

Lessons Written in the Wind May 2015

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On Thursday June 24th 2010 around 2:30 PM, in the suburban neighborhood of Great Neck, New York a freak wind gust known as a microburst ravaged a narrow band through the Village with 100 – 140 mile per hour winds. Although this microburst occurred on a June afternoon without warning, miraculously, no one was killed or seriously injured. The damage to trees was unlike anything anyone had seen in their lifetime. In a park known as the Village Green over twenty trees varying from twelve to forty inches in caliper were destroyed. Several toppled over with their root ball intact and others had the entire crown ripped off while their trunks stayed firmly rooted. Beech, Oak, Linden, Cherry, Maple, Elm and Yellowwood were all included. The winds did not discriminate.

Hurricane Irene originated from a tropical wave on August 21, 2011 in the southern Atlantic Ocean. It travelled northwest in an ideal hurricane forming environment of warm waters and light wind shear. Shortly before becoming a hurricane, Irene struck Puerto Rico as a tropical storm. Thereafter, it steadily strengthened to reach peak winds of 120 mph (195 km/h) on August 24. Irene then gradually weakened and made landfall on the Outer Banks of North Carolina with winds of 85 mph (140 km/h) on August 27. It slowly weakened over land and re-emerged into the Atlantic on the following day. Later on August 28, Irene was downgraded to a tropical storm and made two additional landfalls, one in New Jersey and another in New York. Trees toppled not only because of strong winds but due to soil failure caused by saturated soils and the loss of root friction that resulted. Also, because it was August, the trees were all in full leaf providing strong resistance to the winds thus improving the chances of root/soil failure.

Irene produced heavy damage totaling up to \$296 million (2011 USD) in New York. The storm is ranked as one of the costliest in the history of New York, after Hurricane Agnes in 1972. Much of the damage occurred due to flooding, both from heavy rainfall at inland areas and storm surges in New York City and on Long Island. Tropical storm force winds left at least 3 million residents without electricity in New York and Connecticut. Ten fatalities are directly attributed to the hurricane.

Superstorm Sandy was born on October 22nd, 2012 off the coast of Jamaica, hitting the New Jersey and New York area on October 29th. It caused storm surges and flooding never seen in NYC and along the New Jersey and Long Island coasts. Salt spray caused the browning and death of white pines in the center of Long Island more than ten miles from each shore where the salt spray originated. Salt intrusion into the soil resulted in the rapid death of many trees in tidal flooding areas. And as with the microburst and Irene, trees toppled. Again, many trees that were apparently healthy lifted their large plate of roots out of the ground and laid down on utility wires, cars and homes. It gave us a good reason to re-think how and where we plant trees. It also had us realizing that soil failure can be as important as tree failure when planning, planting, caring for and monitoring trees.

All three of the above events had common themes. They came with little warning in terms of allowing for prevention of tree damage. The winds reached speeds and strength that go beyond most studies and theories that support the resilience and strength of trees. The tree type that failed the most in my observations was the mighty Oak. Soil failure was more common with Oak, Linden and Beech than other genera. A road lined with London Plane trees averaging about twenty five inches in caliper

seemed unfazed after these three storms with the exception of small leaf and twig debris that could occur in any year. Black Cherry, Ash, Maple and most evergreens withstood the gusts where Oaks went down like dominoes. Is this due to less wind resistance, less weight, stronger root systems or a genus/species characteristic? I say yes to all of the above.

In my travels after the storms I found that Maple, Zelkova, Cherry and Ash generally stayed well rooted while losing limbs and splitting at bad crotches and areas of decay. This just reinforced many of the things arborists know about tree defects and characteristics that make trees vulnerable to certain types of damage.

The best lesson to come out of this is that we must, as arborists and design professionals, plan wisely for the placement of trees that will grow very large and those that are known to lack resiliency in the face of extreme wind conditions. Target assessment should be a part of any decision to plant large trees thus minimizing damage to people and property when the 100+ mph winds show up.

Brief Version

Micro-bursts in 2010, Hurricane Irene in 2011 and Super-storm Sandy which arrived in late October, 2012 caused major damage along the east coast of the USA and particularly on Long Island, New York. These events provided a close look at the effects of extremely high winds on trees of varying species, condition/health, size and location. While unexpected storms and their aftermath do not make for good controlled experiments, many of the trends and results point to issues that should be addressed in the future planning for tree care, removals and preservation. Salt intrusion from flooding, desiccation from salt wind, soil failures causing the toppling of healthy oaks and torque related injuries in tree crowns have led us to conclude that not only do trees in poor condition need to be assessed and removed prior to failure. Even healthy trees with adjacent targets should be looked at critically in light of current climate change and the increased probability of violent storms. Plant selections for new trees, community forest decisions, pruning strategies and tree preservation efforts need to factor in climate issues, target assessment, soil types, potential wind-tunnel effects and irrigation in specific locations. Landscape architects and arborists must use the lessons of their experience and observations of extreme weather to plan for the removal, preservation and planting of trees wisely.

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