MEMORIAL DAY TORNADO’S TREE DAMAGE:
LESSONS LEARNED – CEU QUIZ p22
By Mark A Webber, BCMA, CPH, LTE, MArborA, OCMNT, TPAQ, TRAQ | Introduction by Sean Redding, NEC-ISA Secretary

Introduction: Did you know that there is a "Tornado Alley" in New England? The area just east of the Berkshires has a higher concentration of tornado activity than the rest of the area. Every state in New England and almost every county has been hit by a tornado. Tornados have caused over one hundred deaths, hundreds of injuries, hundreds of millions of dollars of damage and countless damaged or destroyed trees over the last century in this area.

This great article from the Ohio Chapter chronicles the damage of 2019 Memorial Day tornado event, the science behind the weather and related research and analysis of tornados impacts on trees and tree care. Photo: Tornados in New England noted in red

On May 27-18,2019 after a relatively quiet 3-day Memorial Day weekend no less than twenty-one tornados affected trees, homes, business and the lives of many Ohio residences. This weather event brought winds as high as 166 to 200 mph and some areas received over 2.75” in a 2 hour period. The paths of most dangerous tornado targeted densely populations centers in and around the Dayton metro area. See photograph left. (Cont’d on page 15)

Photograph Source NOAA(National Oceanic and Atmospheric Administration)
PRESIDENT’S LETTER – Time and Focus Part 2

By Heather Green

Focus. In these current and strange times, with so many parts of everyday life forced to change to minimize the spread of COVID-19. I find it hard to focus.

Time. Working from home and isolating from others is interesting. I cannot not imagine if we had to do this ten or twenty years ago, how much more difficult and un-connected we would feel. Using technology, we can share information and video across timelines and oceans. In comparison to generations before us, we live in a truly blessed time. We can still connect.

Grateful. I am grateful that we have all that we have. These restrictions on our lives do not come with the hardships of war or of extreme weather events such as hurricanes or tornadoes. We have electricity, food, water, working infrastructure, and each other. Through our own actions we have the power to minimize loss of life to this threat.

Through all of this, your NEC-ISA Board of Directors is still moving to support our members, meet your needs, and support our mission and goals. We are still moving forward. As we pivot to meet the needs of our changing world, as we postpone and reschedule events or as we seek alternate resources, we are keeping our mission and goals in focus.

In order for us to be able to accomplish these mission and goals, we have some housekeeping to do. 2020 hopes to be a successful year in accomplishing some much-needed governance clean up. We are moving forward with positive momentum in registering and incorporating our chapter. In addition to this we are looking to adjust our tax status from a 501C5 to a 501C3 as it better aligns with what and how our organization works today. We are working on a 4-step plan to accomplish all this so that we may better serve you. Watch for more news and the roll out on these exciting processes and how you will be a part of this positive change.

While we are rescheduling current events, we are planning for when things return to some sort of normal. Our annual conference (Oct 4th-6th, Manchester, NH) speakers have been lined up and tentatively placed. We are really excited to have this projected plan of speakers and topics. Here are just a few sneak peaks and things to look forward to:

• Our pre-conference workshop plan includes and Electrical Hazards Awareness Program (EHAP); First Aid, CPR & AED; Aerial rescue Certification Course; and a tree tour.
• The utility track includes speaker John Goodfellow, Bob Allen and Jason Parent.
• Nina Bassuk & Peter Trowbridge plan to present on creating the Sustainable Urban Landscape.
• We plan to have the equivalent of an A300 workshop on Tuesday with speakers such as Sam Hill, Geoff Kempter, Dr. Thomas Smiley and Rich Hauer.
• And so much more! Stay tuned as we finalize the line-up and work with the needs of the times.

As I write this article, I wonder how different the world will be in just a few days when this is published. As it does change, we will keep you updated plans and processes need to be adjusted. Please visit our website for the most up to date news.

As we are “Keeping our Trees in Focus,” we are also keeping ourselves, our co-workers, employees, family and community health in focus. Stay healthy. Stay safe.

heather@newenglandisa.org
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COVID-19 UPDATE | ESSENTIAL WORKER LETTER
NOTE: Our website it has the most up to date information.

