

**The Use of Outdoor Teaching Resources by Multidisciplinary University
Faculty and Instructors at the University of Tennessee: A Model for
Establishing and Maintaining the Campus Landscape as a Significant and
Dynamic Outdoor Classroom, Laboratory, and Therapy Center**

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Abstract

Research has shown that plants and the landscapes around us impact our lives. Plants have been shown to reduce anxiety and blood pressure, and to have mentally restorative and psychological benefits. These benefits can include but are not limited to improving our ability to cope with stress and improving our ability to focus and concentrate. During the formative years of higher education, the physical grounds of our campuses have the potential to provide these restorative benefits. Understanding how these landscapes are maintained can provide useful information for their improvement. In regards to campus grounds maintenance, select peer institutions of the University of Tennessee are similar in their employment structure and tend to hire low-wage and low-skill workers to provide the day-to-day upkeep of campus grounds. This can impact the overall quality of these iconic landscapes. A multi-stage training program is proposed to elevate the skill level of these workers. These campus landscapes also have the opportunity to passively and actively educate students. Unfortunately, beyond the natural sciences, little effort has been given to outdoor teaching resources that could potentially be used by all academic disciplines. Thirteen individual outdoor teaching resources were identified as needed by those with teaching responsibilities on the University of Tennessee campus. This research suggests a model of how a university can establish and maintain its campus grounds as a significant and dynamic outdoor classroom and laboratory for an array of academic disciplines, coupled with improving the overall quality of the campus aesthetic.

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List of Abbreviations

APGA	American Public Gardens Association (Organization)
APPA	APPA: Leadership in Educational Facilities (Organization)
GPA	Grade Point Average
NA	Not Available
ODTR	Outdoor Teaching Resource
PI	Primary Investigator
PLSC	The Department of Plant Sciences, University of Tennessee
QEP	Quality Enhancement Plan
SPSS	Statistical Package for the Social Sciences
UT	The University of Tennessee, Knoxville

Chapter 1

Introduction to the Study

The physical grounds and landscape of university campuses are both the seat and symbol of higher education. The United States has over 5,700 higher education institutions (post high school, degree granting). At any given time, roughly 5.7% of the population of the United States is enrolled at an institution of higher education. This translates to over 20 million students on college campuses every year (“National,” n.d., Response section, para. 1). Even with an increase in the popularity of online education, the actual physical environment of a higher education campus remains important. Much is known about the impact of plants on people. However, little attention has been paid to the university landscape and how it can support and enhance its teaching and learning community. This information will increase the role and value of the university’s landscape in the education of its students. Additionally, recruitment efforts could be positively impacted by high quality landscapes composed of well-planned teaching resources.

Purpose/Focus of Study

The purpose of this study was to develop a model and recommendations for the University of Tennessee (UT) as well as other institutions of higher education that wish to broaden their teaching resources to include features on their campus grounds, and improve the overall quality of their managed landscapes. The UT was used for this study and to formulate the model. This study brings forward the idea of using outdoor spaces on campus for learning. This can be referred to as a teaching landscape. A teaching landscape embraces the idea that campus buildings should not be a design statement completely unto themselves but one, which in time, extends as needed into natural or created outdoor spaces. The teaching landscape can have an influential role in shaping and establishing a sense of place as well as extending the physical indoor boundaries of the classroom to outdoors. A teaching landscape is a place where discovery of the plants and the landscape

system can occur under the guidance of a teacher. Additionally, a teaching landscape has the potential to both actively and passively educate campus students, faculty, and visitors. A teaching landscape can also easily be referred to as an informal learning space. The transition from traditional classrooms to informal learning spaces is currently a major topic of research in education. These types of experiences allow educators to put into practice and demonstrate what is taught in the classroom. This study was conducted in three parts:

- (1) An examination of peer-institutions to set a baseline for the current care of campus landscapes. This included questions of administrative structure and job duties of those who take care of campus grounds.
- (2) A census of University of Tennessee teaching faculty and instructors was conducted asking about outdoor teaching resources on campus. This included inquiry into outdoor teaching resources utilized.
- (3) The development of a model for the creation and use of teaching resources specifically on the University of Tennessee campus informed by both the examination of peer-institutions and faculty census (items 1 and 2 above). This includes training suggestions for those who work on campus grounds and recommendations from faculty on their needs for outdoor teaching resources.

This study contributes to the current research literature in public horticulture, landscape design and architecture, and educational administration. A better understanding of how teaching environments can extend beyond classroom walls to the campus grounds impacts the scope of educational resources and opportunities a university has, and benefits the higher education community.

Hypotheses:

1. Campus landscapes are utilitarian and are not considered multifunctional spaces or part of the learning environment.

2. Peer institutions of the University of Tennessee face similar roadblocks to the creation and utilization of outdoor teaching landscapes. These include reliance on workers who have not been formally trained in horticulture to be the main caregivers of the university landscape.
3. If additional outdoor teaching resources were available on the University of Tennessee campus, those with teaching responsibilities will respond that they envision themselves utilizing such resources.

The first hypothesis states that campus landscapes are viewed as primarily utilitarian and not part of the learning environment. This would mean that outdoor spaces are not being fully utilized as multifunctional spaces. For example, courtyards, pedestrian walkways, green spaces, and other outdoor areas have not been designed in a way to also facilitate student learning or support faculty teaching. The second hypothesis brings forth the idea that peer institutions of the University of Tennessee (UT) will face similar roadblocks to the creation of teaching landscapes. It is also assumed that, much like UT, those who handle the day-to-day grounds maintenance do not have education or formal training in horticulture or plant sciences.

The third hypothesis anticipates that faculty with teaching responsibilities will be positive about adding additional outdoor teaching resources to campus, and that they see themselves using such resources. Recent literature supports the idea of transitioning from traditional indoor classrooms to informal indoor learning spaces; outdoors learning spaces are not fully addressed in the literature.

Study Objectives:

1. Analyze the organizational structures that govern the resources used to maintain the campus landscapes/grounds of peer institutions compared to the University of Tennessee.

2. Ascertain the requirements for landscape maintenance jobs on the campuses of peer institutions compared to the University of Tennessee.
3. Determine the desired outdoor teaching resources both natural and created for the instructional staff of the University of Tennessee.
4. Determine if there is a desire for future development of specific outdoor teaching resources.
5. Develop a model of how the University of Tennessee campus grounds can be managed, maintained, and improved for maximum teaching, learning, and aesthetics.
6. Explore how horticultural student internships on the grounds of the University of Tennessee can be utilized towards improving campus grounds.

Theoretical Rationale

Learning theory regarding the importance of providing unique and innovated spaces for education is growing. Additionally, a *“trend toward active and collaborative learning... based on learning theory and research”* is expanding (Oblinger, 2005, pg. 2). A greater understanding of the current generation of learners is helping to formulate ideas about outdoor learning spaces.

“At the turn of the century, basic literacy skills included reading, writing and calculation. Knowing was being able to remember and repeat. Today, knowing includes critical thought, persuasive expression, and the solution of complex problems. It also means utilizing a well-organized set of facts to find new information and use it to solve novel problems.” (Oblinger, 2005, pg. 15)

Much of the current research on learning indicates, *“competence is developed in active, exploratory, and social settings* (Oblinger, 2005, pg. 2).” While research in the above areas is growing quickly, slow to develop has been a connection between active and social learning and outdoor spaces. Additionally, a growing area of

research has been in teaching children about the natural sciences outdoors. This is often called outdoor education but does not incorporate other disciplines or the use of older participants.

Research in the areas of public horticulture and people-plant interactions is growing. Much of the research literature in these disciplines has been constructed in the last 25 years. Graduate programs and researchers at the University of Tennessee, the University of Delaware and Cornell University are leaders in this research. The research in public horticulture provides a framework of how plants benefit humans both physiologically and psychologically (Ulrich and Parsons 1990).

The lack of connection between research in learning theory, public horticulture, and the use of university campus grounds, provided a baseline of information and research needs. In this study, information was gathered on how campus grounds are maintained, faculty teaching needs were established, and recommendations are offered based on what was learned. This study connects the research in these different disciplines and helps fill the gaps of how such information can advance the use of the university campus grounds in teaching and learning.

Chapter 2

Literature Review

Influence of Plants and Green Space on People

Approximately 82% of the United States population lives in areas classified by the United States Census Bureau as either urban or urban clusters ("Fact Book," n.d., People and Society section, sub. heading urbanization). Research shows green vegetation including trees, shrubs and flowers make urbanized areas better (Grahm and Stigsdotter, 2003). In reality, many of these areas are void of vegetation. Societies such as the ancient Egyptians or Persian settlements in Mesopotamia all reveal evidence of populations with high level of interest in plants in urban environments (Shepard, 1967). During the rapid expansion of the United States in the 1860's and 1870's, landscape designers and naturalists like Frederick Law Olmsted were exploring their own intuitive ideas of the positive influence of plants on people. In his writings Olmsted (1865) remarked: "*The enjoyment of scenery employs the mind without fatigue and yet exercises it; tranquilizes it and yet enlivens it.*" (Rybczynski, 1999, p. 258)" It was this kind of thinking that spurred the creation of many of our parks that we enjoy today. Nearly 150 years after Olmsted's work, the body of research surrounding the influence of plants on people has grown substantially. Contributors from both the social and natural sciences have weighed in and advanced many theoretical perspectives on how and why individuals derived enhanced well-being from plants. Many of these ideas and perspectives have differences, however, they do agree that passive experiences with environments having vegetation or other nature should cultivate positive effects on psychological and physiological well-being (Ulrich and Parsons 1990).

Areas within this expanding body of knowledge include evidence based and experimental research on the association between the presence of plants, green space, health and wellbeing (Dadvand, *et al.*, 2012; Donovan, *et al.*, 2011; Frumkin, 2011; Tzoulas, *et al.*, 2007). Epidemiological studies done on a variety of levels from national to localized case studies have all added to the overall body of research (de

Vries *et al.*, 2003; Maas *et al.*, 2006; Mitchell and Popham, 2007, 2008; van den Berg *et al.*, 2010; Grahn *et al.*, 2010; Hartig *et al.*, 2003; Hartig *et al.*, 1991; Park *et al.*, 2007; Park *et al.*, 2010; van den Berg and Custers, 2011; van den Berg *et al.*, 2003). Taking all of this research as a whole, there is indication of a positive association between access to natural or green environments and an individuals perceived quality of their overall general health, (de Vries, *et al.*, 2003; Maas, *et al.*, 2006), longevity (Takano *et al.*, 2002), mental health (Grahn and Stigsdotter, 2003; Hartig, *et al.*, 2003; Maas, *et al.*, 2009a; Ottosson and Grahn, 2005), physical health (Coombes *et al.*, 2010; Humpel *et al.*, 2002) and social health (de Vries, 2010; Kim and Kaplan, 2004; Kweon *et al.*, 1998; Maas, *et al.*, 2009b; Sullivan *et al.*, 2004).

Some of the above research has been called into question due to study design and weak statistical associations. Even with most studies supporting the idea that green space has beneficial health effects, establishing a strong causal relationship is difficult due to the complexity of the relationship. This leads to the idea that *“simplistic urban interventions may therefore fail to address the underlying determinants of urban health that are not remediated by landscape redesign.”* (Maheswaran and Lee, 2011, Abstract, para. 4) The idea of improving human lives with plants is not a simple one and any proposed solution should take into consideration factors beyond the addition of green space and plant material. These factors could include but are not limited to age, gender and ethnicity.

A new and notable evidence-based study conducted between 1990 and 2007 that focuses on the relationship between plants, green space and human health linked to the loss of ash trees from emerald ash borer was published by Donovan, *et al.* (2013). This study has added credence to previous research that showed positive relationships between plants and human health that have been criticized for poor study design. In an analysis of 1,296 counties in 15 states in the United States over an 18-year period it was found that those living in areas infested with the emerald ash borer, an insect that kills ash trees, suffered negative health consequences. Individuals that were part of this study experienced their neighborhood going from

tree lined to void of canopy cover. Health impacts on these individuals included an additional 15,000 deaths from cardiovascular disease and 6,000 additional deaths from lower-respiratory ailments (compared to national average). Both diseases are the first and third most common cause of death in the U.S. ("Centers," 2015, Number of deaths, para. 1). This study shows there "*are plausible mechanisms linking these types of deaths with trees*" (Donovan, , *et al.*, 2013 pg. 139). Various studies provide evidence that our natural environment can reduce stress (Park, *et al.*, 2008), lead to increased physical activity (Kaczynski & Henderson, 2007) and improve air quality (Nowak, *et al.*, 2006). Inversely, stress (Wright, *et al.*, 1998, Everson-Rose and Lewis, 2004), lack of physical activity (Ogoma & Shinoda-Tagawa, 2004, Lucas & Platts-Mills, 2005) and poor air quality (Pope, *et al.*, 2004) are strong predictors of cardiovascular problems and lower-respiratory ailments. Although the Donovan, *et al.* (2013) study showed a strong association linking trees and greenery with human mortality, a pure causal link has yet to be determined. Continued studies are ongoing.

Attention Restoration Theory:

"Direct attention plays an important role in human information processing; its fatigue, in turn, has far-reaching consequences. Attention Restoration Theory provides an analysis of the kinds of experiences that lead to recovery from such fatigue. Natural environments turn out to be particularly rich in the characteristics necessary for restorative experiences" (Kaplan 1995, pg. 1).

Kaplan draws upon concepts from the work of William James, who postulated the five major effects of attention works to make us perceive, conceive, distinguish, remember, and shorten reactions time. James was instrumental in distinguishing between the types of attention humans' experience. They are (James, 1892):

1. Sensorial attention is when attention is directed to stimuli that are physically present.
2. Intellectual attention is attention directed to stimuli that are not physically present.
3. Derived or immediate attention: is attention to something not physically present versus attending to the present.

Most importantly, is the idea that we become fatigued from prolonged experiences of attention. If a person is in a state of mental fatigue the consequences can be serious: inaccuracy, impulsivity, irritability, and incivility (Herzog, *et al.*, 2003). Thus, persons need restoration from such experiences. Attention restoration theory advocates for environments that promote recovery from mental fatigue; these are found in restorative settings that have four properties: being away, extent, fascination, and compatibility. Each of these is well described by Kaplan (1995) and Herzog, *et al.* (2003).

Felsten (2009) uses attention restoration theory as the backbone of his research. He evaluated how students who “*imagined themselves cognitively fatigued from sustained academic effort would perceive the restorative potential of indoor campus settings that varied by view of nature* (Felsten, 2009, pg. 160)” His primary finding suggested college students who perceived views of simulated or real nature experienced restoration from attention fatigue and regarded the views of nature as important. This dissertation sets out to create a model for teaching landscapes, these findings on attention restoration theory are critical to the creation of a viable model for campus learning environments.

Plants and Stress In College:

“*Stress is the process by which an individual responds psychologically, physiologically, and often with behaviors, to a situation that challenges or threatens well-being* (Baum, *et al.*, 1985, pg. 185; Ulrich, 1991).” A growing body of research suggests that environmental stressors such as crowding, air pollution, community,

and traffic can elicit substantial stress in people (Cohen *et al.*, 1986). Additionally, it is reflected in medical records that there has been a dramatic increase in stress among adults and children in Western societies (Grahn and Stigsdotter, 2003).

University students face a range of stressful situations in their transition to a campus setting; and each faces stressful situations unique to that individual. Stressors can include, employment, living arrangements, interpersonal relationships, sexual behaviors, navigating campuses, academics, and new choices. Furthermore, creating a balance between the above situations and transitioning to a campus life can be difficult. Positive or negative outcomes will be determined by each individual choice, which can lead to more or less stress in their lives. It has been shown that for many college students, stress can become debilitating and can manifest itself in both risky behaviors and depression ("American," 2008, Depression Fact Sheet, para. 1). These risky behaviors can vary widely and range from binge drinking and risky sexual behavior to the use of no safety equipment while biking (Patrick *et al.*, 1997).

Research has shown that there are statistically significant relationships between the use of urban open green spaces and self-reported experiences of reduced stress. This self-reported reduced level of stress is true across all ages, sexes, and socio-economic status. It has been found that when green space is incorporated into everyday lives, it can lead to fewer reports of stress-related illnesses (Grahn and Stigsdotter, 2003). This information has potential to impact the way we think about college and university campuses. Additionally, research has indicated the importance of green spaces in close proximity to one's dwelling (Grahn and Stigsdotter, 2003). For thousands of college students who reside on constructed, urban college campuses, this information has potential positive impacts. Being around or viewing green space has been shown to stabilize blood pressure, impact heart rate, and muscle tension (Hartig *et al.*, 2003; Ulrich, 1991). These positive impacts can only be realized when colleges and universities provide green spaces.

Honeyman (1992) looked at vegetation and stress in urban environments. She took an in-depth look at emotions often associated with stress like fear, anger, and sadness. She found that “*Human psychological response is impacted by the absence or presence of vegetation in the urban context*” (Honeyman 1992, pg. 143). This led to her conclusion that the inclusion of vegetation in the urban environment reduces stress in those who experience it. This and several other studies lend to the understanding of how stress can be reduced in the urban environment. Greater amounts of stress can lead to less academic success, which can escalate into even greater amounts of stress (Struthers *et al.*, 2000).

It is also important to understand the mechanisms by which natural environments contribute to the reduction of stress. Physical activity seems to be tied to experiencing a natural environment; for example, a student walking outdoors to a class. Physical activity and its stress relieving properties are well established (Barton and Pretty, 2010; Penedo and Dahn, 2005). Social contact is often associated with time spent outdoors; for example students walking to class together or as a group. Being actively engaged in social contact has known positive effects on stress levels (Heinrichs, *et al.*, 2003). Lastly, natural environments are often perceived as attractive environments. Individuals often seek out attractive environments for relaxation and recovery from difficult circumstances (Hartig, 2008; Kaplan, 1995; Kaplan and Kaplan, 1989). Considering the aforementioned information when designing learning spaces on college campus can lead to meaningful impacts on student learning.

Learning Theory for College Students:

There is a large body of research about student motivation and how students process information. Behaviorism, cognitivism, and constructivism are the three broad learning theories most often utilized in the creation of instructional spaces. Additional learning theory paradigms include humanism and design-base learning theories (“Learning-Theories,” n.d., Various sections). Additionally, humanism and

design-based learning theories are a departure from traditional learning theories that focused solely on metrics like grades and grade point average (GPA). These antiquated ideas of learning focused on outcomes and largely ignore the process of learning (Biggs 1987; Svinicki, *et al.* 2011). Contemporary learning theories take into account not just final outcomes but the transformational process that occurs while a student learns.

Informal Learning Spaces:

People are learning all the time, in varied settings and often most effectively in the context of work itself. "training" –formal learning of all kinds-channels some important learning but doesn't carry the heaviest load. The workhorse of the knowledge economy has been, and continues to be, informal learning. –Peter Henschel, former director of the Institute for Research on Learning (Cross, 2007, Preface, para. 2)

Learning space design has arisen as a significant consideration for colleges and universities ("National," 2004). This has in part been prompted by a change in definition of what constitutes a classroom. Technology, including the Internet, has changed what many view as a classroom. The Internet has transformed our understanding of space, time and place. The process of learning has now taken center stage, as our idea of what a classroom is, has evolved ("National," 2004). .

The learning space students are provided conveys a persona of their institution's philosophy about learning and teaching. Informal learning, which can happen in a variety of situations including team projects, social interactions and casual conversations, continues to be an area of focus for those who recognize its value. Dialogue, networking, rapport-building, and other communal learning channels are gaining acceptance as legitimate ways of pursuing learning (Digenti, 2000).

Internships

An internship, by definition, is a supervised practical experience (Webster's Unabridged Dictionary of the English Language, 1998). This means an internship is not a job; it is a learning experience that is structured to educate students (Inkster and Ross, 1998). Internships are often considered a subcategory of experiential learning. Many universities currently require or recommend an internship as part of a degree requirement (Wipf, 2000). Internships help students to acquire real-world, hands-on experience that puts learning into action (Davis and Williams, 2004).

For undergraduate students in the area of plant sciences, an internship in their field is an opportunity for them to gain supervised practical experience. These students also get the opportunity to interact with leaders with experience in their field. With more internships being demanded by universities and colleges, it has never been more important that the "Green Industry", university campuses, public gardens and arboreta provide meaningful and educational internship experiences (Weppner, 2000).

Some internship research shows that many students report internship programs help clarify future options and career choices. They can also serve as a catalyst to boost self-confidence. Another positive effect of an internship program is an increase in a student's understanding of job or employment responsibilities (Vincent, 1995). This study seeks to explore how college campuses can serve as both venue and training ground for students in the plant sciences. Through these internships students will be able to put theory into practice (Pulte, 2008).

Public Gardens

Public gardens by definition are gardens that are open and accessible to the public (The Columbia Electronic Encyclopedia, 2007). Rakow (2011) expands the definition such that a public garden is both a physical presence that includes plant collections, buildings, and infrastructure and an organization that administers those

elements and uses them to further its mission. The majority of these gardens are classified as either botanic gardens or arboreta. For instance, many university campuses, zoos, cemeteries, museums, city parks, and libraries, though not initially known for their landscapes, are members of the American Public Gardens Association (APGA), and encourage public visitation and enjoyment of their grounds. Even in situations where an organization's main focus may not be botanical or horticultural, they will often consider themselves botanic gardens or arboreta. Examples include University of California, Davis; Mount Hope Cemetery, North Attleborough, Mass.; and the North Carolina Zoological Park, Asheboro, NC, all listed in the membership directory of APGA (Pulte, 2008).

No precise definition of a botanic garden exists. A botanic garden is considered a garden that exhibits plants often with greenhouses for the culture, study, and exhibition of special plants (Merriam-Webster Online Dictionary, 2007). Rakow (2011) defines botanic garden as *"a wide array of both herbaceous and woody plant collections, varied educational offerings for all ages, and research programs focused on plant improvement, conservation, ecology, or basic science"* (Rakow, 2011, pg. 5). However, there are hundreds of botanic gardens in the United States all with different missions and visions. Some functions include educational programs for children and adults, plant breeding, living collections management, management of botanical libraries and herbaria, plant exploration and collection from around the world, and the display of proper horticultural techniques (The Columbia Electronic Encyclopedia, 2007).

Arboreta are a type of public garden with the distinction of being devoted primarily to the growing of woody plants (The Columbia Electronic Encyclopedia, 2007). Arbor, from the Latin "plantation of trees," is the root of the word arboretum. Merriam-Webster Dictionary (2007) defines an arboretum as a place where trees, shrubs, and herbaceous plants are cultivated for scientific and educational purposes. Rakow (2011) defines arboreta, *"as contrasted with botanical gardens, focus on the study and display of woody plants, primarily trees and*

shrubs. They, too, typically offer education programs for children, students, and adults. Their collections may be organized systematically, with each plant family assigned to its own area, or functionally, with plants located where their needs can best be met (Rakow, 2011, pg. 7)."

University Campuses as Public Gardens

Anecdotal information suggests that more and more universities are viewing their entire campus as public gardens. Many universities, including the University of Tennessee, have campus gardens. However, they are set apart from the rest of campus and are not integrated into the university in its entirety. The University of Central Florida has fully integrated their university gardens into their campus setting. Along with a designated area for an arboretum they have become a model for experience-based education and horticultural integration on college campuses ("Campus," n.d., Sustainable Landscape section, para. 1). The University of Chicago, which was designed in part by the heirs of landscape architect Fredric Law Olmsted, has also promoted itself as a campus garden rather than a campus with a garden. Their campus includes features like a botany pond and plantings spread across their urban campus (Harms, n.d.). The promotion of the idea that university campuses in their entirety should be viewed as public gardens is a related component of this research study.

The Discipline of Public Horticulture

Public horticulture is a growing area of horticulture that places an emphasis on people, their education, interaction and enjoyment of plants (Hamilton, 1999). Those who work for public gardens throughout the United States are considered to be in the field of public horticulture. The institutions that employ public horticulture professionals such as botanic gardens and arboreta are widely considered museums. Just as an art museum has a collection of paintings, sculptures, and other artwork, a public horticulture facility has a collection of plants.

The only difference between the two is that a garden or arboretum has a living collection (Altman *et al.*, 2005, Pulte, 2008).

Summary and Evaluation of Literature Review

The idea that plants have positive impacts on our everyday lives is nothing new -but one which has gained sound research studies for support. Throughout human history, an innate connection to green nature and its restorative benefits have been recorded. Several studies have documented that one of the most important restorative benefits of plants is stress reduction. For traditional college students, dealing with stress and its related problems is an important part of life on a college campus.

It is also clear through the evaluation of research literature that ideas on learning spaces are evolving. Additionally, a movement toward looking at learning as a holistic process, taking into account where and how students learn, has become important. This comes with the recognition that much of student learning on college campuses happens away from the traditional classroom. This has brought outdoor learning space design to the forefront as an important consideration in campus planning and design. Allowing for outdoor, informal spaces for students to learn in a peer-to-peer setting has emerged as a growing area of interest.

Internships and hands on practical experience are also an important learning tool for students. Surveys of graduating seniors in the Department of Plant Sciences at UT cite a desire for more hands on practical experiences beyond each students required internship. This leads to the idea that looking at a college campus as an additional outdoor teaching resource, where students can gain hands on practical experience would be of benefit to programs that train students in the plant sciences and related disciplines. Additionally, these ideas and spaces can benefit those not in the natural sciences. The discipline of public horticulture is an important lens through which to view these ideas. Researchers in this area have provided

substantial supporting theoretical rational for the benefits of multifunctional outdoor spaces that focus on learning in a variety of ways.

Chapter 3

Materials and Methods

Introduction

The following is an outline of this dissertation study in its entirety. It is presented in three sections. Each section is discussed in further detail in following chapters.

Section I: Assessment of Peer Institutions

Type of Assessment

Between the fall of 2013 and fall of 2014, an investigation of several peer institutions of the University of Tennessee, Knoxville (UT) gathered information on general campus demographics, administrative structure of facility services, and the level of formal training campus grounds employees needed for employment. A primary source of information was each universities individual website, its human resources department, personal communication with staff, as well as its office of institutional research.

Participants/Population

The population for this survey was limited to five peer institutions of UT (n=5). This gave researchers information from approximately 42% of institutions considered peers. Purposeful selections of universities were made taking into consideration peers identified by the Tennessee Higher Education Commission and benchmark schools in UT's strategic plan (top 25 initiative). A visual representation of universities that were considered for analysis is available in Appendix A-1.

Sampling Framework

Peer institutions for the University of Tennessee are chosen by the Tennessee Higher Education Commission and based on an appropriations formula. Top 25 benchmark universities were selected after review and analysis of U.S. News

and World Report, the Center for Measuring University Performance, Integrated Postsecondary Education Data System, institutional Common Data Sets, and research expenditures as reported by the National Science Foundation conducted by a Chancellor-appointed benchmarking taskforce in March 2010 (Dr. Mary L. Albrecht, personal communication).

Sample and Sampling Procedures

The population of the University of Tennessee's peer institutions is 12. Surveying five schools beyond UT equates to 42% of the institutions the University of Tennessee regards as their peers. Preference was given to diversity in geography of peer institutions. Additionally, a purposeful selection was made taking into consideration benchmark schools in the University of Tennessee's strategic plan (top 25 initiative). The University of Tennessee, Auburn University, the University of Georgia, Iowa State University, North Carolina State University, and Texas A&M University (College Station) were the schools selected for the sample population. This group of schools will be referred to as our "emphasis group," any other school analyzed will be referred to as the "secondary group" (Clemson University, the University of Kentucky, Louisiana State University, Purdue University, the University of Florida, the University of North Carolina Chapel Hill, and Virginia Polytechnic Institute and State University). The secondary group was used for the sole purpose of gaining a broader understanding for this study. The main focus of this research was on the emphasis group of schools.

Section II: Census of Teaching Faculty at the University of Tennessee

Type of Census

In the spring semester of 2014, a census of those with teaching responsibility on campus was conducted (Appendix C). A census is defined as: collecting information from every member of the population. In this study, the population is all those with teaching responsibilities at UT. This census began with general

demographic questions. Participants were asked about outdoor teaching resources (ODTR) on campus. An (ODTR) was defined as “any outdoor element contained on campus that could support student learning.” Individuals were asked several questions about specific ODTR and their perceived availability on campus. Qualitative and quantitative analysis of the responses were used to summarize the needs of current teachers with regards to such resources.

