Decay, Defects and Condition of Street Trees in Four Upstate New York Cities

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Throughout most of New York State, maple species are the most common street tree. It is not unusual for Norway (*Acer platanoides*), silver (*A. saccharinum*), sugar (*A. saccharum*), red (*A. rubrum*), and other maples species to comprise over 50% of the street tree population in communities of all sizes.

As in many areas of the country, maples on the streets today were planted to replace the American elms (*Ulmus americana*) that were lost as a result of the Dutch Elm Disease epidemic that started in the 1930s. Many cities in New York are therefore faced with an aging population of maples that make up a substantial portion of their street tree populations.

The cities we selected for this study of decay and tree health were Albany, Buffalo, Rochester, and Syracuse. These cities are the largest in upstate New York and together have over 67,000 trees that are greater than 12 inches in diameter. They are also typical of other communities in the state in that Norway maple is over 36% of the large tree population and maples species together comprise over 54% of large-diameter street trees.

A street in upstate New York lined with mature sugar maples. Maples commonly comprise more than 50% of the street tree population in small and large communities in New York State.

Project Methods

Street tree data were collected between June and October 2007 on a sample of street trees in the cities of Albany, Buffalo, Rochester, and Syracuse. Within each city, 480 trees were randomly sampled, which included thirty Norway, silver, and sugar maples, and a random selection of non-maple species ranging in diameter from 12 to 30+ inches.

The biological health or condition of the foliage, stems, branches, trunks, and root flares was evaluated using several parameters. Mechanical health was measured by determining decay incidence and severity and visual assessment of other defects. Decay was determined using visual indicators of decay (e.g. cavities, conks, wounds) (Luley, 2006), by sounding with a six-ounce hammer with a hard plastic head, and with the use of an IML Resistograph F400, a tool that provides a measurement of the thickness of the outer shell of wood in a tree.

Defect assessment and decay testing were performed only on the main trunk above the roots to a height of 10 feet. Roots and scaffold branches were not tested for decay or assessed for defects; however, the entire tree was evaluated when making overall condition assessments.

Results and Discussion

The study generated a large volume of interesting results, of which only a small portion can be presented here. A summary of the decay testing results has been published (Luley et al., 2009).

Biological Health

Sugar maple was rated in the poorest condition while the random selection of “other species” was rated in the best overall condition (Figure 1, Photograph 2). Sugar maple also had the most branch dieback (Photograph 2)

Unsurprisingly, the data showed that larger diameter trees were also in the poorest overall condition. Nearly 1/3 of the trees that were 30 inches in diameter or greater were in poor condition, and less than 25 percent of the largest diameter trees were in good condition. These data suggest that urban foresters in New York will be managing a large population of trees requiring increasing management inputs in the future.

Photograph 2 - A street tree sugar maple in the advanced stages of decline. Sugar maple was in the poorest condition and had the most dieback of all maple species.

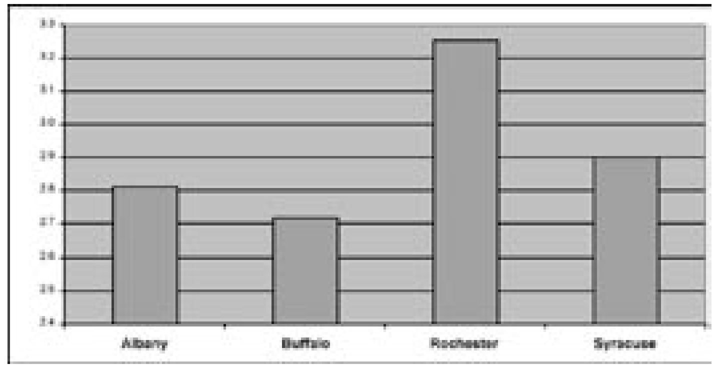

Figure 2. Average condition by city rating for all tree species where 1 = very poor, 2= poor, 3 = fair, 4= good, and 5 = very good.

Large-diameter Norway and sugar maples were found to be in particularly poor condition. The poor condition of Norway maples is notable because this species often makes up a large proportion of trees in many New York State communities as well as in other northeastern cities.

More interesting was the comparison among cities (Figure 2). Trees in Rochester, which has had a long-standing relatively well-funded program, were rated in better condition than the other cities. Trees in Buffalo, where the program has suffered because of financial problems in the city, were rated the lowest. Based on urban forestry budgets for the past five years and total trees (street and park) under city management, Rochester spent an average of $17.66 per tree, while Buffalo spent $12.42 per tree. Albany spent the most at $25.19 and Syracuse spent the least $11.80 per tree. These budget figures include planting and other costs and therefore only partially reflect maintenance inputs into large trees in each city.

