

Tree Appraisal: Installed Unit Costs

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Disclaimer: This article presents the documented research and findings of the authors. This article is not an ASCA position or statement on any aspect of tree appraisal.

Introduction

This article discusses the use of unit costs in tree appraisal, particularly the treatment of installed unit costs in the *Guide for Plant Appraisal*, 10th Edition (CTLA 2019).

Purpose

Our primary purpose is to establish that, despite the contrary admonition in the 10th Ed. (p. 58), installed unit costs remain useful and defensible in the Trunk Formula Technique (TFT) (p. 57). In fact, installation cost is an indispensable part of *total cost* in the Cost Approach (see Appendix III). A secondary purpose is to provide a well-documented history of unit costs in tree appraisal.

This article will be most immediately useful to experienced tree appraisers. We have written it to provide all tree appraisers with a comprehensive reference on this foundational topic.

The Basics: Costs and Unit Costs

We start here with basic topic terms.

Costs. The 10th Ed. defines cost as the amount of money required to create, produce, or obtain something. In our dis-

cussion it is a tree. Costs are *data*, used in the Cost Approach (see Appendix II, Fig. II-1). Costs are current for the effective date of the appraisal (Appraisal Institute 2013, p. 581). The cost to obtain a tree—just sitting there in the nursery—could be useful, for example, in appraising nursery stock as personal property (see 10th Ed., p. 12). When using the Cost Approach in appraising trees that are growing or standing in the ground and intended to remain there, however, the *total cost* to create or produce a substitute tree is indispensable.

Unit costs. A unit cost is the cost of a defined unit of the thing we are developing a cost for. In real estate appraisal, for example, a common unit is a square foot of building floor area.¹ In tree appraisal, a square inch² of trunk cross-sectional area has been used for over 100 years (Appendix IV). The 10th Ed. (p. 57) introduces other tree size units, which we do not address in this article.

An *installed* unit cost includes all the costs to obtain, deliver, install/plant,³ establish,⁴ and perhaps guarantee the tree; it excludes additional costs such as removing and disposing of a pre-existing tree or removing and replacing contaminated soil.



The 10th Ed. (p. 8) clearly explains that while the terms *cost*, *price*, and *value* might be used interchangeably in casual speech, they have distinct meanings in professional appraisal practice (see Figure II-1). Discarding those distinct meanings confuses the tree appraiser, the appraisal, and the appraisal user. We use cost as defined above.

Appendices

We will continue directly with the core topic—installed unit costs—and have placed explanatory and supporting information in appendices. A meaningful understanding of installed unit costs requires an understanding of this supporting material. We describe the historical and current context of tree appraisal in Appendices I and II. Appendix III outlines the Cost Approach. Appendix IV traces the origin, evolution, and nature of unit costs in tree appraisal.

Installed Unit Costs in 8th and 9th Ed. Practice

Wholesale, Retail, or Installed?

As explained in Appendix IV, both 8th (CTLA 1992) and 9th (CTLA 2000) editions allowed an arbitrary choice of wholesale, retail, or installed unit costs.

¹ The comparative unit method is used to derive a cost estimate in terms of the monetary amount per unit of area or volume based on known costs of similar subjects (Appraisal Institute 2013, pp. 584-590; Appraisal Institute 2015).

² Throughout this article, we use a square inch unit for consistency with historical sources and for simplicity of presentation. The unit could of course be a square centimeter of trunk cross-sectional area (see 10th Ed., p. 181; CNLA 2017, Appendix A).

³ Planting is defined as “installing a plant in the landscape” (TCIA 2012, Watson 2014).

⁴ In arboricultural and horticultural practice, establishment occurs in the post-planting period (Watson and Himelick 2013, pp.166-171). Establishment costs that are considered necessary for the plant to survive and thrive on its own (such as moisture management and pest management) can be part of the installed cost of the appraised subject rather than additional costs. Establishment costs are distinguished from ordinary long term maintenance costs.

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Problems. There were a number of problems with this choice. First, it confused cost *data* and value *opinions*. Second, it fostered variability among appraisals, a recognized weakness in tree appraisal practice (Watson 2001). Third, because it was arbitrary, it also fostered suspicion that the choice was made merely to benefit a client. Fourth, it was inconsistent with the *total cost* logic of the Cost Approach (Appendix III), including the role of depreciation.