Participants/Population

The population for this census was inclusive of all those with teaching responsibilities on UT campus. This included, but was not limited to tenure, tenure-track, and non-tenure-track faculty, lectures, and graduate students, teaching at the UT campus during the spring semester 2014. Those absent due to professional development leave or not included in the academic timetable for the fall semester were not included.

Sampling Framework

Names and email addresses of faculty on the UT campus were obtained through the Office of Information Technology and the UT Registrar’s office.

Sample and Sampling Procedures

The population of the University of Tennessee, Knoxville tenure, tenure-track, and non-tenure-track faculty is reported as 1,390 individuals (“Fact,” 2010, Faculty section). For spring semester 2014, 2,500 individuals were listed as instructor of record (those having teaching responsibility) in the timetable of scheduled courses. This included graduate students with teaching responsibility being mentored by tenure-track, and non-tenure track faculty. This also included those with the title of lecture, senior lecture, or distinguished lecturer.

Section III: Development of a Model for a Teaching Landscape At the University of Tennessee

Recommendations:

Based on information gathered and collected from stated peer institutions of UT (Section I), and the needs of those with teaching responsibility (Section II), appropriate recommendations regarding the campus landscape have been made. This is designed to formulate a conceptual model of how UT can equip itself to better meet the needs of its students and educators (Section III).

Chapter 4

Results of Peer Institutions Assessment (Section I)

Introduction

The University of Tennessee, Auburn University, the University of Georgia, Iowa State University, North Carolina State University, and Texas A&M University were all selected for the sample population for further analysis (emphasis group). However, a secondary group was also formed, which includes: Clemson University, the University of Kentucky, Louisiana State University, Purdue University, the University of Florida, the University of North Carolina Chapel Hill, and Virginia Polytechnic Institute and State University were also researched to gain a broader understanding of this topic. Primary analysis was performed on the entire emphasis group of universities in the following areas: (1) university demographics including: enrollment, ethnicity of student population, attendance cost, acreage of campus and campus housing availability. (2) organizational structure, (3) job descriptions/summaries, duties and skills needed for similar grounds maintenance positions, and (4) availability and content of master plans for the campus landscape. Secondary analysis was done in many of the same areas for the secondary group. This information is primarily contained in attachments to this document.

Emphasis Group Demographics By University:

All of the emphasis group (inclusive of UT) are public universities founded between the year 1785 (University of Georgia) and 1887 (North Carolina State University). Student populations vary among the group with Auburn University being the smallest institution with a combined undergraduate and graduate population of approximately 24,864. Texas A&M University is by far the largest with a combined student population of 55,378. Data of student population for all campuses were basically a 50/50 split of male and female students, with the University of Georgia being the only campus with fewer male students than female

students. The racial profile of the emphasis group is skewed toward a White student body. Among the six universities, the average population of White students was 78.5%. Texas A&M University had a Hispanic population of nearly 20%, however, no other racial minority group makes up more than 10% of any other student body (Appendix A).

The annual cost of in-state undergraduate tuition and fees, housing, and other expenses across the emphasis group is fairly similar, with Auburn University being the most expensive at \$29,164 per year and Iowa State University being the least expensive at \$20,002 per year. The average cost of in-state undergraduate tuition and expenses for the emphasis group was \$23,599 per year. The same two schools were also the most and least expensive for out-of-state undergraduate students. The average cost of undergraduate tuition plus expenses for these students was \$40,082. The above data is based on estimates from www.collegedata.com and was accessed in April of 2015; this information was crosschecked with university websites for accuracy. Dollar values given for each university represent the overall average net price for total cost of attendance for all in-state or out-of state undergraduate students, not taking into consideration financial aid. Costs included in these calculations include: tuition and fees, room and board, books and supplies, and other expenses associated with attendance (Appendix A).

Organizational Structure of Personnel on Campus Grounds

The emphasis group of schools was analyzed for information on how campus grounds employees were organized. Organizational charts were obtained from university websites during the time of study and investigated. Each member of the emphasis group currently refers to the overall division overseeing their campus grounds as “Facilities.” This does not hold true across all U.S. universities and each of the emphasis group had slightly different add-ons to the name “Facilities.” This includes names such as “Facilities Management” (Auburn University), “Facilities

Planning and Management” (Iowa State University), and “Facilities Services Department” (the University of Tennessee).

An examination of the employment organizational charts of the emphasis schools, revealed differences on how these universities organized those who manage its physical grounds and landscapes. Organizational charts were analyzed to determine how many layers of personnel exist between division leaders and staff with hands-on responsibilities (Appendix A). Additionally, looking at the vast array of responsibilities division leaders have beyond physically maintaining campus grounds was important to consider. Without exception, these departments are tasked with a large variety of responsibilities that goes well beyond horticulture or landscape maintenance. At the University of Tennessee for example, recycling is a large part of this department. At the University of Georgia, the creation of campus signage falls under the purview of their Facilities Management Division.

Job Requirements For Similar Grounds Positions

Various job postings were analyzed from the emphasis group and the secondary group to create a holistic understanding of (1) average compensation, (2) job descriptions/summaries, (3) job duties, and (4) experience needed for those who maintain campus grounds. Logically, the higher the skill level required including the need to supervise others, the more likely you are to receive a higher level of compensation. For the purposes of this study focus was given to entry-level positions within a facilities department, mostly likely termed as “grounds maintenance.” These jobs were all geared toward those with hands on responsibility for campus grounds and landscapes. These are also the employees who make up the majority of grounds workforce. Figures that follow were generated at www.wordle.net in January of 2016. This site creates “word clouds” a word cloud is a distinct visualization of text in which the more commonly used words are effectively highlighted by occupying more prominence in the representation. Frequently used, but unimportant words, such as “the,” “and,” or

“but” are eliminated to make analysis easier. Distinct sections of job postings from the emphasis group were combined to create each word cloud. Each word cloud was restricted to the top 100 words found in each section.

Compensation:

Average compensation for similar entry-level positions across the entire emphasis group (Appendix A-2) was a starting salary or equivalent hourly wage of \$21,866, plus applicable institutional benefits. The University of Tennessee had the lowest average (advertised) compensation at \$9.50 per hour or approximately \$19,760 annually. The University of Georgia had the highest advertised average compensation of \$25,753.50 per year. Looking at various published governmental statistics used by sources (such as C2ER, Arlington, VA, ACCRA Cost of Living Index, Annual Average 2010) to determine cost of living differences between the cities of each institution was not of great value within the emphasis group. Within the emphasis group, Knoxville TN (the University of Tennessee) has the lowest salary and the lowest cost of living. Auburn, AL (Auburn University) and Raleigh, NC (North Carolina State University) both have median range salaries but rank slightly higher on a standard cost of living index. The difference in the cost of living between all of the emphasis universities home cities is marginal based on analysis of various cost of living indexes.

Job Description/Summary Analysis:

The job description or summary was analyzed for the emphasis group. This section of the job postings was always written in paragraph form and consistently gave an overview of what the job entailed. An analysis of the 100 most prevalent words combined with side-by-side comparisons of these jobs reveals communication to future employees that they will be working on the “grounds” of the university with involvement with plant material. This will be accomplished through the use of “tools” primarily equipment like “mowers.” Figure 1 shows “Job

information on the overall dimensions and physical characteristics of each given campus and provide guidance for future development of the physical campus grounds.

Although these master plans gave information on everything from building facades, maximum building heights, to trash receptacle requirement, of primary importance to this study were the goals of each master plan found in sections specifically addressing landscaped areas and the physical grounds of each university.

Within the master plan, each university defined the spatial framework of their campus to guide campus growth. Public spaces were defined as areas of connection to the surrounding community and linkages were made between the surrounding geographic landscapes. Each emphasis university wanted a cohesive landscape that enhanced the character of its university and surrounding community. Additionally, each wants to improve their individual landscapes by elevating the quality of outdoor public spaces.

Of notable importance to this study was a theme across all of the emphasis groups to make its universities more pedestrian friendly. Each university was striving to find ways to make their campus less car and more pedestrian-centric. Each recognized that walking is one of the “*most desirable defining characteristics of the collegiate experience* (University of Georgia, Physical Master Plan 1997 pg. 34).” This being said, each master plan strives to find meaningful, pedestrian-oriented systems of campus connection. This move towards pedestrian-centered campuses could elevate the importance of providing high-quality landscapes saturated with meaningful outdoor teaching resources.

Chapter 5

Journal Manuscript (Section II)

This chapter was written with the intention of being published in a horticulture research journal. With the following proposed authorship and title:

Pulte, A.J., Plante, A., Hamilton, S.L., Albrecht, M.L., Beyl, C.A., Logan, J. "The use of outdoor teaching resources by multidisciplinary university faculty and instructors: A census of those with teaching responsibility at the University of Tennessee, Knoxville"

Abstract

Beyond the natural sciences, little effort has been given to university campus outdoor teaching resources that could be used by other academic disciplines. Research in outdoor teaching resources could provide valuable information on how a university could best establish and maintain its campus grounds as a significant and dynamic outdoor classroom and laboratory for an array of academic disciplines. The purpose of this study was to find ways to improve campus outdoor learning opportunities for students by an assessment of outdoor teaching resources at the University of Tennessee, Knoxville (UT). Information was gathered from teaching faculty on restrictions to holding class outdoors and outdoor teaching resources that may be of benefit. One-on-one, in-person faculty interviews were used to inform a census of all tenured, tenure-track, non-tenure track instructors, and graduate students with teaching responsibilities. Qualitative and quantitative analyses of the responses were used to summarize the needs of current UT faculty with regard to such resources. Census data were used to identify areas of campus where teachers would use an outdoor teaching resource, but perceived it as unavailable. These areas were compiled to create maps to show campus areas without substantial outdoor teaching resources and the need for additional resources. This information will inform efforts to provide such resources in the future.

Key words: outdoor teaching resource, experiential education, experiential learning, public horticulture, university classroom, outdoor education, outdoor classroom, teaching landscape, university campus grounds as classroom, outdoor laboratory, university campus landscape.

Introduction

The physical grounds and landscape of university campuses are both the seat and symbol of higher education. The United States has over 5,700 higher education institutions (post high school, degree granting). At any given time, roughly 5.7% of the population of the United States is enrolled at an institution of higher education. That translates to over 20 million students on college campuses every year ("National," n.d., Response section, para. 1). Due to increases in enrollment, the actual physical environment of a higher education campus remains very important.

Much is known about the impact of plants on people including the benefit of high-quality public open space (Jacinta *et al.*, 2012). These benefits include the natural environment's ability to relieve mental fatigue and stress (Kaplan and Kaplan, 1989; Ulrich, 1983; Lederbogen, 2011). However, not enough attention has been paid to the university campus landscape and how it can support and enhance its teaching and learning community.

Much of the research in this area has focused on passive ways natural environments benefit individuals. These studies address the benefits that high quality outdoor environments can provide. One of the main benefits documented is stress relief (Grahn and Stigsdotter, 2003; Hartig, *et al.*, 2003; Maas, *et al.*, 2009; Ottosson and Grahn, 2005). A variety of studies have helped us understand the mechanisms by which natural environments contribute to the reduction of stress (Dadvand *et al.*, 2012; Donovan *et al.*, 2011; Frumkin, 2011; Tzoulas *et al.*, 2007).

Physical activity seems to be tied to experiencing a natural environment, for example, a student walking outdoors to a class. Physical activity and its stress relieving properties are well established (Barton and Pretty, 2010; Penedo and

Dahn, 2005). Social contact is often associated with time spent outdoors, for example, students walking to class together or as a group. Being actively engaged in social contact has known positive effects on stress levels (Heinrichs et al., 2003). Lastly, natural environments are often perceived as attractive environments. Individuals often seek out aesthetically attractive environments for relaxation and recovery from difficult circumstances (Hartig, 2008; Kaplan, 1995; Kaplan and Kaplan, 1989). Considering the aforementioned information when designing learning spaces on college campuses can lead to meaningful impacts on student learning. More attention could be paid to how the individual elements or resources contained within an outdoor environment can benefit those who both teach and learn in those spaces. This includes giving educators more reasons to hold their classes' outdoors.

The purpose of this study was to develop recommendations for the University of Tennessee, Knoxville (UT) on how to broaden its teaching resources to include campus landscapes and outdoor spaces. The methods presented here may be useful for similar institutions who also wish to address this need. Those who teach subjects in agriculture, natural resources, and the natural sciences often rely on a variety of outdoor resources to teach their subject matter. There is a need however, to explore how outdoor teaching resources can be enhanced for those disciplines as well as created for those who do not traditionally use them.

Information on the use of outdoor teaching resources was collected from UT faculty through an online questionnaire. An outdoor teaching resource (ODTR) was defined as "any outdoor element contained on campus that could support student learning." An example of an ODTR might be a specific tree from a religious text or a retention pond used by a biology professor. Information on the current use of ODTR was gathered through a census of all teaching personnel (including graduate teaching assistants) on campus. Questions were asked that gathered information on instructor's current and potential use of such resources. For the purpose of this study a census is defined as: collecting information from every member of the

population. In this study, the population was all those with teaching responsibilities at UT. Initial pilot interviews were conducted to refine questions used in the final census. These interviews led to a better understanding of how best to present questions to faculty and instructors. This study sought to find what ODTR were currently in use or desired by those with teaching responsibilities on the UT campus, and yielded preliminary information on how a university's landscape can support teaching and learning through the use of ODTR.

Methods

Population

Feedback was desired from any person at UT with teaching responsibility. This included tenured, tenure-track, and non-tenure-track faculty, graduate teaching assistants, and adjunct faculty at the UT campus during the 2014 spring semester. Those absent due to professional development leave or not included in the academic timetable for the semester were not included in the population. The population of tenure, tenure-track, and non-tenure-track faculty at UT was reported as (1,390) individuals ("Fact," n.d., Faculty section). For the 2014 spring semester, 2,500 individuals were reported as having teaching responsibility. This information was obtained from the universities registrars' office.

Faculty Interviews

A select number of faculty ($n = 14$) participated in a pilot, one-on-one, face-to-face interview preceding the census. Participants were randomly selected based on their departmental affiliations and willingness to be interviewed. Interview feedback was used to inform the final census instrument. The interviews included representatives from the following departments: School of Art; Biological Sciences; Biosystems Engineering and Soil Sciences; Chemistry; Classics; Ecology and Evolutionary Biology; English; Food Science and Technology; Forestry, Wildlife and Fisheries; Geography; College of Veterinary Medicine; Plant Sciences; and Religious

Studies. Their responses were used to refine questions that were being developed for the study census, and to create new content to be included. Interviews were conducted through the fall semester of 2013. Meetings were held in the participants' offices at their convenience.

The interview script (Appendix B) was designed to meet the objectives outlined in the following section. Each part of the interview began with open-ended, qualitative questions, for which participants were able to provide original, responses. This was done in an effort to control bias. Closed-ended, quantitative items then followed the qualitative questions. The quantitative items had been brainstormed by the researchers in small focus groups, and additionally refined by feedback from experts from a campus environmental survey lab (Human Dimensions Research Lab, UT Department of Forestry, Wildlife, and Fisheries) prior to the interviews. Responses given during the face-to-face interviews helped inform the final census instrument. The face-to-face interviews were also important for improving clarity and comprehension of prompts, items, and response options.

Instrument Description

The final questionnaire for the census contained 127 items. Of those, 39 were nominal (three were "check-all-that-apply"), 46 were ordinal, 25 were interval, eight were ratio, and nine were open-ended, qualitative questions. Question routing was effectively used to direct census participants to items that best fit their experiences. For example, if an instructor marked that they had never held class outdoors, they were not presented with questions designed to gather information about experiences holding class outdoors. With question routing, participants would be presented with somewhere between 95 and 125 items.

Items were grouped within the instrument by the objective they were designed to measure. The census had the following six objectives:

- 1: Determine whether or not participants are currently holding class outdoors on or off campus.*
- 2: Determine experience and restrictions to holding class outdoors.*
- 3: Determine what outdoor teaching resources participants think might be helpful for teaching courses in their area.*
- 4: Determine participants' perceptions of availability of outdoor teaching resources.*
- 5: Determine the level of use of outdoor teaching resources (currently existing).*
- 6: Identify background characteristics of participants.*

The online census instrument's format provided opportunities to improve question clarity in a way that is more common in telephone and in-person surveys. Several potentially unfamiliar words and phrases were identified prior to study administration. Java coding was used to embed these words with definitions and examples. Participants could read this information by scrolling their cursor over unknown words, which would result in a "pop-up" definition appearing above the cursor. Potential problem words were defined on every page on which they appeared.

Census Administration

The questionnaire was administered using the Qualtrics web survey application. The university registrar's office provided the school email addresses for all those who had teaching responsibilities in the 2014 spring semester. The population's university email addresses were compiled into a listserv address. The primary investigator (PI) emailed a hyperlink of the questionnaire to the population using the email listserv. Two reminder emails were sent in the two weeks following the initial contact. There was no incentive for participation in the study, although respondents were invited to email the PI if they were interested in receiving a synopsis of the results. The response rate was 20.7 percent ($n = 518$), which is comparable to response rates for other studies that involved web surveys of faculty

at other institutions (Georgina & Hosford, 2009; Georgina & Olson, 2008; Smith, 2008).

Data Analysis

Responses were downloaded from Qualtrics to IBM's Statistical Package for the Social Sciences (SPSS) version 21. Open-ended, qualitative questions were analyzed for phrase counts using WordStat version 6.0 from Provalis Research. All other data were analyzed in SPSS 21. Unanswered quantitative questions were coded as missing data at the time of the download. Independent samples t-tests were used to compare whether perceived restrictions to holding class outdoors differed significantly between those participants who had and had not held class outdoors.

For the examination of ODTR, it was decided data analysis should focus on the resources that appeared to be most meaningful to the population. A resource was examined in-depth if at least 60 faculty members stated they would use the resource if it were available, and greater than 30 percent of those who would use the resource perceived that it was not available at the time of the census. These thresholds were chosen by the researchers based on logical observations of data.

The instrument included a question about which buildings on campus the participants held class. This provided vital information to identify where resources were absent on campus. UT has a large campus of over 500 acres, containing 63 buildings with various intensities of class use. Clustering adjacent buildings for analysis made identifying areas for future ODTR development easier.

Results and Discussion

Background Characteristic of Participants

During the academic semester of study, spring semester 2014, (2,500) individuals were identified as having teaching responsibilities. Of those individuals, (518) responded to the census, for a response rate of (20.7%), (35.5%) self-

reported as being male, (43.2%) as female, and (1.2%) as other, (20.1%) gave no answer to the question of gender. The professional academic make-up of the group was as follows: (16.6%) full professors, (13.9%) associate professors, (10.6%) assistant professor, (16%) lecturer (including senior and distinguished lecturer), (26.8%) graduate teaching assistant, (10.6%) other including clinical faculty and adjunct professors, (5.5%) chose not to report their position. Throughout the group as a whole, (26.6%) were tenured, (11.4%) were considered tenure-track and (35.3%) were considered non-tenure track, and (26.7 %) marked “other” or chose not to report. The majority of respondents came from UT’s largest college, College of Arts and Sciences (41.9%); (15.6%) of respondents came from The College of Education, Health, and Human Sciences, with the remaining 9 colleges all reporting less than (10%) each.

Restrictions to Holding Class Outdoors

Responses were divided into two groups for comparison. If instructors had reported holding class outdoors (on or off campus) at least once a semester, they were placed in the “Outdoor Teachers” group ($n = 100$). All instructors who did not hold class outdoors were placed in the “Non-Outdoor Teachers” group ($n = 360$). An independent sample t-test was used to compare perception of restrictions to holding class outdoors and whether a resource was perceived as not available (NA). In all but one instance, the Outdoor Teachers perceived less ($p \leq 0.01$) restrictions than Non-Outdoor teachers. The option “other reason – not listed” did not differ significantly between groups. Between both groups the following restrictions to holding class outdoors were the most prevalent: distracting for students, no projector system, weather, and insects (Appendix C).

Meaningful Outdoor Teaching Resources

The 31 listed resources that were presented to census participants were divided into two groups: *resource qualities* (e.g. “A quiet space to hold class”) and

true resources (e.g. “A medicinal plant”). Of these, 19 met the criteria for further analysis based on previously stated metrics. Two of the items met qualifications but were excluded from analysis. The true resource, an “example of a non-native ecosystem” ($n = 78$, 32.1% NA), was excluded because essentially the entire campus is a non-native ecosystem. The resource quality, “other built elements” ($n = 207$, 32.9% NA), was excluded because it did not provide insight into what constitutes “other built elements.” Fifteen true resources and two resource qualities were explored further. The 15 true resources were reduced to 13 by combining categories (i.e. “edible plants, like fruits and vegetables” combined with “an edible garden.”) Figure 4 describes the 13 prospective outdoor teaching resources (any outdoor element contained on campus that could support student learning) at UT, their potential use and each individual’s perception of the availability of those resources.

The process that was followed to examine all meaningful ODTR is explained best by highlighting one resource (constructed wetlands), that participants thought would be of particular benefit. Data indicated that for the campus as a whole, “constructed wetlands” had a relatively high number of potential users who thought the resource was unavailable. This ODTR had 80 potential users, representing 15.4% of the population. Of that group of potential users, 61.3% perceived “constructed wetlands” as being unavailable on campus.

The characteristics of potential users were examined for each of the meaningful resources identified. In the case of “constructed wetlands”, (54.8%) of potential users teach in the university’s College of Arts and Sciences. Most of the potential users were graduate students who teach classes (31%), with assistance from faculty mentors, associate and full professors combined represent (39.3%) of potential users. Most of the potential user group was non-tenure track (36.7%). Only (10.2%) of this same group said in a given semester they “never” had class outdoors on campus. When asked to rank how frequently they use various teaching methods, the group reported tending to rely on lectures (mean = 3.44, SD = 0.76)

and visual aids (mean = 3.56, SD = 0.64) between “several times a semester” and “nearly every class”. When asked to rank barriers to holding class outdoors on a 5-point agreement scale with a “neither” option in the center, the biggest barrier was “weather” (mean = 3.18, SD = 1.33). However, when it came to identifying where on campus specific resources, like this one (constructed wetland), should be placed, data needs to be examined in light of which areas on campus potential users hold classes or are expected to have class.

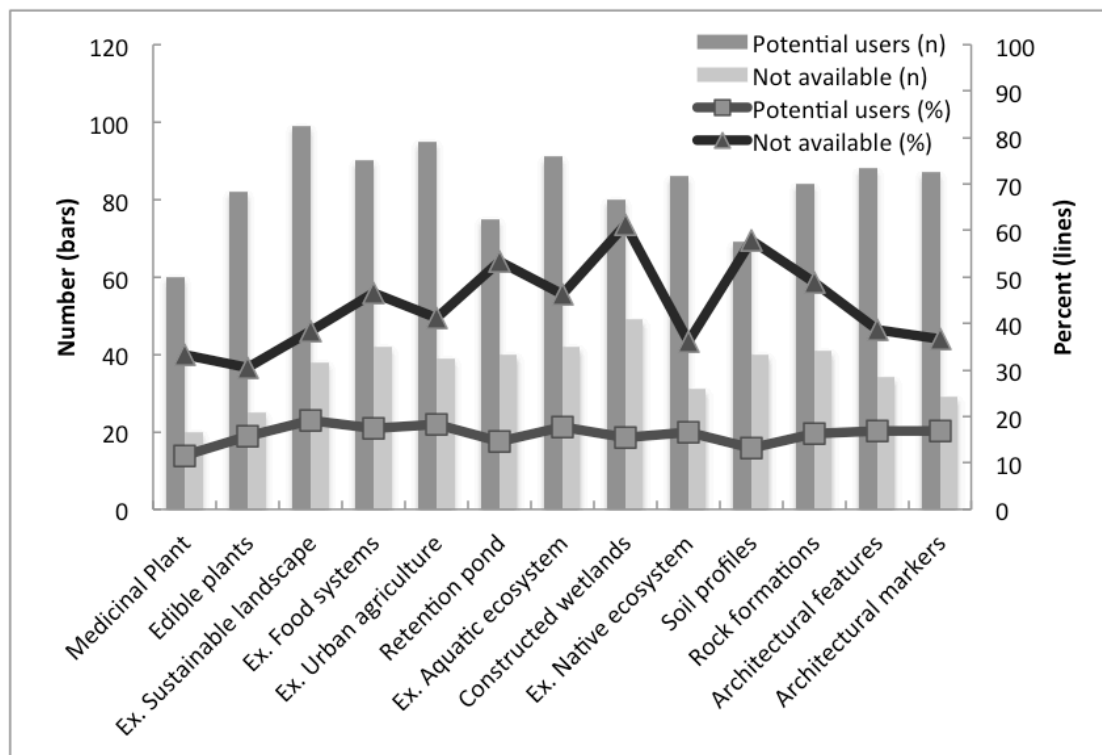


Figure 4 - Prospective Outdoor Teaching Resources

Finding Places for New ODTR

The University of Tennessee, Knoxville at the time of census, had 63 distinct permanent buildings with the potential for classes to be held. Adjacent buildings were clustered together to create nine larger areas for identifying campus areas

without substantial outdoor teaching resources. These clusters were examined by a representative from the university's cartographic services to ensure they were grouped in a logical pattern based on geography, topography and main campus arteries. ODTR data were examined further by first selecting the group of potential users, then the regions of campus where those users teach.

To continue the earlier example of examining "constructed wetlands," the area of campus with the greatest need for this resource was determined (Figure 5). More information would need to be gathered before recommending where this resource location would be most beneficial. This would include practical considerations like campus topography. However, the university can now identify the area of campus that has the greatest number of potential users (East, $n = 32$) and the area on campus whose residents perceived the least availability (Southeast, 75% regional users, 9.18% potential users). Figure 5 describes prospective use and perceived availability of the individual outdoor teaching resource "constructed wetlands," potential users by region of UT campus contrasted with where census participants' classes were held.

Initial maps were created for each section of campus that highlighted the level of need for ODTR in that section. Individual buildings within sections were color coded to represent potential use (Appendix D). If (30%) or more of residents would use a resource, responses were inspected to examine perception of availability by section or building. If more than (70%) of the population would not use a resource, it was not examined further.

These maps were useful to identify specific regions of campus that may benefit from adding an outdoor teaching resource. This information was then further synthesized into campus maps by highlighting where new, specific ODTR would be beneficial in each section of campus. These maps can be provided to campus planning and design committees to facilitate the creation of new ODTR on campus that instructors specifically say they will utilize. These maps were useful to identify specific regions of campus that may benefit from adding an outdoor

teaching resource. This information was then further synthesized into campus maps by highlighting where new, specific ODTR would be beneficial in each section of campus. These maps can be provided to campus planning and design committees to facilitate the creation of new ODTR on campus that instructors specifically say they will utilize.