At this time, the New England Chapter ISA is open and working 100% remotely you can reach chapter staff via e-mail or phone (978-844-0441). In line with the CDC and ISA recommendations, we have canceled or postponed all Chapter events including workshops, ISA Exams, ISA TRAQ Courses and TRAQ Renewal Courses through April 20, 2020. We are monitoring the situation carefully and will provide updates as soon as we have them. We advise that you follow precautionary measures as outlined on the Centers for Disease Control & Prevention website. To learn more about the coronavirus disease, please visit the CDC website here.

ISA/TCIA ESSEIAL WORKER LETTER
As news around the COVID-19 virus evolves, and some U.S. cities and local municipalities shift to "essential work only" quarantine measures, we thought it was important to let you know that ISA has partnered with the Tree Care Industry Association (TCIA) to issue guidance to assist you in determining which types of tree care work should be considered "essential." Joint ISA/TCIA Essential Worker Letter.

NEW ENGLAND CHAPTER WORKSHOP POSTPONEMENTS AND CANCELLATIONS
March 27, 2020 – Aerial Rescue Certificate Course - POSTPONED – watch our website for the rescheduled date.

May 30, 2020 – New England ISA Tree Climbing Championship – CANCELLED – we are very disappointed to announce we will be cancelling this event. We are following ISA’s lead as they have made the difficult decision to cancel the 2020 ISA International Tree Climbing Championship (ITCC) in Albuquerque, New Mexico, U.S., scheduled for 7-9 August 2020. Our focus remains on keeping our members safe.

ONLINE LEARNING OPPORTUNITIES
SPRING NEWSLETTER QUIZ – Take the quiz associated with this issue’s cover story and earn .5 CEUs! We realize you still need credits and we are trying new ways to deliver opportunities to you. See page 22 for details.

April 2, 2020 - FREE Webinar - Urban Forestry Today - Diagnosis in Practice
April 8, 2020 - FREE Webinar – Purdue University - Eastern: Invasive Forest Pest Q & A

Do you know of other on-line CEU opportunities? You can post them directly to our website or contact Heather Leff with the details.
ISA INTERNATIONAL CONFERENCE
Based on the current situation, ISA continues to plan on holding the 2020 Annual International Conference and Trade Show, planned for 9-12 August in Albuquerque, New Mexico, U.S. However, with the ongoing developments surrounding the coronavirus (COVID-19), ISA is monitoring the evolving climate and reviewing information shared by global organizations, health authorities, and local and federal government agencies. We will continue to act in the best interest of our organization and those who will be attending our conference. We will communicate any changes in our event as we have confirmed details.

ISA CREDENTIAL HOLDERS
On March 17, 2020, ISA headquarters announced all paper, in-person exams will be cancelled through April 20, 2020 or whenever it is deemed safe to hold exams again. Pearson VUE testing centers offering computer-based exams have temporarily closed until April 16, 2020 or whenever it is deemed safe to reopen. The situation is being closely monitored and the Texas Chapter will update here as we get information from ISA headquarters. Click here for more information

ISA remains fully operational at this time and will be available by phone at 678.367.0981 from 12PM -5PM EST. This will be effective Monday, 23 March – Monday, 20 April, and we will adjust those dates as this situation evolves.

For our credential holders, we know it is difficult to earn CEUs during this time, so we will be releasing some new, complimentary CEU opportunities soon. We have already extended the recertification periods for those credential holders set to renew within the next 30-60 days. We will continue to evaluate the impact on our credential holders as the timeline associated with this outbreak becomes clearer, and will work with you to ensure there is no negative impact on your ISA credentials due to the COVID-19 virus. ISA COVID FAQ page.

CALL OUT TO STUDENTS – MORE $$ FOR 2020!!
DO YOU KNOW ABOUT THE SHIGO STUDENT SUPPORT FUND?
The purpose of the fund is to provide grants to students endeavoring to deepen their knowledge of arboriculture through participation in conferences, workshops, and other events – up to $400 per request.

