SHOULD HARDINESS ZONES AND LOCATION BE A PART OF THE ISTC SHADE TREE EVALUATION FORMULA?[1]

by J. James Kielbaso

It is a pleasure to be with this panel to speak about some ideas that I have been concerned with for several years while chairman of the Shade Tree Selection and Evaluation Committee.

The first point to be considered is the use of **hardiness zones** on the ISTC Evaluation Guide. The guide currently has 24 distinct classifications, tied to state political boundaries. My major contention is that trees respond to differences in climate more than they do to artifical political boundaries. Plants seem to be told by Mother Nature that they just should not grow beyond some point, principally through the limits of temperature.

Most of us already either buy, sell, or advise on species selections by using hardiness zones. When presented with an unfamiliar selection in a nursery catalog, what is likely to be your first reaction? Mine is to see if it has a hardiness rating and then look to see if the catalog has a hardiness map, which many do. If this doesn't produce the needed answer, how many of you check the standard *Trees for American Gardens* by Donald Wyman, or Rehder's *Manual of Cultivated Trees and Shrubs?* These list trees by the coldest hardiness zone in which they are known to do well. I am sure there are mistakes or exceptions. I have seen *Acer pseudoplatanus,* supposedly hardy only as far north as zone six (Detroit), doing well and producing seedlings at Marquette (at the transition of zones four and five). Nonetheless, hardiness is the normal standard by which we anticipate a trees's growth success. When is the last time any of you checked to see if a tree will grow in your area by looking at a list of the *states* in which it grows? A switch to hardiness zones is, in fact, merely a recognition of what we are already doing.

Our current guide rates species for the various sections, which have political boundaries. We have a list for the east section of Region III, Southern, which takes in at its extremes Maryland and Florida. Our list then states that an American beech, etc., is a 100% tree in this region. If you will look at a hardiness zone map, you will see that this region includes all, or part, of five hardiness zones. By implication, the current method would also suggest that a palm growing in Miami, Florida, would do well here in the Atlanta area or even the northern Tennessee area, since they are part of Region III. How many of you have seen a palm growing in this area?

Some members have suggested that states be divided, owing to hardiness difference. Two years ago a New York member suggested that Long Island is somehow a different growing area than the rest of the state and that it should be rated differently than the other parts of New York because different species could grow there but not in other parts of the state.

The Californian's have already essentially adopted hardiness zones for their Western Region by using no less than five separate listings for their state, which happens to span six hardiness zones.

It is one thing to say a method is not good enough, but quite another to come up with a better idea. A better solution for our chart would be to list trees by hardiness zones rather than by the political boundaries currently used (Fig. 1). At this point there are only 9 zones to be considered since zone one doesn't seem likely to warrant a list. This would then produce nine lists. Or we could divide the continent in two and produce 18 lists; into three parts and produce 27 lists. I tend to favor the two-part 18-list division, but this point should be considered more by the

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Shade Tree Selection and Evaluation Committee. A 27-list chart wouldn't be much different than what we now have. While reviewing the current guide it was noted that Wyoming was inadvertently left out, Eastern Maritime Canada is not represented, and southern Florida members would like a list to reflect their zone 10 trees more adequately. Adding these would make our current guide also consist of 27 lists.

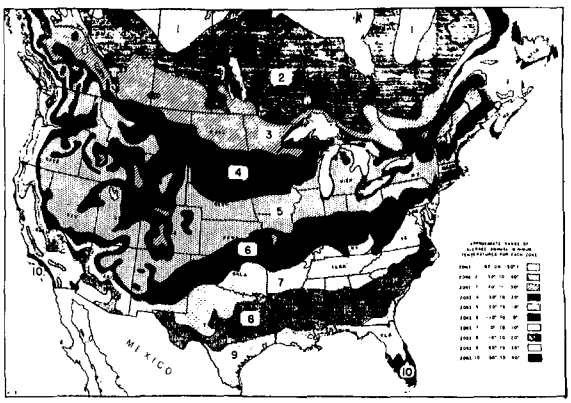


Figure 1.