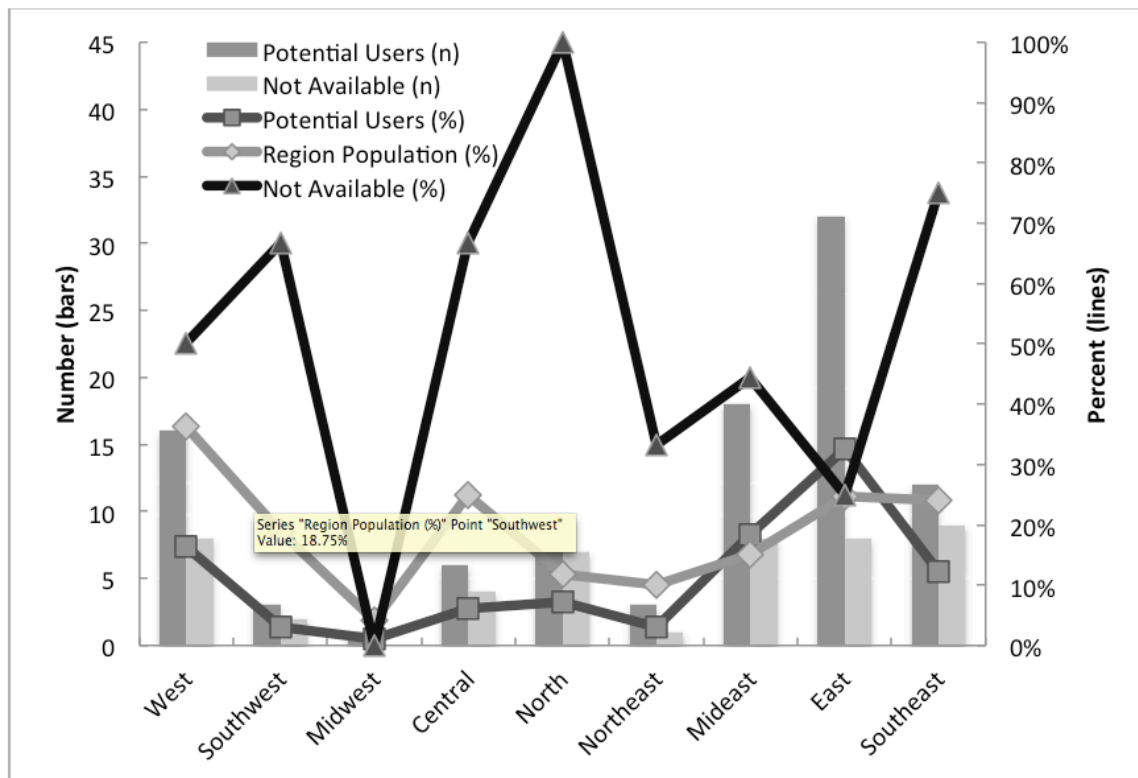


Figure 5 - Prospective use of "Constructed Wetlands" by Regions

Qualitative Analyses

Phrases of two to five words were identified in WordStat for all open-ended questions. This included questions about restrictions to holding classes outdoors, experience holding classes outdoors, identifying specific ODTR that have been used, or may be of benefit, and additional comments. Of these analyses, only one phrase occurred more than (10%) of the time. When asked to identify a specific outdoor

teaching resource that had been of benefit, (18%) of the participants who answered that question mentioned the university gardens.

Word counts were also examined, however this information tended to be more fragmented than a phrase would have been. When asked for restrictions to holding class outdoors, (10.8%) of instructors who had held class outdoors in the previous year mentioned “space”. When asked the same question, (9.2%) of teachers who had not held class outdoors mentioned “technology”. When the teachers who had held class outdoors were asked to describe their experience, (13.8%) mentioned “weather” and (11.5%) mentioned “enjoy”. When participants who had used ODTR were asked to list resources that had been of benefit, (12%) mentioned “trees” and (10%) mentioned “creek”, most likely alluding to a creek that runs through campus.

Summary

The benefit of having a university campus that provides purposeful outdoor teaching resources for its faculty and students is worthy of exploration. This exploration must begin with understanding the needs of the individuals who teach within each distinct university. This study sought to determine how those who teach at UT are currently using outdoor teaching resources. Additionally, information was gathered on how informed teaching faculty are when it comes to the availability of a variety of resources.

From comments made and census responses, it is clear that those who teach at UT rely heavily on the use of traditional lecture methods and technology in the classroom. It is believed that many who replied to the census do not see teaching outdoors as an option they could use with frequency throughout a semester. These objections to teaching outdoors go beyond not having a projector system at their disposal. Many believe teaching outdoors is not relevant to the subject matter within their discipline. For some, this may be the case. However, for others - appropriate, well thought-out and meaningful outdoor teaching resources do not

exist on the UT campus. Additionally, the ODTR they would utilize for teaching their class do exist but they are not aware of their existence.

This study's main strength is providing information to UT on meaningful, desired ODTR needed on campus, and the creation of a model that other universities could possibly use to analyze the current status of ODTR. This information can then be used to develop meaningful ODTR that will be utilized for teaching. One of the weaknesses is its conceptual nature. Unfortunately, just because a resource may be desired, this does not translate directly into the appearance of said resource. The information gathered can be used by the researcher to promote positive change on UT's campus through involvement with campus improvement and construction projects. For example, if an area of campus is being renovated, having a list of ODTR that are both desired and practical for the location can help enhance the campus learning environment.

Chapter 6

Journal Manuscript: Study Model (Section III)

This chapter was written with the intention of being published in a horticulture research journal. With the following proposed authorship and title:

Pulte, A.J., Hamilton, S.L., Albrecht, M.L., Beyl, C.A., Logan, J., Plante., A. "A Model For the Creation and Use of Outdoor Teaching Resources Specifically on the University of Tennessee, Knoxville Campus"

Abstract

Research has shown that plants and the landscapes around us impact our lives. Plants have been shown to reduce anxiety and blood pressure, and to have mentally restorative and psychological benefits. These benefits can include but are not limited to improving our ability to cope with stress and improving our ability to focus and concentrate. The physical grounds of our university campuses have the potential to provide these restorative benefits to students. Understanding how these landscapes are maintained can provide information useful to improving them. In regards to campus grounds maintenance, select peer institutions of the University of Tennessee, Knoxville are similar in their employment structure and tend to hire low-wage, low-skill workers to provide the day-to-day upkeep of campus grounds. This can impact the overall quality and utility of these landscapes. A multi-stage training program is proposed to elevate the skill level of these workers. These campus landscapes also have the opportunity to passively and actively support learning. Unfortunately, beyond the natural sciences, little effort has been given to outdoor teaching resources that could be used by all university academic disciplines. Thirteen individual outdoor teaching resources were identified as needed by those with teaching responsibilities on the University of Tennessee, Knoxville campus. This research has been used to create a conceptual model of how a university can establish and maintain its campus grounds as a significant and

dynamic outdoor classroom and laboratory for an array of academic disciplines, coupled with improving the overall quality of the campus aesthetics.

Introduction

A model for the creation and use of outdoor teaching resources specifically on the campus of the University of Tennessee, Knoxville is proposed. To create this model, 1.) peer institutions of the University of Tennessee, Knoxville (UT) were analyzed. This analysis included an in-depth look at the demographics of an emphasis group of peers, the structural and organizational similarities and differences between these universities, and the jobs of those who manage their university grounds; 2.) a census of teaching faculty was conducted to explore outdoor teaching resources (ODTR) on campus. Information on the current use of ODTR was gathered from all instructors (including graduate teaching assistants) on campus. A census is defined as: collecting information from every member of the population. In this study, the population was all those with teaching responsibilities at UT (n= 2,500 for the 2014 spring semester). An outdoor teaching resource (ODTR) was defined as “any outdoor element contained on campus that could support student learning.” An example of an ODTR might be a specific tree from a literature source used in class or a retention pond used by a botany professor; and 3.) data were synthesized to provide recommendations for the development of outdoor learning spaces on the UT campus. It is desired that other universities will use the model developed from this information to further improve their outdoor spaces and make them an increased part of the educational experience on their campus, providing students both passive and active learning opportunities beyond the walls of the traditional classroom.

An ODTR, can be any outdoor element on campus including objects such as outdoor art installations, natural or built water features, and soil and rock formations. However, plants, and resources with plants as a main component, were the main focus of this study. The idea that plants make positive impacts on our everyday lives is nothing new. There now exists a sound body of research to support

this notion (Ulrich, 1990). Throughout human history, an innate connection to green nature and its restorative benefits have been recorded. Several studies have documented that one of the most important restorative benefits of plants is stress reduction (Park, *et al.*, 2008). For college students, dealing with stress and its related problems are an important part of transitioning to life on a college campus. The use of outdoor 'green' spaces on campus for not only supporting learning but also reducing stress is evolving and becoming increasingly important. A movement towards looking at learning as a holistic process, taking into account where and how students learn, has become increasingly significant (Oblinger, 2005). This comes, in part with the recognition that student learning on college campuses can happen away from the traditional classroom. This has brought learning space design to the forefront as an important consideration in campus planning and design. Modern learning space design allows for informal, outdoor spaces. This allowance for students to engage in an outdoor, peer-to-peer setting has emerged as a growing area of interest (Foran, 2009, Oblinger 2005). Experiential learning in particular has become important for the UT educational community and will be explored further within this model.

How campus landscapes, grounds, and ODTR are managed, from a practical standpoint, is also significant and could be a vital part of their success. This study yields recommendations on how UT can raise the quality of its campus grounds and the efficiency of its management. These recommendations promote higher standards for ODTR as well as for those who manage these resources.

Assessment of Peer Universities

Sampling Frame

Peer intuitions for the University of Tennessee are chosen by the Tennessee Higher Education Commission (THEC) and based on an appropriations formula. Additionally, as part of the University of Tennessee's strategic planning and initiative to achieve a ranking among the 25 best public universities, benchmark universities were selected after review and analysis of U.S. News and World Report,

the Center for Measuring University Performance, Integrated Postsecondary Education Data System, institutional Common Data Sets, and research expenditures as reported by the National Science Foundation conducted by a Chancellor-appointed benchmarking taskforce in March 2010 (Dr. Mary L. Albrecht, personal communication).

The population of the University of Tennessee's peer institutions is 12. Five of these schools plus UT were analyzed to achieve statistical significance. Preference was given to diversity in geography of peer institutions. Additionally, purposeful selections were made taking into consideration benchmark schools in the University of Tennessee's strategic plan (top 25 initiative). The University of Tennessee, Auburn University, The University of Georgia, Iowa State University, North Carolina State University, and Texas A&M University (College Station) were the schools selected for the sample population (Appendix A).

Assessment of Peer Results

As one might expect of schools considered a peer group, there were many similarities among these universities. All of the emphasis group (inclusive of UT) are public universities founded between the year 1785 (University of Georgia) and 1887 (North Carolina State University). Student populations varied with Auburn University being the smallest institution with a combined undergraduate and graduate population of approximately 24,864. Texas A&M University is the largest with a combined student population of 55,378. Student populations tend to be well proportioned between male and female students with more male students being present on all but one campus (University of Georgia). Data show a 50/50 split of male and female students. The racial profile of the entire emphasis group is strongly skewed toward a White student body. Between the six universities the average population of White students is 78.5%. Texas A&M University has a Hispanic population of nearly 20%, however, no other racial minority group makes up more than 10% of any other student body (Appendix A).

The cost of in-state undergraduate tuition and fees, housing, plus expenses across the emphasis group is fairly similar, with Auburn University being the most expensive at \$29,164 per year and Iowa State University being the least expensive at \$20,002 per year. The average in-state undergraduate tuition and expenses cost for the emphasis group is \$23,599 per year. The same two schools are also the most and least expensive for out-of-state undergraduate students. The average undergraduate tuition plus expenses cost for these students is \$40,082 (Appendix A).

Organizational Structure of Personnel on Campus Grounds

The emphasis group of schools was analyzed for information on how campus grounds employees were organized. Organizational charts were obtained during the time of study and investigated. Each member of the emphasis group currently refers to the overall division overseeing their campus grounds as “Facilities.” This does not hold true across all U.S. universities and each of the emphasis group has slightly different add-ons to the name “Facilities.” These include names such as “Facilities Management (Auburn University),” “Facilities Planning and Management (Iowa State University),” and “Facilities Services Department (the University of Tennessee).”

An examination of the employment organizational charts of the emphasis group of schools, revealed differences on how these universities organized those who manage its physical grounds and landscapes. Organizational charts were analyzed to determine how many layers of personnel exist between division leaders and staff with hands-on responsibilities. Additionally, looking at the vast array of responsibilities division leaders have beyond physically maintaining campus grounds was important to consider. Without exception, these departments are tasked with a large variety of responsibilities that go well beyond horticulture or landscape maintenance. At UT for example, recycling is a large part of this

department. At the University of Georgia, the creation of campus signage falls under the purview of their Facilities Management Division.

Job Requirements for Similar Grounds Positions:

Various job postings were analyzed from the emphasis peer group to create a holistic understanding of 1.) average compensation, 2.) job descriptions/summaries, 3.) job duties, and 4.) experience needed for those who maintain campus grounds. Logically, the higher the skill level required including the need to supervise others, the more likely for a higher level of compensation. For the purposes of this study, focus was given to entry-level positions within a facilities department, most likely termed as “grounds maintenance”. These jobs were all geared toward those with hands-on responsibilities for campus grounds and landscapes.

Compensation:

Average compensation for similar entry-level positions across the entire emphasis group (Appendix A) was a starting annual salary or equivalent hourly wage of \$21,866, plus applicable institutional benefits. The University of Tennessee had the lowest average (advertised) compensation at \$9.50 per hour or approximately \$19,760 annually. The University of Georgia had the highest advertised average compensation of \$25,753.50 per year. Looking at various published governmental statistics used by sources (such as C2ER, Arlington, VA, ACCRA Cost of Living Index, Annual Average 2010) to determine cost of living differences among the cities of each institution was not of great value within the emphasis group. Within the emphasis group, Knoxville TN (the University of Tennessee) had the lowest salary and the lowest cost of living. Auburn, AL (Auburn University) and Raleigh, NC (North Carolina State University) both had median range salaries but rank slightly higher on a standard cost of living index. The

difference in the cost of living among all of the emphasis universities home cities was marginal based on data retrieved from various cost of living indices.

Assessment of Outdoor Teaching Resource Availability

During the fall semester of 2013 initial exploratory interviews with faculty of the University of Tennessee were conducted to initiate a study on outdoor teaching resources on campus (ODTR). This developed into a census where information on the current use of ODTR was gathered from all instructors (including graduate teaching assistants) on campus. This yielded important information fully discussed in a previous publication.

Most relevant to this model was the creation of maps that identified areas of campus lacking in ODTR. This was done by asking participants about types of ODTR they would use, but also perceived as unavailable. This information was combined with the geographic location where participants held their classes. This was further joined with knowledge of the logical geographic limitations and physical boundaries of UT campus. For example, there are physical and geographic limitations to adding an ODTR such as a “constructed wetland.” These considerations impacted recommendations for the addition of new ODTR. Maps of possible sites for future additions of ODTR were made available to those who administer the grounds and facilities of UT campus. It is desired that if a building is renovated, or there is new construction on these site maps will be used to develop the surrounding landscape. This will, in turn, raise the educational profile of campus as a whole. If a new ODTR is added to campus, it is also important that it is maintained at a high standard.

Conceptual Model for Adoption of ODTR

To help ensure full actualization of ODTR both new and currently existing, the following model of ODTR implementation is proposed. First, creating awareness of currently existing ODTR on UT campus. Census results indicated a lack of overall awareness of ODTR on campus. A map of currently existing ODTR was created and

given to cartography services at UT for possible adoption into UT's interactive online campus map. This allows for preliminary exposure to these resources for instructors, students, and the public. Second, maps have been provided to UT facility services detailing campus zones for new potential ODTR. If a new ODTR is installed it will be important to develop a custom management plan to establish best practices for ongoing maintenance. Lastly, training and education for instructional staff on how to best utilize ODTR is proposed. This is a critical piece and provides opportunity for maximum utilization of these resources.

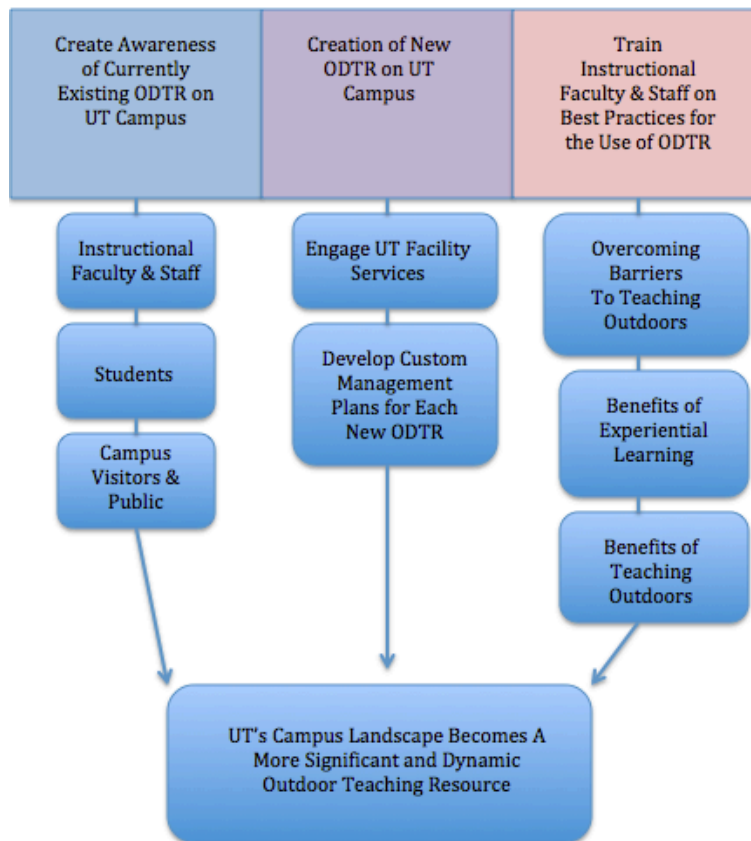


Figure 6 - Maximization of Census Results for UT

Adoption and Implementation of Campus Grounds Standards

The grounds that surround academic buildings are important. Research suggests the benefit of a well-maintained campus grounds has an impact on students' choice of university (Price *et al.*, 2003). They can impact the well-being of current students (De Vries *et al.*, 2003; Maas *et al.*, 2006), and even potentially impact academic performance (Hopeland, 2015). As part of developing the UT campus as a dynamic outdoor classroom, which has the ability to positively impact education on campus, standards of how its grounds are managed must be set and followed. APPA: *Leadership in Educational Facilities*, which was formerly the Association of Physical Plant Administrators, is the primary national organization that codifies standards for campus grounds. Their goal is to impact education through the following APPA mission ("APPA," n.d., purpose, para. 1):

- *"APPA transforms individual facilities professionals into higher performing managers and leaders, which...*
- *Helps transform member institutions into more inviting and supportive learning environments, which...*
- *Elevates the recognition and value of educational facilities and their direct impact on the recruitment and retention of students, faculty and staff."*

Current estimates are that 250,000 educational buildings encompassing 5 billion interior square feet exist nationally. According to APPA and its members, the current funding environment is such that those who manage, and facilitate the management of campus grounds throughout the country, are being asked to do more with less funding ("APPA," n.d., introduction video). The APPA organization has become the main platform for sharing best practices for educational grounds and has approximately 1,300 institutional members. The University of Tennessee is an institutional member of the APPA organization and currently looks to them for some guidance on the maintenance of its grounds. However, there has never been

any formal adoption or implementation of this organization's set of standards (personal communication with Mr. Jason Cottrell, UT Facility Services).

Identification of High Impact Campus Areas (Quality Thresholds)

The logical first step to adopting campus grounds standards was identifying high impact campus areas that are widely used, highly visible, and iconic to campus. Additionally, areas with lower use, facilities out of UT grounds departments' control, or less visible areas were also identified. A map was developed as part of UT's campus landscape vision and site standards adopted in 2012. This plan helped to expose quality thresholds, dividing the campus into 5 main areas (Figure 6). These areas were: (1) "Primary" areas, which are to be maintained to the highest standard possible and are highly visible to students and visitors, (2) "Secondary" areas with a lower profile and reduced amount of maintenance, (3) "Tertiary" areas which receive an even lower amount of maintenance, (4) "Athletics" facilities and grounds managed by the athletics department, and (5) "Transition" areas that receive little or no maintenance and include buildings currently under construction. Areas 1-3 are of primary concern to those who maintain the campus grounds and are defined as follows:

1. Primary
 - i. Highest quality maintenance applied to diverse landscape. High visibility, high-traffic areas.
2. Secondary
 - i. Moderate level of maintenance associated with well-developed public areas and residence halls. Recommended level for most areas.
3. Tertiary
 - i. Less visible campus areas, outlying boundaries, natural areas that are not developed. General mowing, invasive species removal, trash removal on a less frequent basis.

Formal Adoption of Standards

Formal adoption of these thresholds beyond this study is recommended. This could lead to pairing of the appropriate grounds workers with campus



An important part of this model is development of a workplace culture of continuous learning and skill development (continuing education). It is proposed that this be achieved through the use of a structured learning program for employees. Employees who have gone through such programs would then be able to more independently and confidently manage high-impact landscapes with higher

quality thresholds, at a higher-level (Primary Landscapes). Additionally, they would be able to mentor new employees within the grounds department.

In a quickly fluctuating job market, the importance of maintaining a competitive organization have become increasingly significant. This can be achieved, in part, by development of new job skills and further refining previously learned abilities (Maurer, 2001). In a study by Maurer in 2003 where involvement in work-related learning and development activity were explored, many positive benefits were found. According to this study, employees, and by extension employers who were “*oriented toward employee development*” and allowed for participation in learning and development activities, found employees were positively impacted. These impacts include: “*perceiving themselves as possessing qualities needed for learning, having social support for development at work and outside of work, being job involved, having insight into his or her career, and believing in the need for development, in his or her ability to develop skills and to receive intrinsic benefits from participating* (Maurer *et al.*, 2003, p 707).” The development of a workplace with employees of similar beliefs about themselves could prove beneficial. Organizational learning culture has been shown to be a highly valid predictor of job satisfaction. This extends even further with employees immersed in these cultures, less likely to terminate their employment (turnover intention), and more likely to use newly acquired skills on the job (transfer learning) (Egan *et. al*, 2004).

While overall job satisfaction paired with continuing education of employees has not been studied specifically with university grounds workers, other studies from other disciplines suggest a positive correlation between continuing education and job satisfaction (Coward *et al.* 1995). Both job satisfaction and increased knowledge of an employee’s occupation have been cited as leading to higher productivity (Egan, *et. al*, 2004). Understanding influences that support organizational learning, job satisfaction, and the transfer of knowledge to the

workplace setting are essential to the employee development that can lead to this higher productivity (Swanson & Holton, 2001).

With all of the evidence suggesting that continuing education and/or organizational learning can be key for both job satisfaction and productivity, it is only natural this approach would be beneficial to grounds workers at UT as well as peer institutions. In recent years, the trend has not been for higher education institutions like UT to receive increases in funding. In 2015, state appropriations to UT increased by only 0.8%, and nationally, twelve states saw appropriations to higher education decrease (NASBO, 2015). This leads to the belief that it is appropriate to train and further develop the skills of current campus workers.

Creation of a Landscape Academy For UT Grounds Workers

Due to substantial evidence of on-the-job training programs leading to overall higher levels of job-satisfaction and organizational commitment (Birdi *et al.*, 1997), thus leading to higher quality job performance of employees (Egan *et. al*, 2004), an on-the-job training program is proposed. Of note are studies on public-sector jobs where positive returns are seen for both men and woman who participate in workplace (on-the-job) training (Lalonde, 1995). It is additionally proposed that workers who have achieved higher levels of training are given responsibility for landscapes with higher quality thresholds.

This could be achieved through the development of a landscape academy for grounds workers. This academy could begin with a series of training programs held in-house, developed and taught initially by grounds staff managers collaboratively with UT departments with complementary knowledge (i.e. horticulture or plant sciences departments). It is recommended that training mimic the academic setting grounds workers are surrounded by, clothed in the reality of their practical work environment. Thus, a set of training programs that build upon acquired knowledge and skills would be appropriate. In a way functioning much like a college classroom, but operated within the confines of their work availability. This could later be followed by further development of higher-level training. The development of this

idea borrows heavily from the work of J. Kevin Ford, Volume editor of *Improving Training Effectiveness in Work Organizations* (Ford, 2014). Here, numerous pieces of empirical evidence are presented to substantiate this approach, and are presented within the following section.

Keys to Training Success

In an effort to make this training successful, a training culture should exist where training is not looked at as punishment for subpar work. Appropriate time should be set aside for training so it is not seen as a burden. Training material must be consistent across all content and presented in a consistent manner. Additionally, the training needs to be done at consistent intervals. Also, context cues need to be developed around training. For example, in a training scenario, if participants come to expect examinations on content at lower levels of training, they should be able to count on them at higher levels. Participants should always know what to expect as they progress through training. Consistent job tasks components should be identified and trained to levels of automaticity to lessen mental workload –making performance of those trained more reliable under environmental stressors. And lastly, trainers should introduce components of higher-level tasks to novices in early training to set the stage for mastery later. High levels of evidence exist for using these strategies to make the most impact when training workers (Rogers *et al.*, 2014).

Experiential Learning and Internships

In April 2015, the University of Tennessee, Knoxville, released a quality enhancement plan (QEP) with a focus on experiential learning. UT defines experiential learning as “*engaged student learning through direct experience and intense reflection to increase knowledge, acquire lifelong learning and problem-solving skills, and elucidate values* (UT QEP, 2015, p. 5).” This emphasis on experiential learning has emerged as a top priority for UT. One component of experiential learning is students’ participation in internship experiences.

Internships and experiences which can lead to an increased career awareness and career skill, and expanding student's career possibilities and options is set forth as an institutional goal (Eyler & Giles, 1999; Fenzel & Leary, 1997; Gray *et. al*, 2000; Pezzoli & Howe, 2001; Weppner, 2000). It is proposed that UT's desire for more experiential learning, which is nested in strong research that points to its ability to elevate the student experience be a critical component to also help elevate both UT's campus grounds and outdoor teaching resources.

Currently, students in the Department of Plant Sciences at UT are required to complete an internship as part of their graduation requirements. This includes 300 hours of supervised work with a feedback loop every 100 hours. The intent of this internship experience is to give students real-world hands on experience to help prepare them for the work force. It is proposed that a formal linkage be created between The Department of Plant Sciences and UT Facility Services, Grounds Department. This could serve as beneficial for both undergraduate students as well as for the grounds department. It is envisioned that the UT campus could become a training ground for these undergraduates who are majoring in Plant Sciences, making the campus as a whole an outdoor teaching resource. Students would benefit from the real-world, hands-on learning experience from current campus grounds employees. Likewise, current grounds employees could benefit from interacting with students sharing knowledge they have gained in the classroom.

Conceptual Models

To give a visual representation of how UT can improve its ODTR as well as the overall quality of its managed landscapes, the following model has been created (Figure 8). This model could also be customized for use by other university and college campuses. This pictorial representation of recommended components shows how identification of ODTR, paired with identifying campus quality thresholds, and training campus grounds workers work together. In areas of

intersection, items are shown to help facilitate the steps needed to see actualization of progress made in main categorical areas.

Summary and Discussion

It is clear from this study that the physical grounds of a university campus are important. They have the opportunity to actively and passively educate those who occupy them. Additionally, a well thought out, well-managed campus landscape could impart physical and psychological benefits. Promoting experiential learning that involves outdoor spaces in every discipline has the potential to benefit the student experience. This potential lies in combining the positive benefits of exposure to the outdoors, with meaningful educational experiences.

On the University of Tennessee, Knoxville campus there lies potential to improve and enhance not only the campus aesthetics, but its outdoor teaching resources as well. Results from this study identify meaningful, desired, outdoor teaching resources that could benefit the educational experience at UT. Some, but not all of the ODTR proposed would be considered intensive landscapes requiring a baseline of horticultural skill to properly maintain. Thus, it is important to elevate the education of those who manage campus grounds as the complexity of the campus landscape is increased.

Based on an evaluation of an emphasis group of peer institutions' grounds management infrastructure, job skills, requirements of entry-level positions, and an analysis of how their grounds are managed compared to UT, a comprehensive training program for both new and current employees is proposed. The training program allows for skill transfer (skill spillover) from the top tier of management within the facility services grounds department, and from applicable university departments to those who physically maintain campus grounds.

This study provides concrete ways to improve the educational value of campus. Additionally, it creates a structure of how to improve upon UT's current grounds and anticipate new landscape elements. This structure not only involves the training of current and future grounds workers, it proposes internships and

experiential learning opportunities for students in The Plant Sciences and related disciplines.

Beyond this document, campus maps, outlines of customizable training programs, and experiential learning internships have been provided to UT's Facility Services Grounds Department. Additionally, maps of currently available outdoor teaching resources have been developed to elevate their exposure among those who teach on campus. Since the census of those with teaching responsibility was completed, some new outdoor teaching resources have been added to UT. This includes three rain gardens, which can be considered examples of both a sustainable landscape and a constructed wetland. Additionally, through the use of experiential learning internships, a teaching and learning garden, which serves a variety of disciplines, was created. This physical manifestation of research helped codify recommendations for this studies model. This researcher is committed to continue to provide insight for meaningful change to the campus grounds, which enhance its outdoor learning environment.

