrinsic, Place Identification, and Biodiversity qualities of their landscape trees the most. By these rankings, we can arrive at the conclusion that householders in the survey community placed highest emphasis on the belief that their trees are attractive, have a natural right to exist, are important "just because," that they contribute to a local/regional "sense of place," and add biological richness and species diversity to their personal, residential landscapes.

What surprised this arborist/researcher the most was that the "Historical/Evolutionary" category came in dead-last. Recalling the survey question, "Do your trees hold any historical significance, personal or otherwise, to the landscape?" and Satterfield (2001)'s definition of the "historical value of nature and landscapes as a record of past processes (geological formation of the earth) and as an evolving system," one would postulate from Ulrich (1985), Dwyer (1991) and Barro et al. (1997)'s findings regarding large trees, that householders would place much higher emphasis on the historical/evolutionary qualities of the trees in their surrounding landscape.

From personal arboricultural experience (see preface), when a tree is slated for removal and the tree crew is setting up at the work-site, it is completely commonplace for multiple neighbors to come by, either on their morning walks or on their way to work, and comment on how large, and subsequently how old the tree must be, and what a shame it is to lose it. Some even take their emotional response so far as to anthropomorphize the tree, and remark on how much history the tree must have "witnessed" throughout its lifetime.

While research shows people appreciate the largeness of trees, the logical conclusion that a larger tree would have a long and storied history, was not reflected in the survey responses of this study. This could be for a number of reasons, but three that come to mind are that either [1] the value itself was not represented well in the phrasing of the question, [2] perhaps since the Wakefield/Snapfinger community is relatively young, built in the late 1980's/early 1990's, that the trees simply aren't old enough for householders to have that kind of appreciation or reverence for the old, stately qualities that much older trees possess, or [3] since there are relatively large numbers of young people living in this neighborhood, perhaps the ideas of reverence for "old" or "historical" things is not a priority among this particular demographic.

Another explanation is reflected in the notion that, regarding personal landscape trees, perhaps people don't really know what they have until it is gone. In the preface of this thesis, the trees were either dead or being removed, never to occupy and fill that space ever again. There are deep feelings of loss people attribute to scenarios such as these, but those feelings are hard to replicate in a simple 4-page survey questionnaire. Hull IV conducted a survey in Charleston, South Carolina in 1992 where he found that, following Hurricane Hugo "respondents mentioned that they had previously taken for granted how much they valued the urban forest. Interestingly, no one said that they took for granted the values and benefits associated with any other [physical

architectural] feature. These findings suggest that trees are a valued component of Charleston and that the extensive damage to the urban forest made residents aware of these values" (Hull IV 1992, 99). Robert Gifford in his book Environmental Psychology: Principles and Practice, second edition, describes this concept as well, in his notions of "Loss and Destruction" which can build or strengthen place attachment from longing for what was once there (Giffford 1997, 226). Other sources of place attachment outlined in Gifford (1997) include Genealogy, Ownership, Cosmological, Pilgrimage, and Narrative.

Another factor to consider is that no two survey populations are the same. Beyond the need for survey populations of varying demographics, there is also the notion of different personality types found in survey methodologies. Even within this study, it seems there are several types of respondents in tabulating the survey data. Some people have a tendency to check "very much" all the way down the line; those who feel the trees surrounding their properties are invaluable and infallible, and can do no wrong. Others seem completely devoid of any attachment to their trees whatsoever. Their comments are short, curt, and believe the trees contribute nearly nothing to their day-to-day experience or the environment. Interestingly, some who check "none at all" or "very little/not really" for nearly every value category still acknowledge in the comments section that the trees do provide some benefits back to themselves and the property.

Regarding these varying types of personal responses found in this survey examining trees in the residential landscape environment, there may be different types of environmental response personalities at work here. Phillips and Semples have attempted to categorize some of these types of respondents as a means for evaluating these different types of environmental evaluators. Porteous (1996) outlines these environmental personality clusters in his text, *Environmental*

Aesthetics: Ideas, Politics, and Planning. On a spectrum, these personality clusters range from Unemotional Technocrats, General Academics, Spectators, Negatives, Environmentalists, Eco Freaks, and Conservationists. Although trying to categorize responses according to these personality types is beyond the scope of this thesis research, the concept is interesting and may provide useful in future research where repeated studies seek the opinions of other demographics.

Further Questions

In further exploring demographic data for this research, some pertinent, key questions arise which are interesting in considering future research regarding this study. For example, are people who own, and/or have longer length of residency, willing to spend more to maintain their trees? The implication here is that people who own their properties or have lived at the household longer have more time, energy, and money invested in the property and its surrounding trees. The survey responses regarding the willingness-to-pay question of this survey were relatively inconclusive, so further testing of this question may reveal interesting new insights about this curiosity.

Other questions might weigh the amount of education a survey respondent has against how much he or she might be willing to pay to save their favorite tree. Does more education mean a greater understanding of complex biological, economic, and ecological principles, and therefore a higher willingness-to-pay? Does more education allow for higher paying jobs which would equate to higher willingness-to-pay? Would higher educated survey respondents have a strikingly different overall set of intrinsic values held for residential landscape trees than their

less-educated neighbors? And does a higher willingness to pay correlate with other deeper-expressed, coded, open-ended response values?

Other questions might look at other demographic features, such as age. For instance, do older people care more about trees because they have "grown up" with the trees? Or is the opposite is true; that older age reflects a deeper understanding of natural life processes, the circle of life and death; and that an older person would be more inclined to "let the tree go naturally." Perhaps a younger person would be more idealistic and try harder to save their favorite, dying tree. Or maybe a younger person doesn't quite fully understand tree benefits and would not be as inclined to save it.

There are many combinations of questions which can be asked regarding the demographic data and the values held for residential landscape amenity trees. However, because the data pool is so small and only covers one, small neighborhood in east Athens, Georgia, more survey responses are needed to gain statistical validity and a greater range of responses.

Conclusion

The strength in this study lies in the fact that it addresses many of the problems plagued by other environmental-aesthetic research. As Porteous (1996) states in his section on Methodological Problems, "in environmental aesthetics…little attempt has been made to delve deeply into the emotions. As yet, most work remains near the surface, dealing primarily with issues such as preference" (Porteous 1996, 139).

Elaborating on this shortcoming, quoting Zube (1991), Porteous continues, stating that "landscape appraisal research has had a narrow focus, both topically and methodologically. We know very little about how individuals and groups use these landscapes, about the meanings they

associate with them and about the relative importance of esthetic values compared with the host of other values such as ecologic, historic, economic, and symbolic" (Porteous 1996, 212).

Indeed, while research presented in Sommer et al. (1989) and Schroeder and Ruffolo (1996) examines mostly the surface physical attributes of neighborhood trees householders prefer or dislike, this study utilized a value typology system designed to gather the more intrinsic, highly personal, complex, hard to define values which householders attribute most deeply to trees in the landscape.

Research such as this is important for the advancement of landscape architectural study which emphasizes design with intention, but lacks further understanding of plant material and trees beyond basic texture, color, growth rate, size, and sun, shade, and water requirements. Landscape architecture is often considered one of the few design professions which melds aesthetic design with the social sciences. Therefore, research which combines trees in the residential landscape setting with a human component of cognitive understanding and values, can be greatly beneficial aid in creating better, more informed design.

Like the early tree benefits research relayed in Chapter 2 of this thesis, the research regarding social values held for urban landscape amenity trees is still in its infancy. The future of this research, like the tree benefits research, lies in computer mapping and modeling which may someday be able to combine the ability to map social values with a greater spatial understanding, and create visual representations for use in other realms of the social sciences and landscape architecture.

One such study has been conducted in Berkley, California by Yang et al. (2009) which could be on track to accomplish this type of more complete understanding. The research, entitled "Can You See Green? Assessing the Visibility of Urban Forests in Cities" has developed an

urban Green View Index using a rudimentary photo-stitch approach which can be used to evaluate the visibility of urban forest infrastructure from multiple point locations in a city. As world-view computer technology such as the Google Earth Street View become more prevalent and accessible in our society, our ability to associate and attribute more comprehensive social information to using more highly complex mapping technology will allow us to advance social research attributable to green infrastructure such as trees, with relative ease.

When Rowan Rowntree and E.Gregory McPherson first began shading tree diagrams in plan-view on trace paper to better describe the physical environmental benefits of tree shade, could they have possibly ever predicted that 40 years later, satellites and computers would be floating through space, swapping photographic images by the nanosecond, working in concert to accomplish everything they were doing, and so much more?

For now, this research shall be limited to strengthening the survey procedures and collecting more data, and trying to draw more complete conclusions about the data using more complete demographic information from a variety of sources and locations. Additionally, adding in other types of value typologies as revealed through coding of the open-ended response questions will be necessary to refine the questions regarding which values people attribute most and least to their residential landscape amenity trees. Further iterations of this study should include the value typology which scratched the surface in this study: Trees as memorials/reminders of people. Dwyer (1991) mentions this value briefly in his work, but the value typology reveals itself again in this thesis study and should be examined further.

Finally, honing and re-tooling of questions which reveal themselves to be unclear or weak assessors of the desired information should be re-evaluated, rewritten, or stricken and replaced with effective questions aimed at gathering information from the survey respondent

effectively. For example, the Willingness-to-Pay question should be re-examined in-depth, if possible. It is possible that a question regarding non-intrinsic, cost-based value should not have a place in a study which is aimed at reveling and giving voice to the intrinsic, as it is jarring and jolting to the survey participant. Whilst in the midst of an intrinsic journey through the mind, the participant is abruptly asked to deal with numbers and values. Because of this, perhaps the question belongs elsewhere in another type of study.

With these steps in place, the survey should become a stronger, more effective tool for assessing those intrinsic qualities residential householders value most for residential landscape amenity trees.

