

Tree Preservation Methods and Barriers, Perspectives of the Design and Construction Community

Darren A. Olsen, JD, J. Mark Taylor, PhD, JD and Elizabeth Brodbeck
Auburn University
Auburn, Alabama

Building sites are often selected on the basis of existing, mature trees. However, poor construction techniques and a general lack of knowledge in the professional community put trees at risk that were supposed to be saved. The extent to which design and construction professionals are implementing some form of tree preservation on projects has not been quantified. This research surveys design and construction professionals to determine the extent to which science-based tree preservation is being used. It also seeks to define the perceived barriers that limit tree protection during construction.

Keywords: green building, landscape architecture, LEED, tree preservation

Introduction

Because mature trees add intrinsic value to real estate, many building sites are selected on the basis of existing trees (Laband 2009; Coder 1996; Hauer et al. 1994). However, poor construction techniques and a general lack of knowledge in the professional community often contribute to the immediate or eventual loss of the very trees that make a site desirable (Coder 1996b, Hauer et al. 1994; Sandfort and Runck 1986; Vander Weit and Miller 1986; Gilbert 1996).

New research, information and techniques are improving the industry's knowledge of how to build and work around trees in the urban landscape. This coupled with the advance of green building practices has driven a growing interest in tree preservation on the part of communities, homeowners, and builders (Dwyer et al. 1991). Likewise, groups like the U.S. Green Building Council (a non-profit organization) and the creation of LEED Certification have raised awareness about the benefits of tree preservation (USGBC 2009). Still, the extent to which design and construction professionals are implementing some form of tree preservation in Alabama on projects has not been analyzed.

This research surveys design and construction professionals in Alabama to determine the extent to which science-based tree preservation is being used and also to define the barriers that limit tree protection during construction. By investigating the current state of tree preservation, this research hopes to provide insight that will allow for the development of future tree preservation programs for Alabama.

Literature Review

For the purpose of this research, tree preservation is defined as the protection of specific trees or a particular area, group or woodland from intentional damage or destruction during construction activities (Methaney and Clark 1998). It is well documented that construction activities damage and threaten tree health (Sandfort and Runck 1986; Vander Weit and Miller 1986). Furthermore, many of the current building techniques damage the natural environment causing difficulties during the establishment, growth or survival of trees on or near building sites (Alberty et al. 1984; Craul 1994; Randrup and Lichter 2001). According to Despot and Gerhold (2003), many builders are unaware of the damage they cause to trees because it may be several years before trees exhibit symptoms of damage due to construction.

It is well documented that trees add economic, environmental, and aesthetic value to real estate and significantly reduce energy costs associated with cooling (Laband 2009; Stigarll and Elam 2009; Coder 1996). Yet, the overwhelming number of studies and data on tree benefits do not appear to be reaching the design and construction audience. A Pennsylvania survey found that the second largest barrier to tree preservation was lack of knowledge, followed by the perceived higher costs of tree preservation (Depot and Gerhold 2003). The same study found that the single most noted reason not to preserve trees was site constraints (Depot and Gerhold 2003). Over the past two decades--and especially over the past few years--tree preservation guides have been developed for improving

industry professionals' knowledge of how to build and work around trees on the construction site (Johnson 1999; Dickey and Stephen 2004; File et. al 2008; Matheny and Clark 1998).

Methodology

Electronic surveys comprised of 40 multiple choice questions were sent to 1019 design (Architects, Landscape Architects, and Civil Engineers) and construction professionals in Alabama. A total of 80 respondents completed the survey. The survey had two objectives; first, to what extent tree preservation is occurring in Alabama, and second, identifying barriers to tree preservation in Alabama. The survey questions for Objective 1, which seeks to understand to what extent tree preservation is occurring in Alabama, are based on common tree preservation techniques derived from literature, specifically Trees and Construction guides. The questions for Objective 2, which seeks to identify barriers to tree preservation in Alabama, are based on common perceived challenges discovered in literature concerning tree preservation.

Results

Respondents were evenly spread among design and construction professionals. Forty-three percent described their occupation as construction, 43 percent as architecture, 11 percent landscape architecture, and three percent civil engineer. Similarly, those surveyed come from both residential and non-residential backgrounds. Allowed to select all that applied to them when asked to describe the type of construction they are involved with, 76 percent said non-residential, while 55 percent said residential (companies were allowed to select both markets).

Once occupation was established, questioning turned to the specifics behind the professionals' experience with tree preservation. The following section discusses the responses given by design professionals. Specific questions were designed to determine the percentage of design professionals who incorporate tree preservation into their design. Responses indicate that 46 percent of design professionals "always" or "almost always" begin a project with a tree inventory to assess the number, location and quality of trees to be considered during the design process. Thirty percent of design professionals "sometimes" begin a project with a tree inventory. Only 24 percent say they "seldom" or "never" begin with a tree inventory.