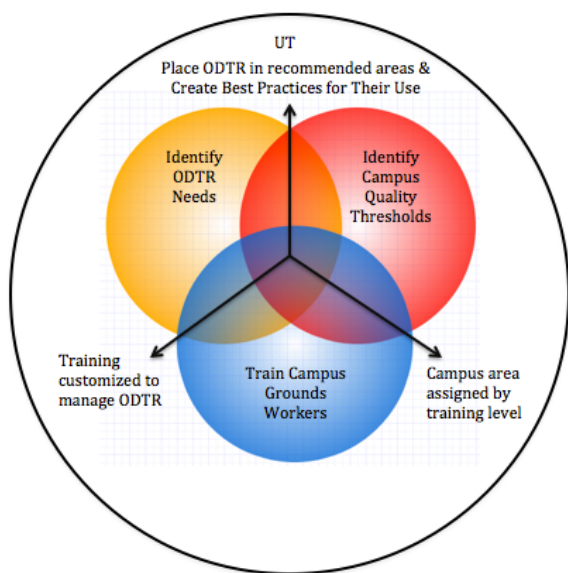


Figure 8 - Conceptual model of integration of study components.

Chapter 7

Conclusion, Recommendations, Impacts and Implications

Review of Hypothesis With Recommendations

The study's first hypothesis was that "Campus landscapes are utilitarian and are not considered multifunctional spaces or part of the learning environment." To answer this, census participants were asked specifically why they do not utilize outdoor spaces for teaching. These questions had nothing to do with the aesthetics of campus, but instead focused on if campus outdoor spaces were viewed as rich environments filled with teaching resources. It became clear through their responses, particularly, their responses to open ended questions, that some of those who teach at UT perceive significant roadblocks to holding their classes outdoors. These include: class size, lack of technology, campus noise, and teaching subject matter they deem as ill-suited for outdoor teaching. Results show that a large percentage of study participants do not consider the campus grounds as a multifunctional space that can be integrated into the teaching and learning environment. However, study participants indicated a desire to utilize suggested resources if they became available. Surprisingly, many of the desirable resources identified by participants are already available on the UT campus. This finding indicated that there was a gap in the study participants' knowledge of campus ground's elements and resources. Additionally, as anticipated, the researcher learned of ODTR on campus being used in a variety of ways that were not fully imagined before the study. One example was the use of outdoor tracks and soccer fields as part of physical education training. The outdoor facilities used by those in physical education are obviously ODTR, but were not specifically asked about in the study. Based upon data collected, the idea to take a class outside for teaching and learning appeared to be a new concept to many instructors. Information and workshops on the benefits of experiential learning, how to overcome the perceived barriers to teaching outdoors, and the benefits of outdoor education are recommended for those with teaching responsibilities. From open-ended comments

made, many respondents seem to take an all-or-nothing approach to teaching outdoors. Responding in some cases they do not have time to dedicate an entire class period to teaching outdoors. A recommended training component for instructional staff could be how to utilize ODTR for some but not all of scheduled class time, or how to direct students to ODTR on campus outside of class.

The study's second hypothesis was that peer institutions of the University of Tennessee face similar barriers to the creation and utilization of outdoor teaching spaces. These roadblocks include reliance on individuals who have not been formally trained in horticulture to be the main caregivers of the university campus grounds. An analysis of select peer institutions revealed that the majority of the workforce that maintains campus grounds could be considered unskilled when they; this is also true of UT. Unskilled labor is a segment of the work force linked with low skill level or has a limited economic value placed on the work they perform. And is associated with, and generally characterized by, low levels of education and wages. Job requirements emphasize the ability to listen and follow instructions, not horticultural knowledge. It is recommended, based on a review of the literature as well as the results of this study, that grounds management training programs be implemented to elevate the education and skill level of ground maintenance workers. The benefit of these training programs can include increased job satisfaction and work performance. Additionally, there is the potential to improve the appearance and educational value of the UT campus. It is recommended that training be performed by campus grounds management and personnel in appropriate academic departments (Plant Sciences, Soil Sciences, etc.), thus, allowing for institutional knowledge, and knowledge of how to properly manage campus grounds, and transfer in a structured way to newer or lower level employees (educational spillover).

Lastly, it was hypothesized that if additional ODTR were available, those with teaching responsibility would use them. This study identified thirteen ODTR as highly desirable to be added to the campus grounds. These thirteen resources were

not only desired, they were reported as unavailable. The location of where specific ODTR should be placed was determined based on data collected on where instructors hold class. Where participants teach on campus is an important consideration before locating and constructing such elements on campus. Study results show an indication that location of the ODTR could be critical to its use. Many ODTR reported as unavailable, are in fact available and known by study researchers, but may not be known or geographically convenient for instructors. This led researchers to divide the campus grounds into distinct geographic regions. Proposed new ODTR with the highest potential user count were identified for each region. This was also paired with practical considerations like campus topography. Proposed ODTR were then placed on campus maps to visually represent where they should be located. It is recommended that these maps be utilized when campus grounds are being renovated, or new monies become available to add specific, targeted, and accessible ODTR that have a high potential of use by those who teach on campus. As mentioned previously, some ODTR exist but are unknown to instructors. Following this study, a map of known, currently existing ODTR on campus was created. It is recommended that this be integrated into UT's online interactive map. Additionally, it is recommended interpretive signage be placed when possible at currently existing and future ODTR. This elevates their educational significance, and they are valuable even with the absence of an instructor. A further recommendation is for plant material on UT campus to be labeled to provide even more educational benefit to campus.

Impacts and Implications

This study focused on UT. However, other colleges and universities can use parts or all of this study to impact the educational value of their campus grounds. The model and research presented here has the potential to start conversations about how we view our campus, and have unlimited potential to improve upon how they are used for education.

As a direct result of this study, UT facilities now have available to them the locations of desired ODTR for future placement on campus. Additionally, specifics have been given on which resources would make the most impact in different regions of campus. Steps have been taken towards a training program for grounds workers at UT in an effort to raise the quality of care of the campus grounds and its ODTR. Plans for formal adoption of a “landscape academy” for those who manage campus grounds have been put in place and will begin during the late summer of 2016. Discussions between those involved with undergraduate programs in The Department of Plant Sciences at UT and Facility Services at UT have already begun to formulate formal experiential learning internships for students. The first such student intern is currently in place and helping with continual development of the “landscape academy” model.

Study Limitations

One limitation of this study is its short duration, capturing data from only one semester of academic study. It is recommended that due to the ever-changing instructional body of UT this study be replicated in five years time to update maps and gather new information. Another possible limitation of the study is the bias created by all researchers involved being primarily from the natural sciences. A low number of comments from census participants mentioned the census as being slightly plant centric or overly plant focused. This could of course be that many potential ODTR contain plants or are in environments that contain plants. Lastly, even with repeated exposure to the definition of the term “outdoor teaching resource,” several census participants had a hard time getting past the idea of an ODTR being just an outdoor classroom. Perhaps with additional exposure to this concept, more instructors will come to view other elements on campus as ODTR.

Final Thoughts

To realize the full possibility of this study, silos between departments and UT facilities services will need to be removed. Historically, there has been little integration between those who manage our campus grounds and the academic departments who prepare students to work in similar fields. This will take purposeful action from both sides. This includes departmental faculty being willing to share their time and knowledge, as well as being open to the experience those who currently manage our campus grounds possess. Inversely, those who manage our campus grounds will need to be willing to share their time and knowledge, as well as demonstrate a willingness to go beyond historical standards for campus grounds maintenance.

Finally, training will need to be a major part of this study's implementation. There needs to be continued expansion of training for instructional staff on the benefits of experiential learning. This should be paired with training on how to incorporate ODTR into instruction, including, how to overcome barriers such as noise, distraction, and class size when teaching outdoors. Concepts of the positive impact of green nature and the outdoor environment should also be incorporated. Adding meaningful ODTR to campus is a wonderful thing, but may not be fully actualized without creating awareness of their existence and training those who have potential to use them. Additionally, training for those who provide the upkeep and maintenance of ODTR needs to be purposeful. This could help ensure the long-term viability of each individual resource.

Above all, this study has set into motion a dynamic plan to improve the UT campus through the addition of meaningful and desired ODTR. This plan is in line with UT's QEP on experiential learning, and supports teaching beyond the natural sciences. Additionally, a plan to improve the overall quality and aesthetics of UT campus grounds while simultaneously improving the availability and quality of ODTR is now more possible. It is the firm belief of the researchers that these are an important step to increasing the impact and value of the collegiate experience at UT.

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Appendices

Appendix A: Emphasis Group Supplements

A-1: List of Schools Considered For Peer Evaluation

List of University of Tennessee, Knoxville peer institutions as identified by the Tennessee Higher Education Commission and the UT Top 25 Initiative.

Tennessee Higher Education Commission identified peers (from https://oira.UT.edu/) (with Top 25 Initiative status)	Top 25 Initiative target and current peers (from http://www.UT.edu/volvision- top25/resources.php)
Institutions common to two lists	
University of Georgia (target)	University of Georgia (target)
Texas A&M University (target)	Texas A&M University (target)
North Carolina State University (current)	North Carolina State University (current)
Auburn University (current)	Auburn University (current)
Dissimilar institutions on the two lists	
University of Texas at Austin (aspiration)	Clemson University (target)
University of North Carolina - Chapel Hill (aspiration)	Purdue University (target)
University of Maryland, College Park (aspiration)	University of Minnesota (target)
University of Virginia, Main Campus (aspiration)	Rutgers University (target)
Louisiana State University	Indiana University (target)
University of Florida (aspiration)	Michigan State University (target)
Virginia Tech	Iowa State University (current)
University of Kentucky	

A-2: Chart of University Statistics

Institution			Enrollment				Ethnicity								Attendance Cost		Campus	
Name	Year	Type	Undergrad	Graduate	Male	Female	Asian	Black/African	Hawaiian/Pacific	Hispanic/Latino	Multi-race	Native American	White	Unknown	In-state	Out-of-State	Acreage	College Housing
Auburn University	1856	Public	19,799	5,065	51.10%	48.90%	2.10%	7.20%	0.80%	2.50%	N/A	0.80%	86.00%	1.30%	\$29,164	\$46,348	1,871	69% freshman
University of Georgia	1785	Public	26,278	8,258	43.10%	56.90%	9.10%	7.50%	0.10%	5.30%	3.00%	0.10%	73.90%	1.10%	\$21,880	\$40,090	605	98% freshman
Iowa State University	1858	Public	27,659	5,296	56.60%	43.40%	3.00%	2.70%	0.10%	4.60%	2.10%	0.20%	83.20%	4.10%	\$20,002	\$32,888	1,984	89% freshman
North Carolina State	1887	Public	24,536	9,473	56.10%	43.90%	5.40%	7.10%	0.10%	4.40%	3.20%	0.50%	77.20%	2.20%	\$20,500	\$35,755	1,600	77% freshman
University of Tennessee	1879	Public	21,182	8,848	50.70%	49.30%	2.90%	7.40%	0.00%	2.80%	2.80%	0.30%	81.80%	0.20%	\$27,640	\$45,830	533	93% freshman
Texas A&M University	1876	Public	44,072	11,306	52.20%	47.80%	5.00%	3.30%	0.10%	19.90%	2.40%	0.30%	68.80%	0.20%	\$22,407	\$39,584	5,200	62% freshman

A-3: Starting Salaries for Entry Level Grounds Positions

University	Median or Listed Salary	
Auburn	\$22,250	
NC State	\$20,442	
Iowa State	\$22,607	
Texas A&M	\$20,384	
Georgia	\$25,753.50	
UTK	\$19,760	
Average	\$21,866	

A-4: Emphasis Group Organizational Charts

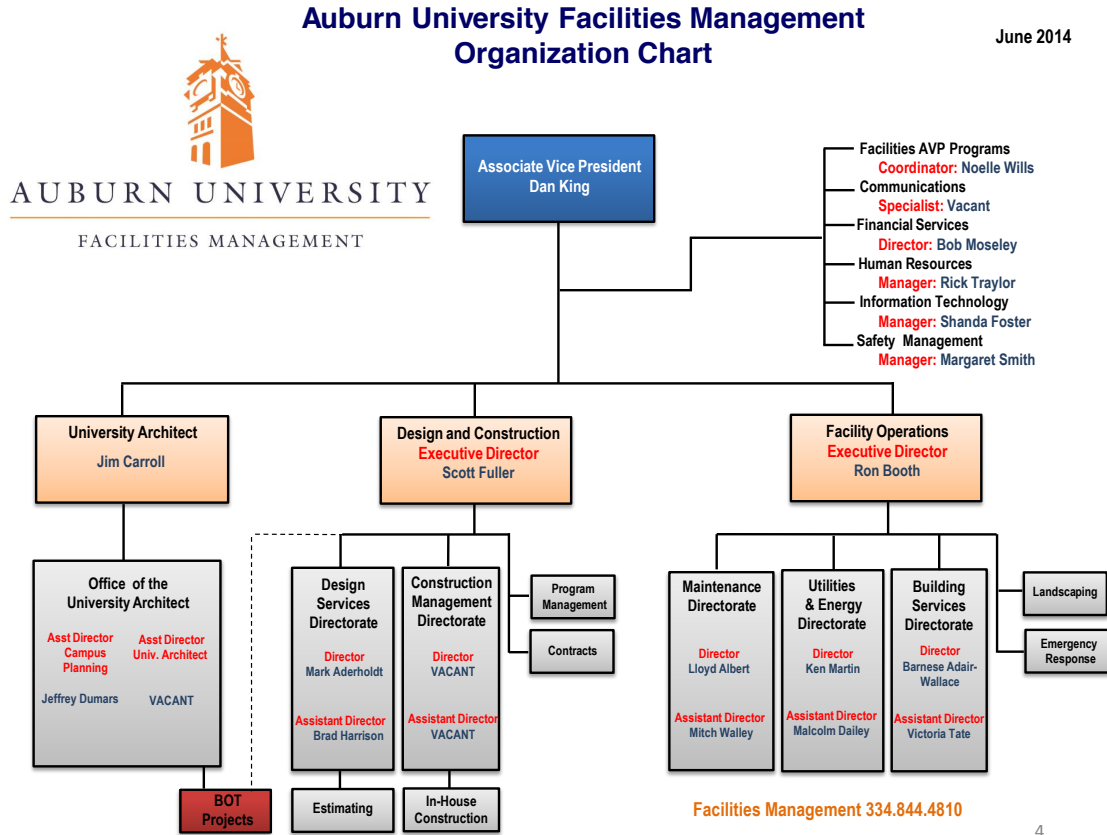


Figure 9 - Auburn Facilities Management Organization Chart

NC State University Facilities Division
Design and Construction Services
January 2015

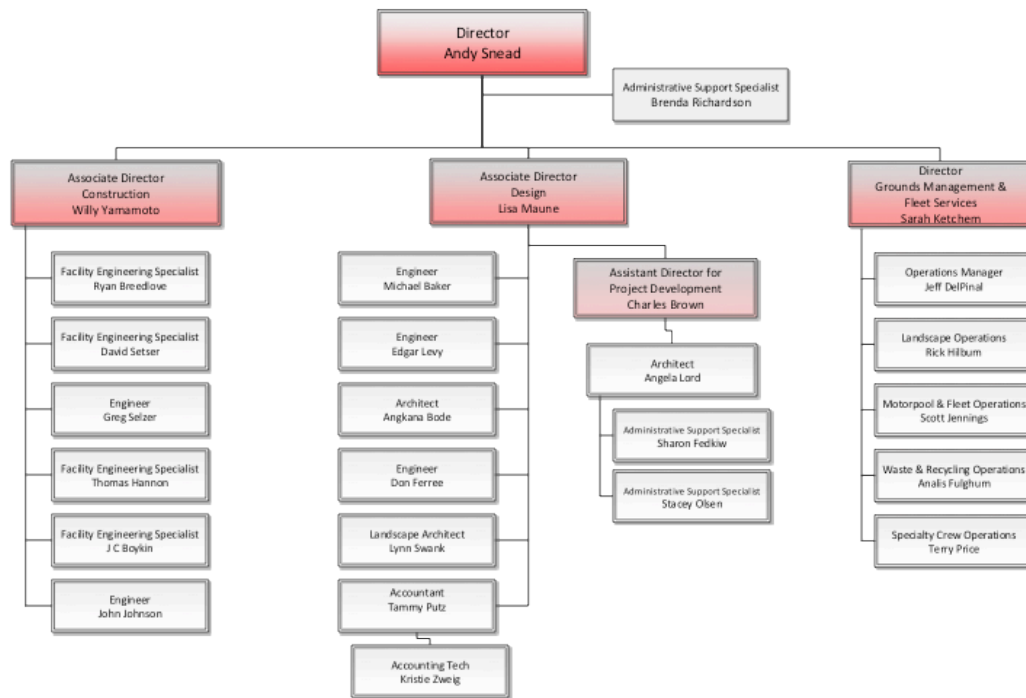


Figure 10 - North Carolina State Facilities Organization Chart

Iowa State University
Facilities Planning & Management
 April, 2015

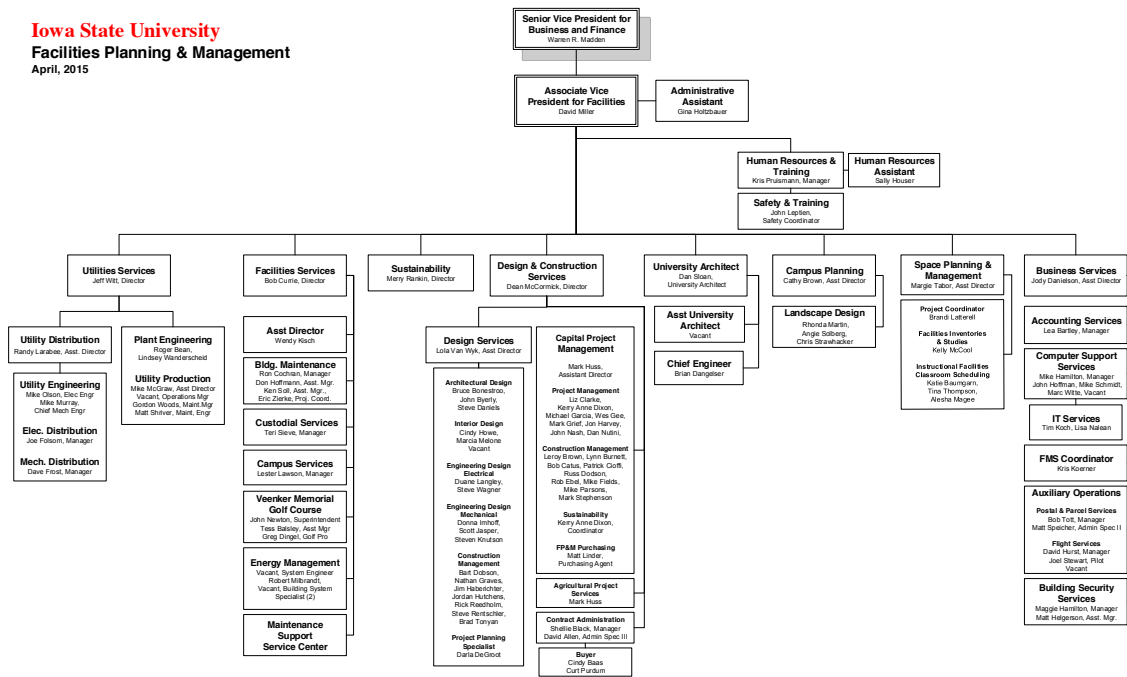


Figure 11 - Iowa State Facilities Planning and Management Organization Chart

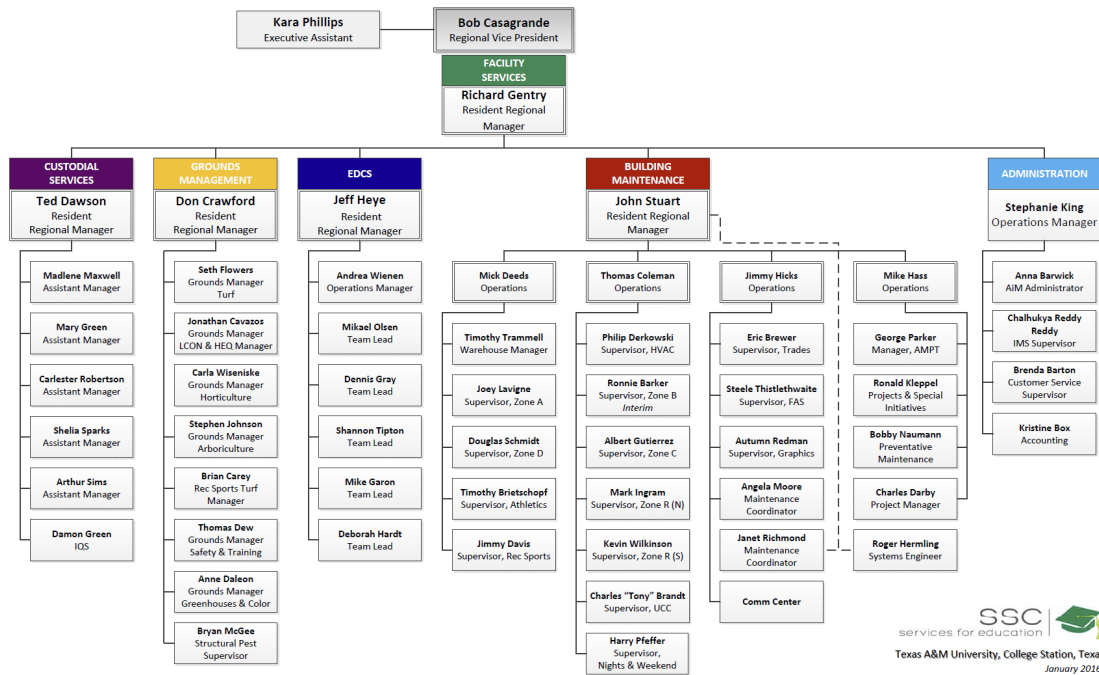


Figure 12 - Texas A&M Facility Services Organization Chart

Facilities Management Division

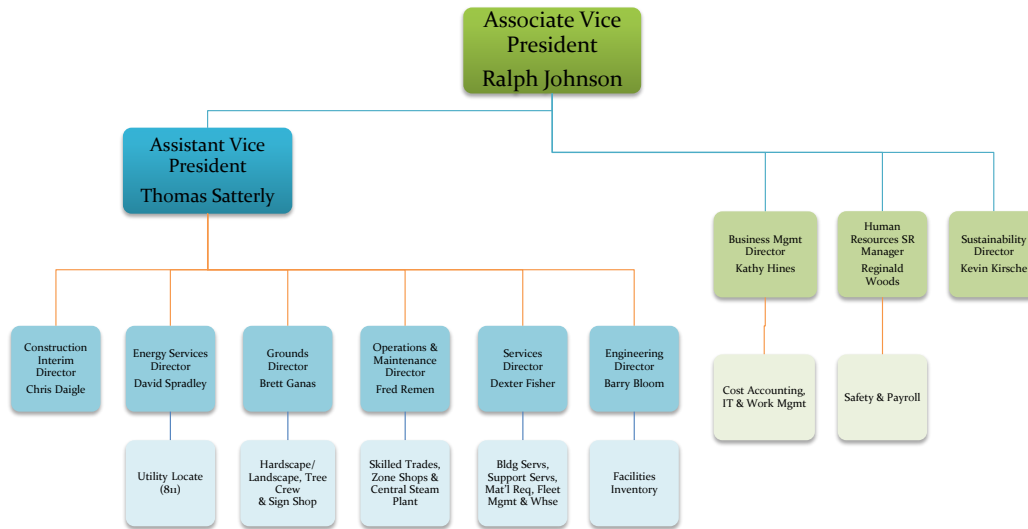


Figure 13 - University of Georgia Facilities Organization Chart

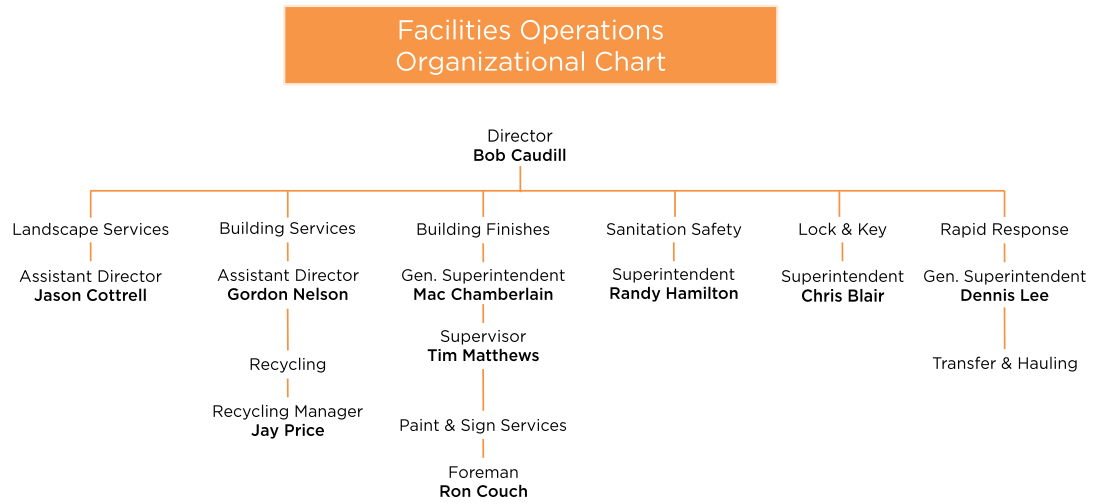


Figure 14 - University of Tennessee Facilities Operations Chart

Appendix B: Face-to-Face Interview

B-1: Face-to-Face Interview Script

Interviewer directions are in italics.

Hello, my name is _____. I'm with the Plant Sciences department.

This survey is being conducted to evaluate outdoor teaching resources for instructors at the University of Tennessee, Knoxville. When I say “outdoors” and “outside”, we mean outside any building but within UT’s campus. Although we will discuss various aspects of the campus, our intent is not to gather opinions about the overall appearance of the landscape. Participation is strictly voluntary and your responses will be kept anonymous.

For more information about this questionnaire or the purpose of this study, please contact Me: Andy Pulte at apulte@UT.edu .

Thank you for your participation!

College

- O Agricultural Sciences and Natural Resources*
- O Architecture and Design*
- O Arts and Sciences*
- O Business Administration*
- O Communication and Information*
- O Education, Health, and Human Sciences*
- O Engineering*
- O Law*
- O Nursing*
- O Social Work*
- O Veterinary Medicine*

Department _____

In your current position, are you non-tenure track, tenure track, tenured or other?

- ☐ Non-tenure track
☐ Tenure track
☐ Tenured
☐ Other _____

In your current position, are you an assistant, associate, full, or adjunct professor, special lecturer, senior lecturer, distinguished lecturer, or other?

- ☐ Assistant professor
☐ Associate professor
☐ Full professor
☐ Adjunct professor
☐ Special lecturer
☐ Senior lecturer
☐ Distinguished lecturer
☐ Other _____

What is the total number of years that you have been teaching at the college level?

How many years have you been teaching at the University of Tennessee?

How many independent study or one-on-one courses do you teach in a normal academic year?

How many courses do you teach in a normal academic year? Please do not include independent study or one-on-one courses

[illegible]

Hand participant card that lists response options. This is what I'm going to be filling in for this next set of questions.

In a given semester, how often do you use the following teaching methods? How often would you say that you use (*state teaching method*)? Would you say never, about once a semester, a few times a semester, several times a semester, or nearly every class?

	Never	About once a semester	A few times a semester	Several times a semester	Nearly every class
Lectures	0	0	0	0	0
Discussions	0	0	0	0	0
Hands-on activities	0	0	0	0	0
Labs	0	0	0	0	0
Student Peer Groups	0	0	0	0	0
Service Learning	0	0	0	0	0
Flipped classroom	0	0	0	0	0
One-on-one instruction (<i>Include assistance with independent study or practicum</i>)	0	0	0	0	0

What other teaching methods do you use in a given semester? How often would you say that you use (*other teaching method*)? Would you say never, about once a semester, a few times a semester, several times a semester, or nearly every class?

	Never	About once a semester	A few times a semester	Several times a semester	Nearly every class
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0

How often would you say that you hold class outdoors? Would you say never, about once a semester, a few times a semester, several times a semester, or nearly every class?

	Never	About once a semester	A few times a semester	Several times a semester	Nearly every class
Class Outdoors	0	0	0	0	0
For "Class Outdoors"	Go to set A	Go to set B			

A. *Question Set A*

What's stopping you from holding class outdoors?

An outdoor teaching resource would be any outdoor element contained on campus that supports the class experience.

Are there any outdoor teaching resources that you may need to hold class outside?