The Regional Plant Appraisal Committees (RPACs)

Some RPACs left the choice, and attendant problems, to individual appraisers. Some RPACs recommended installed costs and unit costs in their regions based on the Largest Commonly Available Transplantable Size Tree (LCATT).⁵

Recognition of the Problems

Some tree appraisers recognized the inherent problems with a wholesale, retail, or installed cost choice and used installed unit costs exclusively in their individual practices. Some tree appraisers called for more informed consideration of the choice (e.g., Scow 2006).

Installed Unit Costs in the 10th Ed.

A guiding goal of the 10th Ed. (p. ix) was to “align the concepts and terminology of plant appraisal with those employed in the general practice of appraisal.” Appendix III explains the total cost logic of the Cost Approach in general appraisal practice.

2012 Draft

The 10th Ed. authors initially recognized the problems with a wholesale, retail, or installed unit cost choice. They understood the *total cost* logic of the Cost Approach in general appraisal practice. The publicly reviewed 2012 draft (CTLA

2012) based the TFT unit cost on “the retail installed cost of a locally available transplantable tree.” In subsequent discussions, the authors simplified the basis to installed cost (Cullen, personal recollection).

2016 Draft

In a chapter draft (CTLA 2016), a different set of 10th Ed. authors rejected both the 2012 draft’s installed unit cost position and the wholesale, retail, installed unit cost choice allowed by the 8th and 9th editions. The new draft stated “In this edition of the Guide, the CTLA recommends using the nursery price as the starting point. The nursery cost [is] the price that the plant owner would pay to purchase the plant.”

2017 Drafts

The first 2017 draft (CTLA 2017a) stated “In this edition of the *Guide*, the CTLA recommends using the price that a landscape professional would pay a nursery grower to purchase and deliver the plant as the basis for unit cost.”

A second 2017 draft (CTLA 2017b) removed delivery cost, strengthened its admonition to exclude installation/planting cost, and provided a rationale. “The CTLA recommends extrapolating the cost of purchasing the largest commonly available nursery tree because that cost is tangible and is related to larger trees. The CTLA advises against extrapolating planting and additional costs when applying TFT because of the weak relationship between these costs for a nursery tree and what they might be for a much larger tree.”

The Published 10th Ed.

The 10th Ed. was released in August 2018 and withdrawn later in the year to cor-

rect editorial and typographical issues. A corrected second printing was released in July 2019. Later in 2019, significant errors and inconsistencies were discovered in Cost Approach worksheets (pp. 84–88). Reportedly, corrected worksheets will be released later in 2020. Our references here are all to the second printing (CTLA 2019).

There was no change in the treatment of installed unit costs from the last draft (CTLA 2017b). “The CTLA recommends extrapolating the cost of purchasing the largest commonly available nursery tree because that cost is tangible and is related to larger trees. The CTLA advises against extrapolating planting and additional costs when applying TFT because of the weak relationship between these costs for a nursery tree and what they might be for a much larger tree.”

Problems with the 10th Ed. Exclusion of Installed Unit Costs

- First, excluding installation from unit costs is inconsistent with the *total cost* logic of the Cost Approach in general appraisal practice (see Appendix III).
- Second, both nursery tree cost and installation cost are tangible. Installation cost is not an intangible.⁶ The 10th Ed. presents a false dichotomy.
- Third, there are no data supporting CTLA’s rationale for its admonition to exclude installed unit costs. There are no data suggesting that the association or relationship between nursery tree cost and extrapolated larger tree cost is stronger than the association or relationship between the nursery tree installation cost and extrapolated larger tree installation cost. Conversely, there are no data suggesting that the association or relationship between nursery tree installation cost and

⁵ Largest Commonly Available Transplantable Size Tree was the 8th Ed. and 9th Ed. term.

⁶ Tangible is not defined in the 10th Ed. The *Dictionary of Real Estate Appraisal*, 6th Ed. (Appraisal Institute 2015) uses tangible and intangible to characterize assets or property, but the logic is applicable to costs. Tangibles are physical and perceivable with the senses. Intangibles, by contrast, are non-physical and include rights such as franchises, trademarks, patents, copyrights, and good will. Installation is a physical process; it is not a mere right to plant a tree that is sitting in a nursery or on a delivery truck.