As further support for a two-part hardiness zone classification are a few other points. The natural forest regions of the United States conveniently break at about the 95-100 meridian (Fig. 2). Whereas hardiness zones follow east-west lines, rainfall-isohyets follow generally north-south lines as do climatic regions (Fig. 3). Again, as with forest regions and natural ranges for U.S. native species, the rainfall and climatic regions appear to suggest a break in the mid-plains which are generally considered to be west of the 97th meridian.

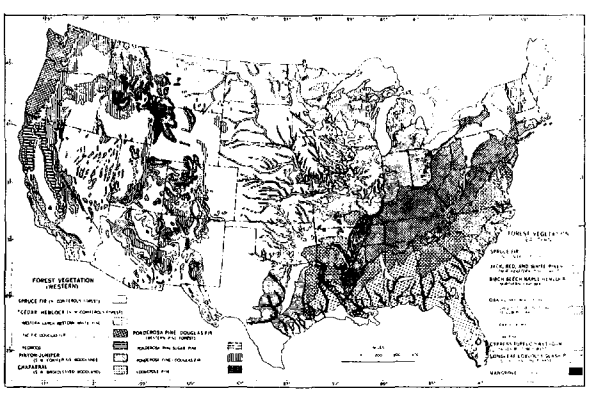


Figure 2.

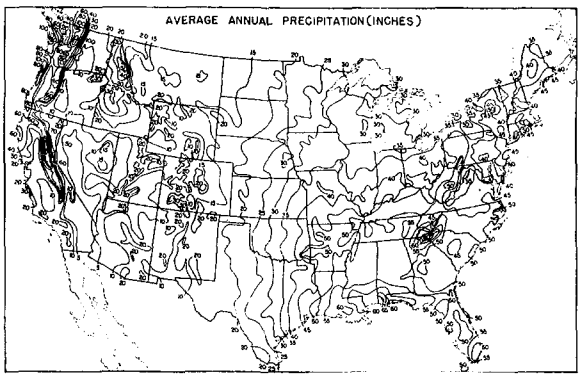


Figure 3.

It is with these thoughts in mind that I suggest that the Shade Tree Evaluation Chart be revised to list species classes by natural hardiness zones rather than by the currently employed political units. I feel this is a sound alternative for the species listing problem.

The next item on my agenda is the concept of a **location factor**. Currently the ISTC Evaluation Guide, or formula, consists of three equal factors; **size, species,** and **condition**. Earlier evaluation methods, or formulas, considered property value and location as separate, more or less, equal factors. Since my connection with the evaluation committee began, there has been discussion of location, or the possibility of considering it separately, but so far no decision has been made. At the 1973 meeting of the Michigan Forestry and Park Association an evaluation workshop was held and it was recommended that location somehow be used in our Michigan chart. Most people recognize good locations and poor locations for trees. Why not recognize location in an evaluation method, too?

A peculiar thing happens when location is discussed with various people. We do not always speak the same language. Some of us consider location to be an "aesthetic or architectural" factor. Specifically, many of us feel that location concerns whether or not the tree is artistically in the right or wrong place. Consider a large white oak on the front grounds of an association office building, and contrast it to a similar sized oak in a corn field or along a street. Consider a blue spruce ideally located in a yard and contrast it with a similar tree at an intersection of two

streets. The aesthetics or function of trees certainly is better or worse in the extreme situations. What about a boxelder on a city street as opposed to one viewed from a picture window across a pond? And yet boxelder heads the 20% trees in almost every listing.

The other peculiar thing that happens when we speak of location is that some of us think of the ecological "site", where is the tree growing and how well can it survive? At an extreme we could wonder about the location value of a pin oak or sugar maple in Michigan on a soil with a 7.8 pH. More realistically, I'd prefer to think of this aspect of location as the problems a tree may have in growing on a site such as on a three-foot treelawn with a driveway on one side. Sidewalks are lifted, drives broken, curbs overgrown, and roots restricted. This is *not* a good location in which to grow a tree. You don't like this example? Try a large, beautiful oak in a paved parking lot. This is not a good place to grow a tree! It is the location, or site, that is limiting the tree.