The next question asks if they incorporate tree preservation into their design process to maximize the protection of existing trees they wished to save. (Figure 1)

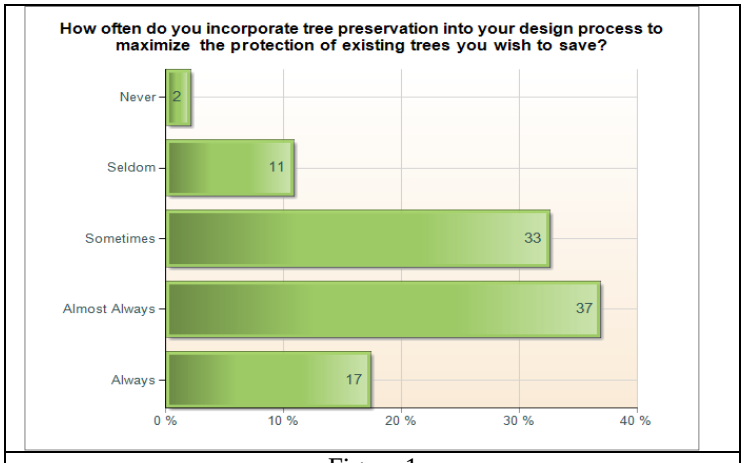

Figure 1

The next two questions asks if they work with a Certified Arborist before beginning design on a project with trees they wish to protect and further after their design is complete does the Arborist review the drawings for their tree protection measures. (Figures 2 & 3)

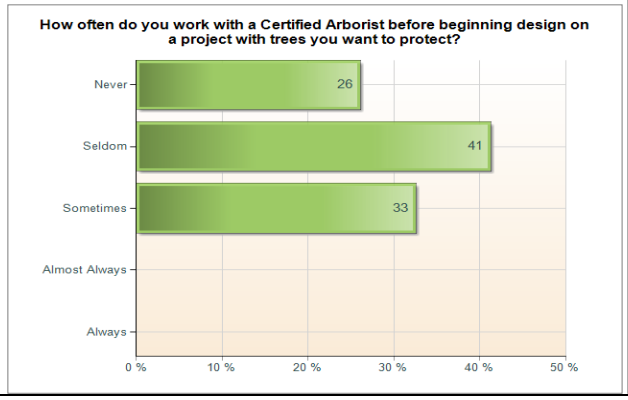

Figure 2

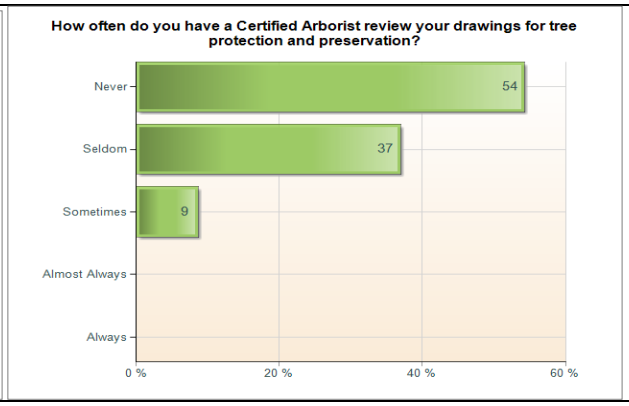

Figure 3

To assess client demand for tree preservation, researchers inquired as to how often clients request tree protection and preservation on projects. The majority (52%) responded "sometimes," 41 percent responded "seldom" or "never," and six percent responded "always" or "almost always."

Researchers also sought to assess the design professional's knowledge of tree preservation. When asked where they had chosen to locate tree protection fences on past projects, 48 percent of design professionals said at the "drip line" and 29 percent "outside the drip line." A mere seven percent located tree protection fences according to the Critical Root Zone Method. Eleven percent answered "inside the drip line." Seventy-four percent of design professionals "always" or "almost always" avoid grade changes within the drip line of a tree they are trying to protect, while 11 percent answered either "never" or "seldom."

One series of questions was intended to assess the level of coordination that is occurring among professionals. When asked how they incorporate tree preservation into their designs, 57 percent of design professionals answered "drawings" and nine percent answered "specifications." Seven percent selected "verbal directive." Twenty-two percent answered "other" and were asked to specify. The majority of them stated that they incorporate tree preservation into both their drawings and specifications.

To the question, "How often do you discuss tree preservation with the construction team at a preconstruction meeting," 48 percent of design professionals stated that they "almost always" or "always" do, 33 percent "sometimes," and 19 percent "never" or "seldom."

