AN ASSESSMENT OF HAZARD CHARACTERISTICS OF MUNICIPAL TREES FELLED IN THUNDER BAY, ONTARIO

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Urban shade trees suffer from injuries to roots, bark, and crown more intensely than their counterparts in natural forests due to the occurrence of various human activities. As a consequence, urban shade trees are more susceptible to infection from insect pests and fungi. One such group of pathogens are decay fungi which enter trees through injuries to the roots and trunk. Subsequently, urban shade trees suffer high rates of decay in the main stem and roots making them potential hazards which could cause injury to property and persons if toppled in strong winds (Matheny & Clark, 1994; Pokorny, 2003; Schwarze, 2008). The extent and seriousness of decay depends upon many variables including host tree species, site situation, climate, and fungi involved. Very little information exists for urban forests in Canada regarding stem-decay in urban street trees and the potential risk hazard that they pose. Thunder Bay's urban forest consists of approximately 20,000 street trees, many of which are at the end of their lifespan and becoming hazardous.

The objective of my proposal was to assess municipal street trees over a two year period (2011-2012) in Thunder Bay that were deemed hazardous and were slated for removal. External characteristics of each tree were to be examined, measured and photographed while the trees were still standing, and upon felling, internal symptoms were to be examined, measured and photographed. Resistograph readings were also to be taken from the stem of each tree. It was felt that if correlations between external symptoms and internal decay could be made, then this would provide a useful tool for Thunder Bay and other municipalities in similar climatic zones to better manage older urban trees by improving the priority of removals of those deemed hazardous.

Kurtis Barker, a graduate student at Lakehead University undertook this project as his Master's thesis topic (Barker, 2014). In total, exterior characteristics were measured on 177 hazard trees destined for removal, 65 in the summer of 2011 and 112 in the summer of 2012. Of these trees measured, 19 species were represented, with white birch (26%), silver maple (16%), green ash (14%) and Manitoba maple (9%) being the most commonly occurring. The majority of trees sampled had a DBH below 75 cm. White birch had the lowest health ratings, with crown die-back brought on by drought stress and bronze birch borer infestation. Damage by severe pruning on major limbs resulted in extensive decay observed among many of the white birch. Silver maple exhibited a decrease in trunk health and structure with increasing age. Large pruning wounds which facilitated invasion by decay fungi, and co-dominant forking were common problems encountered on silver maple. Green ash experienced damage to foliage and exhibited twig and branch die-back in the lower crowns of trees due to ash anthracnose. Manitoba maples had overall low health values due to a number of differing reasons.

Although discs should have been removed from all 177 street trees, only 26 tree discs from this pool of trees were collected by Parks crews. An additional 44 tree discs were collected by Parks crews that came from trees not on the original tree removal lists. Due to the small sample size for each tree species, it was not possible to find a correlation between exterior characteristics and internal defects, although major pruning wounds on mature trees were usually associated with extensive stem decay. All tree discs (70) were photographed and drilled with a resistograph (IML Resistograph F-series). Cracks and advanced decay were readily recorded with the resistograph, but incipient decay was not detected as it had readings similar to sound wood. A significant source of error noted was drill bit deflection caused by knots in the wood, contours, and meandering growth rings.

One hundred and one street trees were observed to be colonized by decay fungi, 22 of these trees were among the original 177, while the remaining trees were additional street trees observed in Thunder Bay. Twenty seven species of decay fungi were recorded, and among these, *Cerrena unicolor, Hypsizygus tessulatus, Pholiota aurivella, Chondrostereum purpureum, Pholiota squarrosa,* and *Ganoderma applanatum* were among the most commonly encountered. Silver maple and white birch were the most heavily infected. Green ash exhibited the lowest infection rate by decay fungi.

Resistographs are commonly used to assess hazard trees, but readings recorded are based on relative soundness vs. weakness of wood rather than on actual wood strength values. As a consequence, decisions on whether a tree is considered potentially hazardous are based on general rules (*i.e.* a tree regardless of species is considered hazardous if a stem contains less than one cm of sound wood for every 6 cm of stem diameter) rather than on species-specific rules or measurements of the wood strength in the tree. Sixteen resistograph drillings on two bolts from a felled silver maple were made to compare the readings recorded on the y axis of the resistograph chart paper with actual wood density and modulus of elasticity (MOE) values taken of wood samples from the same regions in the bolts. Results of a linear regression model suggest that it is possible to put actual wood strength values to the y axis readings on a resistograph. If more replicates were done, and more species sampled, this could provide for a methodology which would give measurements that urban foresters could use to more accurately predict when a tree is likely to fail based on published wood strength values for different tree species.

References

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