STRESS MANAGEMENT FOR TREES[1]

by Terry A. Tattar

Abstract. Excessive stress is a common cause of tree mortality in the urban environment. People must take positive steps to minimize and avoid stress on trees if urban shade trees are to survive and grow.

Stress kills trees. However, stress is also part of the environment of all trees and a stress-free condition for a tree can only exist in an environmentally controlled laboratory. Rather, it is the degree (the intensity and the duration) of stress that determines the health effects that will result.

Stress can be defined as a detrimental force or influence. Trees have evolved to most successfully tolerate the low levels of stress that are usually found in the natural forest ecosystem. However, even in the forest an extreme of environmental stress, such as prolonged drought, or successive insect defoliations can result in tree mortality. Additional levels of stress have been shown to deplete the tree's energy reserves and thereby decrease the tree's ability to protect and repair itself (Wargo, 1975, Houston and Wargo, 1981).

It is in the artificial ecosystem of urban shade trees, sometimes referred to as the "urban forest" that stress levels often reach a lethal magnitude. Unfortunately this is precisely the environment where trees are most needed to improve the quality of life in towns and cities (Tattar, 1978). The problem, therefore, is how to grow trees and preserve their health in hostile environments where high levels of urban stress, such as restricted root space (figure 1) and construction injury (figure 2) are everpresent. If we examine a

Figure 1. Urban shade tree growing in conditions of restricted root space.

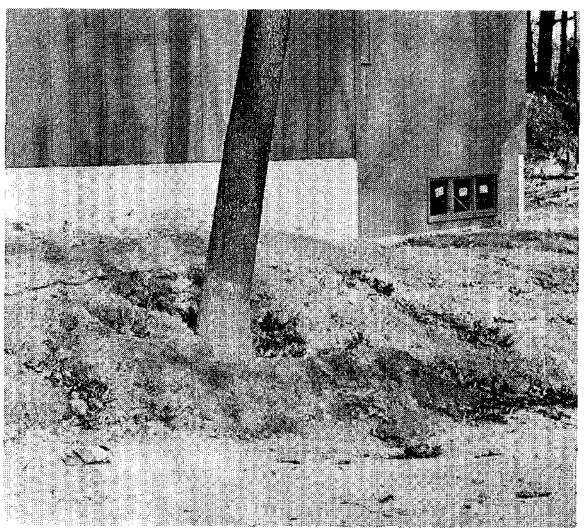

Figure 2. Injury from raising the grade around an established tree during house construction.