One could argue that the above is really condition, but I submit that condition is somewhat different. The current ISTC guide explanation of the use of the condition factor states that:

> "few trees are perfect. As trees become old they very often become defective in one or several ways. The person making an appraisal must consider the condition of the tree and judge how nearly each tree approaches a perfect specimen."

This implies factors intrinsic to the tree such as growth rate, size, crown shape, insects, diseases, decay, deadwood, etc. How near to perfect is the *tree*, not how near perfect is the *location* and *site*. This is how location is somewhat different than condition.

An example to further elaborate this difference might be to consider a salt-sensitive sugar maple growing well along a little used roadway. A decision is made to begin using the road more and salting heavily for winter traffic. The tree hasn't really changed in condition at all, but most of us, at least in the North, might somehow feel that it is not such a good tree for that site or location, based on recent reports and experiences in such situations. The above-ground portion of the tree is still as good as before and no changes have been made, but suddenly the future of the tree is questionable. This to me then, is the second aspect of the "location" of a tree. Location consists of the *aesthetic* and the *site* qualities and they should be taken into account in an evaluation.

What better suggestion have I to offer? Our Michigan committee recently wrestled with this and ended up in a compromise. Admitting that location is currently not amply considered, just how should it be incorporated? Should it be an equal fourth factor, or equal to condition as a second half of the third factor? In an attempt to preserve as much of the current formula as possible it was decided to recommend that condition and location be rated 0 - 100 each, and the average of the two used as the third factor. Adding it as a fourth factor would introduce one more subtracting factor to the formulas which might result in too-low values and possibly require an increase in basic value. I am not sure of the rightness of acceptability of this alternative, but location should be given more consideration than it currently is. Moreover, it may even be considered as a fourth equal factor. The formula as tentatively suggested would be changed as follows:

from:

$$\text{Value} = \text{basic V} \times \text{species V} \times \text{condition V}$$

to:

$$\text{Value} = \text{basic V} \times \text{species V} \times \frac{\text{condition} + \text{location}}{2}$$

or to:

$$\text{Value} = \text{basic V} \times \text{species V} \times \text{condition V} \times \text{location V}$$

As another related concern, it seems that the Evaluation Guide is weighted heavily to selection recommendations. Of the 44 page evaluation booklet, 35 pages (80%) are devoted to selection lists, 4 pages to introductory remarks, 1 page to the basic value factor, and less than one page (2%) to the important "Condition" factor. No guidelines are given except "how nearly each tree approaches a perfect specimen."

Some guideline or chart or checklist should be

incorporated to aid us in placing trees in condition and/or location classes. The rebuttal to this notion is that we then deprive the "expert" of his expertise. On the contrary, it would lead to more consistent objective evaluations by experts and lead to a more "scientifically" acceptable method as suggested by McNabb at the 44th ISTC conference held in Chicago in 1968.

Our expertise would still be responsible for placing trees in the various categories by recognizing the factors evaluated.

We have already gone to great effort to rate the individual trees for the expert. Why not let him decide that, too?

My suggestion is that we give the expert the same guidelines for condition-location that we give him for species, and it is *only* a guideline. We have heard before and will probably hear again that our chart is only a guideline and not "Gospel-truth," and that all items, even species ratings may be changed, based on expertise. I would suggest that if the current 24 lists of species is not too dangerous, then a condition-location guideline would also not be too dangerous.

Though not part of the advertised topic, another even more abstract, uncertain notion needs to be considered. It concerns the basis of the **method for deriving the basic value**, the first factor of the chart.

Late in 1973 I surveyed several commercial tree planters and asked them to estimate cost to replace 100% trees of various sizes for a homeowner. My understanding is that the chart has *replacement* as its basis in reality. The results were rather interesting, but not unexpected (Table 1). A wide divergence with the chart was found in the lower size ranges and less as size increased, at least up to 16 inches, beyond which no estimates were made. The chart has been previously criticized as producing values *too high* for large trees. I have no proof of this and it may be debatable. My survey suggests that it is *too low* for small trees and about right for medium sizes. To make the chart more realistic, should we vary the dollar value for different ranges of size on some sliding scale?