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extrapolated larger tree installation cost is weaker than the association or relationship between nursery tree cost and extrapolated larger tree cost.

As explained in Appendix IV, the trunk formula was originally devised specifically because of a lack of readily available large-tree data. Unit costs have been used in tree appraisal for over 100 years as a surrogate for unavailable large-tree data. Generally,⁷ larger trees will cost more than smaller trees, and larger trees will cost more to install than smaller trees. The 10th Ed. provides no evidence as foundation for this exclusion of installed unit costs.

Fourth, excluding installed unit costs constrains well-founded appraiser choice⁸ (contrary to 10th Ed. p. iv) in developing a scope of work (10th Ed. p. 24); and undermines the appraiser’s ability to develop the best *available* evidence and weigh its relevance and reliability in the specific appraisal problem (contrary to 10th Ed. p. 106).

Fifth, in a litigation setting, excluding installed unit costs effectively excludes otherwise admissible expert evidence by making it professionally improper to even develop it.⁹ An admonition in professional guidance to not develop certain evidence may have a chilling effect on the admissibility of that evidence, which could be admissible except for the admonition. An ill-founded admonition usurps the judge’s “gate keeper” role and deprives the trier-of fact of the opportunity to assess the weight of admissible evidence, in this instance based on installed unit costs. An ill-founded admonition to exclude installed unit costs rigs the game in favor of evidence based on tree-only unit costs.

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Problems with 10th Ed. Additional Costs

The 10th Ed. provides tree appraisers with the opportunity to include installation cost as an additional cost.

- First, installation cost is always a part of the *total cost* of the appraised subject in the logic of the Cost Approach (Appendix III). Installation cost is not an additional cost. Installation cost is not optional.¹⁰
- Second, while the 10th Ed. text appears to be silent on the source of additional TFT installation costs, most if not all the examples use the installation cost of the largest commonly available tree as the additional installation cost. Suggesting that installation cost will be constant with increasing tree size is illogical. Suggesting that a much larger tree—say a 20” tree—can be installed for the same cost as a 4” tree is absurd.
- Third, even if an additional cost for installation of a large tree is logically derived, it would not be properly depreciable as part of the *total cost* of the appraised subject tree.

Caution With Installed Unit Costs

Tree appraisers have long been aware of the propensity of square inch unit costs to develop large total costs. Tree appraisers must remain mindful of this. It would be extremely useful to have actual large tree installed cost data to enable application of the Direct Cost Technique (DCT, 10th Ed. p. 56) rather than TFT, or to have enough data to calibrate TFT-based

costs. In the absence of such data, tree appraisers must remain mindful of the weight of the evidence developed with installed unit costs in TFT. Adjustments might be made through depreciation (10th Ed. p. 41) or through consideration—in reconciliation—of the quality and sufficiency of the evidence for the appraisal problem (10th Ed. p. 106).

Summary

The 10th Ed. exclusion of installed unit costs in TFT, while no doubt well intentioned, is problematic and ill-founded. It is inconsistent with the *total cost* logic of the Cost Approach. In fact, installation cost is an indispensable part of *total cost* in the Cost Approach. The 10th Ed. provides no evidence as foundation for its exclusion of installed unit costs.

Bowes (p. 1) compared archaeologists and appraisers. “We never have all the data we want ... And we may not even be able to confirm what little we do dig up.” That observation fits the analytical problem tree appraisers have when estimating installed costs for large trees using TFT. We may have imperfect data, but we often have to apply the data we have to solve the appraisal problem.

The 10th Ed. option of including installation cost as an additional cost is similarly problematic and is not a workable alternative to developing total cost of an installed appraised subject in TFT.

Recall that the 10th Ed. is a guide not a standard, and that it is “not intended to discourage appraiser choice” (10th Ed., p. vi; ASCA 2019). Tree appraisers today have a sound basis for using installed unit costs in TFT and using the results with appropriate cautions.

⁷ Notwithstanding supply and demand anomalies.

⁸ By contrast, the wholesale, retail, or installed cost choice in the 8th and 9th editions was arbitrary and ill-founded.