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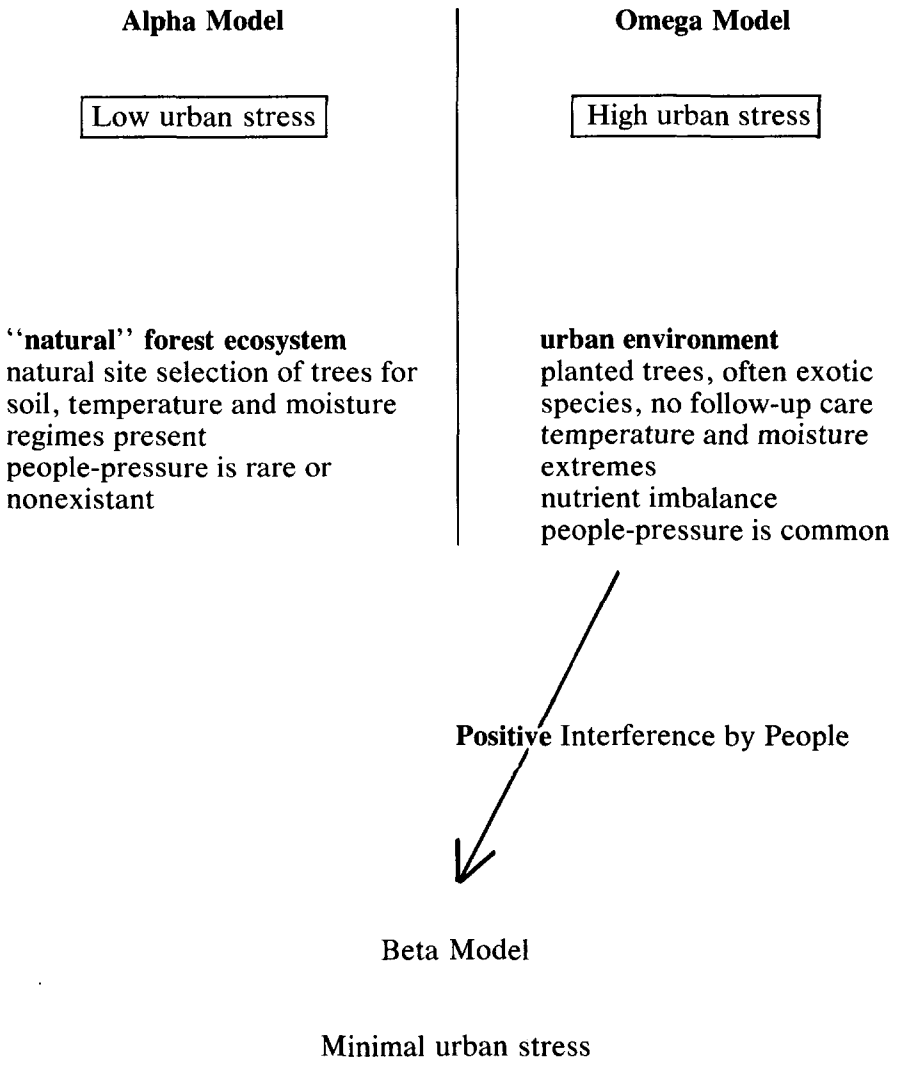

Figure 3. Stress models for trees in the urban environment.

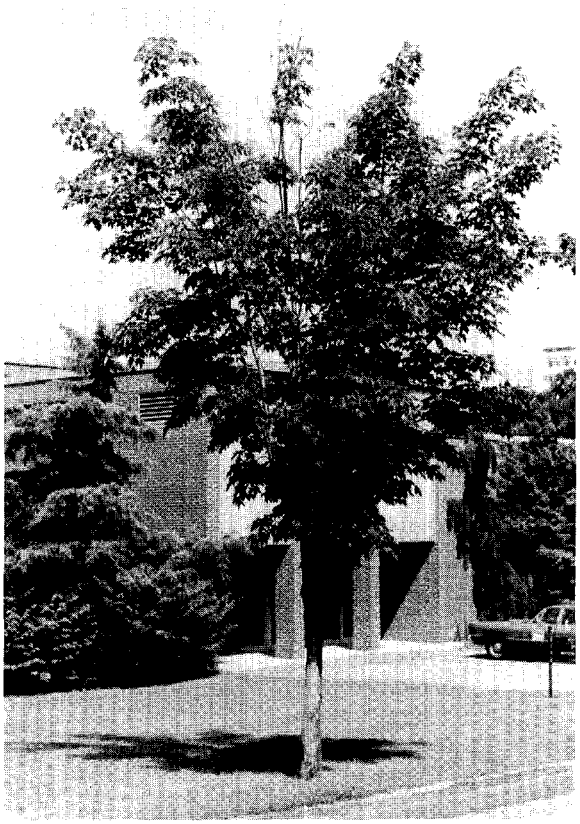

Figure 4. Dieback on a roadside sugar maple resulting from chronic stress.

stress model of the forest ecosystem contrasted with one of an urban ecosystem the need to alter the urban model to make it more "forest-like" is evident (figure 3). Positive interference by people is needed to *minimize* and *avoid* stress and to achieve a low urban stress condition proposed as model B.

Too often we look at the result of stress instead of the causes of stress. Whether it be a general symptom like dieback (figure 4) or the presence of weak pathogens or secondary insects, these are most often the end result of stress and not the cause of the problem. Instead, we must attempt to prevent or minimize the stresses that weaken trees and allow the attack of secondary organisms (Houston, 1981). We must also consider tolerance to urban stress a major desirable trait when selecting shade trees for planting.

Literature Cited

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