Table 1

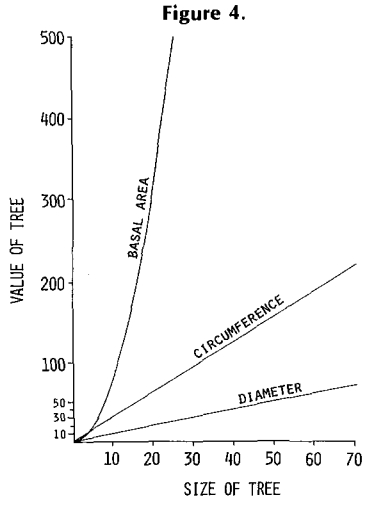
COMPARISON OF "ESTIMATES" FOR TREE PLANTING WITH CURRENT ISTC BASIC VALUES

DBH	CHART BASIC VALUE	ACTUAL ESTIMATES (AVERAGE VALUES)
2	31	116
3	71	178
4	126	288
5	196	378
6	283	485
8	503	670
10	785	912
12	1131	1373
14	1539	1677
16	2011	2109

An even more fundamental problem is the basis of the basic value. The current value is $10 per cross-sectional square inch area at 4.5 feet above the ground, or basal area. In forestry the standard 4.5 feet and basal area, are used to estimate volume of timber, which I'm not too sure is really appropriate or necessary in our shade tree work. The use of basal area suggests that volume of wood is what we are evaluating.

Why the use of basal area rather than circumference or diameter? The three are all valid measures of the size of a tree, but they are quite different as the size of tree varies (Fig. 4). Note that Fig. 4 is intended to show the various *rates* of increase.

Figure 4.



The fact that basal area starts its upward curve slowly and then at an increasing rate, could well explain why it is low on the low end and high on the high end, but about right at the mid-range. On the low end it is quite easy to say that replacement should be used when possible. This would appear to be an admission that it isn't right at this range, and if that is true, why should someone believe that it is any more correct at other values? Falling back on replacement seems to be a "cop out" to use the present vernacular. We should strive to produce a method which yields realistic values at all points in its range. Tables II and III present comparisons of dollar values per diameter and circumference based on estimated costs and the current ISTC Evaluation Guide.

Table II

BASIC VALUES BASED ON ESTIMATED COSTS TO PLANT A TREE

DBH inches	Circumference inches	Estimated costs $	$/inch D	$/inch C
2	6.3	116	58	18
3	9.4	178	59	19
4	12.6	288	72	23
5	15.7	378	75	24
6	18.8	485	80	25
8	25.1	670	84	26
10	31.4	912	91	29
12	37.7	1373	112	32
14	44.0	1677	120	38
16	50.2	2109	131	42

Table III

BASIC VALUES BASED ON CURRENT ISTC EVALUATION GUIDE

Diameter	Circumference	ISTC Basic Value	$/inch D	$/inch C
2	6.3	31	15	5
3	9.4	71	27	8
4	12.6	126	32	10
5	15.7	196	39	12
6	18.8	283	47	15
8	25.1	503	63	20
10	31.4	785	78	25
12	37.7	1131	94	30
14	44.0	1539	110	35
16	50.2	2011	125	40
20	62.8	3142	150	50
30	94.2	7069	236	75
40	125.6	12,566	314	100
50	157.0	19,635	393	125
60	188.4	28,274	470	150

More importantly, does the value of a tree for our purposes increase on a line related to the basal area, the circumference, or the diameter of the tree trunk? Does it increase at a constant rate or at an increasing rate? This point will require further study but the Michigan workshop recommendation was to suggest a change from basal area.

It is hoped that this brief review of problem areas will lead to changes that will make our present good method even better and more acceptable to other professionals. Two suggestions are rather straightforward and easy to accomplish, one may take a little effort, and the last will likely still require much study and debate.

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