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COMING SOON

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NEW ENGLAND CHAPTER WORKSHOP UPDATE

ISA Tree Risk Assessment Courses – Full Course – Springfield, MA – Mar 2-4, 2020

By Heather Leff

Mark Duntemann of Natural Path Forestry taught another sold-out ISA Tree Risk Assessment full course in Springfield, MA. The City of Springfield generously allowed us to hold the course at the John J. Shea center in Forest Park.

Did you miss this event? We are holding another TRAQ Full course August 17-19 in Brattleboro, Vermont. The registration deadline is July 17th. In addition, we are holding a TRAQ Renewal course on August 20th in Brattleboro. The registration deadline is July 20th. See our website for details or register today:

TRAQ August 17-19 | Brattleboro, VT

The ISA Tree Risk Assessment Qualification (TRAQ) program provides an opportunity for professionals in the arboriculture industry to expand their knowledge through education and training in the fundamentals of tree risk assessment. DEADLINE TO REGISTER IS 2.2.20. Members $625, Non-members $750. Day 1 & 2 8-5, Day 3 8-12. 14.5 CEUs

REGISTER TODAY FOR TRAQ!

TRAQ Renewal August 20 | Brattleboro, VT

The ISA TRAQ credential is valid for five years. To reinstate your qualification, you must take a one-day refresher course and exam, the TRAQ Renewal Course, which includes five hours of instruction and three hours to complete the exam. This course is being offered on August 20, 2020 in Brattleboro, Vermont. DEADLINE TO REGISTER IS 7.20.20. The fee is set at $220 USD for ISA members and $260 USD for non-members. 5 CEUs

REGISTER TODAY FOR TRAQ RENEWAL!

Aerial Rescue Workshop Update

As you may be aware, we had an Aerial Rescue Workshop Scheduled for March 27th at Dartmouth College in Hanover, New Hampshire. This class is currently postponed due to the Covid-19 outbreak. We are hoping to reschedule the class for the summer. Thank you for your patience.

New England Chapter ISA – Tree Climbing Championship

The 2020 NEC-ISA TCC was scheduled for May 30th at Keene State College. We are very disappointed to announce this event has been cancelled due to the Covid-19 emergency. Please visit the TCC page on our website for up to date information.

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✉️: heather@newenglandisa.org
☎️: 978-844-0441
CONNECTICUT: Greg Lukos glukos@hvmaster.com

Spring is typically the time of year for optimism and hope of new beginnings. We look for crocus to pop through the tiny craters that the ground reveals once winter’s grasp lets go and the soil warms. Daffodils spring to life in those familiar areas of our gardens that just weeks ago seemed so foreign. Red maple buds swell with anticipation of long summer days when shade is so welcome. Not unlike every other spring, I have this hope again, but somehow this spring feels different. I stop for a moment and look around, and I listen; the noise is less now than usual; crowds of people are now scattered or missing, even the birds seem strangely unsettled.

As our nation’s news is consumed with COVID-19. Cancellations and postponements abound. They include many tree care industry’s meetings and projects. Considering that, there is not much to report in Connecticut. There is however a bright spot to share.

The New England Chapter is being recognized as an allied green industry organization and has been invited to partner and collaborate with Eversource’s Vegetation Management team in establishing a Utility Arboretum at its Berlin, CT campus. I spoke with Doug Pistawka, Eversource’s Supervisor of Vegetation Management and co-lead on the project. Doug is a longtime associate, friend and has always been a leader in Arboriculture. A kick-off conference call was postponed due to the COVID-19 epidemic and will be rescheduled. It is exciting be a part of this initiative.
One of the primary purposes of the arboretum will be educational, to establish a Right Tree - Right Place demonstration area to educate the public about the diversity of species that may be planted adjacent to utility lines. Collaborating with allied organizations will enhance Eversource’s ability to help spread the word. Eversource Arborist, Pat Tracey, is spearheading the initiative with plans to have it completed in May of this year, it includes plantings of over 50 compatible trees and shrubs, a pollinator garden and a model, unenergized 5 span overhead electrical system.