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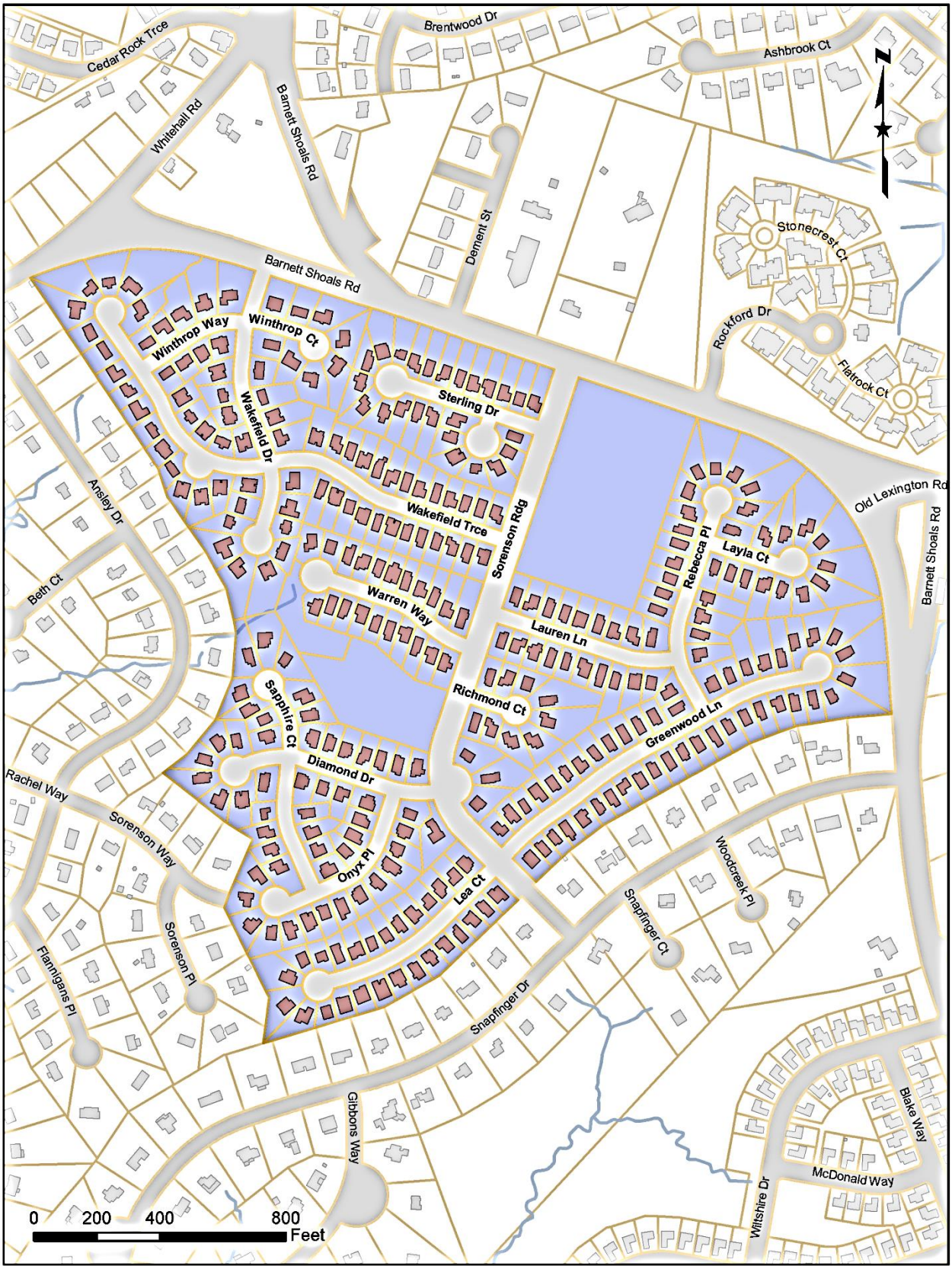
APPENDIX A:

SITE MAPS OF NEIGHBORHOOD SURVEY AREA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Ashbrook Ct
Whitehall Rd
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Stonecrest Ct
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Rockford Dr
Flatrock Ct
Winthrop Way
Winthrop Ct
Sterling Dr
Wakefield Dr
Old Lexington Rd
Ansley Dr
Wakefield Trce
Sorenson Rdg
Rebecca Pl
Layla Ct
Barnett Shoals Rd
Beth Ct
Warren Way
Lauren Ln
Richmond Ct
Greenwood Ln
Sapphire Ct
Diamond Dr
Rachel Way
Sorenson Way
Onyx Pl
Lea Ct
Woodcreek Pl
Snapfinger Ct
Flannigans Pl
Sorenson Pl
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Blake Way
Gibbons Way
McDonald Way
Wiltshire Dr
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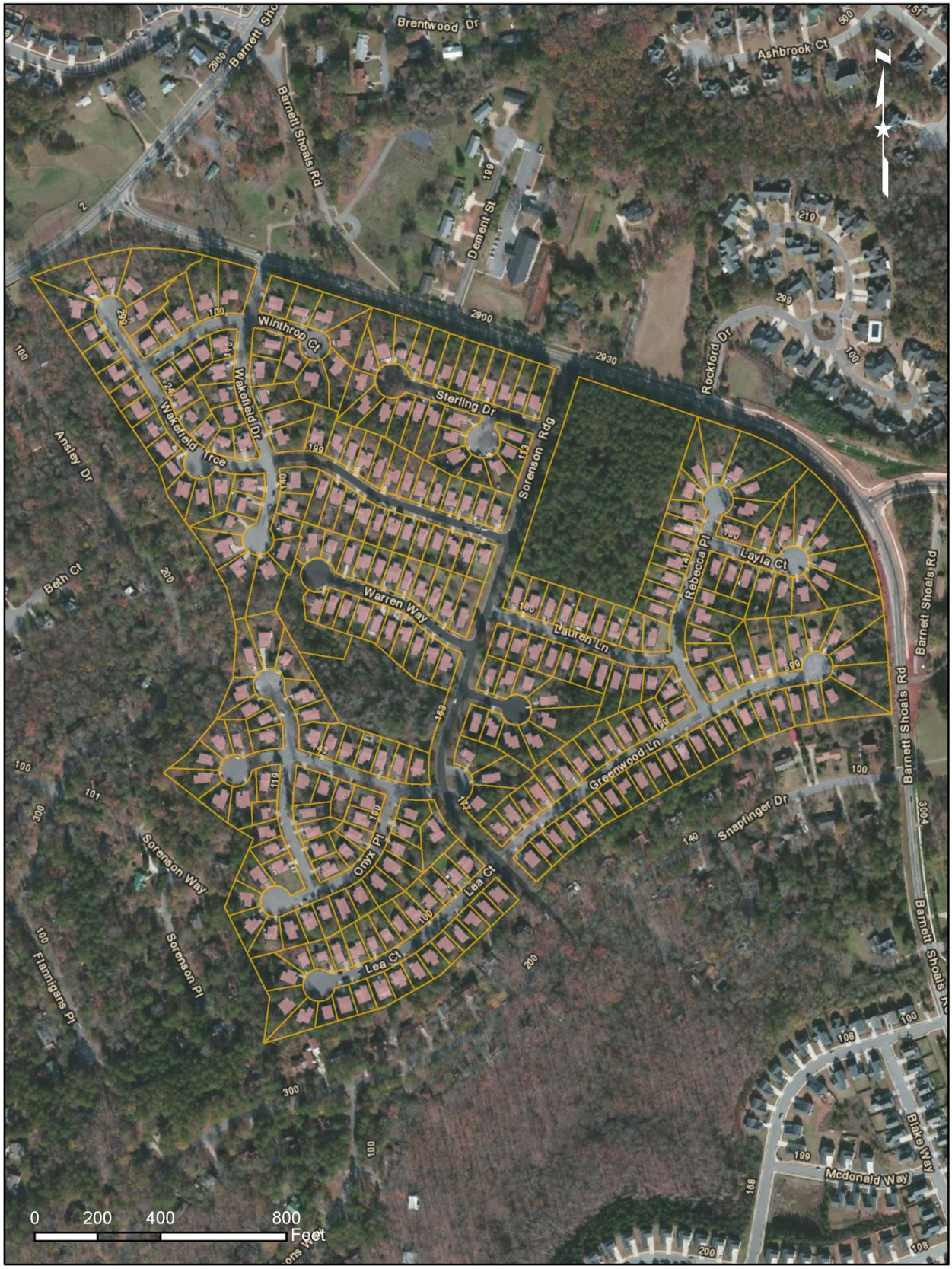
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Ashbrook Ct
Barnett Shoals Rd
Dement St
Winthrop Ct
Wakefield Dr
Wakefield Trce
Sterling Dr
Sorenson Rdg
Rockford Dr
Ansley Dr
Beth Ct
Warren Way
Lauren Ln
Rebecca Pl
Layla Ct
Greenwood Ln
Snapfinger Dr
Onyx Pl
Lea Ct
Sorenson Way
Sorenson Pl
Flannigans Pl
Blake Way
Mcdonald Way
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Feet

APPENDIX B:

SURVEY INSTRUMENT

Please answer these questions as thoughtfully and honestly as possible. Remember, all information collected from the questionnaire will remain anonymous.

---

1) What is your age?

- ☐ 18-24 years
- ☐ 25-34 years
- ☐ 35-55 years
- ☐ 56-76 years
- ☐ 77+ years

2) What is your gender?

- ☐ Male
- ☐ Female

3) What is the highest degree of education you have completed?

- ☐ No degree
- ☐ High school diploma
- ☐ Bachelor's degree
- ☐ Master's Degree
- ☐ Ph. D doctoral degree

4) Do you own this home or are you renting?

- ☐ Own
- ☐ Renting

5) How long have you lived at this residence?

- ☐ Less than one year
- ☐ More than one year
- ☐ More than 2 years
- ☐ More than 5 years
- ☐ More than 10 years

6) How many people currently reside in your household?

- ☐ 1 person
- ☐ 2 people
- ☐ 3 people
- ☐ 4 or more people

---

7) Based on these photographs, choose the category of landscape trees that best characterizes your residential landscape surroundings. (Choose only one)

☐ **No landscaping, just lawn**

☐ **Shrubs only (up to 6-8 ft)**
plus lawn

☐ **Ornamental (flowering/ fruiting) landscape trees (12-25 ft)**
plus shrubs and lawn

☐ **Small shade trees (25-40 ft)**
plus ornamental flowering/ fruiting trees, shrubs, and lawn

☐ **Large shade trees (40-65 ft)**
plus small shade trees, ornamental flowering/fruting trees, shrubs, and lawn

☐ **Natural/forest mix**
plus large shade trees, small shade trees, ornamental flowering/fruiting trees, shrubs, and lawn

For this section, please consider the landscape trees surrounding your home - choose your answers to the following questions based on how much you agree or disagree with the statement provided.

1) Do the trees on your property contribute to sustainable development within the context of your landscape?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

2) Do your trees have a natural "right" to be here?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

3) Do the trees on your property encourage you to be outside more?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

4) Do these trees provide inspiration for spiritual thought or experience?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

5) Do you find the trees on your property attractive?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

6) Are these trees critical to life-sustaining, ecological support systems within your landscape?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

7) Do your trees hold any historical significance, personal or otherwise, to the landscape?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

8) How important is it that future generations have access to these landscape trees?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

9) Do you think there is an economic benefit that can be derived from the trees on your property?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

10) Do the trees on your property provide employment opportunities for people?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

11) Do these trees contribute to a greater biological richness or species diversity to the site?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

12) Are these trees characteristic or typical of the local or regional "place" of the landscape?

☐ Not at All ☐ Very Little/ Not Really ☐ Neutral/ Don't Know ☐ Somewhat Yes ☐ Very Much

13) Are there natural healing or restorative effects that can be attributed to your trees?

☐ ☐ ☐ ☐ ☐

Not at All | Very Little/ Not Really | Neutral/ Don't Know | Somewhat Yes | Very Much

14) Are your trees important as a part of the natural wilderness?

☐ ☐ ☐ ☐ ☐

Not at All | Very Little/ Not Really | Neutral/ Don't Know | Somewhat Yes | Very Much

15) Even if these trees served no human, biological, or ecological purpose, would they still be important, "Just because?"

☐ ☐ ☐ ☐ ☐

Not at All | Very Little/ Not Really | Neutral/ Don't Know | Somewhat Yes | Very Much

16) Do these trees make you feel more connected as a species, to the entire biotic community as a whole?

☐ ☐ ☐ ☐ ☐

Not at All | Very Little/ Not Really | Neutral/ Don't Know | Somewhat Yes | Very Much

17) Do the trees on your property make you appreciate the greater complexity of the biological/ecological systems around you?

☐ ☐ ☐ ☐ ☐

Not at All | Very Little/ Not Really | Neutral/ Don't Know | Somewhat Yes | Very Much

18) Do you derive intellectual or creative inspiration from the trees in your landscape?

