Strong Winds – Weak Trees – Lots of Debris

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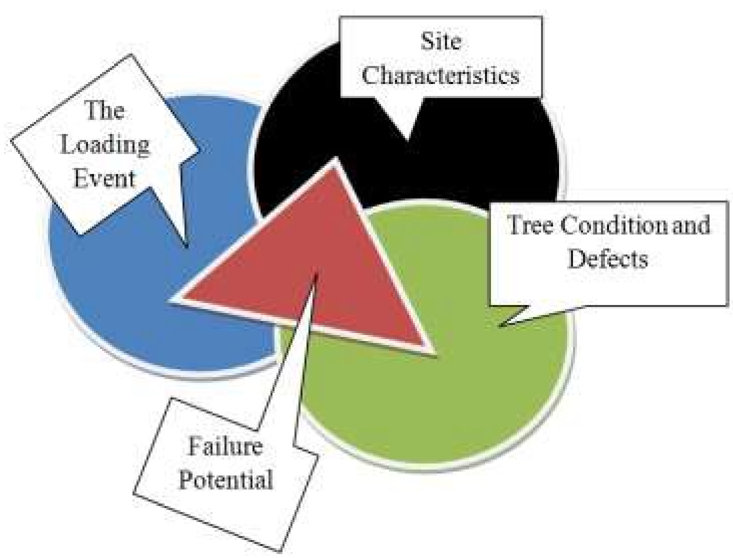
On June 21, 2013, the perfect storm swept through much of the southern two-thirds of Minnesota. In that path, community tree canopies were ravaged to different degrees with some communities only slightly damaged while others lost years of chlorophyll, shade in the summer and relief from winds in the winter. Unfortunately, many of those trees did some damage to sidewalks, curbs, cars, houses and utility lines on their way down. One month later, many communities and tree care companies are still scrambling to clean up the debris and begin the recovery process and once again there are those wondering if this damage could have been prevented.

The Storm Failure Triangle©

It's rare when one single event with one single force is the sole reason for all of the damage to trees. Tree damage typically ranges from a few broken branches to trees uprooted and blown to the next county with loading events ranging from 25-30 mph wind storms to raging winds accompanied by heavy rains or ice. When tornadoes sweep through an area, trees affected are often innocent bystanders than they are bad trees fraught with weaknesses or architectural problems. More commonly, trees that topple range from dense-canopied evergreens in windswept landscapes with water-soaked soils to majestic and mature shade trees perched in narrow boulevards.

The Storm Failure Triangle summarizes the main components of a weather loading event that result in some degree of damage by categorizing them as either:

1. The loading event
2. Site characteristics
3. Tree condition and any defects



Loading event:
Any weather event that puts an unusual strain on a tree's architecture or stability. Loading events range from a common thunderstorm with winds greater than 25-30 mph to 130 mph down-bursts or tornadoes. Events may also include the weight of rain, ice or snow. The greater the loading on a tree, the greater the potential for damage or failure.

Unfortunately, there is no control over loading events but some damage can be lessened by avoiding planting or locating trees that are more vulnerable to some common loading events such as ice storms. However, avoiding tornadoes is out of the picture.

Site characteristics:
These include soil types, wind exposure or protection (friction), soil profile and saturation level, root plate space (narrow boulevard versus expansive lawn), plant competition.

There is some level of control in this category; the most notable is to avoid planting high density trees in open areas that have chronically saturated soils. Or, avoid planting trees that mature at a height of 60 feet in boulevards that are four feet wide.

Tree condition and defects:
Often the most obvious and include size, presence and extent of decay, abnormal lean, included bark branch attachments, codominant leaders, canopy density, presence of static or dynamic cabling systems, live crown ratio, stem girdling roots, restricted rooting space, root loss due to construction activities and die-back.

This is the category with the greatest opportunity to mitigate much of the damage and failures that result from storms. Early and regular pruning can minimize architectural defects. Placing trees out of harm's way or protecting trees from unintentional vandalism, string trimmers or lawn mowers can reduce the frequency and extent of decay. Avoiding planting trees genetically prone to decay or poor architecture in high risk areas may not reduce the risk of damage or failure at the tree level but will reduce the frequency of damage to people and property.

Failure potential:
The likelihood that the tree will fail or incur some degree of damage. The more loading on a tree, the more site characteristics that compromise a tree's stability, health or condition and the more defects impacting a tree, the more likely failure or damage will result and the greater the severity.

The June 2013 Storm

The storm that swept through Minnesota on June 21 was not all that unusual. Straight-lined wind storms may not be very predictable here but they are not unexpected when the humid, warm days of summer arrive. June 21 was a bit unusual in the respect that the high winds (60 mph and greater) were accompanied by soaking rains (2.5 to more than 7 inches). Saturated soils, sandy through clayey, offered less friction and anchorage potential for the tree roots. A perfect storm.

Since 1995, the University of Minnesota's Department of Forest Resources has led the collection of storm damage data to trees as a result of loading events. When the storms hit Minnesota, two teams of researchers hit the streets and collected as much information as possible that related to the types of damage, the size and species of trees damaged and the site conditions. Damage was assessed in urban forests from Morris to the metro. Although not all data has been entered and analyzed, some familiar trends were revealed.

1. There was a high rate of complete failures, e.g., full or partial wind-thrown trees.

2. Most of the complete failures were attributed to (other than the high winds) saturated soils, dense-canopied trees, and trees with compromised root plates.

3. The same defects (consistently since 1995 when the research started) showed up in most of the abnormal failures or damages incurred by the trees: decay, included bark in branch attachments, and codominant leaders.

4. Small trees fared better than larger trees.

5. Boulevard trees failed more frequently than lawn or park trees.

4. Spruce and other dense-canopied conifers were over-represented in the complete failure categories.

Information is still being collected and there could be as many as 3,000 + trees evaluated this summer, significantly adding to the robustness of the conclusions drawn about damage and failure potentials. More importantly, lessons learned about mitigating some of the damage and failures will help both communities and property-owners avoid some of the monetary and environmental losses in the future.

At the conclusion of the 2013 season and analysis of all data collected, a summary article will be posted that will include some suggested management practices that reduce these losses to boulevards, parks and lawns.