If asked for an example: Examples will come later in the interview, but for now it's really up to your interpretation. Would you like me to re-read the definition?

B. Question Set B

Tell me about your experience holding class outdoors.

An outdoor teaching resource would be any outdoor element contained on campus that supports the class experience.

Are there any outdoor teaching resources that you have incorporated into your courses?

- ☐ No
☐ Yes

If yes: Tell us about specific outdoor teaching resources you have found to be of benefit or any restrictions you may have faced.

ALL: What are some outdoor teaching resources that could be contained on campus that you would like to incorporate into your courses?

To the best of your knowledge, what is the availability of (*state teaching resource*) on campus? Would you say it is not available, somewhat available, or available?

Resources	Not Available	Somewhat Available	Available
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0

Give respondent card that lists possible resources and response options. For the next set of questions, this is what I'm going to be filling in.

The following is a list of outdoor teaching resources. Please tell me your level of use for each of the resources I list.

	Haven't used. Wouldn't use if available	Haven't used. Would use if available	Available, but haven't used	Have used
A specific tree	0	0	0	0
A medicinal plant	0	0	0	0
A plant from literature	0	0	0	0

A plant from religious text	0	0	0	0
An example of a sustainable landscape	0	0	0	0
An example of food systems	0	0	0	0
An example of urban agriculture	0	0	0	0
A retention pond	0	0	0	0
An example of an aquatic ecosystem	0	0	0	0
An example of a native ecosystem	0	0	0	0
An example of a non-native ecosystem	0	0	0	0
Soil profiles	0	0	0	0
Rock formations	0	0	0	0
Built elements (pavers, benches)	0	0	0	0
Sculptures	0	0	0	0
Architectural feature	0	0	0	0

Are there any other outdoor teaching resources that could be used to teach courses within your discipline? Please let me know your level of use for each of the other resources.

	Haven't used. Wouldn't use if available	Haven't used. Would use if available	Available, but haven't used	Have used
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0

Which buildings are your classes held in this semester?

What is your birth year? _____

What is your gender?

- ☐ Male
☐ Female
☐ Other

Is there anything else that you think we should know?

Appendix C: Census

C-1: Census instrument

Qualtrics Survey Software

<https://utk.col.qualtrics.com/ControlPanel/Ajax.php?action=Ge...>

Introduction

This survey is being conducted through a member of the Plant Sciences department to evaluate outdoor teaching resources for instructors at the University of Tennessee, Knoxville. When we say “outdoors” and “outside”, we mean outside any building but within UT’s campus. Although we will discuss various aspects of the campus, our intent is not to gather opinions about the overall appearance of the landscape. Participation is strictly voluntary and your responses will be kept anonymous.

For more information about this questionnaire or the purpose of this study, please contact Mr. Andy Pulte at apulte@utk.edu.

Thank you for your participation!

Body

Which of the following colleges are you currently employed through?

- | | |
|---|---|
| ☐ Agricultural Sciences and Natural Resources | ☐ Engineering |
| ☐ Architecture and Design | ☐ Law |
| ☐ Arts and Sciences | ☐ Nursing |
| ☐ Business Administration | ☐ Social Work |
| ☐ Communication and Information | ☐ Veterinary Medicine |
| ☐ Education, Health, and Human Sciences | ☐ Other |

What is your home academic department?

In your current position, are you non-tenure track, tenure track, tenured or other?

- ☐ Non-tenure track
☐ Tenure track
☐ Tenured
☐ Other

Which of the following **best** describes your current position at UT?

- ☐ Assistant professor
☐ Associate professor
☐ Full professor
☐ Adjunct faculty
☐ Lecturer
☐ Senior lecturer

- ☐ Distinguished lecturer
☐ Graduate Student
☐ Post Doc
☐ Clinical Faculty
☐ Visiting Faculty
☐ Other

For the purposes of this survey, "course" is defined as an individual class session where you hold the primary teaching responsibility. For instance,

- If you teach one lecture session where multiple class sections meet **simultaneously**, that would be one course.
- If you teach one section (lecture, lab, etc.) that meets **separately** from the other sections, consider each section an individual course.

If your situation is not adequately defined above, please use your best judgement when answering the following questions.

What is the total number of years that you have been teaching at the college level?

How many years have you been teaching at the University of Tennessee?

How many courses do you typically teach in a academic year? Please do not include independent study or one-on-one presentations.

How many independent study or one-on-one courses do you teach in a typical academic year?

In which semesters do you teach at least one **course**?

- ☐ Spring
☐ Summer and/or Mini-term
☐ Fall

About how many students are enrolled in each of the **courses** that you teach during the **spring** semester?
Please do not include independent study or one-on-one courses.

If you're not sure about the exact number of students, please take your best guess.

- | | |
|--------------------------------|----------|
| <input type="text" value="0"/> | Course 1 |
| <input type="text" value="0"/> | Course 2 |
| <input type="text" value="0"/> | Course 3 |
| <input type="text" value="0"/> | Course 4 |
| <input type="text" value="0"/> | Course 5 |
| <input type="text" value="0"/> | Course 6 |
| <input type="text" value="0"/> | Course 7 |
| <input type="text" value="0"/> | Course 8 |

About how many students are enrolled in each of the **courses** that you teach during the **summer** or **mini-term** semester? Please do not include independent study or one-on-one courses.

If you're not sure about the exact number of students, please take your best guess.

- | | |
|--------------------------------|----------|
| <input type="text" value="0"/> | Course 1 |
| <input type="text" value="0"/> | Course 2 |
| <input type="text" value="0"/> | Course 3 |
| <input type="text" value="0"/> | Course 4 |
| <input type="text" value="0"/> | Course 5 |
| <input type="text" value="0"/> | Course 6 |
| <input type="text" value="0"/> | Course 7 |
| <input type="text" value="0"/> | Course 8 |

About how many students are enrolled in each of the **courses** that you teach during the **fall** semester? Please do not include independent study or one-on-one courses.

If you're not sure about the exact number of students, please take your best guess.

0	Course 1
0	Course 2
0	Course 3
0	Course 4
0	Course 5
0	Course 6
0	Course 7
0	Course 8

Please select any of the following teaching methods that you may use at any time during a given semester.

- | | |
|--|--|
| ☐ Class outdoors (on or off campus) | ☐ Online discussion boards, blogs or wikis |
| ☐ Lectures | ☐ Online assignments |
| ☐ Discussions | ☐ Research projects |
| ☐ Hands-on activities | ☐ Oral presentations |
| ☐ Labs | ☐ Flipped classroom |
| ☐ Student Peer Groups | ☐ One-on-one instruction (Include assistance with independent study or practicum) |
| ☐ Service Learning | ☐ Games |
| ☐ Clickers or Personal Response Systems | ☐ Field Trips |
| ☐ Visual Aids | ☐ Charrettes |
| ☐ Video | ☐ Clinical experiences |
| ☐ Guest Speakers | ☐ Other |
| ☐ Demonstrations | |

In a given semester, how often do you use the following teaching methods?

	About once a semester	A few times a semester	Several times a semester	Nearly every class
» Lectures	☐	☐	☐	☐
» Discussions	☐	☐	☐	☐
» Hands-on activities	☐	☐	☐	☐
» Labs	☐	☐	☐	☐
» Student Peer Groups	☐	☐	☐	☐
» Service Learning	☐	☐	☐	☐
» Clickers or Personal Response Systems	☐	☐	☐	☐
» Visual Aids	☐	☐	☐	☐
» Video	☐	☐	☐	☐
» Guest Speakers	☐	☐	☐	☐
» Demonstrations	☐	☐	☐	☐
» Online discussion boards, blogs or wikis	☐	☐	☐	☐
» Online assignments	☐	☐	☐	☐
» Research projects	☐	☐	☐	☐
» Oral presentations	☐	☐	☐	☐
» Flipped classroom	☐	☐	☐	☐
» One-on-one instruction (Include assistance with independent study or practicum)	☐	☐	☐	☐
» Class outdoors (on or off campus)	☐	☐	☐	☐
» Games	☐	☐	☐	☐
» Field Trips	☐	☐	☐	☐
» Charrettes	☐	☐	☐	☐
» Clinical experiences	☐	☐	☐	☐
» Other	☐	☐	☐	☐

What other teaching methods do you use in a given semester?

What's preventing you from holding class outdoors?

An outdoor teaching resource would be any outdoor element contained on campus that supports student learning.

What are some **outdoor teaching resources** that you may need to hold class outside? If there are none, please leave this question blank.

In a given semester, how frequently do you hold class outdoors on or off campus?

	Never	About once a semester	A few times a semester	Several times a semester	Nearly every class
Class outdoors on campus	☐	☐	☐	☐	☐
Class outdoors off campus	☐	☐	☐	☐	☐

Tell me about your experience holding class outdoors.

An outdoor teaching resource would be any outdoor element contained on campus that supports student learning.

Are there any **outdoor teaching resources** that you have incorporated into your courses?

- ☐ No
☐ Yes

Are there any **outdoor teaching resources** that you may need to hold class outside? If there are none, please leave this question blank.

Tell us about specific **outdoor teaching resources** you have found to be of benefit.

Please mark the extent to which you disagree or agree that each of the following reasons below for **not** holding class outdoors.

	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree
Too noisy	☐	☐	☐	☐	☐
Distracting for students	☐	☐	☐	☐	☐
Distracting for instructors	☐	☐	☐	☐	☐
Voice doesn't carry	☐	☐	☐	☐	☐
Class size is too large	☐	☐	☐	☐	☐
Unsuitable class environment	☐	☐	☐	☐	☐
No projection system	☐	☐	☐	☐	☐
Inadequate seating	☐	☐	☐	☐	☐
No dry erase boards	☐	☐	☐	☐	☐
Allergies	☐	☐	☐	☐	☐
Weather	☐	☐	☐	☐	☐
Not relevant to course material	☐	☐	☐	☐	☐
Insects	☐	☐	☐	☐	☐
Time constraints	☐	☐	☐	☐	☐
Other reason - not listed	☐	☐	☐	☐	☐

What are some other reasons for not holding class outdoors?

To the best of your knowledge, what is the availability of the following **outdoor teaching resources** on campus?

	Not Available	Somewhat Available	Available	Not Sure
A medicinal plant	☐	☐	☐	☐
A plant from literature	☐	☐	☐	☐
A plant from religious text	☐	☐	☐	☐
Edible plants, like fruits and vegetables	☐	☐	☐	☐
Herbs	☐	☐	☐	☐
Another specific type of plant	☐	☐	☐	☐
A specific tree	☐	☐	☐	☐
A stand of trees	☐	☐	☐	☐
An herb garden	☐	☐	☐	☐
An edible garden	☐	☐	☐	☐
A native plant garden	☐	☐	☐	☐
Another, specific type of garden	☐	☐	☐	☐
An example of a sustainable landscape	☐	☐	☐	☐
An example of food systems	☐	☐	☐	☐
An example of urban agriculture	☐	☐	☐	☐

To the best of your knowledge, what is the availability of the following **outdoor teaching resources** on campus?

	Not Available	Somewhat Available	Available	Not Sure
A retention pond	☐	☐	☐	☐
An example of an aquatic ecosystem	☐	☐	☐	☐
Constructed wetlands	☐	☐	☐	☐
An example of a native ecosystem	☐	☐	☐	☐
An example of a non-native ecosystem	☐	☐	☐	☐
Soil profiles	☐	☐	☐	☐
Plant labels	☐	☐	☐	☐
Signs for garden beds	☐	☐	☐	☐
Historical markers around campus	☐	☐	☐	☐
Architectural markers in front of buildings	☐	☐	☐	☐
Rock formations	☐	☐	☐	☐
Architectural features	☐	☐	☐	☐
Seating	☐	☐	☐	☐
Tables	☐	☐	☐	☐
Other built elements	☐	☐	☐	☐
A quiet space to hold class	☐	☐	☐	☐

The following is a list of outdoor teaching resources. Please tell me the amount you might use each of the following **outdoor teaching resources** if they were available on campus.

	Not at all	A little	Somewhat	A great deal
A medicinal plant	☐	☐	☐	☐
A plant from literature	☐	☐	☐	☐
A plant from religious text	☐	☐	☐	☐
Edible plants, like fruits and vegetables	☐	☐	☐	☐
Herbs	☐	☐	☐	☐
Another specific type of plant	☐	☐	☐	☐
A specific tree	☐	☐	☐	☐
A stand of trees	☐	☐	☐	☐
An herb garden	☐	☐	☐	☐
An edible garden	☐	☐	☐	☐
A native plant garden	☐	☐	☐	☐
Another, specific type of garden	☐	☐	☐	☐
An example of a sustainable landscape	☐	☐	☐	☐
An example of food systems	☐	☐	☐	☐
An example of urban agriculture	☐	☐	☐	☐

The following is a list of outdoor teaching resources. Please tell me the amount you might use each of the following **outdoor teaching resources** if they were available on campus.

	Not at all	A little	Somewhat	A great deal
A retention pond	☐	☐	☐	☐
An example of an aquatic ecosystem	☐	☐	☐	☐
Constructed wetlands	☐	☐	☐	☐
An example of a native ecosystem	☐	☐	☐	☐
An example of a non-native ecosystem	☐	☐	☐	☐
Soil profiles	☐	☐	☐	☐
Plant labels	☐	☐	☐	☐
Signs for garden beds	☐	☐	☐	☐
Historical markers around campus	☐	☐	☐	☐
Architectural markers in front of buildings	☐	☐	☐	☐
Rock formations	☐	☐	☐	☐
Architectural features	☐	☐	☐	☐
Seating	☐	☐	☐	☐
Tables	☐	☐	☐	☐
Other built elements	☐	☐	☐	☐
A quiet space to hold class	☐	☐	☐	☐

Which buildings are your classes held this semester? Select all that apply.

- | | | |
|--|---|--|
| ☐ Alumni Memorial Building | ☐ Estabrook Hall | ☐ Natalie L. Haslam Music Center |
| ☐ Art and Architecture | ☐ Ferris Hall | ☐ Neyland Biology Annex |
| ☐ Ayres Hall | ☐ Food Safety and Processing | ☐ Neyland Thompson Sports Center |
| ☐ Bailey Education Complex | ☐ Food Science Building | ☐ Nielsin Physics Building |
| ☐ Biosystems Engineering & Environmental Sciences | ☐ Greenhouses | ☐ Pasqua Nuclear Engineering |
| ☐ Black Cultural Center | ☐ Health, Physical Education & Recreation | ☐ Perkins Hall |
| ☐ Blount Hall | ☐ Henson Hall | ☐ Philander P. Claxton Education Building |
| ☐ Brehm Animal Science | ☐ Hesler | ☐ Plant Biotechnology Building |
| ☐ Buehler / Dabney | ☐ Hodges Library | ☐ Science & Engineering |
| ☐ Burchfiel Geography Building | ☐ Hoskins Library | ☐ Senter Hall |
| ☐ Center for International Education | ☐ Howard H. Baker Jr. Center for Public Policy | ☐ Silverstein-Luper Building |
| ☐ Ceramics | ☐ Humanities and Social Sciences | ☐ South Stadium Hall |
| ☐ Clarence Brown Theatre | ☐ International House | ☐ Stokely Athletics Center |
| ☐ College of Nursing | ☐ James A. Haslam II Business Building | ☐ Stokely Management Center |
| ☐ Communications | ☐ Jessie Harris Building | ☐ Student Services Building |
| ☐ Dougherty Engineering | ☐ John D. Tickle Engineering Building | ☐ Taylor Law Center |
| ☐ Dunford Hall | ☐ McClung Museum | ☐ Temple Court |
| ☐ Earth & Planetary Science | ☐ McCord Hall | ☐ University Center |
| ☐ East Stadium Hall | ☐ McLeod Food Technology | ☐ Veterinary Teaching Hospital |
| ☐ Ellington Plant Sciences | ☐ Min H. Kao Engineering Building | ☐ Walters Life Sciences |
| ☐ Engineering Annex | ☐ Morgan Hall | ☐ Other |
| ☐ Environmental & Landscape Lab Building | ☐ Music Building | <input type="text"/> |

What is your birth year?

Year (ex. 1960)

What is your gender?

- ☐ Male
- ☐ Female
- ☐ Other

Is there anything else that you think we should know?

C-2: Census Tables*Table 1 - Perceived restrictions to holding class outdoors*

Perceived restrictions to holding class outdoors as a function of whether the instructor currently uses the ODTR {1 = Disagree, 2, Somewhat disagree, 3 = Neither agree nor disagree, 4 = Somewhat agree, 5 = Agree}

	Overall		Outdoor Teachers		Non-Outdoor Teachers	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Too noisy	3.42	1.41	2.62	1.41	3.63	0.65
Distracting for students	3.62	1.39	2.63	1.45	3.55	0.73
Distracting for instructors	3.14	1.47	2.13	1.35	2.98	0.88
Voice doesn't carry	3.16	1.47	2.43	1.39	3.03	0.85
Class size is too large	3.22	1.51	2.80	1.38	2.87	0.82
Unsuitable class environment	3.41	1.48	2.23	1.32	2.21	1.08
No projection system	3.65	1.49	2.37	1.59	3.46	0.78
Inadequate seating	3.60	1.47	2.41	1.49	3.57	0.69
No dry erase boards	3.26	1.53	2.16	1.46	2.74	0.85
Allergies	2.77	1.32	2.10	1.12	1.83	0.79
Weather	3.61	1.20	3.23	1.29	2.74	0.84
Not relevant to course material	3.42	1.56	2.00	1.32	3.07	0.88
Insects	2.63	1.31	1.78	0.99	3.13	0.80
Time constraints	3.12	1.33	2.82	1.39	1.82	0.85
Other reason - not listed	2.72	1.05	2.48 ^a	1.14	2.07 ^a	0.96

^aMeans did not differ significantly ($p > 0.05$) when compared in an independent samples t-test.

Table 2 - College in which participants' courses are taught

	Overall (n)	Overall (%)	Outdoor Teachers (%)	Non- Outdoor Teachers (%)
Agricultural Sciences and Natural Resources	44	8.9	25.0	5.0
Architecture and Design	7	1.4	4.0	.8
Arts and Sciences	217	43.7	47.0	42.5
Business Administration	34	6.8	2.0	8.1
Communication and Information	25	5.0	2.0	6.1
Education, Health, and Human Sciences	81	16.3	13.0	17.2
Engineering	36	7.2	3.0	8.6
Law	12	2.4	1.0	2.8
Nursing	12	2.4	0.0	3.3
Social Work	7	1.4	0.0	1.7
Veterinary Medicine	12	2.4	2.0	2.8
Other	10	2.0	1.0	1.1
Total	497	100.0	100.0	100.0

Table 3 - Current position with the university

	Overall (n)	Overall (%)	Outdoor Teachers (%)	Non- Outdoor Teachers (%)
Assistant professor	55	11.2	10.0	11.4
Associate professor	72	14.7	12.0	14.2
Full professor	86	17.6	19.0	17.8
Adjunct faculty	26	5.3	4.0	6.1
Lecturer	66	13.5	13.0	14.8
Senior lecturer	15	3.1	2.0	3.6
Distinguished lecturer	2	0.4	0.0	.6
Graduate Student	139	28.4	36.0	25.3
Clinical Faculty	8	1.6	0.0	2.2
Visiting Faculty	2	0.4	0.0	.6
Other	19	3.9	4.0	3.3
Total	490	100.0	100.0	100.0

Table 4 - Years teaching at the college level

	Overall	Outdoor Teachers	Non- Outdoor Teachers
Mean	11.68	11.84	11.80
Median	7.00	6.00	7.00
Mode	2	3	2
Standard Deviation	11.49	12.11	11.41
Minimum	0	1	0
Maximum	56	45	56
Valid	476	100	360
Missing	42	0	0

Table 5 - Years teaching at their current university

	Overall	Outdoor Teachers	Non- Outdoor Teachers
Mean	9.30	9.93	9.25
Median	4.00	4.00	4.50
Mode	1	1	1
Standard Deviation	10.54	11.34	10.38
Minimum	0	1	0
Maximum	45	40	45
Valid	476	100	360
Missing	42	0	0

Table 6 - Number of courses typically taught in an academic year

	Overall	Outdoor Teachers	Non- Outdoor Teachers
Mean	3.59	3.71	3.60
Median	3.00	4.00	3.00
Mode	4	4	4
Standard Deviation	2.24	1.71	2.36
Minimum	0	1	0
Maximum	21	8	21
Valid	476	100	360
Missing	42	0	0

Table 7 - Frequency of using various teaching methods

Frequency of using various teaching methods {1 = About once a semester, 2 = A few times a semester, 3 = Several times a semester, 4 = Nearly every lesson, 0 = Never (Excluded from Analyses)}

	Overall		Outdoor Teachers		Non-Outdoor Teachers	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Lectures	3.56	0.69	3.34	0.81	3.63	0.65
Discussions	3.52	0.72	3.42	0.68	3.55	0.73
Hands-on activities	3.09	0.85	3.35	0.74	2.98	0.88
Labs	3.17	0.79	3.42	0.60	3.03	0.85
Student peer groups	2.91	0.82	3.05	0.77	2.87	0.82
Service learning	2.20	1.04	2.19	0.98	2.21	1.08
Clickers or Personal Response Systems	3.45	0.77	3.43	0.79	3.46	0.78
Visual aids	3.59	0.65	3.65	0.57	3.57	0.67
Video	2.74	0.85	2.77	0.87	2.74	0.85
Guest speakers	1.86	0.78	1.95	0.75	1.83	0.79
Demonstrations	2.78	0.83	2.84	0.81	2.74	0.84
Online discussion boards, blogs or wikis	2.91	0.92	2.32	0.82	3.07	0.88
Online assignments	3.02	0.84	2.59	0.84	3.13	0.80
Research projects	1.91	0.87	2.13	0.89	1.82	0.85
Oral presentations	2.08	0.95	2.11	0.95	2.07	0.96
Flipped classroom	2.92	0.85	2.94	0.87	2.91	0.85
One-on-one instruction	2.84	0.81	2.84	0.80	2.85	0.82
Class outdoors (on or off campus)	2.05	0.96	2.05	0.96	0.00	0.00
Games	2.27	0.88	2.58	1.03	2.10	0.74
Field Trips	1.83	0.79	1.98	0.83	1.61	0.67
Charrettes	2.11	0.93	2.00	1.00	2.25	0.96
Clinical experiences	3.07	0.77	3.14	0.38	3.06	0.83
Other	2.61	1.09	2.75	0.96	2.57	1.16

C-3: Responses to open ended question on restrictions to holding class outdoors (What's preventing you from holding class outdoors?)

- Also, I'm not sure of good, convenient locations for outdoor work. I'd be open to it -- and I think the students would love it -- but administration and logistic issues typically prevent me from moving things outside.
- and harder for them to hear instruction or discussion.
- Class size
- distraction might be possible
- FYI- My weekends typically are spent outside, in hiking boots or on a bike. I discovered when I moved to TN the importance of getting outside to build resilience for the other stuff that comes at me in life.
- I do not talk about plants in the wild!
- I just don't like the cold and this spring has been so cold
- no forum / location
- no shade
- This is my first time teaching the course and I think if the weather is 'right' I might hold an outdoors discussion (?)
- 1. There is no suitable space for gathering. 2. Outdoor space on campus is very noisy and windy. 3. Students are easily distracted, especially because we cannot hear one another.
- A combination of convenience and visual aid availability.
- A couple issues... weather is always a factor; seating for all students; ability to use powerpoints (which students have complained when not used since it helps them with lectures); cannot during the lab class as students need the computers to work on (specialized software on the computers, so can't just use their laptops). In addition, there is significant distraction, which, for the large class (120 students) would be a huge issue.
- A distraction for the materials to be covered.
- A number of my courses are distance education online courses. The other courses are taught off-site in a location not convenient for outdoor class of any type.
- All my classes are online, with the exception of a few in a semester where we visit a client location.
- All the classes I'm currently teaching are distance education classes. I only rarely get to teach face-to-face.
- Allergies, location, distractions
- As a student, I found outdoor sessions difficult to focus on. The space seemed too open; the teacher's voice dissipated into the air; other students were wandering or playing around. It was nice to be outside but not effective for the course goals.

- As a Teaching Assistant, I do not design the courses but follow the syllabus as laid out by professors.
- At the veterinary school - the teaching is traditional and I need to maximize every minute to get it all taught - it is just not conducive to being outside too
- Because I teach a lab course
- Because the profession the student will enter is practiced indoors.
- Because we typically use a lot of equipment and do a lot of hands-on activity with materials, we are constrained to using a laboratory in our building.
- Being outdoors would generally present a barrier to student learning in this course rather than a help, because we use a lot of materials (e.g. microscopes) that we would have to move outside.
- Bugs
- Business classes not suited for outdoor learning
- business courses require centralized software/technology that doesn't play well outside
- Can't project on a screen. Class is too large.
- Chemistry classes
- Class content is not conducive to outdoors
- Class focus and accessibility of teaching resources.
- Class material requires presentations (powerpoint) or chalkboard stuff
- Class size
- Class sizes are too large.
- Classes are too large to keep the students organized. Technology needed for class outdoors is not sufficient, i.e. no white boards.
- Computer lab is used
- content is not conducive to being covered outdoors
- Currently, I am teaching online courses so teaching outdoors is not an option. In the past, I found that moving a class outdoors was distracting.
- Dependence on Technology, difficult to plan for weather conditions
- Difficult to keep kids focused when they are outdoors. Also, we don't have a white board available to teach on outdoors.
- Difficult to use the visual aids used for lectures and difficult with such a large class
- Difficulties associated with noise and inability to use document camera or other electronic projection devices.
- difficulty arranging / logistics
- Difficulty incorporating technology with outside experiences
- Distracting for students. Prefer access to visual aids, computer/Powerpoint, whiteboards.
- Distraction
- Due to time constraints and locating a place where all students could fit and hear the instructions or lecture is difficult.

- During the regular school year I have no reason to lecture outdoors. In the summer when there are field classes ALL of every class period is outdoors.
- Either class size (being too large) or confidentiality reasons (I teach courses related to clinical work in psychology).
- First of all, the course content is not appropriate most of the time. I don't see that sitting around on the grass has any educational benefit. second of all, the kinds of outdoor activities that I have in mind are not always understood by outside observers. On the few occasions that I have involved students in outdoor activities, I have gotten criticism.
- Food Science courses, particularly those with labs, are not suited for outdoor classes.
- Hard to control an outing.
- hard to find meeting space that will allow us to complete the assignments
- Hard to predict if weather will allow, too many distractors, I have to force my voice, hard to show images: too much light
- Haven't thought about it.
- I am hearing impaired and can hear my students better in a room. But, seeing as outdoor classes are the exception rather than the norm, I find this question oddly worded.
- I am in math; need a board. Not relevant to teach outside.
- I conduct field trips (which are outdoors when weather permits) - so that might be considered outdoor instruction.
- I currently teach an online class, so we don't hold meetings.
- I did not enjoy classes outside during my undergraduate career due to noise and other distractions. Beyond this, I have been informed that holding class outside has drawbacks that are not typically considered such as "losing your voice" very quickly because of the need to "speak louder" than what is the norm inside.
- I do not because there is no place to go that is appropriate for outdoor teaching
- I do not have the opportunity.
- I do not hold class outdoors because during the Spring semester for instance, the weather is still cold. For the Fall semester, classes are not held outdoors because it is occasionally very warm and it might be a source of distraction for my students.
- I find it distracting to move 60 people outside for class.
- I hadn't thought about it. Students in my class use laptops, worksheets, notes, printed articles, and the whiteboard, so keeping all of this organized for a class outside would be difficult for forty students.
- I have 70 students in one class. The other class is a lab where much of the work is done on a computer. Sometimes when the weather is nice and they

are doing a small group activity that does not require the computer, I'll encourage everyone to go outside.