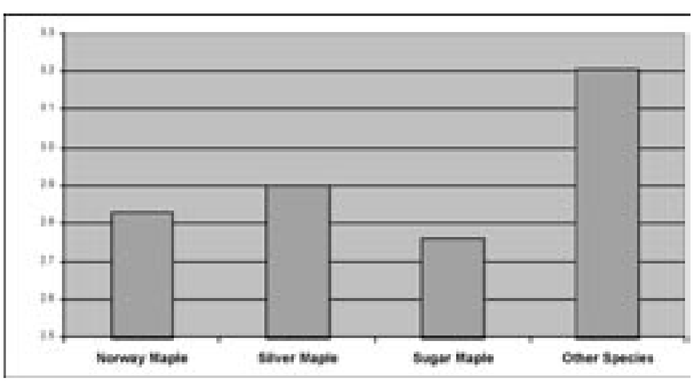

Figure 1. Overall condition by tree species for all trees where 1 = very poor, 2= poor, 3 = fair, 4= good, and 5 = very good. The ratings combine both biological and mechanical health.

Photograph 3 - A Norway maple street tree infected with *Ganoderma lucidum*.

Past major storm events may also have contributed to the condition of trees in each city. Rochester was struck by a major ice storm in 1991. Syracuse and Rochester street trees were subjected to straight-line winds of

Photograph 4 - In most cases, decay was present but was not an immediate structural concern, as only 3% of the street trees sampled had more than 70% of the radius decayed. Decay incidence was high overall (58%) even in trees in the smaller diameter classes (53%).

over 85 miles per hour in 1998. Buffalo trees were damaged by heavy snow in a freak Friday-the-13th event in October 2006. Albany's trees have also been subjected to a number of smaller scale damaging weather events.

Decay Incidence and Severity

Decay incidence averaged 58% for the four cities (Luley et al. 2009). However, the number of trees with substantial amounts of decay (where more than 70% of the radius was decayed) was low and averaged 3.2%. These data suggest that over 2,100 trees with high levels of decay are present on the streets in these cities. Decay severity was the highest in silver maple and in the two largest diameter classes.

One interesting result was the high incidence of decay (53%) in the 12-18 inch diameter class (Luley et al. 2009). Although there were no trees in this size range with significant levels of decay, the high incidence suggests that decay is likely initiated early in the life of the tree. It therefore could be useful to investigate how the decay in these trees becomes established and progresses, so that management methods could be developed to reduce the incidence and severity of decay in street trees.

We also documented the frequency of positive decay indicators including wood decay conks, decay cavities, and visual evidence of decay. Only 10% of the trees sampled had positive decay indicators, yet 58% of the trees had decay. This demonstrates the importance of also recognizing and evaluating the potential decay indicators in decay assessments. Potential decay indicators can be old wounds and tree reaction or the result of decay, such as cracks or bulges.

Photograph 5 - Wounding is important because decay fungi often infect trees through wounds. Overall, 44% of the trees sampled had wounds, and pruning wounds accounted for 18% of them.

Wounding and Other Defects

The survey documented the frequency of wounding and other defects on the lower trunk. Wounding is important because wounds are known to be a starting point for decay (Photograph 5).

The presence of defects other than decay is important because they may affect longevity and structural health, and some can be reduced by management practices. For example, defects that could partially be reduced by management were deep planting (suggested by the lack of flare present on 25% of trees), girdling roots (7% of trees), and compression forks (affecting 6% of the sampled trees). These defects were also tested for decay and will be evaluated along with other indicators of decay to determine their relationship to decay presence and severity.

Conclusions

Large-diameter maples, because of their documented poor condition and higher amounts of decay, will present a continuing management challenge to city foresters in these upstate NY cities. This issue will be particularly true in the management of Norway maple because of its large population size. The poor biological condition of sugar maple suggests that it should only be used where site and growing conditions are appropriate for this species.

Large-diameter silver maple had the highest severe decay incidence, supporting the previous observation of the decay susceptibility of this species. Continued diligence is needed in monitoring large-diameter trees of this species for decay. The results also indicate that although the number of trees with serious amounts of decay is relatively small, continued monitoring to identify these individuals is needed.

Defects other than decay were identified in the survey. Many of these defects, such as the compression fork shown here, can be reduced by proper management such as timely pruning.

Based on the overall results of this study, city tree managers in New York are faced with an aging population of maples that have substantial health issues. It appears that biological health as reflected by the overall condition rating and dieback is currently more of a management concern than the number of trees with serious amounts of decay in their trunks. Removal and replacement of these aging maples provides a chance to balance street tree diversity. Most city foresters in New York have already implemented policies for eliminating or reducing the planting of Norway maple and other maple species.

Acknowledgements

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