“Right Tree Right Place” was a focus of the Vegetation Management Task Force and their final report states “the successful future of the roadside forest will require a broad spectrum of participants that must work together to design and maintain a roadside forest with diverse species that is appropriate for Connecticut’s wide mosaic of urban to rural landscapes”.

Some collaborative opportunities for the Arboretum might include:
- Workshops, seminars and training events
- Spreading the word to tree and landscape professionals about the arboretum through media channels
- Arbor Day, Earth Day and similar events

Please be safe, be mindful of others and enjoy the view!

MASSACHUSETTS: Jonathan Webb jwebb@mountauburn.org
No Spring Report

MAINE: Mike Hughes hughesarborandlandmgmt@gmail.com
Spring has come early to coastal Maine. Insect activity can be anticipated to get a faster jump as well this year. A sharp eye is being kept by MAA arborists, and the Maine State Forest Service for the expansion of EAB and HWA. Quarantines areas have been established in areas of concern. Perhaps the difference with our other New England states is the hard push by some groups to ban the use of pesticides and in some cases fertilizers in various towns on the coast of Maine. Keeping coastal waters as clean-as-possible, and the public as safe as possible, are the primary reasons for the push. Ogunquit, South Portland, and Portland have pesticide ordinances in place currently. Many other towns are looking in the same direction. There has been a hearing at the Maine State Legislature to ban the use of imidacloprid.

Due to concerns about Corona virus, MAA’s Spring Workshop was canceled, and the Maine Flower Show put on by MELNA (Maine Landscape and Nursery Association) was also canceled. We are in uncharted territory this year. How it will affect our speaking engagements, seminars, and production work moving forward remains to be seen.

NEW HAMPSHIRE: Lucas Beane lbeane@lucastree.com
Spring seems to have sprung early this year in New England, and I hope by me writing these words, it does not jinx the area with multiple late March and early April winter storms! All in all, it appears to have been an “easy” winter for New Hampshire’s forests, animals, and utilities considering we have not had the long spells of severe cold or many large storm events that cause prolonged power outages. In fact, the latest buzz on the local media is the ticks have already come out to play and it is time to start protecting ourselves from those nuisance creatures as we come out of our winter hibernation and start to get into the woods more often.

📞: heather@newenglandisa.org
☎: 978-844-0441
I’ve read about a couple of newsworthy items in the recent weeks. First, in a March press release, the Society for the Protection of New Hampshire’s Forests announced that they have partnered with Manchester Water Works to conserve an additional 1,878 feet of undeveloped shoreline on Lake Massabesic, the primary drinking water supply for Manchester and surrounding communities. This may seem small but is a remarkable feat to protect such a valuable and beautiful natural resource in such a highly populated area of the state. I’ve spent many days on and around this lake and the conservation efforts that continue to take place here continue to amaze me, and it is a luxury to have a natural resource like this so close to an urban environment.

More noteworthy news coming from New Hampshire is an interesting research study recently published from the Hubbard Brook Experimental Forest. Over the past 5 years, researchers conducted the “first-ever experimental ice storms” and their results are now available! This study looked at how northeastern forests respond to ice storms, the damage associated with certain thresholds of ice accumulation, the amount and effects of the accumulated woody debris after ice storms, and how the forest and trees recover from damage sustained from ice storms. This research is the first of its kind under a relatively controlled environment and the information benefits all arborists and foresters in New England. I highly recommend reading more and watching the short video showing how this study took place.

Lastly, I’d like to share that the University of New Hampshire Cooperative Extension has announced the grand opening of a new county office to be opening on May 2nd. The Strafford County Extension Office in Dover, NH will have many events open to the public and will be a valuable addition to this community. Please remember, the Extension can be used by landowners, arborists, and all citizens to help identify unknown insects and plants you may observe and are also available to assist in diagnosing plant health concerns that may arise. Often our earliest indication of a new pest or new invasive in state comes from these questions and observations and early detection can go a long way.

Until next time, I hope everyone has a safe spring!