⁹ Detailed treatment of the admissibility of expert evidence is beyond the scope of this article. The issue is grounded in federal and state rules of evidence (see, e.g., LII 2020). Cappellino (2020) explains that “the overarching aim of Rule 702 is to establish the relevance and reliability of the expert’s opinion.”

¹⁰ Excepting personal property appraisal problems.

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Appendix I: Historical Context of Tree Appraisal

Appraisal is problem solving. An appraisal is always an answer to a question about monetary worth. From antiquity through the mid-20th century, history shows us that tree appraisal has always answered contextual, not abstract, questions about the monetary worth of trees. Tracing the early history of tree appraisal, however, is beyond the scope of this article. In the early 20th century, in North America, contextual questions emerged about the distinct monetary worth of non-timber trees (e.g., Colton 1916, 1919; Parker 1907; Roth 1916, p.98; Stone 1921). A variety of local, regional, or proprietary tree valuation methods came into use.

The Guide. In response to practitioner demand, a North American industry committee started work on a consensus tree valuation method in 1947. This led to the 1957 publication of the first of 10 editions of what we now know as the *Guide for Plant Appraisal* (see 10th Ed., Table 1.1; Cullen 2005, 2014). In this article, we refer to the 8th (CTLA 1992), 9th (CTLA 2000), and 10th editions. While the *Guide's* scope broadened to include other plants, we limit this article to tree appraisal.

Appendix II: Current Context of Tree Appraisal

Our current context is transition from 9th Ed. to 10th Ed. guidance. To understand our discussion of installed unit costs, keep the following current concepts in mind

Opinions. The 10th Ed. (p. 7) explains that the result of an appraisal is always an *opinion* and is not a fact. Tree appraisal develops an opinion of the monetary worth of a tree. This opinion has been known as an “appraised value” (8th Ed., p. 57; 9th Ed., pp. 64, 74). The 10th Ed. also describes this monetary opinion as the “assignment result” (pp. 7, 20, 157) and notes that it can be a value or a cost

(p. 20). Appraised value is interchangeable with assignment result.

Varied appraisal problems. Appraisal problems vary widely. The 10th Ed. (pp. 18ff) explains that the first step in the appraisal process is defining the appraisal problem by identifying six key elements. This essential step “eliminates ambiguity about the nature of the ...” appraisal problem and the appraiser’s assignment.

Types of value. Recall from the Introduction, that *cost*, *price*, and *value* have distinct meanings (see Figure II-1). The 9th Ed. (p. 19) recognized that value also has different meanings and clearly stated “... the type of value sought must be defined at the outset.” The 10th Ed. (pp. 20–22) explains that the type of value or assignment result sought is a key element of the appraisal problem.

Approaches to value. The 9th Ed. (p. 20) recognized three distinct approaches to value: Cost, Income, and Market. The 10th Ed. (p. 25) reinforces and expands on the role of the three approaches to value or assignment result: Cost, Income, and Sales Comparison (Market in the 9th Ed.). An appraisal approach is simply defined as a systematic procedure for developing an opinion of appraised value or assignment result (Appraisal Institute 2015).

Data. The three approaches rely on different types of data, as shown in Figure II-1.

Appraisal Approach	Type of Data
Cost	Reproduction or Replacement Costs
Sales Comparison (Market)	Sales Prices
Income	Income and Expenses

Figure II-1. Approaches to value rely on different types of data.

Cost data are related to production. Price data, by contrast, are related to exchange. (Appraisal Institute 2013, p. 26) Income and expense data by contrast, are related to generation of benefits (Appraisal Institute 2013, p. 439).

The 10th Ed. (p. 31) notes that “appraisers form opinions of value that are based on data.” It is essential to recognize the difference between a monetary *opinion* (appraised value or assignment result) and the *data* used in developing the opinion. Opinions are outputs. Data are inputs. Recall that value, as an output or result, is always an opinion. Thus, there are no value data.

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Unit costs are data. The 9th Ed. Trunk Formula Method (TFM) and the 10th Ed. Trunk Formula Technique (TFT) both rely on unit costs. TFM and TFT are both clearly positioned in the Cost Approach (Appendix III). Thus, unit costs are derived cost *data* utilized in the Cost Approach.

Keep the historical and current context of tree appraisal in mind as we look at installed unit costs in 8th, 9th, and 10th Ed. practice.