☐ ☐ ☐ ☐ ☐

Not at All | Very Little/ Not Really | Neutral/ Don't Know | Somewhat Yes | Very Much

19) Are these trees representative of the ability of nature to recover in the face of human development?

☐ ☐ ☐ ☐ ☐

Not at All | Very Little/ Not Really | Neutral/ Don't Know | Somewhat Yes | Very Much

20) **In a hypothetical scenario, a certified arborist comes to your house because (s)he has noticed your favorite landscape tree is showing symptoms of disease. At this stage, she says, if your tree does not receive expensive treatment soon, it will decline and die. From the list of price options, please choose the largest amount you would be willing to pay to save your favorite tree.**

- ☐ $100
- ☐ $250
- ☐ $500
- ☐ $1,000
- ☐ Do nothing

Open-Ended Questions: Please use your own words to ascribe thoughtful, meaningful responses to the questions presented in this section. There are no wrong answers to these questions.

1) What do you value most about the landscape trees surrounding your personal residence? Why?

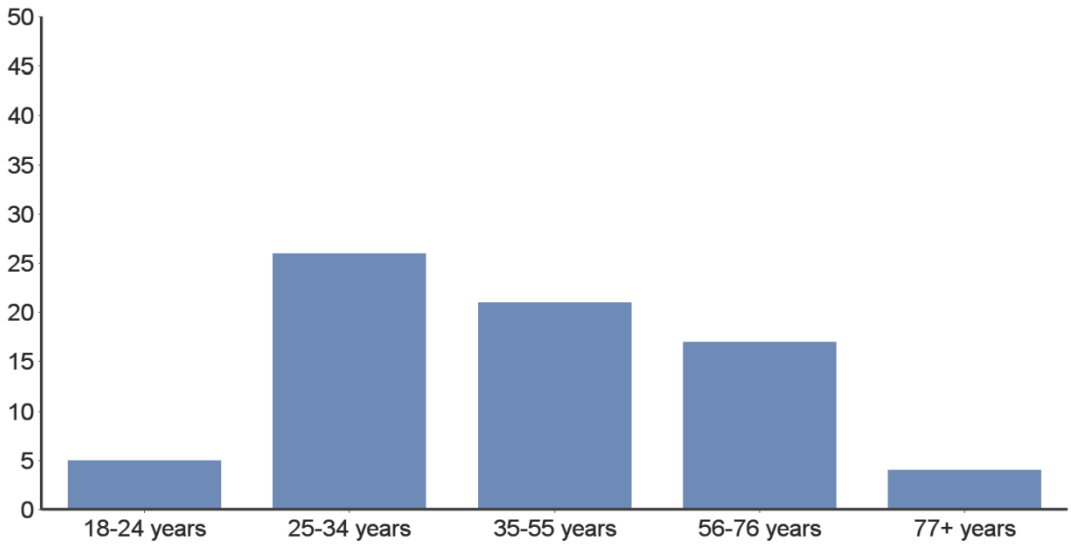
2) Do you have a favorite tree on your property? If so, how would you describe it?

3) Why is the tree your favorite? What do you like about it and what makes it special to you?

APPENDIX C:

QUALTRICS RESULTS REPORT

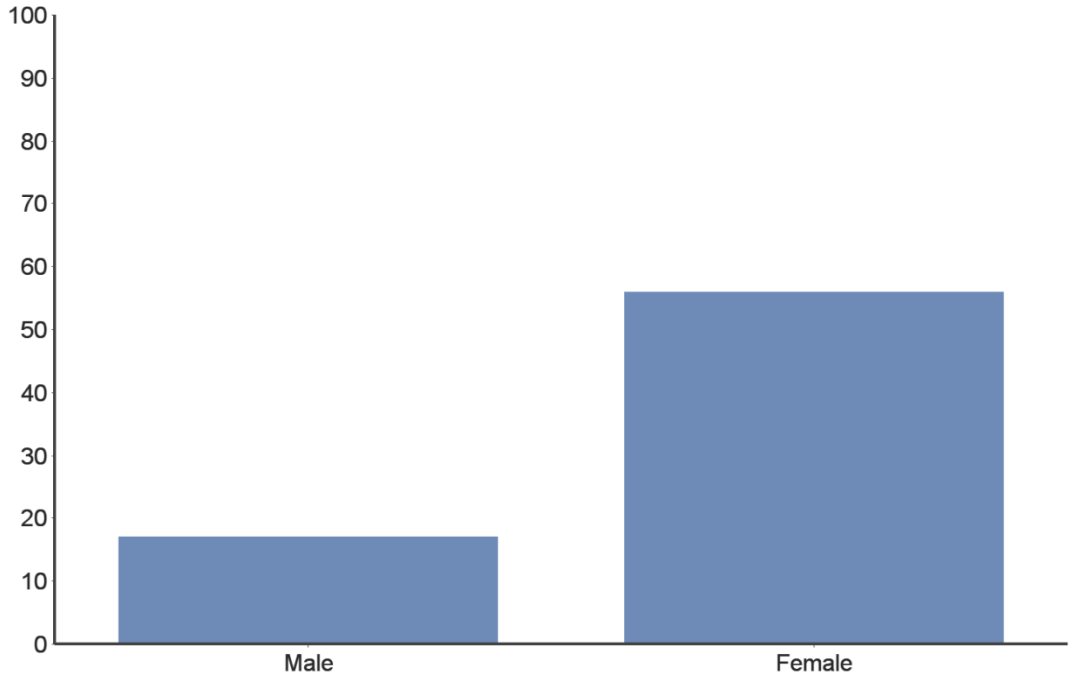
What is your age?



#	Answer	Bar	Response	%
1	18-24 years		5	6.85%
2	25-34 years		26	35.62%
3	35-55 years		21	28.77%
4	56-76 years		17	23.29%
5	77+ years		4	5.48%
	Total		73	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
1	5	2.85	1.07	1.04	73	73

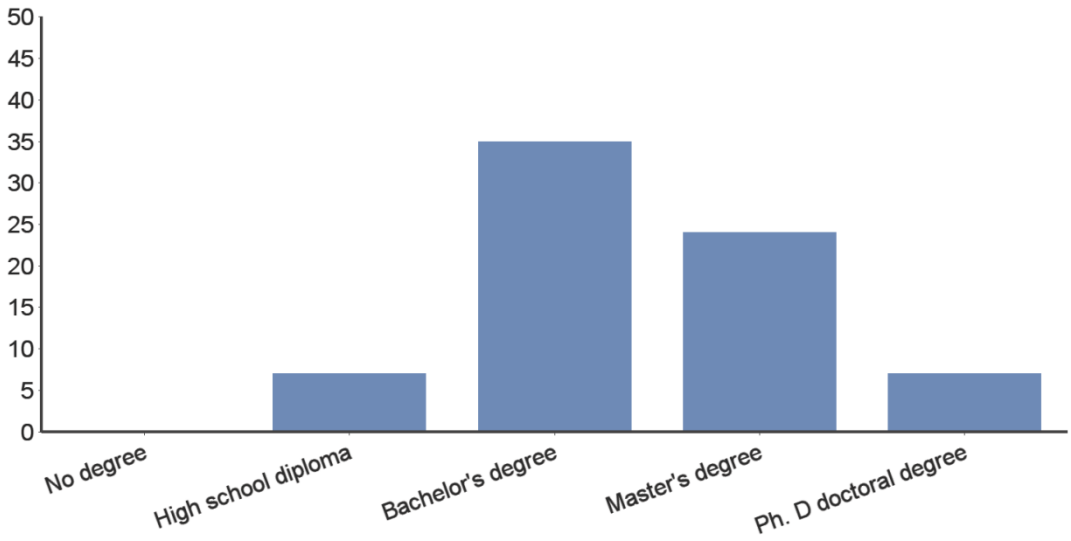
What is your gender?



#	Answer	Bar	Response	%
1	Male		17	23.29%
2	Female		56	76.71%
	Total		73	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
1	2	1.77	0.18	0.43	73	73

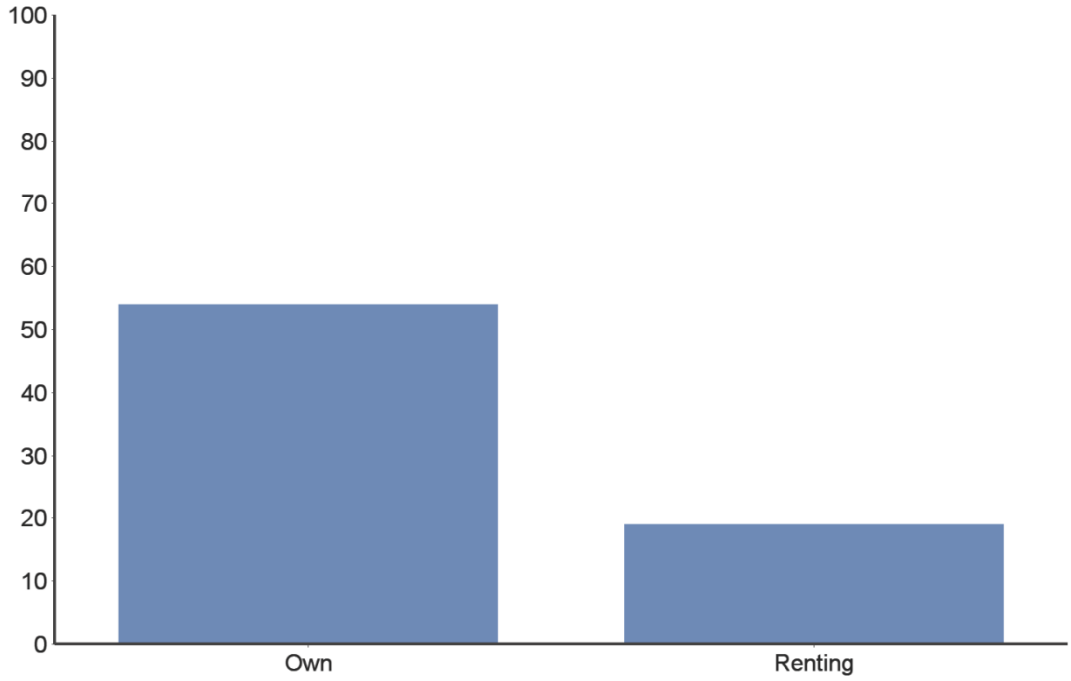
What is the highest degree of education you have completed?