Rhode Island: Scott Wheeler swheeler@cityofnewport.com

Like every aspect of our life, tree related educational programs, worker trainings and planting ceremonies have been put on hold. The Newport Tree Conservancy has cancelled it annual Arboretum Week program of events and the 2nd Annual Tree Warden Workshop has also been cancelled. It is recommended that you reach out directly to program sponsors as this situation evolves.
RI communities are beginning to make plans to cancel or to reschedule its Arbor Day celebration to late spring or fall. The RI Division of Forest Environment has confirmed that Tree City USA communities have the flexibility to meet the requirement to hold an Arbor Day celebration at a date of their choosing.

Nature does not take a pause and that includes the spread of Emerald Ash Borer (EAB) to Rhode Island. Chris Rooney, from National Grid, reports finding extensive woodpecker damage in the crown of ash trees, in Ashaway RI, that upon closer examination reveal extensive EAB infestations that indicate multiple years of infestation. Statewide the state’s ash population is estimated to make up 5% of our trees but there are localized concentrations where 25% to 30% of the trees are ash trees. National Grid is partnering with RIDOT to map areas of ash concentration to better manage mitigation efforts.

The Newport Tree Conservancy in 2020 will be treating the second ½ of the ash population mapped and identified for treatment in 2019. The City of Providence is finalizing an Ash Preservation Plan in response to the Emerald Ash Borer, and will begin treating prioritized ash trees in the spring as funding allows.

The Center to Advance Minority Participation in the Construction Industry with the help from many local Tree companies and the RI Tree Council is planning to run a Tree Worker Training class. Originally scheduled for the spring of 2020 it has been rescheduled to the spring of 2021. The goal is to expose participants to careers that they wouldn't normally think of in the Arboriculture field. A similar program was sponsored over a decade ago and successfully placed some participants in longer term Arboriculture employment. The class is composed of 150 hours of classroom and field learning. The students will receive first aid and CPR training, OSHA 10-hour safety training, PPE, an introduction to trees, and an introduction to working in the Arboriculture industry (Chainsaws, Chippers, pre-job briefs, etc). If NEISA members are interested in helping with the class or would like to participate in the job fair at the end of the class, please reach out to Chris Rooney at 401-642-2246.

The City of Providence, along with partners (Providence Neighborhood Planting Program, The Nature Conservancy, Groundwork RI, and RI DEM) is beginning the process for an urban forest master plan (called the PVD Tree Plan). It will be a comprehensive plan encompassing the whole urban forest and will involve extensive community engagement with an equity focus. The Providence Neighborhood Planting is celebrating the 30th anniversary of Program on Feb. 12th. Over 16,000 trees have been planted through this partnership between the City and the Mary Elizabeth Sharpe PNPP Fund of the RI Foundation.

The Rhode Island Tree Council is offering its 55th Tree Steward Course. Tree Stewardship combines learning about trees, caring for trees, and understanding how people and trees can best grow together! Whether you are a novice or a seasoned tree care giver this course is for you. The course work will include Tree Biology, Tree Identification, Tree Planting & Pruning, Tree Health, Urban Forestry and Soils. Classes will be held at the Jamestown Public Library, starting May 5th from 6pm-8pm and will run every Tuesday evening through May, with one Saturday outdoor field day, May 30th from 10am-1pm. Registration can be made online at www.ritree.org or by calling the office at 401.764.5885. Cost is $50.00 RITree Member, $75.00 Non-Member. Mention you saw the course information in this newsletter and get the RITree Member price. ISA & Master CEU’s approved.
VERMONT: Mark Duntemann naturalpathforestry@gmail.com

No Spring Report

Celebrating Women in Arboriculture

In honor of International Women’s Day (March 8th) ISA featured stories about women in arboriculture throughout the month of March. Five women were honored. We are very proud that three of the five women are from New England! Huge shout out to these amazing women!