Appendix III: The Cost Approach

Recall from Appendix II that the 9th Ed. introduced and the 10th Ed. reinforces the three approaches to value, and that an appraisal approach is simply a systematic procedure for developing an *opinion* of appraised value or assignment result.

Selecting an Approach

The 10th Ed. (p. 25) describes selecting the appropriate and relevant approach(es) in each appraisal problem. That selection is beyond the scope

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of this article, and we discuss the Cost Approach as if a tree appraiser considers it appropriate and relevant for the appraisal problem. Selection of the Cost Approach does not assume or require that the tree will actually be planted. It starts with the question: “what *would* it cost?” It develops a monetary estimate, not a proposal or contract. ASCA Past-President Gary Mullane (2020) recalls a trial judge saying “I don’t want to know or care about what an appraisal guide says; I want the jury to know what it *would* cost to put these trees back *if* it could be done.” As another example, i-Tree’s development of structural value (10th Ed., p. 58) answers the question “what *would* it cost to restore this urban forest’s structure.”¹¹

Cost Data

The Cost Approach relies on cost *data* (see Figure II-1) and estimates the current cost—as of the effective date of appraisal (Appraisal Institute 2013, p. 581)—to build, construct, create, develop, or produce a substitute for what is being appraised. In our discussion it is a tree.

Total Cost

Whether the appraiser selects reproduction cost or replacement cost (see 10th Ed., p. 55), the Cost Approach develops *total* cost. O’Flaherty (1969) explained that the estimate “must reflect all ingredients of cost ...” Bowes (2011, p. 8) similarly emphasized that “... the word cost means all costs ...” including hard and soft costs. The Appraisal Institute’s most current books (2007, pp. 257, 263; 2013, p. 571; 2015, p. 53) all describe estimating *total* cost.

Hard (or direct) costs include all materials, labor, and other things necessary to complete the reproduction or replacement. Soft (or indirect) costs include things like contractor overhead and

profit, permits, or a guaranty or warranty of the substitute tree.

Applied to appraising a house, office building, or factory, the Cost Approach considers total cost, i.e., not just the materials and supplies but also delivery to the site and the labor to build the structure, as well as soft costs. The 10th Ed. provides no sound reason why trees should be treated differently.

... the Cost Approach develops total cost, including all hard and soft costs.

Depreciation

The Cost Approach also deducts depreciation from the *total* cost estimate, as appropriate for the appraisal problem. Smith and Belloit (1987, p. 165) described it as Cost-Depreciation Analysis. Bowes (2011, p. 8) made a point to contrast “cost” and “cost approach.” He explained clearly that “the cost approach involves further calculations with cost,” including depreciation.

The Classic Cost Approach

Smith and Belloit (1987, p. 9) explained succinctly that the classic Cost Approach in real estate appraisal is “based on the theory that a knowledgeable purchaser would pay no more [in exchange] for a property than the cost of having an acceptable substitute built nearby.” A classic Cost Approach adds an estimate of the market value of the land to the depreciated total cost and makes any necessary property rights adjustment (Appraisal Institute 2013, p. 578) to develop an opinion of the market value of a property.

The Cost Approach in Tree Appraisal

Recall from Appendix II that the type of value varies. If a tree appraisal problem seeks to estimate the contributory real

estate market value of the tree(s), then the market value of the land must be considered. The 10th Ed. provides guidance on such estimates (pp.79–81), and that is beyond the scope of this article. Many tree appraisal problems, however, seek to estimate some defined value or cost other than the contributory real estate market value of the tree(s), and the market value of the land may not need to be considered (Cullen 2016).

Total Cost—The Important Point

The important point for this article is that in professional appraisal practice, the Cost Approach develops an estimate of *total* cost of the appraised subject. When appraising trees that are or were growing or standing in the ground and intended to remain there, installation/planting is a part of total cost. Installation/planting is not an additional cost. Unit costs are logically based on installed costs.

Appendix IV: History of Unit Costs in Tree Appraisal

Origins

Parker. In 1906, George A. Parker (1907, 1914) valued the city park trees in Hartford, Connecticut, using a “money standard for value” of \$75 per square foot (effectively \$0.52 per square inch) of trunk area, to be adjusted for five factors encompassing species, condition, and location. His standard was based on “much thought and many trials.” Street trees were valued using the same system in 1907. The purpose of the valuations was to support appropriations for maintenance. Parker also suggested a population density multiplier.