#	Answer	Bar	Response	%
1	No degree		0	0.00%
2	High school diploma		7	9.59%
3	Bachelor's degree		35	47.95%
4	Master's degree		24	32.88%
5	Ph. D doctoral degree		7	9.59%
	Total		73	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
2	5	3.42	0.64	0.80	73	73

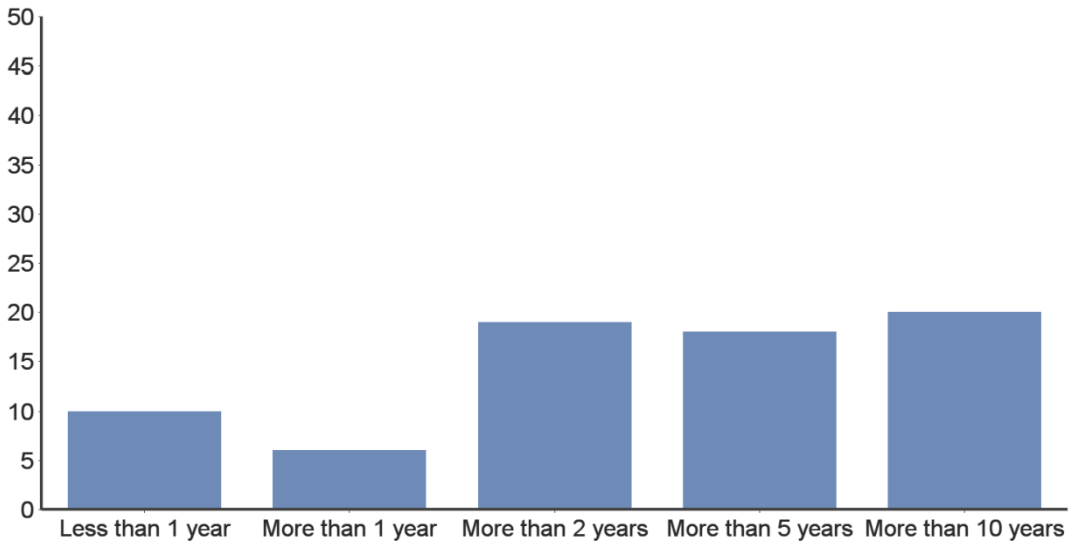
Do you own this home or are you renting?



#	Answer	Bar	Response	%
1	Own		54	73.97%
2	Renting		19	26.03%
	Total		73	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
1	2	1.26	0.20	0.44	73	73

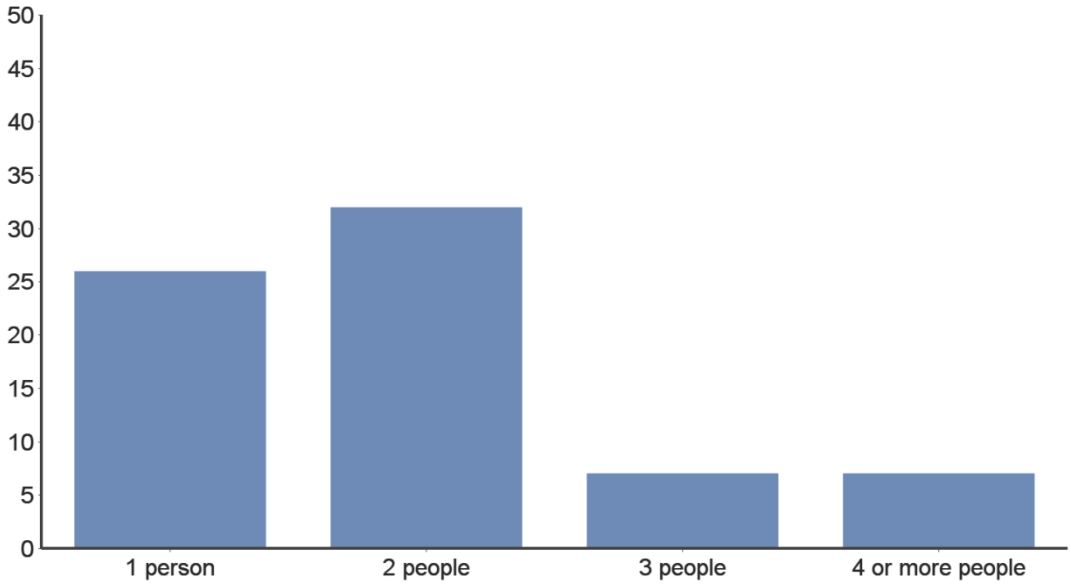
How long have you lived at this residence?



#	Answer	Bar	Response	%
1	Less than 1 year		10	13.70%
2	More than 1 year		6	8.22%
3	More than 2 years		19	26.03%
4	More than 5 years		18	24.66%
5	More than 10 years		20	27.40%
	Total		73	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
1	5	3.44	1.81	1.34	73	73

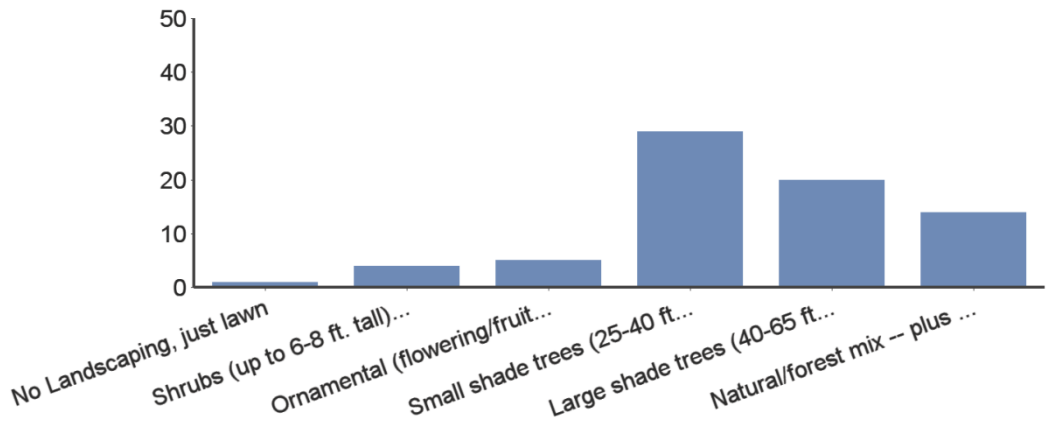
How many people currently reside in your household?



#	Answer	Bar	Response	%
1	1 person		26	36.11%
2	2 people		32	44.44%
3	3 people		7	9.72%
4	4 or more people		7	9.72%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
1	4	1.93	0.85	0.92	72	72

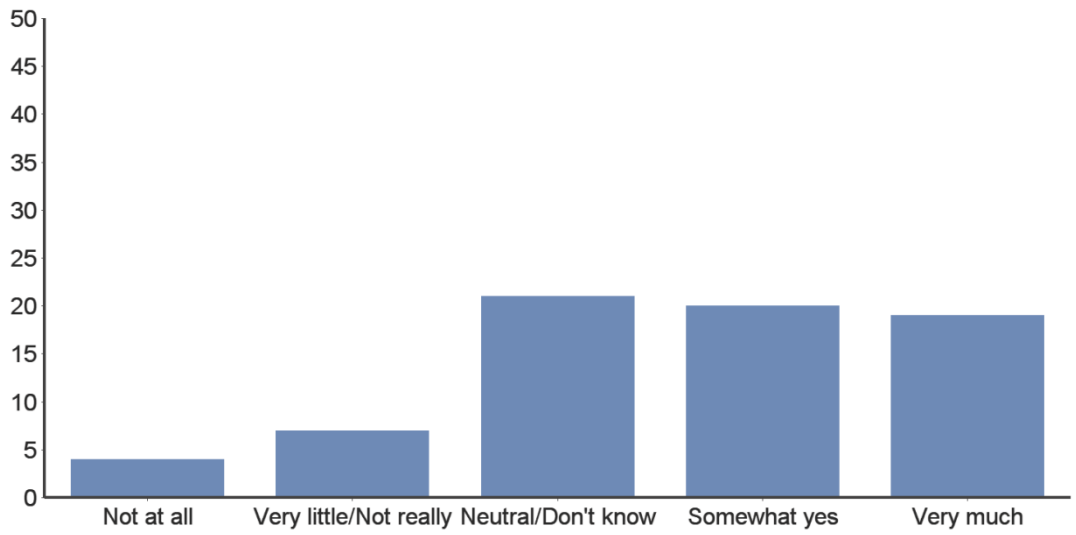
Based on these photographs, choose the category of landscape trees that best characterizes your residential landscape surroundings. (Choose only one)



#	Answer	Bar	Response	%
1	No Landscaping, just lawn		1	1.37%
2	Shrubs (up to 6-8 ft. tall) -- plus lawn		4	5.48%
3	Ornamental (flowering/fruiting) landscape trees (12-25 ft. tall) -- plus shrubs and lawn		5	6.85%
4	Small shade trees (25-40 ft. tall) -- plus ornamental flowering/fruiting trees, shrubs, and lawn		29	39.73%
5	Large shade trees (40-65 ft. tall) -- plus small shade trees, ornamental flowering/fruiting trees, shrubs, and lawn		20	27.40%
6	Natural/forest mix -- plus large shade trees, small shade trees, ornamental flowering/fruiting trees, shrubs, and lawn		14	19.18%
	Total		73	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
1	6	4.44	1.28	1.13	73	73

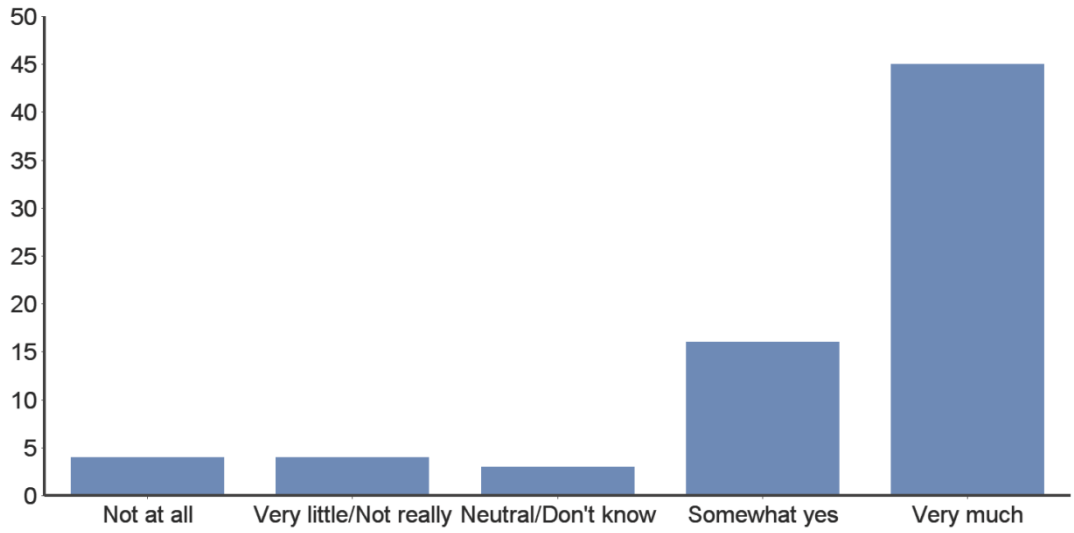
Do the trees on your property contribute to sustainable development within the context of your landscape?