Heather Dion, City Forester – City of Hartford, CT
ISA Certified Arborist
Chair – CT Urban Forest Council

Sara Sanowich, Manager of Forestry Operations and Sustainability - UNITIL
New England Chapter ISA President Elect
UAA Past President
ISA Certified Arborist

Women’s Tree Climbing Workshop, operated by local sisters, Bear and Melissa Levangie (both ISA Certified Arborists), and a team of instructors this is a three-day experience dedicated to creating a safe, encouraging and empowering learning environment for women to climb trees with an emphasis on arboriculture.

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The damage from this tornado outbreak caused for major property damage that included broken windows, houses being pushed off foundations, building walls to collapse, roofs were torn off, sheds thrown 2-3 miles from their original locations. The storm damage was so extensive that President Donald Trump issued a Presidential Disaster Declaration for federal assistance for individuals and businesses. The varying degree of tree damage was observed depending on the intensity of each of the twenty-one tornados. Trees located in the paths of the tornados of highest strength experienced failures at epic proportions. The epic failures are best described like someone took a lawnmower cut trees at one general uniform height. Many of the tree failures were related to the higher intensity tornados by wind forces that overwhelmed previously structurally sufficient trees. Trees that were not in the direct path of these tornados that relatively defected tree experience less damage.

Prior to 2008, Ohio typically experiences only 2-3 tornados per year(Coder.2008) since the Buckeye state has a yearly average of 19 per year(NOAA). Remarkable only one person was killed as the result of this event. The pre-tornado alerts that were received via cell phones, radio, television, tornado sirens, and National Oceanic and Atmospheric Administration (NOAA) alerts were contributed to saving many lives.

How Do Meteorologists Measure The Intensity of Tornados?

Tornado’s intensity is measured by what is called the EF Scale. The EF scale stands for the Enhanced Fujita Scale, and it classifies tornados into the following categories of progressing strength and wind speeds. Those are:

- EF0...Weak.......65 to 85 mph
- EF1...Weak......86 to 110 mph
- EF2...Strong....111 to 135 mph
- EF3...Strong.....136 to 165 mph
- EF4...Violent...166 to 200 mph
- EF5...Violent...>200 mph

Memorial Day Tornado Pattern/Wind Speed and Tree Damage Assessments

For purposes of this article, I concentrated this article focus into five individual tornados in and near the Dayton Metro area that had the most significant tree damage since most significant damages occurred in these areas verse other areas were damage was less prevalent. In most
sites, uprooting was substantially more common than trunk breakage, although their relative frequencies varied with tree diameter, and among species and sites in complex ways. Many of the damaged trees in the other areas were related to ones with preexisting defects. The five areas were quick moving storm events, and each was designated by a unique name to show the distinct differences in damage impacts. The information provided below was collected from the NOAA data for each event and field observations made by the author (See Table A).