- I have a large class and not sure how to do it logistically.
- I have done this a few times. Since most students take notes on laptops and many do not have long battery life on their computers, they find it hard to manage the class outside. Also, not everyone is comfortable with using a laptop in his or her lap for 50-75 minutes. Some classes require classroom technology, making outdoor classes impossible (or forcing a change in pedagogy/course design for that class).
- I have not been provided with a good reason to do so, nor is there an obvious place outside to hold such classes.
- I have not thought about it, but it is a good idea.
- I have nothing to write on outdoors
- I have severe allergies. If I could have sessions outside, I would occasionally.
- I have so many students in each course that it would be difficult, I think, and I just haven't ventured in that direction! I do teach biology, so I think I could find a reason to go outdoors. We do one lab that goes outside but that is it.
- I held one class period outside, and I found it to be more trouble than it was worth. It was a hassle to coordinate and there were too many distractions.
- I hold class outdoors when a student project incorporates that.
- I incorporate technology into every class, which is not available outdoors.
- I make regular use of technology during my lectures, which would be difficult if I held class outdoors. Although I could have discussion outdoors, I've always feared that this would be more of a distraction than anything else.
- I make use of resources in the classroom
- I need a theatre
- I need a whiteboard, but Even with one available I still do not think outside classroom is going to work for my discipline.
- I need the blackboard and I do not see any added benefit to teaching outdoors.
- I need the blackboard and the computer a lot
- I need to have access to technology so that is why I do not hold my classes outdoors.
- I never considered it as an option. I'm not sure how 40 students would be able to receive instruction outdoors, where we would even go to have class with relatively few distractions, and what could be taught better outside than inside.
- I never tried to ask. But I don't think it will be approved by the department.
- I normally teach statistics and reliability courses in which my lectures are on Powerpoint slides. I also need a dry erase board to work through problems during class.
- I often use powerpoint slides and/or video clips that require me to be connected to a projector/screen.

- I primarily teach statistics, so I must have a computer simulator available at all times.
- I rely on my Powerpoint slides. Students typically come unprepared (no paper copies, no computer, etc.) and they rely on my slides being projected to know what is going on. I believe there are too many distractions outside (noise, people walking around, bugs, less than favorable temperatures). I believe, for my class sizes, I would have to shout for all students to hear me. Outdoors is inappropriate for some of the in-class activities I do (tissue paper experiment, flying paper helicopters).
- I run a nuclear engineering lab. It would be insanely difficult to perform that outside
- I see no point in doing so, and I need audio visual equipment to teach.
- I show images and require a screen.
- I TA for the biology department, and the labs we do wouldn't be possible in an outdoor environment.
- I teach 100% on-line, My students are in all areas of the country.
- I teach a lab section.
- I teach a media class that requires use of computers to write and access online media material.
- I teach academic writing classes, and being outside is largely arbitrary to what I do. The only time I take a class outside is if the weather's nice and we're doing something that we could do outside--purely as a treat for the students. I would love to teach outdoors, but it just doesn't line up with what I do!
- I teach art history. We do it in the dark.
- I teach English, and I use technology so frequently in class, that it would be difficult to have class outdoors. Also, the weather has been too cold to have class outdoors comfortably.
- I teach evening courses.
- I teach German. Teaching outdoors would be pointless and distracting and would deprive me of the technology I generally use in the classroom.
- I teach graduate courses on literacy acquisition. Rarely does indoors/outdoors make a difference for acquisition. However, almost all instruction and practice goes on indoors.
- I teach in distance education courses using on-line strategies
- I teach in the technology classroom- going outside doesn't add to the course.
- I teach lab sections. I am unable to hold class outdoors unless the lab calls for it.
- I teach labs and discussion sessions. They are pre-determined, so I do not have a say in what is done each week. Also, most subjects would not benefit from spending time outdoors.

- I teach lower level math classes. Holding classes outdoors would be impractical due to the difficulty for taking notes and not being able to use the projection system I use virtually everyday
- I teach music classes and we need white boards, pianos and a way to hear music.
- I teach online
- I teach PEAP classes. If classes are outdoors, it is weather dependent.
- I tried it once. It is not ideal for math. I need a board. The students do not pay attention.
- I typically do some sort of lecture followed by activities, games, discussions, etc. I usually need either PowerPoint or whiteboard for visual aids during lectures. I don't want to convene in the classroom for lecture, then move to the outside, then move back inside again.
- I typically use power point and videos. I probably could/should have held a class or two outside, but really never thought about it.
- I use a projector and would not be able to use this outdoors
- I use in-class visual aids for every class. This is a key element of learning a foreign language and outdoor classes do not allow the use of this or other features of classroom technology.
- I use smart classroom technology in every class meeting. These capabilities are not available outdoors.
- I use technology every time I teach and it would not be practical to use outdoors as a classroom
- I use the Smartboard extensively. There is not a place to do that effectively. Also, I feel it would take away instruction time with getting people there, possible interference from other activities, etc.
- I use video technology in a standard classroom session. There is no convenient and quiet place for me to hold my classes outdoors.
- I used to hold class outdoors, but I found it was too loud. I could project to the students, but I couldn't hear them.
- I usually use PowerPoint or other AV aids in my class discussions and lectures.
- I would be glad to do so in the future.
- I would be too distracted and I am sure my students would as well
- I would love to hold class in Circle Park - it's right next to our building - but there's no place to sit. I don't mind sitting on the ground but it would sure be nice if there were some tables we could move around. There are some benches along the walkway, but they get overtaken by smokers so it's very unpleasant to sit out there. If UT would get with it and disallow smoking in all public spaces, outdoor classes would be fabulous.
- I would love to hold class outdoors, but I don't for several reasons. First, I just don't know what's available for outdoor classrooms. Second, because math is best learned by seeing/working examples, I would need a board

outdoors to write on for my students. Third, I don't know that there is any space that would accommodate 30-35 students.

- I'm a teaching assistant who teaches discussion sections. I am not in control of the content or the format of what I teach, and my lectures are heavily dependent on PowerPoint.
- I'm afraid my class has too many students such that it would become unwieldy outdoors
- I'm located in JHB, which makes holding class outdoors difficult. During one spring semester a couple of years ago, I held class in the World Fair Amphitheater.
- I'm not aware of any outdoor classroom facilities, and our weather is a bit unpredictable during the spring semester months.
- I'm not sure where there is space large enough for the whole class. Also I depend on the in-class technology quite a bit.
- If I had good outdoor classroom (where can deliver content with visual aide access), would love to take class outside on a beautiful day. I have done it on some rare occasions.
- If I am using PPT for lectures with images of sites and objects, I cannot hold class outdoors. For other classes, I find the students get distracted and don't pay attention though I am willing to take them out if they ask and the class is under 20 people.
- If I had fewer students, I might. I teach writing and literature courses, so if I had more ideas for outdoor lessons, I'd be open to it as well. For now, I utilize the various technology in the classroom, so I would also need ideas for lesson plans that do not require this tech.
- In nearly every class meeting, I need to use the projector, speakers, and/or document viewer.
- Inconvenience. Distraction. Weather.
- It does not really fit the content of what I teach. In the past, I have held individual class sessions outdoors but I don't do this on a regular basis.
- It doesn't fit in with the course material nor do we have time in a 50-minute class period.
- It has been too cold. We meet at 8:10 am.
- It is a distracting environment, and I have too many students to keep track of outside.
- It is a distraction for students.
- It is a Lifeguarding class so we are typically have it in the pool. If it is nice outside and the outdoor pool is open we will swim outside, typically the season does not allow.
- It is difficult to find a good space devoid of construction noise.
- It is hard to lecture chemistry to 320-380 students outdoors. For my 1-section class with only 24 students it is still hard to convey the chemistry material to be covered in a lecture outdoors.

- It is inefficient and distracting.
- It is not appropriate for classes I teach. However, I do offer the students opportunities to take part in field surveys that are all outdoor events.
- It is not appropriate for the course material I teach.
- It is not conducive to teaching language with our work load.
- It is not conducive to the course requirements. However, it is something I would definitely consider as an additional activity.
- It is not conducive to what I need to accomplish in class. I have too many students for people to be able to hear. Even with only 10 students people don't pay attention, there are too many distractions if outside - no where to sit, weather is rarely appropriate,
- It is often too noisy. There is construction in the area, has been for some time, there is no easy way to use a visual aid or slideshow setup.
- It is very difficult to hold a mathematics course outdoors because oftentimes blackboards on wheels are not readily available. It is not optimal to give an entire lecture orally without providing examples on the board. There are not good seating areas around the building I teach in for holding class.
- It is very difficult to teach mathematics outdoors. Furthermore, I think the idea of having class outdoors is highly unproductive. The point of having a short class periods is to foster intense learning, which cannot be done outdoors.
- It would be additional work to organize - where would we sit? I don't know where I'd do this.
- It would only work on days where the focus is nearly 100% discussion-based. For mixed-method days (some lecture, some discussion, some team work), it would be a bit more challenging.
- It's basic human osteology labs with real human remains, so understanding anatomy of complete/fragmented bones in classroom should come first before any outdoor activities in following-level courses like forensic anthropology
- It's distracting for students and seems unprofessional
- It's not conventional. And I worry that it would distract my law students. I want them focused closely on the text.
- It's not required by the class syllabus. Also, too many students in the class.
- It's physics.
- it's been cold
- it depends on the course
- Just haven't thought of it!
- Lab equipment and/or technology requirements may prohibit use.
- lab may include outdoor, field component - ltd. time for inclusion
- Lack of technology
- Lack of writing surface. Students likely distracted.

- large class size, no projection screen, sound issues
- Large classes make it hard to hear. No suitable location.
- Lectures need a board for me to work on example problems. No distractions.
- Lose student attention
- math generally needs a chalkboard or dry erase board
- Math is hard to teach outside unless you use chalk
- Math requires a chalkboard or document camera to present the material.
- Mathematics curriculum is quite rigorous - no spare time for extra creative lessons!
- Meed board and video, classes too large
- Most class days are structured to need the technology in the building such as overhead display, internet connectivity.
- Most of my classes are at night. Also, most of my day classes are during the summer.
- Most of my classes are Distance Education and I have to use the video recording equipment, which is located indoors.
- Mostly due to a lack of suitable outdoor spaces for teaching.
- My area of reserach is voice disorders. Teaching outside presents a poor signal to noise ratio for the instructor, resulting abusive loud vocal behavior that can lead to very serious career ending voice disorders. Since I am also a professional singer, eaching outdoors is NOT acceptable. Unless a VERY loud amplification system is employed, no faculty should be teaching outdoors.
- My class involves creating solutions to described processing situations.
- My class is a physics lab, all the labs that we assigned need to be done inside
- My class is an online course.
- My class size is too large
- My classes are a mix of critique of projects pinned to boards (I would need a lot of clean pin-up space to be outside), work on the computer (need plugs) and lecture with projected image.
- My classes are big lectures. It wouldn't work. Maybe a seminar, but I think teaching outdoors would be too distracting.
- My classes center around technology and the technology provided by UT does not allow us to be mobile. We use desktop iMacs.
- My classes requires the students to utilize computers in almost every class. This would not be conducive in an outdoor environment.
- my course is an online course
- My course requires use of presentation equipment.
- My courses are delivered asynchronously online, rather than F2F. We do this to provide scheduling flexibility as they are part of an undergraduate minor program. If I were to return to teaching F2F, I would love to hold some class sessions outside becauseI love being outside. I have taught some of my online

courses from outside, if I can control the noise level sufficiently so that the recording is not affected.

- My courses has a distance ed element and will not work well outdoors
- My courses involve the use of sewing equipment and tables - outdoors is not conducive to the kind of work I do - and frankly there is way too much distraction to ever hold a meaningful class outdoors from my point of view.
- My lectures require Powerpoint presentations and students often take lots of notes, which is more conducive to do inside.
- My subject matter is not "outdoors" oriented in its content (as plant sciences would be). Whereas it would be nice to be able to go outside for an occasional outdoor classroom on pretty days, we have little space around the building to do so (and no specilly prepared place) and I have been told that we must meet in the assigned classroom unless special permission is requested and granted. This policy does not lend itself to impromptu outdoor meetings.
- Need a board for discussion. Also, it's too cold for the majority of the year.
- need a board, Math cannot be done outdoors!
- never considered it. students have to have computer access during class.
- Never thought of it and I am not sure I am allowed to hold class outdoors.
- No appropriate space, doesn't always fit class style
- No available green space. The green space at UT has been eaten up with concrete.
- No convenient and comfortable place near the classroom (in the stadium) to teach outside. Walking to a nice grassy area takes up too much class time.
- No good space close to the building I work in
- No need or reason to
- No place to sit
- no places to sit, does not link to my material
- No real good space.. too noisy, poor shelter and seating.
- No reason that I know of to do so.
- No reason to do so; impossible for lab classes, and lacking in A/V support for traditional lecture classes.
- No reason to.
- no screen , no audiovisual
- No screen, no projector.
- No space available near my building appropriate for an outdoor classroom.
- No space to do so
- No space. Too hard to hear what is being said.
- No visual aids (e.g. whiteboard, projectors, document camera, SMART board, etc.)
- no way to show powerpoint

- no way to use PowerPoint slides, hard to write on a board, hard to hear, basically it makes no sense.
- no white board
- No writing spaces to illustrate the necessary work or projection systems to work. It is nearly impossible to keep students focused on math when outside unless you are doing applications involving outside elements.
- Noise, no space, difficult to hear, allergies
- Not a good outdoor space for my 50-student classes. I might consider it with my summer 20-student class.
- Not a need
- Not applicable for topics
- Not applicable to my discipline
- Not applicable to my teaching or research
- Not applicable.
- not appropriate
- Not appropriate for my 200-student course, too many distractions outside, too hard for students to hear.
- Not appropriate for subject matter.
- Not appropriate for the class format.
- Not appropriate for the material (virology/microbiology).
- Not appropriate for the material. I teach astronomy. We do have observations (daytime and nighttime) on the roof of the physics building for extra credit.
- Not appropriate for the subject matter
- Not appropriate given subject matter.
- Not appropriate. Some activities could be done outdoors but would not be enhanced by doing outdoors.
- Not conducive to the classes I teach.
- Not conducive to the retail and consumer science field.
- Not conducive to Use of technology
- Not in line with subject matter taught
- not in the lesson plans
- not needed
- Not needed.
- not often necessary to content of lectures; no convenient amenities near our building for teaching outside
- Not possible to deliver needed material outdoors
- Not practical for the size of the class. For group rounds in clinics we do go outside when the weather permits
- not practical with large classes and computer classes
- Not really relevant to the material, students are distracted and it's hard to hear one another

- Not relevant to math classes I teach.
- Not very relevant to service learning projects other than ethnographic data collection, which is done.
- Occasionally my TAs have done an exercise on social class where they had students go outside on the stairs outside Stadium Hall. Stadium Hall does not have an outdoor space nearby. Big intro course has a lot of students. One upper-division course is taught in the evenings. The only time I have taken students outdoors was when I taught Spanish classes at Texas. They had a nice lawn, and one could do language activities in that setting. It is less appropriate for the anthropology classes I teach now. Also, I show a lot of films and visuals, so I need the technology.
- Online-- who knows where they are receiving and processing. Clinicals are indoors.
- One my class is precalculus, and another computational research methods. I need a board and computers. They are hard to find outdoors.
- Online classes.
- Online course
- Online format only
- Only a 50 minute class. It would take up class time to gather together, go out, and find a place.
- Opps, see previous comment. Still relatively new to UTK and would like to develop a course that had field trips and/or outdoor activities. At my previous institute I taught outdoors (on a farm) for the laboratory portion of the course.
- Outdoor classes are a way to dodge teaching responsibility. Students are distracted from bad teaching or inconsequential content.
- Outdoor classes would be inappropriate for the subjects I teach. I need technology, boards, etc. that are not available outdoors. Students' attention tends to wander outdoors.
- Outdoors lacks the technology for my classroom style.
- PowerPoint not available
- Prefer visual aids available in the HBB
- Primarily unpredictability of weather and the knowledge of adequate spaces for instruction.
- See earlier response.
- Seems the good weather would be distracting & it doesn't seem a good place to do it that would keep out noise.
- Since I am teaching physics labs it is hard to implement physics experiments outdoors.
- Since I teach a language communication is VERY important. I have experimented with holding class outdoors several times during my career, let say 4 to 6 times in the 14 years and it has not been successful. Students cannot listen to me, they cannot listen to each other. Also, even though the

weather was exceptional and we wanted to take advantage of that, I personally was not very comfortable sitting in the grass, and there was not an appropriate place for us to sit. In the case of the students, they were uncomfortable writing because the lack of appropriate sitting and some of them were distracted looking at the elements!

- Sometimes class too large and students need to hear each other's ideas/pronunciation or need to view videos, demonstrations, presentations, speakers, and do group work. Hard to do outside when noisy, windy, rainy or when we need smart technology.
- Students are easily distracted by passersby, cars, birds, a breeze, and generally a non-climate controlled environment. My voice also doesn't carry well outdoors.
- Students get distracted
- Students need to sit during lectures on chemistry.
- students would get too distracted
- Subject does not lend itself to holding classes outdoors.
- Subject matter and resources for outdoor labs/classes.
- Subject matter requires controlled environment
- teach online
- Teaching a language requires a classroom.
- Teaching exercise physiology lab that requires equipment
- Teaching math classes outdoor is usually not reasonable
- Technology is needed such as audio visual and visual materials.
- The basis of the labs that I teach are not able to be performed outdoors. We use cameras which do not perform well with sunlight.
- The class I usually teach as a graduate student is Geogrpaphy 101 – a large lecture class. I don't teach outdoors because I rely heavily on using classroom technology for my lectures. I would also find it difficult to manage a large class outdoors, if I could even find a space large enough to teach them in the first place!
- The class is in the evening; 3/4 of which occur after dark.
- The class is online.
- The class is too large (~100 students).
- The classes I teach are political science, public administration and law. They do not lend themselves well to outdoor learning. However, I do, at times, teach off campus at the courthouse.
- The classroom setting is appropriate for the lecture courses I currently teach. Other instruction takes place in the lab or greenhouse.
- The content of my course does not lend itself well to outdoor teaching. One of my courses is a practicum that involves handling of confidential information that can not leave our clinic. The second course is an evening section and it is typically dark.

- The course cannot be taught outdoors and requires some teaching aid for instruction.
- The course requires use of equipment and chemicals that need specific facilities indoors to use.
- The courses are fundamentally theoretical.
- The courses I teach require boards and other visual objects.
- The lab exercises for each of these classes warrant the use of special equipment only available in an indoor classroom.
- The material is not conducive to being taught outdoors, need computer projection capability and access to a blackboard.
- The material isn't conducive to outdoor instruction.
- The material that I teach is not conducive to outdoor instruction.
- The materials used are not available outdoors.
- The materials used in lab/discussion
- The nature of the course is not suitable to do outdoor activities and I believe because it is 100 level course, i don't think it's worth doing outdoor activities
- The students already have a short attention span in the classroom so I anticipate that the added distractions of outdoors (seeing people walk by, cars driving by, etc.) would only make it worse.
- The subject covered includes derivation of equations and solving sample problems
- The topics I teach require many images of other places so it would be difficult and confusing to hold a class outside. I have on occasion taken student on field trips if the topic of discussion is local.
- There are comparatively few places where a lecture can be comfortably given on campus, especially near my department. Also, my classes frequently require access to visual materials or paperwork that would be hard to represent or blow away outside.
- There are no good exposures of rock on campus and there is not enough time to drive to well exposed outcrops within a 2 hour period.
- There are no spaces outside near BEC that is conducive to working on projects & teaching large groups. When my cooperative learning groups work on classroom projects they need space for books, paper, computers, etc to make up classroom lessons. In many classes I show demonstration & case study videos and I need access to the technology that isn't available outdoors. When using any technology for a group, ambient sound is a problem, which is exacerbated outdoors.
- There are not good spaces near the classroom and you never know with the weather; also when I have done it before students seem far more distracted than when in the classroom
- there are not good spaces outdoors for holding class and there are too many distractions.
- There is no chalkboard or white board.

- There is no classroom space outdoors that is separate from the typical distracting bustle of the UT Campus
- There isn't a good space to go outside, also construction noise is a concern, and I'm not sure what to do with powerpoint outside.
- There isn't a great space for teaching outdoors in a lecture format. It can be hard to hear if there needs to be a lot of discussion. It's hard to plan outdoors ahead of time because the weather can be unpredictable. My students would love to be outdoors on a nice day, but that is difficult to anticipate. Outdoors would also seem to lend itself to some kind of experiential learning...I did do an observation class activity outdoors in the Fall, but it had to be planned at the last minute when I knew the weather was going to be nice. If I just lectured outdoors, it would be difficult to do with 50 people....
- They don't fit into the teaching goals of the classes. We are a lab-orientated discipline.
- This course is a technology course concerning the integration of technology devices and online tools in the K-12 classroom. Therefore, class meets in a computer lab. While we do not have a "full class session" held outdoors, once a semester student participate in a digital scavenger during one class where they take pictures throughout campus.
- This is applied statistics. It's hard to cover lots of math on computers outdoors.
- This semester has not been warm enough and my subject area is not very conducive to meeting outside
- Time limits. Would love to do that.
- Too dependent on weather. Lack of AV. Can't plan the day to do it ahead of time.
- Too distracting--doesn't add to experience in any way.
- Too hard to hear.
- Too many students
- too many students - or because for smaller groups I need to use a microscope; some of my labs include tissue specimens (that may draw scavengers - haha! its true!)
- Too many students and inappropriate for topics
- Too many students and too distracting.
- Too many students in the class so location would be an issue. Course with smaller number of students in primarily an online course.
- too public, can be noisy
- topic not conducive to being outdoors
- Truthfully, I never thought about it! I like the idea. Barriers would be weather, or noise related at certain locations on campus...
- Typically with the number of students in my class (50), the risk of having students distracted, and getting everyone to the meeting place is more hassle than it is worth. Also, I am not familiar with the outdoor spots on campus

- that would be beneficial for my class to visit as part of the curriculum we try to cover.
- Typically, the classes are too large--too many students. Need a white/black board or screen for every class.
 - Unaware of facilities
 - Unknown access to an appropriate location
 - use of technology limits me
 - Use of visual aids like power point
 - Very occasionally I will take a particular exercise outdoors, but for general study, I find it is harder for the students to concentrate outdoors
 - We don't have access to a/v aids outdoors.
 - We have one outdoor lab session but the rest of the lessons do not require class to be outdoors.
 - We need to have microscopes and centrifuges and fecal samples etc
 - Weather is usually not conducive - too hot, too cold, too windy. Only on a truly "perfect" day would the students have any interest either - and then they'd be distracted. I usually use a proxima/internet, so I can't imagine the lighting being appropriate outside unless it was a shaded pavillion. I try to minimize sun exposure (although I wear sunscreen). I dress professionally on days I teach and don't want to get my clothes/shoes dirty.
 - Weather, technology, materials
 - Well law does not seem to lend itself to holding class outdoors. Even on a nice day the time it would take to move the class outdoors, etc. I think the students would rather get out of class a bit early to enjoy the day. :-)
 - When I teach some courses we may go outside but not the ones I am doing now
 - While the lecture portion is not held outdoors, at least one of the lab sessions is (conducting a 1-mile walk test). Other than this fitness test, all other tasks are completed using specific equipment that is located in our labs.
 - Why would I? My classes are best taught in studios.

C-4: Responses to open ended question ODTR needs (What are some ODTR that you may need to hold class outdoors?)

- A quiet environment where language can be easily heard.
- absence of bugs (mosquitoes, ants, chiggers, and the like)
- An environment where students do not feel uncomfortable producing a foreign language (i.e., no casual spectators).
- Bench style seats with a table in front of them
- Once I got accustomed to using outdoor classroom, I also would need someone to drag me from the outdoor classroom, back to office to get back to the rest of my work.
- or this:
https://www.google.com/search?q=outdoor+classroom+design&espv=210&es_sm=122&tbm=isch&imgil=JSNeB6zxKzr97M%253A%253Bhttps%253A%252F%252Fencrypted-tbn2.gstatic.com%252Fimages%253Fq%253Dtbn%253AAND9GcTZBdu_C2_X9GCF22Vfj90bf5pynO_wP_EdziOHvptT3tZhhNMC%253B400%253B300%253ubVpuMy2NDEpiM%253Bhttp%25253A%25252F%25252Fhastingsplayground.blogspot.com%25252F2010%25252F11%25252Foutdoor-classroom.html&source=iu&usg=__Qv_g7qTbMSNt7WD0j41scgDhjV8%3D&sa=X&ei=u3wxU_OZDbLC0AHOkodGcCQ&ved=0CEMQ9QEwAw#facrc=_&imgdii=_&imgrc=JW4KVys_rwGqB%253A%3B2VylxnrHxarv9M%3Bhttp%253A%252F%252Fwww.cityschoolyardgarden.org%252Fwp-content%252Fuploads%252F2010%252F11%252Framada-1.jpg%3Bhttp%253A%252F%252Fwww.cityschoolyardgarden.org%252F2010%252F11%252F01%252Fso-much-has-happened-so-fast%252F%3B1731%3B106
- Projector
- relatively free of distractions (especially noise
- Something like this:
https://www.google.com/search?q=outdoor+classroom+design&espv=210&s_sm=122&tbm=isch&imgil=JSNeB6zxKzr97M%253A%253Bhttps%253A%252F%252Fencrypted-tbn2.gstatic.com%252Fimages%253Fq%253Dtbn%253AAND9GcTZBdu_C2_X9GCF22Vfj90bf5pynO_wP_EdziOHvptT3tZhhNMC%253B400%253B300%253BubVpuMy2NDEpiM%253Bhttp%25253A%25252F%25252Fhastingsplyground.blogspot.com%25252F2010%25252F11%25252Foutdoor-classroom.html&source=iu&usg=__Qv_g7qTbMSNt7WD0j41scgDhjV8%3D&sa=X&ei=u3wxU_OZDbLC0AHOkodGcCQ&ved=0CEMQ9QEwAw#facrc=_&imgdii=_&imgrc=JSNeB6zxKzr97M%253A%3BubVpuMy2NDEpiM%3Bhttp%253A%252F%252F2.bp.blogspot.com%252F_N8r8s0jcVjI%252FTOYCV27Bs9I%252FAAAAAAAAAAJE%252FNeAQx0zuBa4%252Fs1600%252FOutdoor_Class

room_Horseshoe_bench.jpg%3Bhttp%253A%252F%252Fhastingsplayground.blogspot.com%252F2010%252F11%252Foutdoor-classroom.html%3B400%3B300

- White/Chalk Board (at the least)
- Why do I have to answer such questions?
- would be great!
- 1. Quiet, discrete area of campus. 2. Something to sit on other than grass or dirt.
- A board. I still think it would not be useful to hold a math class outdoors.
- A large, quiet area that could hold 100 students. An outdoor projection system would help, too.
- A pavilion area with rows / seating and perhaps a table. I do not want to ask older students to "sit on the grass" out of fear they might not be able to get back up.
- a place in the shade, with a white board, and the privacy / focus that a class room provides
- A place to gather that is not surrounded by distractions, with seating, and shade.
- a place to sit - but again all my classes are too big to use this
- A place with quiet, seating, and a reason to be outdoors.
- A projector and screen. That would be pretty awesome.
- A quiet area where I can take 30 students
- a small quiet seating area even a hillside would work not talking about an arena or real "seats". I spend lots of time in the summers teaching at a scout camp and they are masters at that approach. I encourage you to visit Camp Buck Toms between June 1 nd July 15 to see that approach in action.
- A space perhaps with no ceiling but sound walls but even then I am not so sure about doing it.
- A table and some chairs, but not totally necessary. Really just a nice lawn and no smokers!!!
- A way to how video and project the screen from my ipad.
- Access to outdoor equipment/tools in the various CASNR disciplines (e.g., potting soil, clinometers, soil probe). Clipboards would also be helpful.
- Access to video projection, microphone.
- Adequate seating arranged so that students could see and hear me and each other, a quiet space where it was easy to hear and talk.
- Adequate sitting and a space that would be caustically friendly to the speakers. Something like an amphitheater?
- Amphitheater with seating, ability to show visuals (ppt).
- Amphitheater, whiteboards, presentation screen/monitors
- ampitheater type setting with tech resources

- an 85 person capacity classroom with excellent projection system (even on a sunny day) - does not exist
- an amphitheater type classroom layout on grounds surrounding the Jessie Harris Building
- An obvious place to hold outdoor classes (nice environment with little distractions).
- An outdoor amphitheater with a fixed-in-place computer and closely controlled climate and discussion conditions.
- an outdoor classroom with boards
- Appropriate seating for classroom instruction. Round or arch style seating (small amphitheatres)
- At least one blackboard will be needed; technological equipment, such as a document camera, a podium with connections for a computer, and speakers.
- Availability of the track when the track and field team isn't using it
- Benches and tables.
- can't use video or powerpoint...
- comfortable seating and warmer weather
- Communal tables and benches would make it easier to have some discussions and/or lectures outside.
- computer and capacity for effective use of audio-visual aids
- contained area that would eliminate many of the outdoor distractions (other students, car and construction noise, glaring light)
- cover
- Dedicated space that allows for discussion, and some shelter from the weather.
- Designated area, chairs, away from car noise
- Don't know.
- electrical hookups for laptops
- Electrical outlets/a power source, speakers, a projector.
- field visits
- free UT transportation to off-site facilities such as water & sewage treatment plants and other facilities in the region would be helpful.
- Give us benches in a circle that hold 20-30 people. Give us a round gazebo with benches and narrow tables in a circle. There are several places in and around the Education and Humanities buildings where these could be of use. My students LOVE meeting outside and so do I.
- Good space, with seating, that allows the students to be able to sit in a way where they can see each other and have a discussion
- high capacity wifi, hi capacity seating
- I am not sure really.
- I cannot imagine why I would want to hold a class outdoors.