#	Answer	Bar	Response	%
1	Not at all		4	5.63%
2	Very little/Not really		7	9.86%
3	Neutral/Don't know		21	29.58%
4	Somewhat yes		20	28.17%
5	Very much		19	26.76%
	Total		71	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	0.61	1.33	1.15	71	71

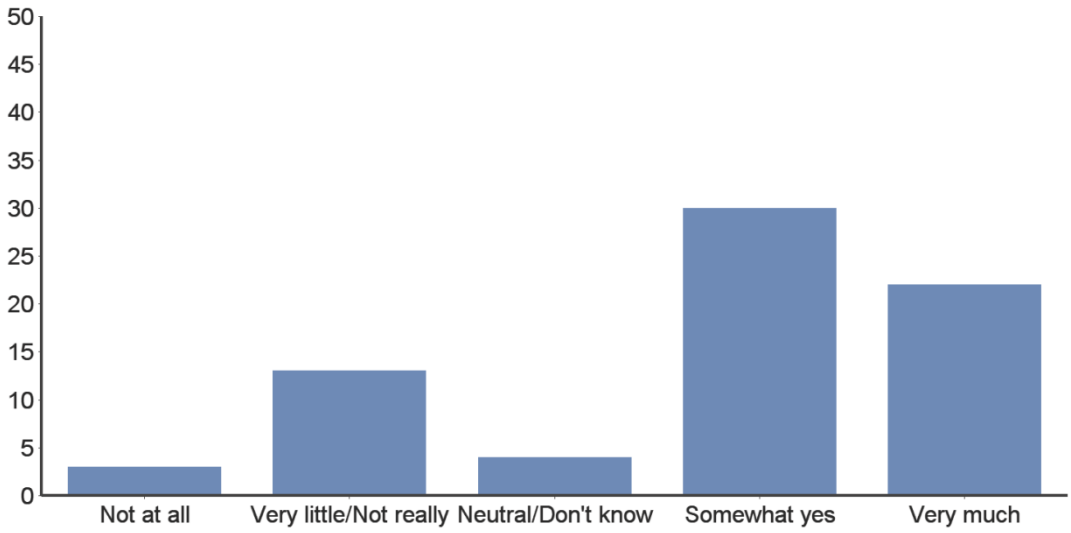
Do your trees have a natural "right" to be here?



#	Answer	Bar	Response	%
1	Not at all		4	5.56%
2	Very little/Not really		4	5.56%
3	Neutral/Don't know		3	4.17%
4	Somewhat yes		16	22.22%
5	Very much		45	62.50%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	1.31	1.31	1.15	72	72

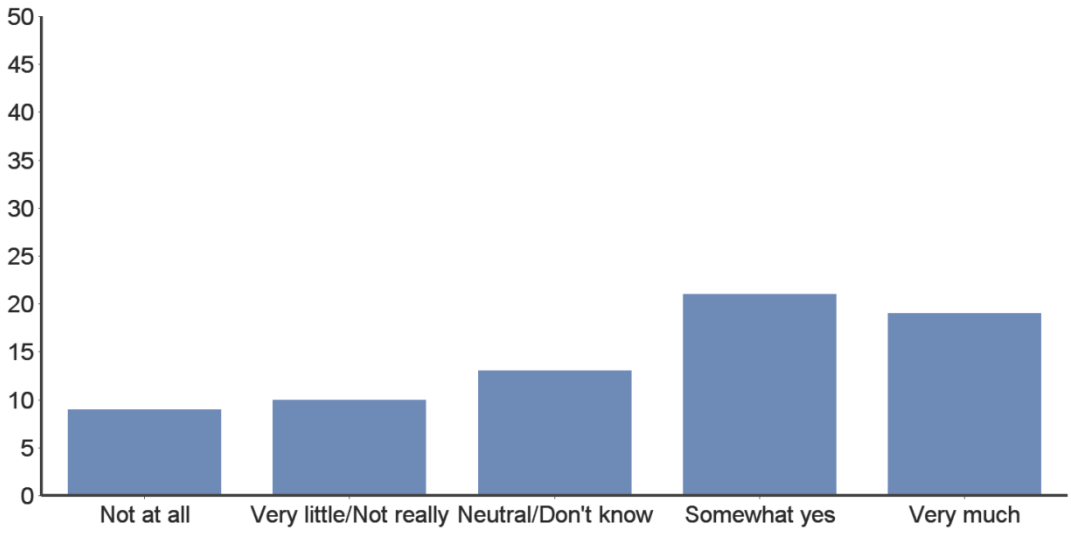
Do the trees on your property encourage you to be outside more?



#	Answer	Bar	Response	%
1	Not at all		3	4.17%
2	Very little/Not really		13	18.06%
3	Neutral/Don't know		4	5.56%
4	Somewhat yes		30	41.67%
5	Very much		22	30.56%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	0.76	1.42	1.19	72	72

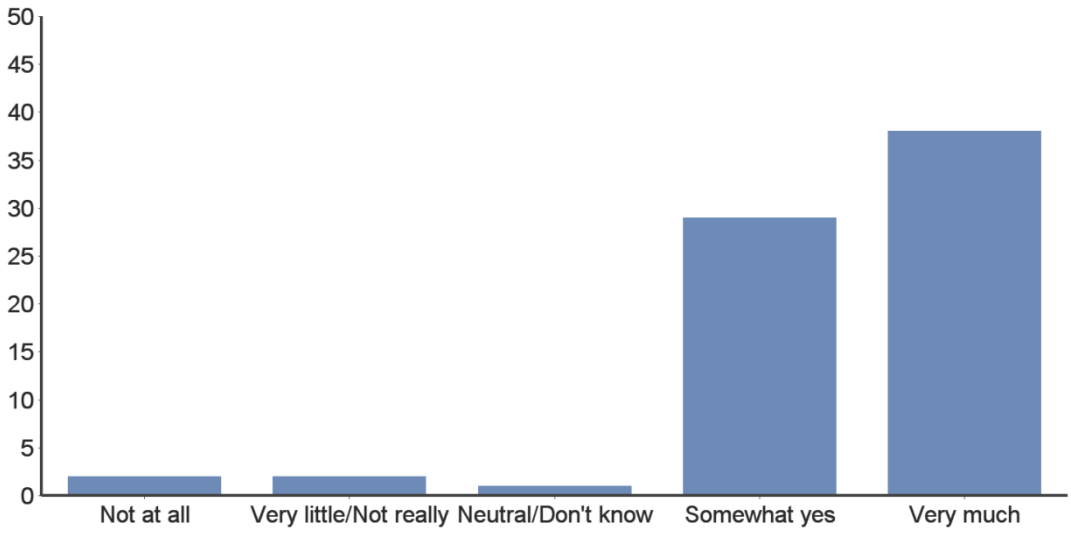
Do these trees provide inspiration for spiritual thought or experience?



#	Answer	Bar	Response	%
1	Not at all		9	12.50%
2	Very little/Not really		10	13.89%
3	Neutral/Don't know		13	18.06%
4	Somewhat yes		21	29.17%
5	Very much		19	26.39%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	0.43	1.83	1.35	72	72

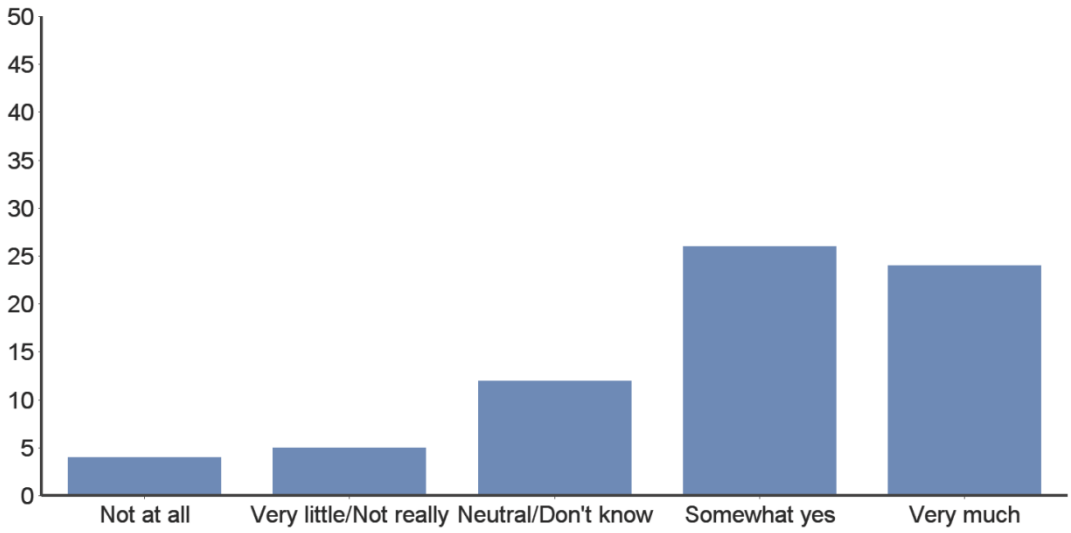
Do you find the trees on your property attractive?



#	Answer	Bar	Response	%
1	Not at all		2	2.78%
2	Very little/Not really		2	2.78%
3	Neutral/Don't know		1	1.39%
4	Somewhat yes		29	40.28%
5	Very much		38	52.78%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	1.38	0.77	0.88	72	72

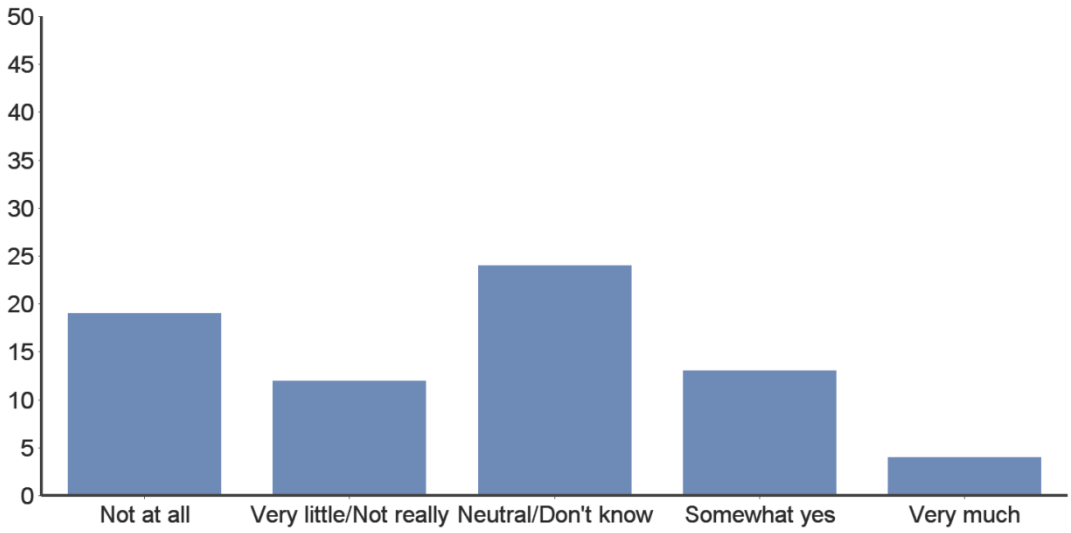
Are these trees critical to life-sustaining, ecological support systems within your landscape?