### Table A

<table>
<thead>
<tr>
<th>Name &amp; Wind Speed</th>
<th>Width</th>
<th>Area Impacted</th>
<th>Damage Notes</th>
<th>EF-Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brookville through Trotwood to Dayton and Riverside</td>
<td>0.60 mile</td>
<td>20 miles</td>
<td>Event occurred from 10:41–11:13pm</td>
<td>EF-4</td>
</tr>
<tr>
<td>Wind Speed-170-175 MPH</td>
<td></td>
<td></td>
<td>The damage included well-built apartment buildings with complete roof and exterior wall removal. Also, significant tree devastation , including numerous trees debarked and rubbed down to the trunk were found along the Stillwater River east of Riverside Drive. Areas of ravines and slopes experience more intense damage that relatively flat areas.</td>
<td></td>
</tr>
<tr>
<td>Riverside in Montgomery County extending to Xenia Township in Greene County, Ohio</td>
<td>0.70 miles</td>
<td>10 miles</td>
<td>Event occurred from 11:12–11:32pm.</td>
<td>EF2-EF3</td>
</tr>
<tr>
<td>Wind Speed 136-165 mph</td>
<td></td>
<td></td>
<td>Entire roofs lifted, as well as the collapse of several exterior walls with interior walls left standing. Additional homes along Gardenview and Wendover Drives experienced high-end EF2 damage, with windows shattered, garage doors collapsed and entire roof structures removed. Trees uprooted, trees were leafless, upper canopy removed.</td>
<td></td>
</tr>
<tr>
<td>Central Mercer County, Ohio, including Celina</td>
<td>250 yards</td>
<td>11 miles</td>
<td>The event occurred from 10:02–10:17 pm.</td>
<td>EF3</td>
</tr>
<tr>
<td>Wind Speed-150 mph</td>
<td></td>
<td></td>
<td>Homes, outbuildings, trees also, utility poles were damaged here, and a freestanding cellular Communication tower was knocked down. At least two homes suffered Partial roof loss and one home lost its entire roof. A 50-100 yard a swath of trees was snapped and uprooted in a forested area leading Up to the western edge of Celina. Evidence of multiple vortices within the tornado was also evident in the debris pattern here. Widespread tree damage and many trees destroyed.</td>
<td></td>
</tr>
<tr>
<td>Milton in Darke/Miami Counties</td>
<td>.75 miles</td>
<td>10.8 miles</td>
<td>Event occurred from 10:25–10:44pm.</td>
<td>EF3</td>
</tr>
<tr>
<td>Wind Speed-140 mph</td>
<td></td>
<td></td>
<td>Widespread tree damage and many trees destroyed. Moderate structural damage to roofs. A few homes suffered the collapse of some exterior walls, and while this was more common with garage walls, it also occurred on a few well-built walls away from garages. At one home, a lawn tractor was thrown out into the adjacent field to the northeast. This event had variable wind speeds.</td>
<td></td>
</tr>
<tr>
<td>Northeast Montgomery County, Ohio</td>
<td>.25 mile</td>
<td>7.6 miles</td>
<td>Event occurred from 11:34–11:45pm.</td>
<td>EF2</td>
</tr>
<tr>
<td>Wind Speed-135 mph</td>
<td></td>
<td></td>
<td>Tree damage was significant in this area including uprooted conifers, debarking, tree trunk failures and those survivor trees only branch stubs remain. Several homes in this area had complete or near complete roof removal, with some collapse of an exterior wall.</td>
<td></td>
</tr>
</tbody>
</table>
Survivor Trees

Trees that were previously structurally sufficient that were located in the areas of the EF0 tornados had little to no damage. However, many of the failures and loss of trees in the EF0 tornados zones and on the outer edges of the higher categories sustained severe losses due to previous defects like codominant branch unions, decay from previous poor pruning cuts, poor root configurations, roots injured by mechanical injury (mower blight), root systems with limited volume and trees with irregular canopy architecture. Tree species in the White Oak group (Quercus), Red Oak (Quercus rubra), Bald Cypress (Taxodium distichum) and other trees with excurrent shaped canopies survived. Trees with limited defects with strong central leaders with a low proportion of overextended tree branches sustained less life threatening injuries even in tornados with ratings of EF2-EF3.

Photograph Source MkWebber 2019 American Sycamore (Platanus occidentalis) that was trained as a Central Leader tree and well cared for before a 135 mile per hour winds from the Northeast Montgomery County, Ohio Tornado. The trees to the left of the picture are Black Locust (Robinia pseudoacacia) trees that were riddled with trunk decay prior to the tornado. The main damage path of this tornado was approximately 45 feet away from the previously discussed trees.

The Sounds of the Memorial Day Tornados and the Real-Life Experiences

As part of this investigation, I conducted interviews with people who took cover and rode out the storm. The aftermath in these areas impacted by these tornados was reminisced of a war zone. Many reported that when the incident tornados impacted their properties in the areas of the EF-2 and EF-3 is the occupants reported that they never heard the sound of a train, but instead reported that they felt intense painful pressure to their eardrums. They also reported that windows imploded, their homes shook, and the sounds of debris flying striking their homes. During my inspections, I found house installation that was embedded into trees and other trees experienced excessive bending in branches and trunks that the cambium buckled. In many instances, 2 x4’s were driven through walls, and in one case, the tornado pulled a 1000lb wood stove from a building, and it was thrown inside a bedroom of a house that was 4-blocks away.