- I could potentially see using food crops growing in a garden plot as an instruction tool.
- I just need space for students to be able to write/take notes. I typically use technology, but I could design some lecture class sessions to focus on group/student peer work, and not rely on PPT & lecture.
- I love being outdoors, but I don't know how successful my class would be outside.
- I think an outdoor "classroom" would be fantastic. It may seem silly, but if there were a space with some kind of not-too-uncomfortable seating enclosed on three sides with hedges to help with acoustic and with students' focus, the outdoor teaching option would be much more viable.
- I think space - there is not a lot of space around my building to accommodate 20 students comfortably and let them hear me with the construction on the UC.
- I would need an amphitheater or other tiered-seating area to accommodate around 120 students. Outdoor projection technology would also be useful, but I would have to think seriously about doing away with visual aids for teaching outside.
- I would need some comfortable seating in a quiet spot that is a fast walk from my assigned classroom.
- I would not even know where to start.
- I'm not sure outdoor classroom opportunities are necessary for this course.
- I'm not sure that I know many outdoor teaching resources that align with my concentration.
- If I had access to a large field on campus and the proper permissions, I would do a rocket lab in my Functions and Modeling math class in the fall.
- If there was an outdoor amphitheater with row of seats, or if there was a more private location without distractions, I might...might...consider it.
- If we were to attempt to hold a technology course outdoors we would need a covered facility (or at least shaded) to remove glare from a laptop or tablet screen. Then assurance that the Wi-Fi signal was strong enough for high speed Internet connectivity.
- If you are thinking of implementing outdoor teaching, you MUST contact the Department of Audiology and Speech Pathology to make sure that any arrangements you make do not place the instructors at risk of developing a pathology.
- It would be interesting for my students to see how the physics experiments are conducted by physicists. To do that an outdoor trip to ORNL would be very interesting.
- it would be nice to teach using power point, and a console for videos, clips, films
- It's not really that relevant to the courses I teach. The one time I took my Migration and Transnationalism class outdoors was when the entire class

- walked to downtown Knoxville to watch an immigrant rights march that happened to be going on during classtime.
- Lab equipment restrictions; transport of and support of technology.
 - Large clusters of outdoor seating (groups of picnic tables perhaps), blackboards on wheels or some other way to present information visually
 - Lecture space (chalkboard and/or AV equipment access. Coverings (in case of inclement weather) access for all students.
 - Listing of locations?
 - Maybe a cluster of small stone/concrete tables. I can imagine doing group work outside. And the tables would keep students focused on one another.
 - Mentioned in the previous answer.
 - More green space! This campus has hardly any. I'm not even sure where students can go, other than to sit on the curb.
 - More time. It is not possible to drive to well exposed outcrops in the time that we hold lab. Therefore, we bring many examples into the classroom to show students what they would see outside.
 - My course was in the evening; it is not practical to hold class outdoors after dark.
 - NA
 - NA-I teach online classes
 - None
 - none
 - None
 - None
 - None that I can think of
 - None.
 - None.
 - None.
 - None. I teach at night.
 - Not possible
 - Online access
 - Outdoor classrooms. That is, an outdoor board and seating area in a place with limited distractions.
 - outdoor dry erase board
 - Outdoor pool
 - Place to sit and table or other workspaces
 - Places where students can sit in a circle on benches or ledges
 - Places where groups of 20-30 students could sit and not be run over by pedestrian or even vehicular traffic.
 - Portable projector
 - Primarily a place
 - Projection capabilities and adequate space to support note-taking.

- Projection screen and projection facilities.
- Projector and screen, electricity, a roof, desks with table tops.... (sounds like indoors at that point to me!)
- Projector for slides and sufficient darkness to view the slides
- Projector, writing board.
- Proper venue for 35 students and accommodations for bad weather
- Protection from the elements - yet a glass house would give me the sense of being "on display" and undoubtedly distracting to the students as evidenced by people passing by the windows. You should have seen them that day we got our "surprise" snow that began about 9 a.m. I had to quit early they were so distracted.
- Raid
- reasonably comfortable
- relatively enclosed space, maybe?
- seating area for 30 students with a sun cover.
- Seating- I have large sections of 85 students- seating is tough. Also, I would need to think about presentation issues- with no technology support, it becomes impossible to show a video or to use any presentation software- I would need to make significant changes in my teaching material to adapt it to an outside area
- seating, a large enough space, somewhere with acoustics so I could be heard
- seating, desks, cover
- Seating, quiet, shade, desks
- Seating, space away from roads and construction.
- Seats, protection from sun
- Seats/Desks (for students to work at)
- Shelter, controlled climate
- Smart classroom set up: projector, screen, and system to connect to laptop.
- Smartboard
- Smartboard outside.
- SmartSymposium projection? Physics lab gear, power.
- Some means to project some audio visual elements on a screen /back of outdoor classroom structure. Would be nice if had some writing surface, for some uses. Seats configured so sometimes students look toward front, but can easily adapt for breakout groups, then return to larger class discussion. Some students may need access to electric outlet for laptops (that may not have battery life for entire class.)
- Some mechanism for a/v aids
- Some type of group gathering area that would be secluded enough to minimize distraction and interruptions.
- Some type of organized space (with chairs or benches for students to sit on, and good audio)

- Space. Space to sit (can be grass).
- Spaces large enough where we would not be distracted by passersby.
- Spces set aside for teaching/class sized groups
- Speakers for music. Board for writing or projecting notes on board
- Tables and seats close together. Sound protection (trees would do).
- tech
- The first key is to get rid of construction outside of Haslam. It is deafening even inside, and worse outside. Once the new UC is completed, I would welcome the chance to get my students outside on pleasant days.
- There is simply no reason for me to habitually hold class outside.
- There would have to be some sort of board to write on. Too many times graphs dominate our discussions.
- use of visual aids (projector / screen) are still important for my teaching curriculum
- UT Gardens
- Visual aids (e.g. whiteboard, projectors, document camera, SMART board, etc.)
- White board
- White board; projection screen
- Wifi

C-5: Responses to open ended question on experience with outdoor teaching

(Tell us about your experience holding class outdoors?)

- Benefits of outdoor classes include more student engagement, better student retention of material that is observed first-hand, and the opportunity for students to gain a good understanding of the challenges of the work environment in their chosen field (poison ivy, rain, etc).
- Drawbacks include traffic noise (on campus), transportation costs (off-campus), scheduling challenges due to weather (snow!!), and the tendency of some students to engage less and miss portions of the lesson.
- We have a three-hour field trip on a weekend for both fall and spring semesters
- Depending on the environment, can be somewhat distraction. However, students generally like to be outdoors
- Due to the nature of the subject I teach (Animal Science), most labs are held outdoors. Weather can be challenging at times.
- During the spring semester (when I teach the soils behavior lab), we obtain soil samples using our department's truck-mounted drill rig. The students learn a great deal about how to setup the equipment and obtain samples from the subsurface.
- Each major lecture topic is accompanied by laboratory exercises, most of which are outdoors either on campus or off.
- Experience? We hold class outdoors in order to examine living specimens of different tree species and collect ecological data for student analysis, interpretation, and incorporation into lab reports.
- Fun to get out and the students enjoy it!
- Generally some form of outdoor activity planned (worksheet), field trip, but for smaller classes might even be an outdoor lecture
- Hands on labs at Oak Ridge FRREC and 2 major field trips to research forest in Asheville, NC and somewhere on eastern edge of Plateau to observe thinning operation.
- Hard to focus
- I bring students to Jordan in the summer. The first half of every day is spent excavating a Roman military outpost. The students also spend time travelling outside on the weekends, including visiting other archaeological sites, camping, and experiencing the landscape. The outdoor component is a central aspect to the study abroad program.
- I can show them materials as they exist, and it is impossible for them to experience them in the same way when the materials are in a pot or other container.
- I have a field orientated class project.

- I have only taken a class outside on rare occasions when the weather was nice and the day's plan would not be disrupted by doing so. The difficulty is that there are so many distractions outdoors that the attention of the students can wander. In addition, I use a lot of visual content (necessary for the topics I teach - theatre and film), which does not transfer outdoors well (no way to easily show visual content).
- I held class outdoors one time because of a fire drill. The students found a spot and circled up and class went on. It was unique and enjoyable.
- I occasionally have class activities outdoors on campus if the weather is suitable. The students enjoy it and it is a nice change from being inside all the time. Normally, the outdoor activity lines up with the class activities about light so it's a nice connection.
- I teach golf and tennis for the PEAP department. It is a necessity to hold those classes outdoors. However, the students respond well and seemed focus the entire time.
- I teach physical activity classes, so most classes are conducted outdoors.
- I teach soccer, so I teach this class outside on the soccer field for the majority of the semester. We only come inside if the weather is bad.
- I teach students in the use of tree sticks in one class, in another, student peer groups do off campus research projects, in another, I lead students in a fish collection.
- I typically only do this with a small group. However, when I'm meeting with a group of fewer than ten people (either a group project I'm advising or a class where many people are absent) and the weather permits I like to go outside. More than 10 people is a problem because it's difficult to hear and be heard by everyone.
- I use the immediate vicinity of my building or the UT Gardens.
- I use the outdoor setting to model language experience lessons.
- I use the UT Gardens as an example of a public garden for my students.
- I wish there were more places to do so.
- In one of the Environmental Geology Labs we have an activity on Second Creek by the bridge on campus. In this activity students measure properties of the creek such as width, depth and current flow to calculate the discharge of the creek. In another lab they measure the slope of the hill on the back side of the EPS building.
- Integral to learning about biology. Has become less frequent as UT has increasingly become urbanized.
- invaluable experiences
- It is a great way to connect with students. It needs to be less formal, but it can be as effective. And, everyone enjoys it.
- It is absolutely needed for our curriculum, as we are teaching outdoor related skills and outdoor leadership. Therefore we utilize an experiential based learning atmosphere that offers intentional, purposeful and directed learning

outcomes. Since our goal is to develop these outdoor leadership principles, we have found that the direct experience and focused reflection is much more successful in the intended environment.

- It is an introductory ecology lab that really requires you to observe nature. I think actually making observations and generating hypotheses is a skill that they don't really get elsewhere.
- It is best for hands-on instruction and demonstrations.
- It is typically very nice and the students really like moving around and seeing some of the laboratory biology in action outdoors.
- It sometimes can be noisy as cars, students and other factors are taking place outside. However when the weather is perfect, students really enjoy it!
- It sucks. There isn't any space that is conducive for students to get in small groups and still have someplace to write. There's always sun-glare or other weather demands. There's no place to have a lecture without disturbing people who aren't trying to enjoy the weather. The few times I have gone out, it was because I was in HSS or the Hill--these places have quick access spaces where people can congregate. But other buildings don't. I don't plan to go outside, but sometimes the weather is too nice to ignore.
- It works well if we are doing a very focused group activity that needs results.
- It's an ecology class. Students learn field methods and do group projects
- It's great to get the students outside of the classroom and moving. It's a different experience.
- It's harder to hold focus, but it improves morale.
- It's nice to spend a day outside and the students generally like it.
- It's a lot of fun and students love it! Students learn how to design and conduct a natural observational study in which they spend several lab sessions outdoors collecting the data relevant to their study. The students highly enjoy getting outside and actually "doing" science! I would love to be able to incorporate something like this into several classes that I teach or will teach in the future.
- Kids love it, as long as you keep them active. They get distracted if you are just talking at them or expecting them to discuss. Just wish there was more access to technology outside
- My students enjoy learning biology using real specimens in their natural habitat. They also respond well to the less formal discussions we have when gathered around something of interest outside.
- Noisy, way too much traffic noise, Usually more a distraction than a productive session. People have to yell to one another to be heard over all the cars, busses, and construction noises.
- not sure what you want to know
- Outdoor classes are often used to give students hands-on experience. On campus I use short outdoor activities to break up a lesson, and use "walk and

talk" sessions for full or half-class periods in smaller classes. Frequency of full-length labs and field trips depends on the class, and these are typically off-campus.

- Pleasant, I wish there were more outdoor class spaces immersed in learning landscapes, e.g. roof gardens, green roofs, living walls, water treatment systems, etc.
- Reasonably easy, most people stay where you tell them and pay attention. Students enjoy getting out of the lab
- Several of my courses are hands-on with the outdoors serving as an essential tool to facilitate class. The students are more engaged when they can assess tree condition (good, fair, poor, dead), ID species, take dbh, look at the condition of the tree canopy in the field. Basic concepts are taught in door class lectures, but students have the freedom to demonstrate in the field following grasping these basic concepts.
- Several times, in nice weather, I have held classes in the amphitheater. This was not just to enjoy the sunshine, but I used the very structure of the amphitheater to make points about hierarchies of power and influence at a college institution. Also, I have had students make use of material/public rhetorics displayed in conspicuous campus locations. We have also left "public writing messages" in prominent places on campus.
- Some minor distractions (traffic, other environmental noise)
- Sometimes it works -- but often there are too many distractions.
- Sometimes open inquiry, sometimes highly structured
- Students are encouraged to interact with and make connections between the lesson and the new environment.
- Students enjoy being outside and moving. Have to have students learn in the field for the wildlife and fisheries major.
- Students have specific assignments, experimenting with water infiltration into soil, using GPS units, measuring slope angles, measuring CO₂ flux, measuring flow in Second Creek. The outdoor activities involve skill training and/or data gathering.
- Students love it.
- Students really like them, but the syllabus does not include many of them
- Students seem to like it. I also try to make it relevant to the material that we are covering that class
- Students typically enjoy these classes much more than being outdoors (even when it's cold). Usually, we play games, such as kickball, capture the flag, volleyball, and ultimate frisbee. Students find these to be stress relieving, and these outdoor classes help build class cohesion.
- The students perform lab duties which may take them outside. These include GPS exercises, soil moisture measurements, soil collection, stream flow measurement, etc.

- The students will go to galleries the downtown gallery that's part of the school bar and also the 1010 gallery which is a student run gallery also we as a class go to the McClung and the museum on campus when exhibits are relevant to the projects.
- There is an outdoor class space behind Claxton. I use it once a semester. I usually do group work type projects since there are three big tables. Students almost invariably love it. So do I.
- these are independent studies, often at a regional medical facility or the Knoxville Zoo
- They are done to gather data for lab
- They are the favorite part of the class for most students.
- They are very useful for getting the students to put in practice what we learn in theory. Sometimes difficult to schedule when the weather is bad, snowing and very cold etc, but so far we have only had to reschedule once.
- Too much construction noise. Conditions have to be just right (no wet grass and enough sun or shade). The AA building has a HUGE 3rd floor deck but no outdoor furniture. a wasted resource. There are no collective gathering spaces for groups of 15-20.
- Tree ID on Campus. Forest ecology off campus. Smokies field trip.
- Typically I conduct field trips to parks and other recreation areas or public lands in the region.
- Typically, the students go on walks in Ijam's nature center. But if on campus, we collect water samples from Second Creek or visit the 'Green living' house across campus.
- Usually, I talk my students to a memorial or site of public memory on campus to talk about it rhetorically.
- Very good learning opportunities for the students - the primary course deals with techniques for collection of animals, and field handling and usage of sampling gear by students is essential
- Very good, we typically work with cattle and other livestock species in barns off campus.
- We always visit the site of the proposed project a least once, sometimes several.
- We enjoy meeting in garden and playground spaces on occasion, especially when the weather is amenable.
- We go on walks looking at diseased plants and abiotic stresses
- We have class outdoors for our lab on impact cratering in GEOL 104. The students use slingshots to create impact craters into containers filled with flour.
- We have labs where students must go outside to collect data.
- We perform wildlife disease investigations at outdoor labs in Oak Ridge and in Tellico Plains for students

- We spend time collecting and identifying insects associated with the various niches on campus.
- We use the track, intramural fields, and various other locations around campus for activities
- weather dependent
- When possible, our clinical groups of 5-7 students, plus a resident or intern, plus myself, will hold discussions in the UT Trial Gardens. It is always a pleasure. Road noise from Neyland Drive is often a problem.
- When teaching first year landscape architecture students I use campus as a learning lab. I ask students to draw in plan and section various design details ranging in scale from a segment of campus, a parking lot, an outdoor "room", a flight of stairs, a bench, etc. This helps students see many elements of design and scale relationships that prior had gone unnoticed. I wish there were more innovative landscape elements to expose the students to in order to challenge their assumptions of campus landscape design and outdoor structures.
- Works well

C-6: Response to open ended question specific ODTR (Tell us about specific ODTR you have found to be of benefit?)

- Indian mound - as above, but traffic noise can be a problem.
- Third creek greenway - good for walk and talk sessions, and group activities. Needs improved access on the north side of Ag campus.
- ?? see earlier comment
- Access to ponds and lakes on or bordering UT property
- Anthropology Research Facility
- As landscape architecture students, my classes have enjoyed exploring and drawing some of the design details at the amphitheater at Gate 21, a project relatively recently designed by a local landscape architecture firm. They enjoy learning about the pervious pavers used in this area and seeing how people use the space for study, relaxation, and as a meeting spot.
- Cherokee woodlot
- Courtyard - great for outdoor discussions, and observations of plants.
- Creeks running through campus are resources for water related lectures.
- depends on relations with Knoxville Zoo and specific services in medical facilities -- requires continuing contact with local "hosts"
- Different species of trees (lab collecting tree leaves); Second Creek, adjacent to campus; hillside behind Earth and Planetary Sciences
- Field equipment for outdoor projects and exercises (departmentally "owned," and vehicles from the UTK Motor Pool.
- Fiji Island, U.T. Gardens, Waterfall and pond next to U.C.
- general infrastructure
- I have used the UT gardens site for several outdoor labs. The site is useful simply for open spaces (compass and pacing exercises) and for basic tree measurements (height and diameter).
- I often talk about and sometimes take my students to the Second Creek (or is it Third Creek?) greenway that runs near the Neyland Biology Annex. We also explore the area between our building and the Hill in search of plants and trees to identify.
- I regularly take students to Second Creek. We regularly use the hill, north of Ayres Hall.
- I use the building architecture from several different buildings to point out specific concepts (like stress on structures, arches, etc).
- I use the native tree species in an around Ayres Hall.
- I use the soccer turf field next to the TRECS. I have also used the track for conditioning class.
- I use the torch in circle park to teach a lesson on developing children's language using the language experience approach.

- I would say visiting the trial gardens and nearby examples of "green landscaping" and storm-water management. In addition visits to local research and experiment stations.
- I'm not entirely sure this counts, but when we study mythology we take a "field trip" to the Europa and the Bull statue outside McClung Tower.
- I'm saying that the UT library is an outdoor teaching resource.
- Landscape, terrain, trees, soil, creeks, etc. - I teach physical geography, so we investigate the natural elements around campus.
- Landscapes on campus and UT gardens
- n/a
- Natural features, landscapes etc.
- Our campus is rich with poor design examples which I use as examples of what not to do, in particular some of the most recent buildings
- Pastures where animals are located
- solar decathlon
- Some of the experimental gardens, the labeled landscaped areas around the hill, the UT botanical gardens, and also just the trees and plants around the main campus area.
- Tables and seating in the Trial Gardens.
- The aforementioned green living house.
- The amphitheater, sidewalk space, bulletin boards or other sites where messages tend to be displayed for public consumption.
- The buildings themselves are examples of what to do and what not to do, or how building behave.
- The forest on the Hill
- The statue of edmontosaurus in front of the McClung Museum is a location that I take paleontology or dinosaur students to see or I send them to look at this feature.
- The stone/concrete circular bench outside of McClung Plaza, the amphitheatre outside HSS, the courtyard in Melrose Hall. I used them as "open spaces" but the seating available in the first two were valuable.
- The tables behind Claxton.
- The UT Gardens....how to do economical ADA compliant walks, interpretive signage, labeling plant collections, how student interns can be utilized in maintaining a public garden.
- Trees on campus grounds and in trial gardens
- UT Gardens
- UT Gardens
- UT Gardens, Native American Interpretive Garden
- UT Gardens, UT Campus, UT ETREC, Neyland Stadium, Baseball, Softball, Soccer
- UT Gardens; Third Creek Greenway

- ut properties
- Vegetation on UT's campus, specifically, street trees, plants and trees at the gardens for example.
- We use UT campus's general geographical characteristics such as streams, building locations, geological strata, soil, etc.
- We visit the gardens and play spaces of the UT Early Learning Center. I would be interested in more routinely incorporating the UT Gardens as well.

C-7: Responses to open ended question on additional reasons for not holding class outdoors (What are some other reasons for not holding class outdoors?)

- ALL WORKS IN THEORY, IT'S PRACTICE THAT SCREWS THINGS UP.
- If the purpose of this survey were more clearly articulated, I might have been able to comment further, but as it is, it is not clear why online classes were not a choice option for more of the questions presented.
- Regarding structures (that offers seating, etc.), I know there is an outdoor classroom in the gardens on the Agricultural campus. (I love the gardens there, and periodically will take portable work out to tables there.) Some of the "tiered" landscaping around the stadium and Humanities building allow for taking discussion-classes outside. For classes that are partly lecture based coverage, some of these settings don't quite work. This survey, however, has made me rethink some of my presumptions. If I knew there were good access to outdoor facilities, I could re-work my approach to material. On a beautiful day such as today (after long winter...), I would love to take it outside-- if we can keep the class moving forward.
- Access is a main issue from where classes are held.
- Although I realize that many of the plant species listed (edible, medicinal, herbal, native) are available on the Ag campus, that is virtually inaccessible for my courses on the Hill and around the main Library. These areas are so over-built, crowded, and filled with automobile traffic that it is virtually impossible to have a decent class session outdoors. I have tried on multiple occasions.
- Currently I cannot see how I could utilize an outdoor classroom for my general chemistry class.
- don't relegate outdoor learning environments to gardens. these spaces and learning landscapes should be integrated throughout campus.
- Experiential learning seems likely to be the new QEP for accreditation. CASNR, despite what we seem to think of as being very experiential-learning in nature, was lambasted in the recent 5 year review for not having enough experiential learning particularly where employers were concerned. One question related to the survey would be what type of experiential learning, or lack thereof, was under review, and would it pertain to outdoor experiential learning? The review team members from campus were Bill Dune (Engineering), Bonnie Ownley (EPP), John Waller (Animal Science, now retired), and Bob Auge (Plant Science).
- Faculty need more support for field trips. UT should pay for hotel, with about 2 weeks in advance
- Ferris Hall is not adapted for teaching foreign languages. We cannot move the tables and it's highly detrimental to the quality of the class.

- For some disciplines, the entire campus can be an outdoor classroom on some class units. My class subjects are not solidly in that set.
- Having tables and seating in the open space next to Jessie Harris on white ave would be excellent. since many of these resources are available at the Early learning center.
- I am a plant molecular biologist, and I can hardly think of any situation where teaching outdoors would be beneficial to my students except in my class on genetic engineering. Perhaps if there were plots comparing non-engineered to GMO crop this would be good instruction tool.
- I am actually a proponent of finding "alternative" classroom space, or expanding how we conceptualize the "classroom," but yes, the factors of weather and logistics can impede. I do what I can to meet in the assigned classroom while offering opportunities to use what exists elsewhere or nearby to enhancing learning.
- I apologize for not answering all questions. Because I am at a campus in Nashville, some of the material did not apply.
- I believe that an outdoor gym with different stations would be useful as well as a recreational playground, with swings, slides, monkey bars, seesaws (adult sizes) benches, pic-nic area and water fountain, will also be a great outdoor resource to have around campus. Outdoor activities should be encouraged and languages can be used in all everyday/real life situations. When we have a cultural activity, like cooking it is hard to bring food indoor (and inappropriate) so this kind of place would be great!! Close to HSS would be wonderful and the gardens behind HSS have enough room to foster such a recreational area.
- I certainly would support the development of these sorts of resources on campus even though they might not be directly relevant to my teaching of literature classes.
- I currently teach one section of CHM 130 per semester. Teaching responsibilities include one discussion and one lab per week. Lab obviously occurs in the General Chemistry labs within the Buehler building. My discussion is taught in the Haslam Business Building. Not sure why y'all are so concerned about being able to teach outdoors, but I reserve outdoor sessions for review sessions when I cannot book a classroom.
- I do not teach anymore, therefore could not fill out the survey
- I do not teach areas of the law that are connected in any significant or meaningful way to the outdoors. But I love the idea of teaching outdoors and have done it a few times. I would be interested in knowing what you find out. So, I hope you'll publicly post the results somewhere.
- I don't think so.
- I have not considered the Cherokee woodlot or UT arboretum as on campus in my answers. These 2 research and education center properties are

instrumental to my outdoor teaching efforts and provide examples of aquatic and upland ecosystems not found on the UTK east and west campuses.

- I teach 19th century American lit, and many of the writers I teach are very interested in either the natural environment of North America or slavery and black history. I can think of many outdoor spaces - whether natural or architectural - that might be made useful for my classes. I've only been here since August, and I haven't really looked much into it, though.
- I teach at night. Outdoor learning isn't really feasible. This wasn't taken into account in your survey.
- I think having outdoor spaces available is a great idea, I think given my course material and the size of my class it would be difficult for me to utilize personally. That said, I think every classroom should have windows!
- I think it is a great idea to teach outside and have some facilities available. Please don't interpret my responses of never using these facilities as evidence that I think they are not worthwhile. But for teaching asynchronous online courses, in a subject area that does not relate to the natural sciences, or history or architecture, etc, I cannot use them much if at all. But F2F instructors should think about using them as a change of pace and to freshen up the students' attitudes about coming to class.
- I think it would be a great opportunity to be able to take students outside to conduct class. If the technology and resources were in place, I would do it in a heartbeat. I might not do it all the time, but I would like to model such flexibility to my students.
- I think many of the ideas listed for outdoor resources would be helpful for general student knowledge, even though they may not be applicable to each class.
- I think teaching outdoors sounds lovely, as does teaching face-to-face. But DE is a large part of our program so I don't see that changing any time soon. Best of luck with this research and with persuading folks to take advantage of the lovely resources available to them!
- I think the choices in the last questions should be changed to "not available," "somewhat available," and "not sure" or "do not know." When I did not know the answer I did not have a way to answer.
- I think this is an important topic, but is very discipline specific - I teach in the landscape program and so am well aware of all of these resources, but my role is to teach history, not water retention so the questions were really not relevant!
- I use a wheelchair
- I wish I were on campus - I would definitely take advantage of these resources. I wish you luck in your research.
- I wish your project the best of success and hope that the university leadership listens to your data. I also hope that you can add outdoor classroom spaces...my students and I would love them!