A subsequent set of questions was intended to capture the perceived challenges and barriers to tree preservation. The design professionals were asked to name the primary reason they do not implement tree protection and preservation on a regular basis. (Figure 4)

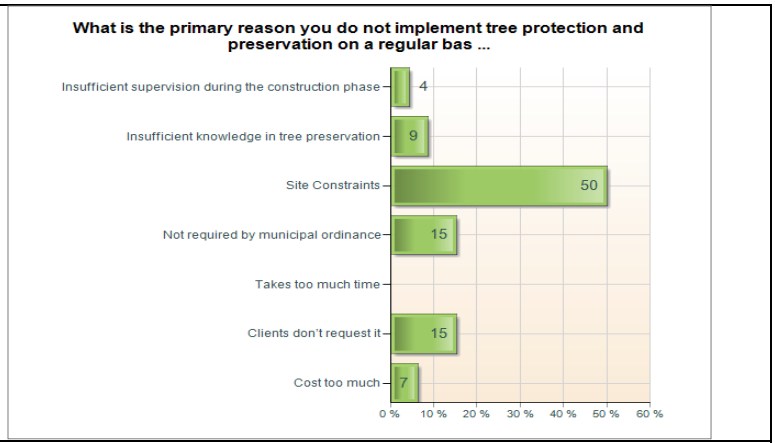

Figure 4

The following section discusses the answers given by construction professionals in response to the line of questioning directed towards them. The majority (56%) of the surveyed construction professionals indicate that they—or their sub-contractors-- "always" or "almost always" conduct tree protection and preservation measures on a site with trees they wish to protect. Twelve percent replied "sometimes," and 30 percent chose "never" or "seldom." When asked to define the percentage of their projects in which they implement some type of tree preservation strategy above and beyond what is required in the construction documents, 48 percent of construction professionals answered "none" or "less than 5%." Fifteen percent answered "60% or more."

As with the questions aimed at design professionals, one line of questioning was intended to assess the level of coordination that is occurring among professionals. When asked how often tree protection and preservation measures (fences, barrieres, etc.) are incorporated into the contruction documents, 47 percent of construction professionals responded "sometimes" and 42 percent responded "seldom" or "never." Twelve percent answered "always" or "almost always." These results seem to conflict with the information given by the design professionals. (Figure 5)

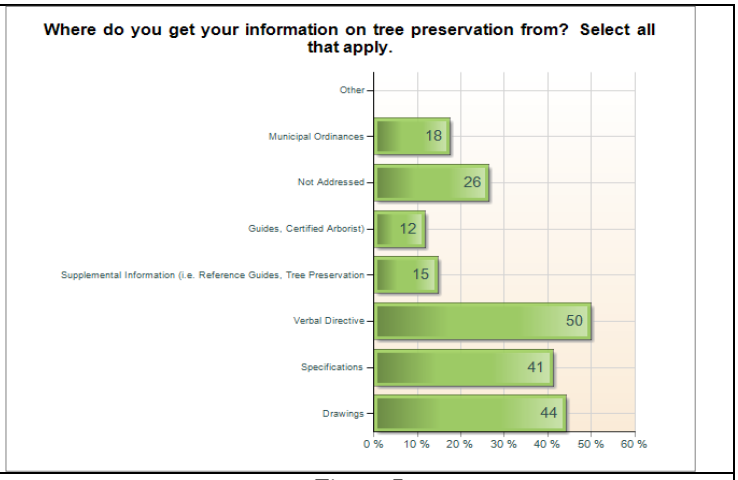

Figure 5

Additionally, construction professionals were asked how often they discuss tree protection with the design team at a preconstruction meeting. The results were fairly evenly distributed. Twenty-one percent said "always," 24 percent "almost always," 24 percent "sometimes," and 21 percent "seldom." Just 12 percent responded that they "never" had the discussion during preconstruction. (Figure 6)