Colton. W.W. Colton (1916, 1919), working in Massachusetts, noted various methods then in common use, including an arbitrary *value*—often \$1.00—per square inch of trunk area, and Park-

¹¹ The structure of an urban forest is its composition, i.e., the number, age/size and species distributions, condition, and location of the trees. It does not mean only the structural integrity of trees considered in depreciation for physical condition (10th Ed., p. 62).

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er’s Method, a “variation” using \$1.00 per square inch but also considering the adjustments factors described by Parker earlier.

In 1916, a reported Massachusetts civil damage award for a wrongfully removed tree was closely related to a \$1.00 per-square-inch figure (Anon. 1916, Anon. 1919). It is clear that by 1916, practitioners were commonly using a square inch of trunk area as a reference unit metric.

Colton described in more detail his own method using \$0.75 per square inch based on the “invested cost over 50 years.” This “standard *value* unit” was adjusted for species, condition, and pest resistance. Colton found location too subjective to consider.

Prof. G.E. Stone. Unit *costs* in tree appraisal might well have been devised in earlier times, but the first published use of unit *costs* was by Professor George E. Stone at what is now the University of Massachusetts (Stone 1916, Stone n.d.).¹² Stone was interested in the value of non-timber trees killed by manufactured illuminating gas leaking from defective gas mains. He specifically addressed the problem of appraising trees that were larger than substitute trees available from nurseries by using a unit cost developed from the transplanted or installed cost of an available size tree. Stone effectively applied a Cost Approach, developing a substitute tree cost and then, like Parker, considering deductions for tree species, condition, and location,¹³ to develop an opinion of tree value. We now understand such deductions from cost, in order to reflect value, as depreciation (see 9th Ed. p. 21, 10th Ed. pp. 61–65).

Unit Costs Get Lost Along the Way

Stone’s clear establishment of the per-square-inch figure as a *cost* got lost for a while—over 60 years actually—along the way to our current context.

Felt Formula. Dr. E.P. Felt was the New York State entomologist from 1898–1928 and subsequently director of the Bartlett Tree Research Laboratories. He built on Stone’s work (Spicer 1953, 1969, 1982) and developed a more widely known tree valuation formula. The Felt Formula, like Stone’s, used a dollar amount per square inch and considered tree species, condition, and location. Felt’s formula also considered a residential land value factor. Felt, unlike Stone, did not explicitly tie the per-square-inch unit figure to transplanted tree cost. He described it as a “basic value of a square inch of [trunk] sectional area.” The figure remained \$1.00, as used earlier by Parker, until after WW II (Felt 1929a, 1929b, 1930, 1938, 1942) when it was increased by Spicer.

1st–7th Editions. Recall, from Appendix I, that committee work on the consensus “Guide” began in 1947, charged with devising a standardized method. While the new method dropped Felt’s land value factor,¹⁴ the committee was largely motivated by updating the \$1.00 per-square-inch figure to reflect the post-WWII economy. In 1951, the committee recommended \$5.00 per square inch, and in 1957 the 1st Ed. adopted that figure. The nationally used figure was periodically updated based on “industry surveys and the ... consumer price index” (see, e.g., Chadwick 1980; Neely 1988, p. 26). The figure had increased to \$27.00 per square inch in the 1988 7th Ed. Like Felt, the first seven editions generally treated the per square inch figure as a *value* rather than a *cost*.

... the first seven editions treated the per-square-inch figure as a *value* rather than a *cost*.

In practice, tree appraisers observed that the “value” per-square-inch figure often underestimated the actual installed *cost* of trees smaller than 10–12 inches in trunk diameter and might overestimate the *value* of trees larger than 40 or even 30 inches in trunk diameter (Chadwick 1980; CTLA 1992, p.16; Neely 1975, p. 7). This set the stage for re-emergence of unit *costs* as originally used by Stone; and for the introduction of Adjusted Trunk Area (ATA).

Unit Costs Re-Emerge

Unit *costs* re-emerged in the 8th Ed. and became clearly established in the 9th and 10th editions.