- I would advocate for more outdoor learning resources and feel that they are very important.
- I would like to have a garden of common pastures, and toxic plants/trees to teach the veterinary students
- I would love to have ready access to natural features and landscapes such as rain gardens, or complementary ecosystems that show how plants and landscapes work together in different environments, e.g. different soils planted with plants that suit that drainage etc.
- I would love to see more outdoor teaching facilities on campus! Good luck finishing up your dissertation!
- I would probably use an outdoor classroom once or twice a semester if 1) it has smart room capabilities, and 2) if it had a covered roof for shade/rain avoidance. I think it would be neat to see an screened in porch style outdoor classroom with one to three walls allowing for a weather proof screen and projector system. I would really love a best-of-both-worlds option.
- I'm a Graduate Teaching Assistant for physical education classes.
- I'm sorry that I'm not more positive about outdoor classes, but I teach computer programming to large classes, so it seems pretty impossible. Good luck with your survey.
- I'm sure there is, but I can't think of anything right now.
- If classes were smaller, field trips to local electrical facilities would be possible.
- Interesting study. I would love to get my students outside, and even to take field-trips to tour local facilities. Best wishes!
- Intro Field Trips in Geology are done each Semester to Ijams. Most Geology major courses have one or more fieldtrips each semester off campus for field work.
- Just that I very much like the UT Gardens
- Large parts of this survey were completely irrelevant for most disciplines (other than agriculture/botany/etc). It would have been nice to have an option to skip those questions.
- Look into University of Minnesota's use of Augmented Reality software to use virtual scavenger hunts and other games for students to play to hone skills using mobile devices, distributed plant materials, and free software.
- Many of these outdoor resources might be available on the Agricultural Campus but not on the main campus. I think students would benefit from markers, labels of type of herbs, names of trees, architectural information, etc. as they might "pick up" this information subconsciously or by sheer osmosis if we as faculty are less apt to integrate them into our course content.
- Material involving plants seemed only remotely connected to my usual courses.

- Most of my data is irrelevant because I'm just a GTA for a nuclear engineering lab
- Most of this doesn't apply to my content area. If I were in science education, I would imagine using many of these resources much more.
- My answers are assuming that the UT gardens are effectively, for my classes, "off-campus." It would be possible to do a microclimate analysis of campus to determine the best locations for outdoor rooms.
- My classes do projects and if the project involved plants, etc, we would use them. That option was not presented in the survey.
- N/A
- No
- no
- no
- No
- no
- no
- no
- No
- no
- No
- No, but I think this is a really interesting research project, and I'm curious to know what the ultimate goals of the researcher are.
- No.
- No.
- No.
- No.
- NOPE! GOOD LUCK.
- nothing
- Nuclear Engineering is just not a good candidate for an outdoor class.
- Only relevant plants for courses could be non-native plants, since I teach a course on Mexico and Central America. I bring in examples of foods and fruits for people to taste. I also do that in section on American Cultures where I cover Asian American cultures. In the course on Mexico and Central America, and in the Introduction to Cultural Anthropology, I use pictures to show students what native plants look like in regions we study. In the Intro course, I do that especially for a section where we cover the Huaorani of in the Amazonian region of Ecuador who are food collectors. It might be difficult for Tennessee's agricultural department to grow these tropical plants.
- Our campus has been degraded by elimination of green space, such as construction of parking lot next to McClung Tower, horrible concrete amphitheater next to Humanities, and Sorority Village next to Neyland, not to mention destruction of the UT farm.

- Outdoor classrooms are worth it. Make them available to sign up use. Plants are good.
- part of training is making the best of what is available. Students (in indep stud) survey and identify needed pr useful aspects of environment; some studies focus on interaction of environment with (captive) animals (zoo)
- Perhaps this survey is best suited towards teachers and professors in the natural sciences, not the social sciences.
- Please let me know how I can be of further assistance. Your project sounds interesting, and I would love to see our campus incorporate more outdoor lessons and resources into regular classes.
- Questions regarding outdoor classes (e.g., about plants, trees) is not relevant to my discipline.
- Really, I was born in 1960. You needed a "unable to assess" selection in your last section, because I have no clue about almost all of those elements, so I checked "somewhat available". I wanted to say "unable to assess" for pretty much every item there Good luck with your research.
- Small buses or trolleys in place of the full size buses.
- Snakes
- Survey should have had an unsure option or noted no need to answer if that was possible. For the many items I felt I was simply engaged in wild uninformed guesses.
- Thanks for asking these questions. UT could be a great campus to hold classes outdoors, but it seems geared for cars and large crowds, not people in classes.
- That you should not to chemists questions that are only relevant to natural scientists like plant or insect teachers
- The Ag campus is pretty distant for most people, so it would be cool if more of those resources were spread out.
- The change of pace when I have taken a class outside is a great experience for the students- as class sizes have increased over the past few years, the ability to take 85 students outside is difficult if not impossible. I once used the small amphitheater next to the library and that was great although it would not work now due to the larger class size.
- The computer lab in Jessie harris is very out dated, poorly managed and inadequate for student use, yet my department has to use it for a lab during the semester and it is really hard to tell students they have to wait because only a handful of the computers work correctly. In addition, my computer only has an HDMI port and none of the ports work through out many of the building I have tried for personal projects as well as teaching materials. There should be posted instructions in each room to make settin up computers more easy. Every room has a different set up and it is frustrating using my first 5-10 minutes trying to configure that particular set up.

- The courses I teach are short courses and mostly held at the UT Medical campus in the Anthropology Research Facility or at the Bass Building so some questions do not exactly pertain to survey.
- The earth is 4.54 billion years old.
- The name of the physics building is Nielsen not Nielsin.
- The production of designated outdoor teaching spaces would be a great asset to the university's existing infrastructure. The integration of productive landscapes (gardens, etc.) would also be a wonderful asset.
- The proximity of the UT Trial Gardens to the Veterinary Teaching Hospital is very nice. We use the gardens for small group discussions as possible, and for important stress-relief. Attractive landscaping, much in the past by the Ornamental Horticulture and Landscape Design programs has enhanced our campus.
- The stipends in Geography for graduate student instructors is an embarrassment to the university as there are other grad student instructors performing the same job for the university in other departments for twice as much pay.
- This class is once a week for 2 hours and the class is responsible for holding a fundraising event. We basically lost two of those weeks to snow. While I think we could use outdoor sessions for "special topics" - in addition to regular schedule - such as holding events in the outdoors, etc, I don't think it would be a good use of the limited time for this particular course to have an outdoor session.
- This is a crazy survey. . . . why all the comments about edible plants?
- This survey is way too long and tedious... Sorry, I don't have an hour to do this with care.
- This survey needs to be targeted towards the type of teaching you engage in; for example, 90% of the "outdoor resources" were irrelevant to me since I teach a course in mathematics. I have no use for medicinal plants, trees, herbs, etc and, since the options did not include "This is not relevant to my teaching", I was forced to mark "Disagree" and / or "Unaware". This type of survey format will bias your statistics.
- This survey seems to be more relevant for natural sciences.
- This was a great survey--included lots of things I've never thought about!
- Types of plants (herbaceous, woody, medical, herb, etc.) don't matter as much as if they are under stress and/or have disease. Sometimes, people are too fast pulling up things just because they 'don't look good'. Destroys a lot of teaching resources.
- UT has not taken advantage of the outdoor resources that are available, nor the expertise of the personnel. Many similar universities, even those located in cities, have naturalized wooded areas, gardens, outdoor areas where groups can sit and discuss in a comfortable setting and other amenities. And despite some efforts, the campus remains basically a dump, if you look there

is trash everywhere - along sidewalks and buildings. This is a combination of lack of suitable (and suitably maintained) garbage containers, and lack of a campus ethos toward having a nice place to work.

- UT has really improved the campus outdoor space but much more needs to be done. It's still trashy - maybe more trash containers would help. And I think we could better utilize outdoor space near buildings - such as roof top patios, or the patio space all around the communication building, put more places to sit in Circle Park, add tables and chairs on the plaza outside of the HSS building. AND MOST OF ALL, DISALLOW OUTDOOR SMOKING.
- We do not have forest resources on campus, so must go elsewhere. I do not know the availability of other resources listed on your survey because I do not use them or necessarily need them to teach class
- We need more space outdoors for students to meet and for faculty to meet with students. We need space to quietly work, reflect and relax.
- We would be more competitive with schools in the top 25 if the 3-D area was contained in a unified space/building it would be equally good if the whole school of Art was contained in one primary unified space. Also, if there was a art museum that housed study collection of 2-D 3-D and 4D Art works, this would easily raise our status among the top 25 programs & research institutions whose focus is on Studio Arts.
- With respect to the "do you know if it's available" questions, it would have been nice to be able to respond "no clue" where appropriate.
- Would be EXCELLENT to see accessible outdoor classrooms for a variety of uses. While my current courses do not lend themselves to outdoor activities that well - I hope that evolves during my time here at UTK. Good luck with your project.
- You need additional categories, such as "Uncertain/No idea" on a few of your questions.....:-;.....
- You should have included an "I don't know" for the availability of the outdoor resources. I left those blank because I don't know.
- Your questions seem very plant biased. The classes I teach that are field-based are on animals and involve field trips to natural areas within driving distance of Knoxville. We don't use any on-campus resources except using vehicles from the motor pool and equipment from the department. Since we do no work with plants, I've left a few sets of your questions blank.

Appendix D: Campus Maps

D-1: Map codes for specific regions of campus

Compiled by Pulte, A. and Plante, A., Spring 2014

The following report is organized by specific outdoor teaching resources, which have identified by researchers as having the greatest potential use and the least availability for the campus as a whole. Use and perceived availability is broken down by region of campus in which classes are taught. The buildings within each region are defined with acronyms below.

If greater than 30% of those who teach a class in a building would use an outdoor teaching resource, the perceived availability of that resource is marked on the table. The perceived resource availability for the building is the **majority** perception for **all instructors** who teach in that building, regardless of **whether or not** they would use the resource.

Availability is also included for the region of campus. The region availability is the **majority** perception for **all** of the **potential users** who teach in one of the buildings within that area of campus.

Regions of Campus

- West
 - Biosystems Engineering & Soil Science Lab (BEES)
 - C.E. Brehm Animal Sciences (BAS)
 - Ellington Plant Sciences (PS)
 - Food Safety & Processing (FSP)
 - Food Science (FT)
 - McCord Hall (MC)
 - Morgan Hall (MH)
 - Plant Biotechnology Building (PBB)
- Southwest
 - College of Veterinary Medicine (Teaching Hospital) (VTH)
 - Environmental & Landscape Lab
 - South Greenhouse
- Midwest
 - Aquatic Center (AQU)
 - Physical Education (H.P.E.R.)
 - Tennessee Recreation Center for Students (T-RECS)
- Central
 - Art and Architecture (AA)
 - Ceramics Addition (CER)
 - Clarence Brown Theatre (CBT)
 - Natalie L. Haslam Music Center

- North
 - Dunford Hall (DUH)
 - Haslam Business Building (HBB)
 - Henson Hall (HH)
 - Hodges Library (LIB)
 - Howard H. Baker Jr. Center for Public Policy (HBC)
 - Stokely Management Center (SMC)
- Northeast
 - Taylor Law Center (LAW)
 - Jessie Harris (JHB)
- Mideast
 - Bailey Education Complex (BEC)
 - Claxton Education Building (C)
 - College of Nursing (CN)
 - Communications & University Extension (COM)
 - Hearing and Speech Center (SLB)
 - Humanities and Social Sciences (HSS)
 - McClung Museum (MM)
 - Student Services (SSB)
- East
 - Alumni Memorial Building (AMB)
 - Ayers Hall (A)
 - *Austin Peay*
 - Burchfiel (BGB)
 - Dabney / Buehler (BU)
 - Dougherty (DO)
 - Earth & Planetary Sciences (EPS)
 - Hesler (H)
 - Nielsen (PHY)
 - Min Kao Engineering (MINKAO)
 - Science & Engineering (SE)
 - *South College*
 - University Center (UC)
 - Walters (WLS)
- Southeast
 - East Stadium (ESH)
 - Estabrook (EST)
 - Ferris (FH)
 - John D. Tickle Engineering Building (JHB)
 - Neyland Dr. Biology Annex (NBA)
 - Pasqua Nuclear Engineering (PSQ)
 - Perkins Hall (PER)
 - South Stadium (SSH)

Medicinal Plant

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West			X	
BEES			X	
BAS	X			
PS			X	
FSP	X			
FT	X			
MC	X			
MH	X			
PBB			X	
Southwest		X		
VTH			X	
E & L Lab		X		
South GH			X	
Midwest			X	
AQU	X			
HPER	X			
T-RECS			X	
Central			X	
AA	X			
CER	X			
CBT	X			
NLH Music	X			
North			X	
DUH	X			
HBB	X			
HH	X			
LIB	X			
HBC	X			
SMC	X			
Northeast		X		
LAW	X			
JHB	X			
Mideast			X	
BEC	X			
C	X			
CN	X			
COM	X			
SLB	X			

Medicinal Plant

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS	X			
MM	X			
SSB	X			
East			X	
AMB	X			
A	X			
BGB		X		
BU	X			
DO	X			
EPS	X			
H			X	
PHY	X			
MINKAO	X			
SE		X		
UC			X	
WLS			X	
Southeast			X	
ESH	X			
EST	X			
FH	X			
JHB	X			
NBA			X	
PSQ			X	
PER			X	
SSH				X

Edible Plants				
Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West			X	
BEES			X	
BAS			X	
PS			X	
FSP			X	
FT		X		
MC	X			
MH	X			
PBB				X
Southwest		X		
VTH	X			
E & L Lab		X		
South GH			X	
Midwest			X	
AQU	X			
HPER	X			
T-RECS			X	
Central			X	
AA			X	
CER	X			
CBT	X			
NLH Music	X			
North			X	
DUH	X			
HBB	X			
HH		X		
LIB			X	
HBC	X			
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast			X	
BEC	X			
C			X	
CN	X			
COM	X			
SLB	X			

Edible Plants				
Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS	X			
MM			X	
SSB	X			
East		X		
AMB	X			
A	X			
BGB			X	
BU	X			
DO	X			
EPS			X	
H			X	
PHY	X			
MINKAO	X			
SE			X	
UC		X		
WLS				X
Southeast				X
ESH	X			
EST	X			
FH	X			
JHB	X			
NBA		X		
PSQ	X			
PER	X			
SSH				X

Example of a Sustainable Landscape

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West		X		
BEES			X	
BAS	X			
PS			X	
FSP	X			
FT	X			
MC	X			
MH			X	
PBB		X		
Southwest		X		
VTH	X			
E & L Lab		X		
South GH		X		
Midwest				X
AQU	X			
HPER	X			
T-RECS				X
Central			X	
AA			X	
CER	X			
CBT	X			
NLH Music	X			
North			X	
DUH			X	
HBB	X			
HH		X		
LIB			X	
HBC		X		
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast			X	
BEC	X			
C	X			
CN	X			
COM	X			
SLB	X			

Example of a Sustainable Landscape

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS	X			
MM	X			
SSB	X			
East		X		
AMB		X		
A	X			
BGB		X		
BU	X			
DO	X			
EPS			X	
H		X		
PHY	X			
MINKAO	X			
SE		X		
UC		X		
WLS		X		
Southeast			X	
ESH				X
EST			X	
FH	X			
JHB			X	
NBA		X		
PSQ	X			
PER	X			
SSH			X	

Example of Food Systems

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West		X		
BEES			X	
BAS			X	
PS			X	
FSP		X		
FT		X		
MC	X			
MH			X	
PBB		X		
Southwest		X		
VTH	X			
E & L Lab		X		
South GH			X	
Midwest			X	
AQU	X			
HPER	X			
T-RECS			X	
Central			X	
AA		X		
CER	X			
CBT	X			
NLH Music	X			
North		X		
DUH		X		
HBB	X			
HH		X		
LIB		X		
HBC	X			
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast			X	
BEC	X			
C	X		X	
CN				
COM	X			
SLB	X			

Example of Food Systems

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS	X			
MM			X	
SSB	X			
East		X		
AMB	X			
A	X			
BGB		X		
BU	X			
DO	X			
EPS		X		
H		X		
PHY	X			
MINKAO	X			
SE		X		
UC		X		
WLS		X		
Southeast			X	
ESH				X
EST		X		
FH			X	
JHB	X			
NBA		X		
PSQ	X			
PER	X			
SSH			X	

Example of Urban Agriculture

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West		X		
BEES			X	
BAS		X		
PS			X	
FSP			X	
FT	X			
MC	X			
MH			X	
PBB			X	
Southwest		X		
VTH	X			
E & L Lab		X		
South GH		X		
Midwest			X	
AQU	X			
HPER	X			
T-RECS			X	
Central			X	
AA			X	
CER	X			
CBT	X			
NLH Music	X			
North		X		
DUH		X		
HBB	X			
HH		X		
LIB			X	
HBC	X			
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast		X		
BEC			X	
C	X			
CN	X			
COM	X			
SLB	X			

Example of Urban Agriculture

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS	X			
MM		X		
SSB	X			
East			X	
AMB	X			
A	X			
BGB			X	
BU	X			
DO	X			
EPS			X	
H		X		
PHY	X			
MINKAO	X			
SE		X		
UC		X		
WLS			X	
Southeast		X		
ESH				X
EST				X
FH	X			
JHB	X			
NBA			X	
PSQ	X			
PER	X			
SSH			X	

Retention Pond				
Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West		X		
BEES			X	
BAS	X			
PS		X		
FSP	X			
FT	X			
MC			X	
MH	X			
PBB		X		
Southwest		X		
VTH	X			
E & L Lab		X		
South GH			X	
Midwest			X	
AQU	X			
HPER	X			
T-RECS			X	
Central		X		
AA	X			
CER	X			
CBT	X			
NLH Music	X			
North		X		
DUH	X			
HBB	X			
HH	X			
LIB	X			
HBC	X			
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast		X		
BEC	X			
C	X			
CN	X			
COM	X			
SLB	X			

Retention Pond				
Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS	X			
MM	X			
SSB	X			
East		X		
AMB		X		
A	X			
BGB		X		
BU		X		
DO		X		
EPS		X		
H		X		
PHY		X		
MINKAO		X		
SE		X		
UC			X	
WLS			X	
Southeast		X		
ESH	X			
EST			X	
FH	X			
JHB			X	
NBA		X		
PSQ	X			
PER	X			
SSH	X			

Example of an Aquatic Ecosystem

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West			X	
BEES			X	
BAS	X			
PS		X		
FSP	X			
FT	X			
MC			X	
MH			X	
PBB			X	
Southwest			X	
VTH			X	
E & L Lab		X		
South GH			X	
Midwest			X	
AQU	X			
HPER	X			
T-RECS			X	
Central		X		
AA		X		
CER	X			
CBT	X			
NLH Music	X			
North		X		
DUH	X			
HBB	X			
HH		X		
LIB	X			
HBC		X		
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast		X		
BEC	X			
C			X	
CN	X			
COM	X			
SLB	X			

Example of an Aquatic Ecosystem

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS	X			
MM	X			
SSB	X			
East			X	
AMB	X			
A	X			
BGB			X	
BU			X	
DO			X	
EPS			X	
H			X	
PHY			X	
MINKAO			X	
SE			X	
UC			X	
WLS			X	
Southeast			X	
ESH	X			
EST			X	
FH	X			
JHB			X	
NBA			X	
PSQ	X			
PER	X			
SSH	X			

Constructed Wetland

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West		X		
BEES		X		
BAS	X			
PS		X		
FSP	X			
FT	X			
MC				X
MH	X			
PBB		X		
Southwest		X		
VTH	X			
E & L Lab		X		
South GH			X	
Midwest			X	
AQU	X			
HPER	X			
T-RECS	X			
Central		X		
AA		X		
CER	X			
CBT	X			
NLH Music	X			
North	X			
DUH	X			
HBB	X			
HH		X		
LIB	X			
HBC	X			
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast		X		
BEC	X			
C		X		
CN	X			
COM	X			
SLB	X			

Constructed Wetland

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS	X			
MM	X			
SSB	X			
East		X		
AMB	X			
A	X			
BGB		X		
BU		X		
DO		X		
EPS		X		
H		X		
PHY		X		
MINKAO		X		
SE		X		
UC		X		
WLS				X
Southeast		X		
ESH	X			
EST	X			
FH	X			
JHB			X	
NBA		X		
PSQ	X			
PER	X			
SSH	X			

Example of a Native Ecosystem

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West		X		
BEES			X	
BAS	X			
PS		X		
FSP	X			
FT	X			
MC				X
MH	X			
PBB			X	
Southwest			X	
VTH	X			
E & L Lab		X		
South GH			X	
Midwest			X	
AQU	X			
HPER	X			
T-RECS			X	
Central		X		
AA			X	
CER	X			
CBT	X			
NLH Music	X			
North		X		
DUH		X		
HBB	X			
HH		X		
LIB			X	
HBC			X	
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast			X	
BEC	X			
C		X		
CN	X			
COM	X			
SLB	X			

Example of a Native Ecosystem

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS	X			
MM	X			
SSB	X			
East			X	
AMB		X		
A	X			
BGB			X	
BU			X	
DO			X	
EPS			X	
H			X	
PHY			X	
MINKAO			X	
SE			X	
UC			X	
WLS			X	
Southeast			X	
ESH				X
EST			X	
FH	X			
JHB			X	
NBA			X	
PSQ	X			
PER	X			
SSH	X			

Soil Profiles				
Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West		X		
BEES			X	
BAS	X			
PS		X		
FSP	X			
FT	X			
MC	X			
MH		X		
PBB		X		
Southwest		X		
VTH	X			
E & L Lab		X		
South GH		X		
Midwest			X	
AQU	X			
HPER	X			
T-RECS			X	
Central		X		
AA	X			
CER	X			
CBT	X			
NLH Music	X			
North		X		
DUH	X			
HBB	X			
HH	X			
LIB	X			
HBC	X			
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast			X	
BEC	X			
C	X			
CN	X			
COM	X			
SLB	X			

Soil Profiles				
Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS	X			
MM			X	
SSB	X			
East		X		
AMB	X			
A	X			
BGB		X		
BU		X		
DO		X		
EPS		X		
H		X		
PHY		X		
MINKAO		X		
SE		X		
UC		X		
WLS		X		
Southeast		X		
ESH				X
EST	X			
FH	X			
JHB			X	
NBA		X		
PSQ	X			
PER	X			
SSH				X

Rock Formations

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West		X		
BEES			X	
BAS	X			
PS		X		
FSP	X			
FT	X			
MC	X			
MH	X			
PBB	X			
Southwest		X		
VTH	X			
E & L Lab		X		
South GH	X			
Midwest		X		
AQU	X			
HPER	X			
T-RECS		X		
Central			X	
AA			X	
CER		X		
CBT	X			
NLH Music	X			
North		X		
DUH	X			
HBB	X			
HH			X	
LIB			X	
HBC	X			
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast			X	
BEC	X			
C			X	
CN	X			
COM			X	
SLB	X			

Rock Formations

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS	X			
MM			X	
SSB	X			
East		X		
AMB			X	
A	X			
BGB	X			
BU	X			
DO	X			
EPS	X			
H	X			
PHY	X			
MINKAO	X			
SE	X			
UC	X			
WLS	X			
Southeast		X		
ESH				X
EST			X	
FH	X			
JHB			X	
NBA		X		
PSQ		X		
PER	X			
SSH	X			

Architectural Features

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West		X		
BEES			X	
BAS	X			
PS		X		
FSP	X			
FT	X			
MC	X			
MH	X			
PBB	X			
Southwest			X	
VTH	X			
E & L Lab			X	
South GH	X			
Midwest	X			
AQU	X			
HPER	X			
T-RECS	X			
Central			X	
AA			X	
CER	X			
CBT	X			
NLH Music	X			
North			X	
DUH	X			
HBB	X			
HH		X		
LIB			X	
HBC	X			
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast			X	
BEC			X	
C			X	
CN	X			
COM		X		
SLB				X

Architectural Features

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS			X	
MM			X	
SSB				X
East		X		
AMB	X			
A	X			
BGB	X			
BU	X			
DO	X			
EPS	X			
H	X			
PHY	X			
MINKAO	X			
SE	X			
UC	X			
WLS	X			
Southeast			X	
ESH				X
EST			X	
FH	X			
JHB	X			
NBA				X
PSQ			X	
PER	X			
SSH			X	

Architectural Markers

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
West		X		
BEES			X	
BAS	X			
PS			X	
FSP	X			
FT	X			
MC	X			
MH			X	
PBB			X	
Southwest			X	
VTH	X			
E & L Lab			X	
South GH	X			
Midwest			X	
AQU	X			
HPER	X			
T-RECS	X			
Central				X
AA			X	
CER	X			
CBT	X			
NLH Music	X			
North			X	
DUH	X			
HBB	X			
HH		X		
LIB			X	
HBC	X			
SMC	X			
Northeast	X			
LAW	X			
JHB	X			
Mideast			X	
BEC			X	
C			X	
CN	X			
COM			X	
SLB			X	

Architectural Markers

Region	≥ 70% Wouldn't Use	≥ 30 % Would Use		
		Not Available	Somewhat Available	Available
HSS			X	
MM			X	
SSB			X	
East		X		
AMB	X			
A	X			
BGB			X	
BU			X	
DO			X	
EPS			X	
H			X	
PHY			X	
MINKAO			X	
SE			X	
UC	X			
WLS			X	
Southeast			X	
ESH				X
EST			X	
FH	X			
JHB			X	
NBA			X	
PSQ	X			
PER	X			
SSH		X		

D-2: Example Map of Potential ODTR Placement

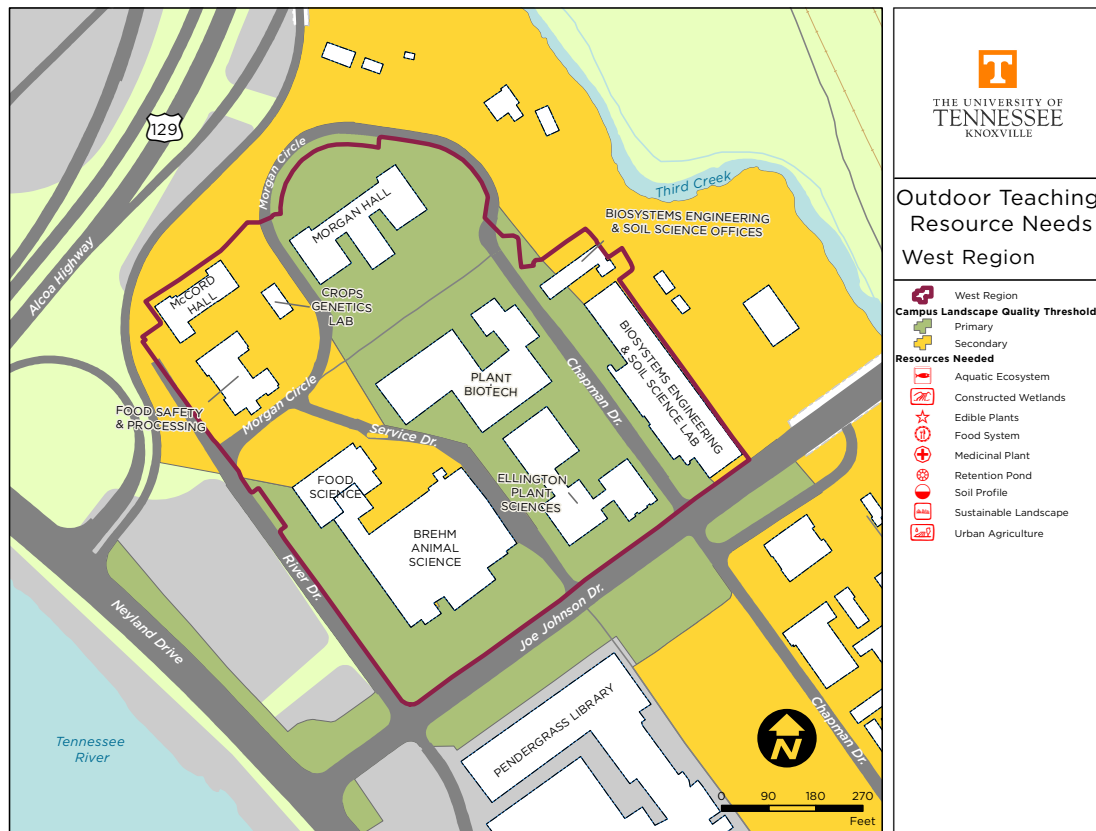


Figure 15 - ODTR Placement Map Example

Vita

Andy Pulte grew up in the nursery industry in Grand Island, NE. He is on the faculty of the Plant Sciences department at the University of Tennessee. His current responsibilities include teaching, advising and coordination of the UT Plant Sciences undergraduate program. Andy has contributed to several gardening publications including *Fine Gardening*, *State-By-State Gardening* and *At Home Tennessee*. Additionally, he speaks regularly to diverse groups and travels extensively to feed his passion for people and plants. Andy has traveled and enjoyed gardens throughout the U.S. as well as locations such as Thailand, South Africa, New Zealand, Costa Rica, England and Western Europe. Andy gardens in a residential community north of Knoxville, TN. He seeks out unusual plants for his home garden that inspire questions from those who visit.