#	Answer	Bar	Response	%
1	Not at all		4	5.63%
2	Very little/Not really		5	7.04%
3	Neutral/Don't know		12	16.90%
4	Somewhat yes		26	36.62%
5	Very much		24	33.80%
	Total		71	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	0.86	1.29	1.14	71	71

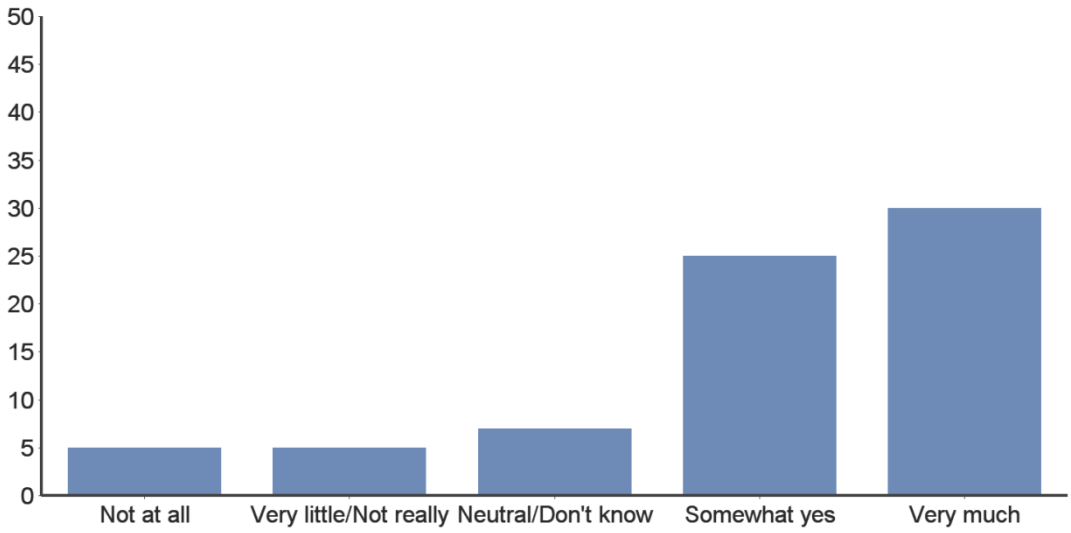
Do your trees hold any historical significance, personal or otherwise, to the landscape?



#	Answer	Bar	Response	%
1	Not at all		19	26.39%
2	Very little/Not really		12	16.67%
3	Neutral/Don't know		24	33.33%
4	Somewhat yes		13	18.06%
5	Very much		4	5.56%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	-0.40	1.48	1.22	72	72

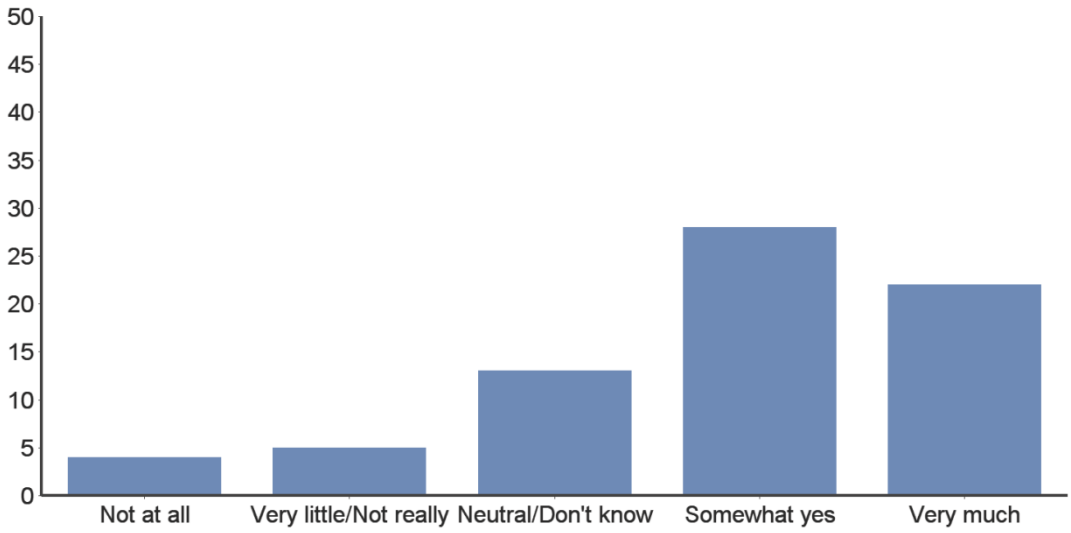
How important is it that future generations have access to these landscape trees?



#	Answer	Bar	Response	%
1	Not at all		5	6.94%
2	Very little/Not really		5	6.94%
3	Neutral/Don't know		7	9.72%
4	Somewhat yes		25	34.72%
5	Very much		30	41.67%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	0.97	1.44	1.20	72	72

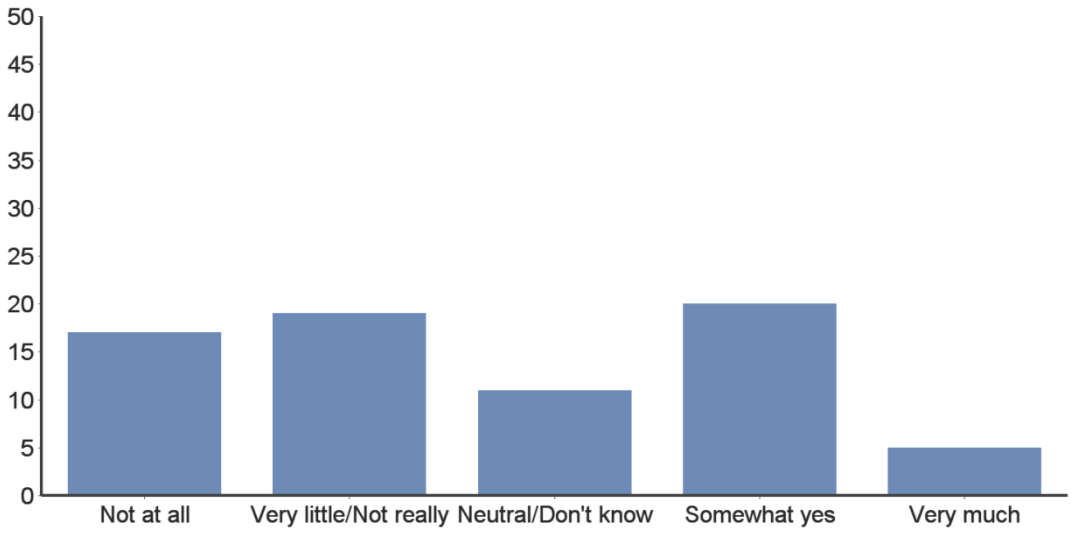
Do you think there is an economic benefit that can be derived from the trees on your property?



#	Answer	Bar	Response	%
1	Not at all		4	5.56%
2	Very little/Not really		5	6.94%
3	Neutral/Don't know		13	18.06%
4	Somewhat yes		28	38.89%
5	Very much		22	30.56%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	0.82	1.25	1.12	72	72

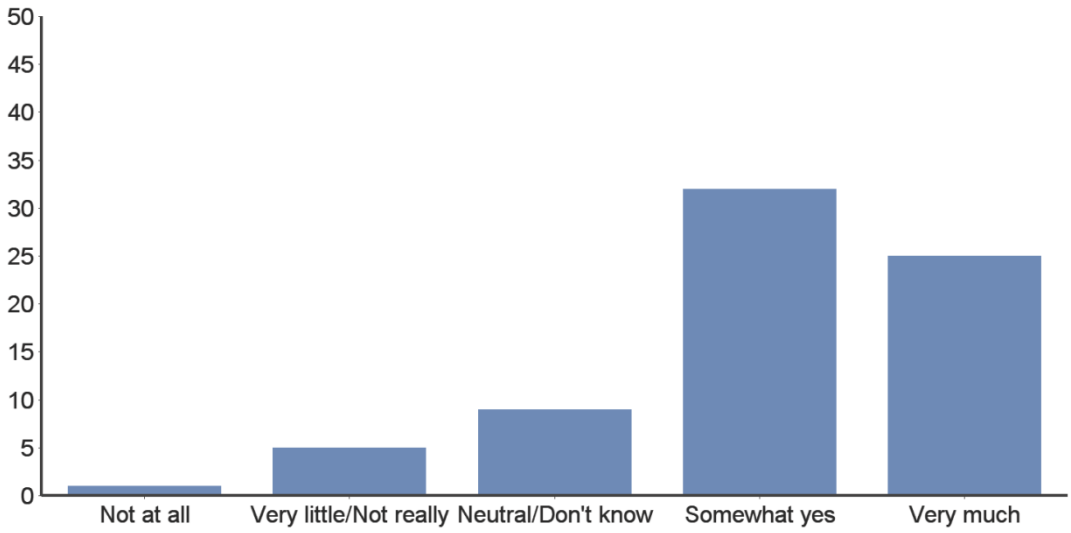
Do the trees on your property provide employment opportunities for people?



#	Answer	Bar	Response	%
1	Not at all		17	23.61%
2	Very little/Not really		19	26.39%
3	Neutral/Don't know		11	15.28%
4	Somewhat yes		20	27.78%
5	Very much		5	6.94%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	-0.32	1.69	1.30	72	72

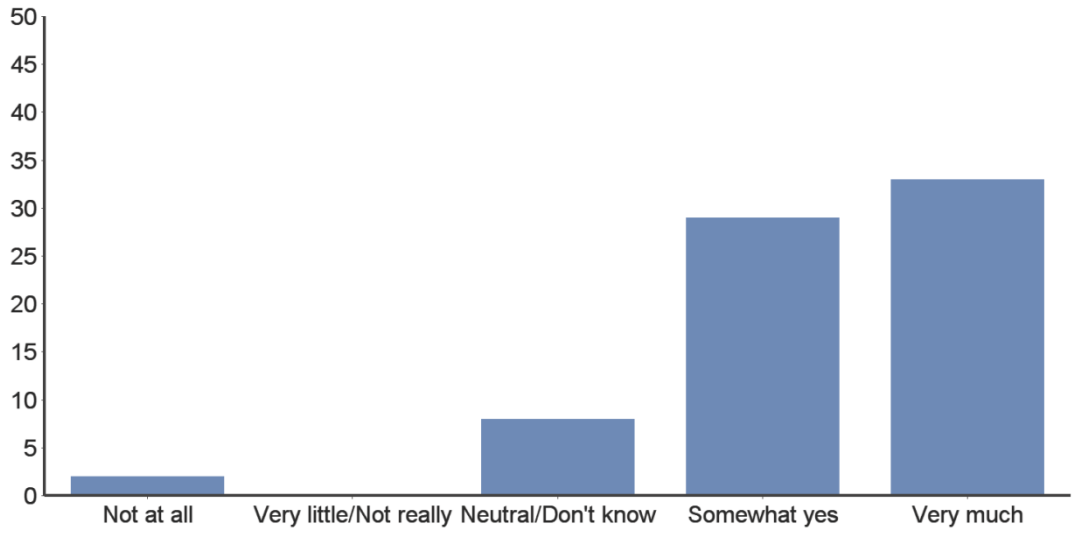
Do these trees contribute to a greater biological richness or species diversity to the site?