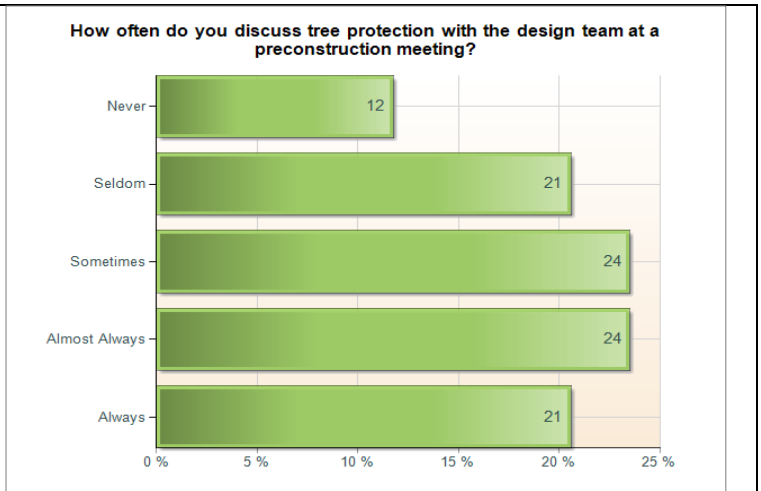

Figure 6

Still another series of questions was intended to assess the knowledge that construction professionals have regarding tree preservation techniques and the extent to which tree preservation is occurring during projects. Seventy-seven percent of construction professionals "seldom" or "never" work with a Certified Arborist before beginning construction on a project with trees they want to protect. Just three percent answered "almost always." No one selected "always." This response was similar to the design professionals' answers when asked about their interaction with Certified Arborists above. When asked where they get their information on tree preservation and given the opportunity to mark all that applied, fifty precent of construction professionals answered "verbal directive," 44 percent "drawings," and 41 percent "specifications." When asked to assess their personal knowledge of tree presevation, 53 percent of construction professionals chose "minimal," and both "familiar" and "knowledgeable" were selected by 24 percent.

Construction professionals were also prompted to list the primary barriers to implementing tree preservation on a project. Their responses indicate that the greatest challenge to tree preservation is that clients don't request it (56 %). Site constraints were the second-most noted at 50 percent, third was that tree preservation was not incorporated in the construction documents (41%).

Conclusions

Ideally, the first step of the tree preservation process begins during the programming phase of a construction project. The greatest challenge to tree preservation noted by design professionals are the constraints imposed by the site; however, results indicate that construction clients and municipalities seldom request tree preservation. So, from the beginning, tree preservation is sidelined. It is reasonable to conclude that barriers imposed by site constraints might get more attention if tree preservation were more important to the community and the client.

Public apathy issues aside, the survey also indicates that industry professionals are suffering from significant holes in the body of knowledge surrounding tree preservation. Designers don't appear to be familiar with established best practices such as the "Critical Root Zone Method" and instead are relying on old rules of thumb such as the "drip line" when protecting tree roots.

Although a high percentage of design professionals do perform tree inventories, they rarely work with a Certified Arborist. This fact leaves one to question the quality of the tree inventories being performed. Further evidence of the low quality of tree assessments is shown since 91 percent of design professionals say they "never" or "seldom" have a Certified Arborist review their drawings. Results also indicate that construction professionals have limited and conflicting information concerning tree preservation techniques. This is important to note because without specific guidance and enforcement by the design professionals, the construction contractors are not likely to implement proper tree preservation. Moreover, the results indicate a lack of coordination between design and construction professionals.

In addition to the site and informational challenges recognized by the designers is the issue of enforcement. From the designer's perspective, they always or almost always incorporate tree preservation into the design process to maximize the protection of existing trees they wish to save. On the other hand they recognize that, as the designer, they may not be able to enforce tree preservation without financial penalties or responsibility for construction administration within their scope of work.

Interestingly, in response to the question concerning barriers to tree preservation, a significant number (33%) of respondents chose "Other." Among the reasons specified were several issues related to site constraints and others related to lack of knowledge, the responses to this question warrants further study beyond the scope of this project. (Table 1)

#	**Response**
1	lack of education
2	Haven't experienced barriers beyond site constraints
3	small lot size in urban areas
4	Cheaper to cut the tree(s) down and replant then to save them

5	No barrier
6	Rare occurrences due to lack of communication
7	budget engineering and time constraints
8	Lack of construction team cooperation.
9	All of these reasons plus the fact that most contractors simply do not follow the drawings and specifications.
10	DoD construction is subject to Base Environmental jurisdiction. If it is not levied by the base, it is not incorporated.
11	Sites are usually brownfields that is being reused. Unlike ******, most locations in central *[State]* strip the land and flatten it.
12	ignorance by contractor, civil engineer, architect
13	general contractor complacency
14	lack of traning of Architect & Contractors
15	just depends if significant trees on site, then we addresss

Table 1

The construction professionals' perspective on barriers to preservation is similar to the design professionals' viewpoint. Site constraints and lack of community and client interest dominate the results. On the other hand, construction professionals identified the failure of tree preservation to be incorporated into the construction documents as another barrier. Surprising to note, increased costs don't seem to be a major concern for either the design professionals or the construction professionals. Both the design and construction professionals recognize a lack of knowledge as a barrier to tree preservation. Most construction professionals consider their knowledge of tree preservation to be minimal, while most design professionals consider themselves to be at least familiar. It follows that communication and enforcement are critical elements to tree preservation. Based on the conclusions, design professionals would seem to benefit from being educated in more effective ways to incorporate tree preservation into construction documents. Similarly, construction professionals would benefit from learning more about on site tree preservation methods.

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