8th Edition. The 8th Ed. abandoned the periodically updated national “value” per square inch figure and adopted a “cost per unit area” (called Basic Price), developed regionally or individually from the cost of the largest commonly available transplantable size tree. We refer to it as LCATT. This was a significant shift in tree appraisal methodology (pp. 5, 16). This edition also renamed the per-square-inch procedure as the Trunk Formula Method (TFM).

9th Edition. Recall from Appendix II that the 9th Ed. recognized three approaches to value. This edition clearly positioned TFM in the Cost Approach, relying on cost data (see Figure II-1). Basic Price was renamed Unit Tree Cost, better describing the nature of the data. Unit Tree Cost was developed from the cost of the LCATT.

¹² It is clear that Parker corresponded (1915) with Stone about tree value; and it is likely that Colton and Stone also communicated. While it is unclear who first developed a per-square-inch method of tree appraisal, Stone’s is the first published description of a per-square-inch unit *cost*.

¹³ To clarify the history described by the 10th Ed. (pp. 1-3) and Cullen (2005, 2014), Stone’s unpublished formula considered only species and condition. Stone’s 1916 published narrative description, however, also considered location.

¹⁴ The committee felt that the “property value as a whole” was outside the competence of tree appraisers (Armstrong 1954).

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8th and 9th Editions. 8th Ed. and 9th Ed. TFM shared three other important characteristics.

1. Wholesale, retail, or installed unit costs. In both editions, the unit cost could be based on the wholesale, retail, or installed LCATT cost. A Regional Plant Appraisal Committee (RPAC) or the individual appraiser would select which type of unit cost “most nearly represents the increase in value of the appraised tree with increase in size or trunk area.” (See 8th Ed. pp. 48, 57, 59; 9th Ed. pp. 59, 71, 10th Ed. p. 61 text box.)

Thus, while both 8th Ed. and 9th Ed. explicitly developed a *cost*-based unit, they both seemed to cling to the earlier notion that it was a *value* unit. Recall from Appendix II that there are no value data, which the first nine editions failed to recognize.

This wholesale, retail, or installed cost choice was essentially arbitrary. That is, it was not based on any well-founded principle.

2. Species, condition, and location adjustments. In both editions, the substitute cost of the appraised tree (unit cost x appraised tree size) was adjusted by species, condition, and location factors. The 9th Ed. (p. 21) identified these adjustments as *depreciation* in the Cost Approach.

In both 8th Ed. and 9th Ed., these adjustments were a required part of TFM. Thus, TFM included both the cost development steps and the cost adjustment (depreciation) step needed to develop an opinion of appraised value, or assignment result. In the 10th Ed., by contrast, TFT includes only the cost development steps; depreciation is a separate and discretionary operation (10th Ed., Fig. 5.1; Cullen and Komen 2019).

3. Adjusted trunk area (ATA). Recall that in TFM the per-square-inch figure is multiplied by the trunk area of the appraised tree. Both 8th Ed. and 9th Ed. used an Adjusted Trunk Area (ATA) for appraised trees larger than 30 inches in diameter. Both editions explained that this was “to account ... for a rate-of-tree-value increase of a large tree being less than its rate of increase in trunk area” (8th Ed. p. 16; 9th Ed. p. 37). If the rate of increase of tree value is, in fact or opinion, less than the rate of increase in trunk area, then that should be accounted for. There were problems,¹⁵ however, using ATA to make the accounting (see 10th Ed. p. 41).

Recall that while the first seven editions treated the per-square-inch figure as a *value* unit, the 8th and 9th editions developed it as a *cost* unit. The 9th Ed. clearly positioned TFM in the Cost Approach, relying on cost data. But ATA was prematurely adjusting value. Value adjustments in the Cost Approach are properly made through depreciation.

Acknowledgments

We are grateful to Dr. Bruce Fraedrich of the Bartlett Tree Research Laboratories and to Prof. Dennis Ryan and Dr. David Bloniarz of the University of Massachusetts for their help in obtaining rare historical material. Jan Scow, RCA #382, provided insight on his 2006 article. We also appreciate insightful review comments from Robert Brudenell, RCA #417. 🌿

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¹⁵ The technical problems with ATA are outside the scope of this article (but see, for example, Komen 2016).

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