#	Answer	Bar	Response	%
1	Not at all		1	1.39%
2	Very little/Not really		5	6.94%
3	Neutral/Don't know		9	12.50%
4	Somewhat yes		32	44.44%
5	Very much		25	34.72%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	1.04	0.89	0.94	72	72

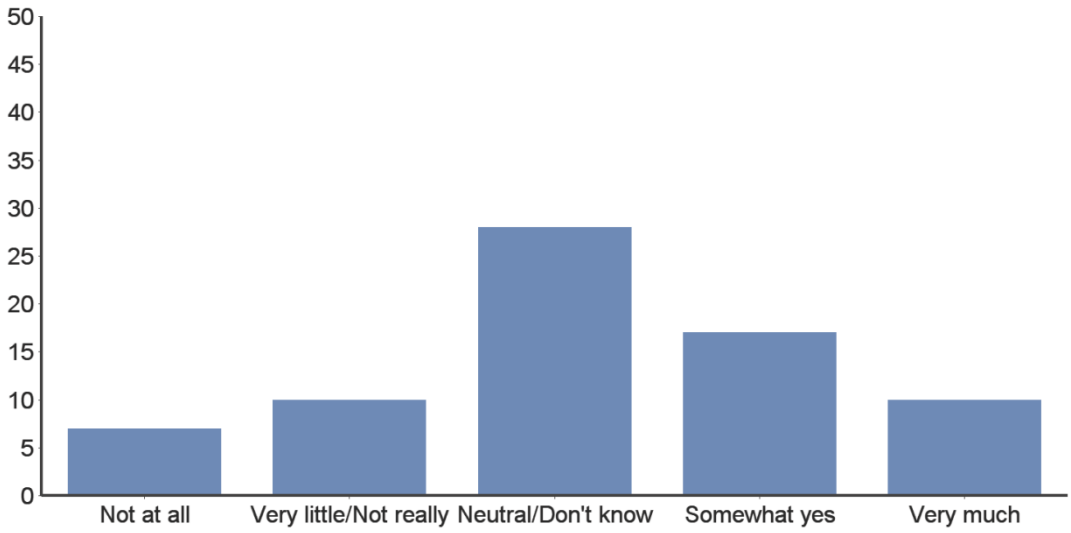
Are these trees characteristic or typical of the local or regional "place" of the landscape?



#	Answer	Bar	Response	%
1	Not at all		2	2.78%
2	Very little/Not really		0	0.00%
3	Neutral/Don't know		8	11.11%
4	Somewhat yes		29	40.28%
5	Very much		33	45.83%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	1.26	0.76	0.87	72	72

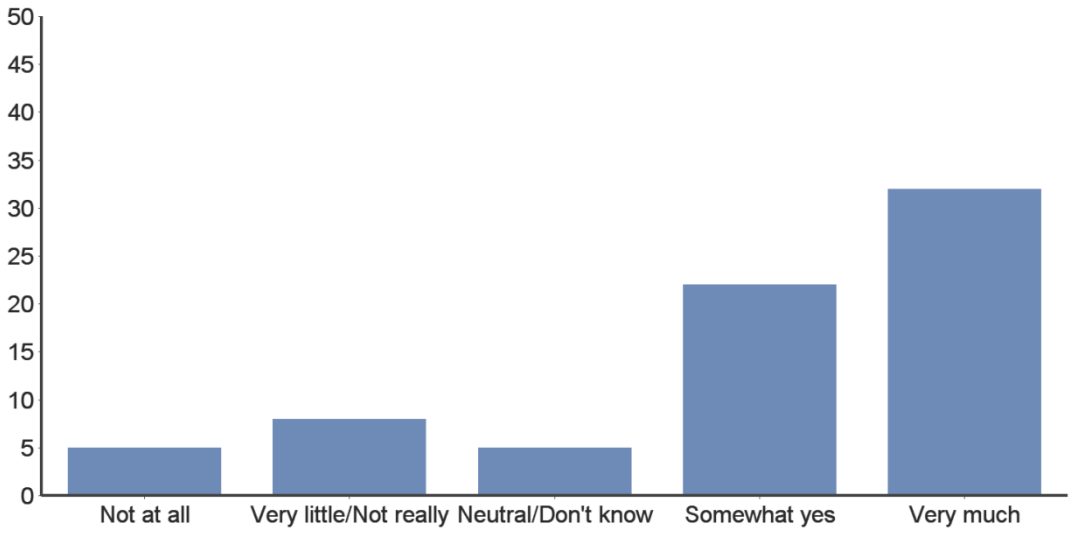
Are there natural healing or restorative effects that can be attributed to your trees?



#	Answer	Bar	Response	%
1	Not at all		7	9.72%
2	Very little/Not really		10	13.89%
3	Neutral/Don't know		28	38.89%
4	Somewhat yes		17	23.61%
5	Very much		10	13.89%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	0.18	1.30	1.14	72	72

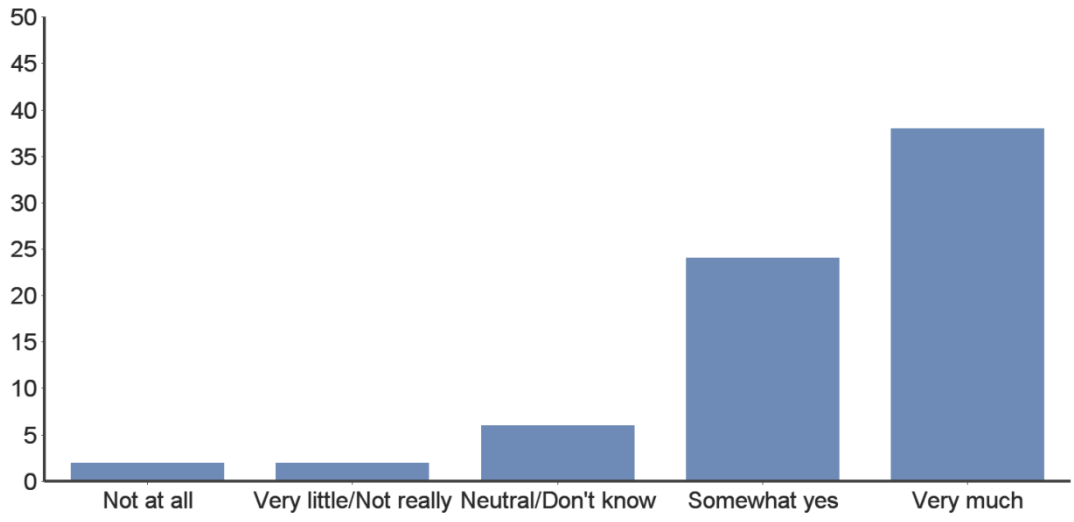
Are your trees important as part of the natural wilderness?



#	Answer	Bar	Response	%
1	Not at all		5	6.94%
2	Very little/Not really		8	11.11%
3	Neutral/Don't know		5	6.94%
4	Somewhat yes		22	30.56%
5	Very much		32	44.44%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	0.94	1.60	1.27	72	72

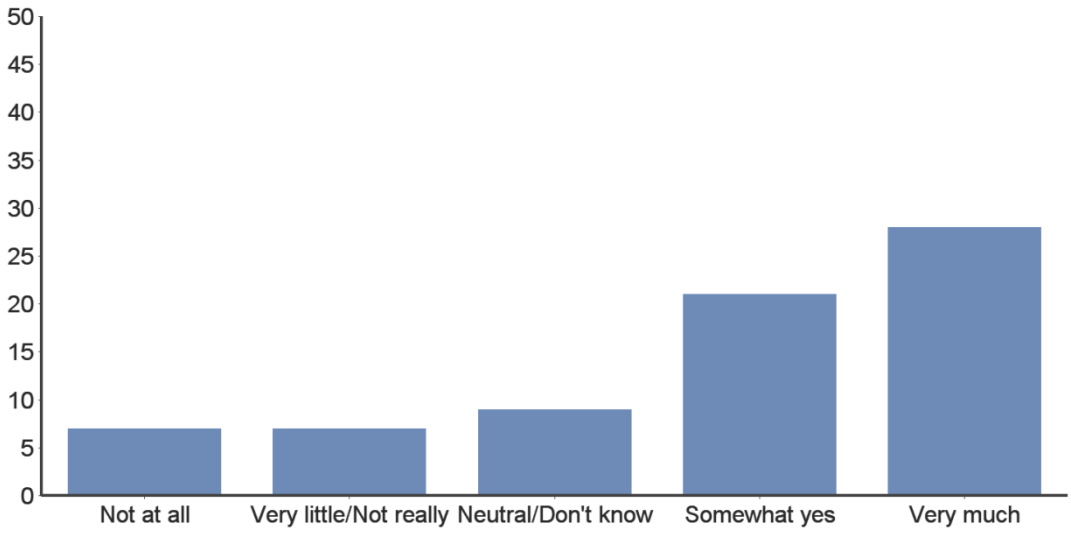
Even if these trees served no human, biological, or ecological purpose, would they still be important, "Just because?"



#	Answer	Bar	Response	%
1	Not at all		2	2.78%
2	Very little/Not really		2	2.78%
3	Neutral/Don't know		6	8.33%
4	Somewhat yes		24	33.33%
5	Very much		38	52.78%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	1.31	0.89	0.94	72	72

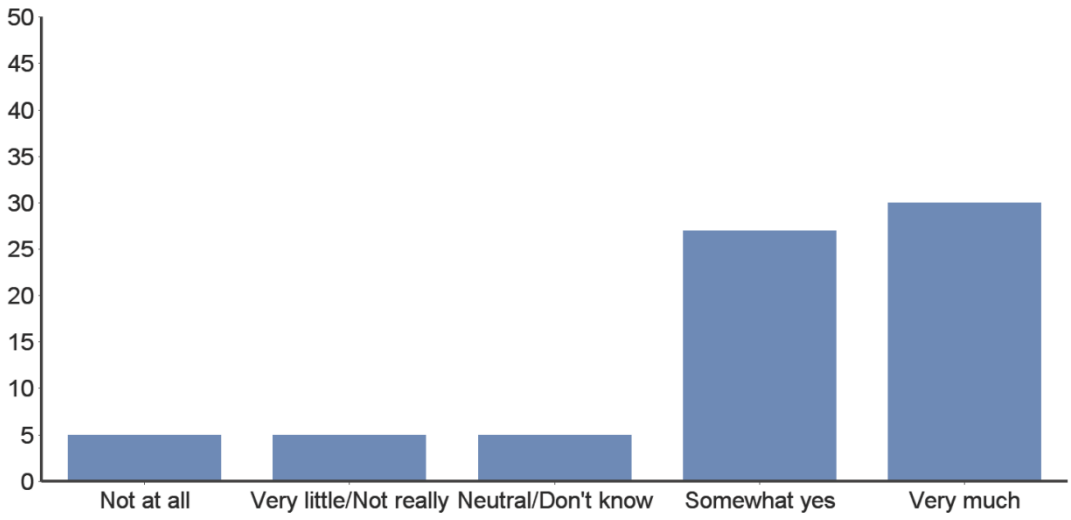
Do these trees make you feel more connected as a species, to the entire biotic community as a whole?



#	Answer	Bar	Response	%
1	Not at all		7	9.72%
2	Very little/Not really		7	9.72%
3	Neutral/Don't know		9	12.50%
4	Somewhat yes		21	29.17%
5	Very much		28	38.89%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	0.78	1.75	1.32	72	72

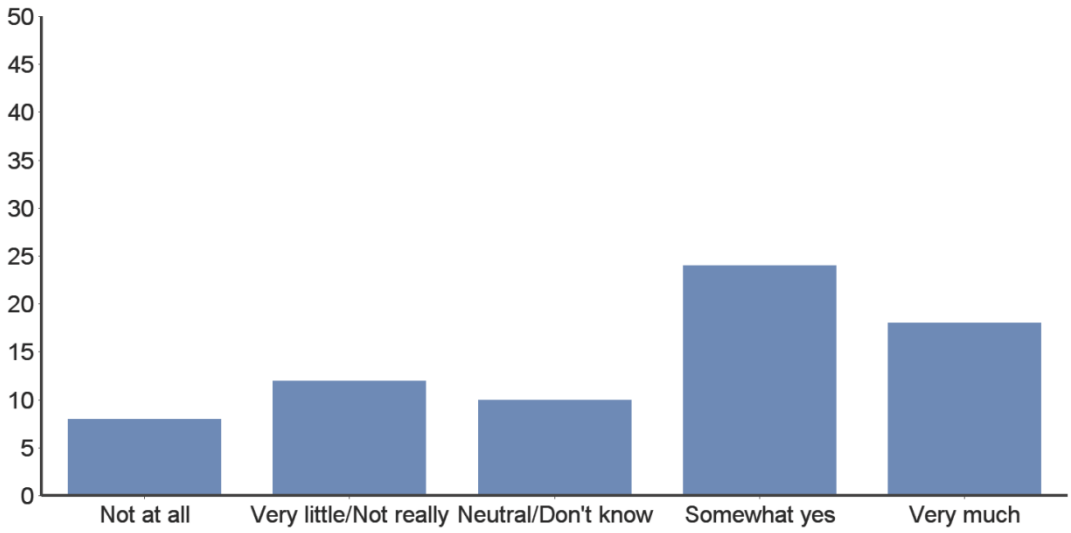
Do the trees on your property make you appreciate the greater complexity of the biological/ecological systems around you?



#	Answer	Bar	Response	%
1	Not at all		5	6.94%
2	Very little/Not really		5	6.94%
3	Neutral/Don't know		5	6.94%
4	Somewhat yes		27	37.50%
5	Very much		30	41.67%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	1.00	1.41	1.19	72	72

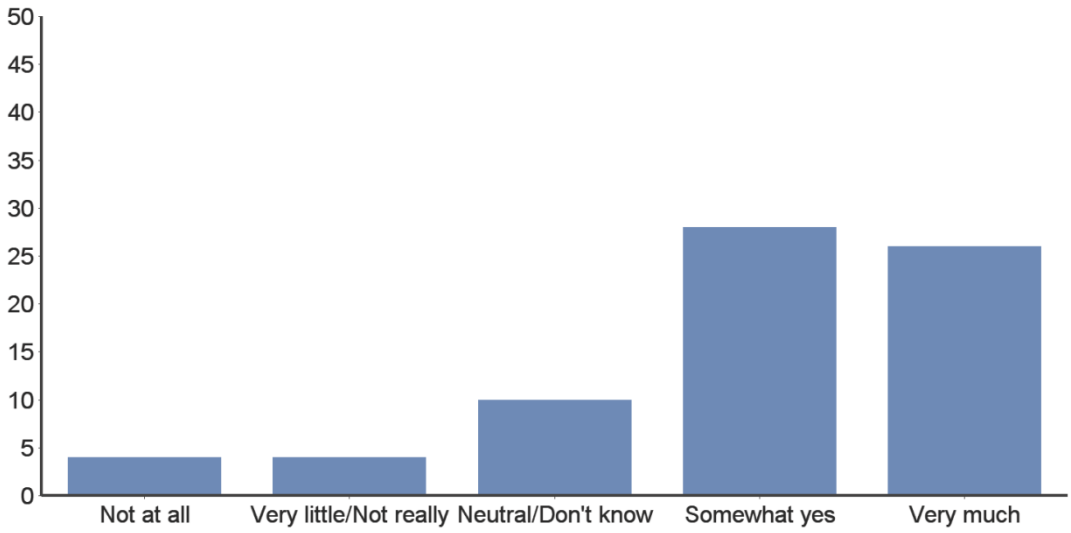
Do you derive intellectual or creative inspiration from the trees in your landscape?



#	Answer	Bar	Response	%
1	Not at all		8	11.11%
2	Very little/Not really		12	16.67%
3	Neutral/Don't know		10	13.89%
4	Somewhat yes		24	33.33%
5	Very much		18	25.00%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	0.44	1.77	1.33	72	72

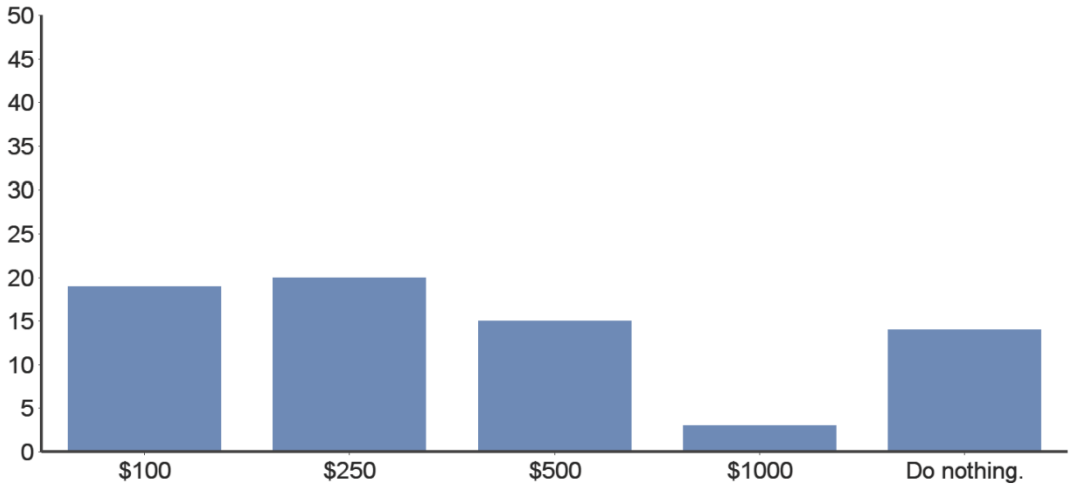
Are these trees representative of the ability of nature to recover in the face of human development?



#	Answer	Bar	Response	%
1	Not at all		4	5.56%
2	Very little/Not really		4	5.56%
3	Neutral/Don't know		10	13.89%
4	Somewhat yes		28	38.89%
5	Very much		26	36.11%
	Total		72	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
-2	2	0.94	1.24	1.11	72	72

In a hypothetical scenario, a certified arborist comes to your house because (s)he has noticed your favorite landscape tree is showing symptoms of disease. At this stage, she says *if your tree does not receive expensive treatment soon, it will decline and die.* From the list of price options, please choose the largest amount you would be willing to spend to save your favorite tree:



#	Answer	Bar	Response	%
1	$100		19	26.76%
2	$250		20	28.17%
3	$500		15	21.13%
4	$1000		3	4.23%
5	Do nothing.		14	19.72%
	Total		71	100.00%

Min Value	Max Value	Average Value	Variance	Standard Deviation	Total Responses	Total Respondents
1	5	2.62	2.07	1.44	71	71

What do you value most about the landscape trees surrounding your personal residence? Why?

Text Entry
Birds and squirrels.
I appreciate the shade, I enjoy the color of the foliage, I like that they provide residence for squirrels and birds, and I like that they balance my yard aesthetically.
They were here first and I feel it important to keep them in a natural environment.
Trees are essential to the present and future life of the planet Earth. They produce oxygen for all of God's creation and help sustain water and nutrients in the Earth. They provide protection and a nesting place for the diverse birds of our planet and other creatures that climb and seek nuts and berries. I personally enjoy standing and/or sitting in the yard to be one with nature.
I appreciate most the different species living around my house because of the trees and shrubs. It's SO nice to sit outside and work on schoolwork in a shaded area with all these birds flying around.
The way they set off various parts of the house itself, deck and mailbox. As; behind the mailbox (facing the house) is a beautiful white AZALEA to the right and pink CRAPE MYRTLE to the left. The concrete drive has three CRAPE MYRTLE tree row - white, pink, and red. They overhang the driveway enough to park 2 cars side by side and be fully shaded from now on. Across the hose front (right side) an arc of 8 ft.(+) holly bushes and one tree 10 ft.(+) cover that side for about 20 ft. giving shade/"privacy" fence. (Whoops!) Back deck has a tree shading a portion of it - always gets a bird nest in it each year.
They provide shelter and nesting places to birds and other wildlife. It's very important to us that our backyard offers all our outdoor critters a place they can hang out and find safety, food, water, etc.
They shade the house and yard, helping control my energy bills. Also, they keep the squirrels fed.
The shade and privacy are very important. Since my "land" (1/5 of an acre) has a busy street on one side I think the trees and bushes provide some noise and pollution abatement.
I like that they provide shade and privacy to an extent. I also like that the pine trees on my property drop cones, which I can then use for other purposes. I also value that they provide oxygen and a more natural setting on my property.
View More

Statistic	Value
Respondents	70

Do you have a favorite tree on your property? If so, how would you describe it?

Text Entry
Yes, 45 foot tall elm
Yes, a maple my wife and I planted just a few months after we purchased the house. All other trees predate us... so the maple is a favorite for nostalgia.
Yes, it is a magnolia and provides shade to my backyard in the mornings.
My favorite tree are the Mimosa trees that grow in the space right behind my backyard. The trees are in bloom for only a month or so and have the most delicate and fragile blooms of a pale pink. The blooms look like miniature fans and decorate the landscape with a distinct personality of their own.
There is one tree I love. It's partially my neighbor's and partially ours because it straddles both properties. I love how tall and big it is, but what I love most about it is its trunk is covered in ivy. It has all these crazy, curvy branches extending off it, which makes it look kind of cool.
My favorite (cluster in this case) are the 3, about 20 ft. tall crape myrtles. They form continuous, very blended "fence" that gives privacy from the next door house, LOTS of shade for 2 parked cars (see #1) all through the summer, and, when they blossom they come in a sequence, front to rear or white first, then pink one, and finally the red, over a period of weeks. Really neat!
No (we've only lived there for 2 months and our old place had no trees, so honestly I'm just thrilled to have any trees!)
All my trees are special.
I cannot say I have a favorite tree. I like the fact that they are all different - sizes or species. It is interesting to know their names and keep track of their flowering and fruiting and leaf-falling times.
I do not have a favorite tree on my property. There are two sweet gums, two pines, and a Chinese tallow tree, all of which produce significant droppings and not that attractive to me.
View More

Statistic	Value
Respondents	70

Why is the tree your favorite? What do you like about it and what makes it special to you?

Text Entry
It blocks the light from the street light!
see above
It has giant climbing branches and is simply beautiful.
I love the pervasive perfume of the blooms of the mimosa. It is a species of tree that grows in Georgia. The tree itself is very willowy and grows high above the natural landscape. The blooms and leaves are delicate yet the root is very strong and very very deep. The mimosa tree is very special to me because it allows me to be over thankful of the diversity and beauty that God has created. It also reminds me that all mankind is fragile and each person has a unique strength and beauty that must also be nourished and appreciated.
I like its shape, but I also like watching the squirrels jump from branch to branch. I do a lot of schoolwork sitting outside and it's just relaxing to watch.
I'm the kind of person who will seek out a shady spot when parking while shopping if I have to walk a couple of hundred yards to a store, etc. I want to come back to a COOL car, not an "oven". This cluster of 3 BIG, colorful trees branches over my drive in a 1/2 arch (sketch included) live shade that enables 2 vehicles to be parked and rest out of the summer sun starting about 11:30-noon, for the rest of the day! Cool cars.
See above.
N/A
The fig tree is bare in the winter then it greens up with the spring. Fall comes and the leaves fall off. It is a seasonal indicator.
I grew up with 5 of these variety. Japanese maple is new for me - bought it at charity 6-7 years ago. Rain has helped it along. I also like wildflowers - have Queen Anne Lace in the spring (May). I have little time to spend in my yard, one day maybe. It's a great joy.
View More

Statistic	Value
Respondents	66