Discussion

Trees and tornados

Tornadoses can be a component of many types of storms, and they are intense, high velocity, rotating storm events that have historically plagued trees (Dr. Kim D. Coder, 2008). Tree species within the same Genus respond differently to the same types of tornadic events (Shirakura et al. 2006). The top momentary wind speeds of tornadoses can be tremendous and it has been well documented in research that tornados produce variable damage to trees (Zenoble. Peterson 2017)( Frelich et al .2012). Research also shows that variation in damage-path width could result from at least three processes beyond simply variation in the radius of the vortex itself (Karstens et al. (2013)). The first being as Karstens et al. documented damaged areas that, based on the direction of treefall, this resulted from either rear-flank downdrafts and the second being a channeling of high-velocity inflows along
narrow valleys and ravines. The effect the valleys and ravines had on wind flow led Karstens et al. (2013) to suggest that observed variation in damage path width may be influenced by local topography. A third possibility is that some of these damage paths result from multivortex tornadoes. In the case of the Memorial Day tornado outbreak showed all three traits since the treefall direction was variable (e.g., Fujita 1989) (Karstens et al. 2013). The Memorial Day tornados revealed the effects of vortex number (single or multiple) on variation in damage-path width. Additionally, trees species showed species variations in damage response when subjected to strong tornadic winds(Godfrey.Peterson 2017). Additionally, my observations found that a species-dependent difference in resistance in trees exposed to excessive wind speeds and this has been seen and recorded in other events such as in hurricanes, and may be due to particular leaf shape or trunk properties (e.g., Xi et al. 2008)(Webber 2018).

The Brookville through Trotwood to Dayton and Riverside(BTDR) tornado, for example, had the estimated wind speeds of 170-175 MPH. This tornado produced significant tree damage. NOAA data states that this was an EF-4 with an average width .60 miles wide and had the storm path of 20 miles. Research by (Godfrey.Peterson 2017) shows that tornados like the BTDR will have a greater mean width and leave more regular damage paths, while wider paths tended to have fewer undamaged portions and were more continuous. Since EF4 and EF5 tornadoes tend to be wider (Brooks 2004) states that these events have a potential inference as more-intense vortices may fluctuate in diameter less than weaker tornadoes.

Coder’s (2008) research found that the direction of the heaviest winds changes with the passage of the storm and this causes in many cases wood fibers to be stretched and pulled in directions that forces wood fibers to exceed the load capacity of the targeted tree. Trees near the direct track of the tornado must withstand the bending loads applied by winds as well as the twisting (torque). Also, tornadoes are often accompanied by heavy rains, damaging hail, and intense lightning activity, all which impact trees. The Memorial Day tornadoes contained wind propelling rain, soil, or debris that would likely be created by a heavier force (has more mass) than atmospheric gas components(Coder 2008). For the same wind velocity, the more materials in the windstream, the more impact this wind will have on a tree. There is a weight class difference in storm winds which all impact trees differently. In addition to twisting and bending loads applied by “heavier” winds, tissue scouring can greatly damage trees.

**Force (Pressure) Not Wind Speed Is What Breaks Trees**

Storm wind loads on trees are not well represented by wind velocity values(Coder 2008)(Godfrey.Peterson 2017). Wind impacts on trees are directly related to the force or pressure wind applies to tree parts(Niklas2002)( Ossenbruggen et al.). Research by Winn et al (1999) found that wind pressures oscillate and fluctuate as a tornado approaches and vary in intensity depending on the location of the funnel cloud. The pressure of the wind applied to a tree can be estimated by multiplying the square of wind speed times one-half the density of the air moved(Coder 2008). The pressure of wind on trees is usually calculated at some standard temperature (like 68F) at the elevation of sea level. A simplified formula for quick estimates of wind pressure is given below:

\[
\text{wind pressure in pounds per square foot} = (0.013) \times (\text{wind speed in mph} \times 0.45)^2
\]

**Table B** demonstrates the comparison between wind velocity in miles per hour and wind pressure in pounds per square foot created using the simplified formula above. A most compelling fact is that as wind speed doubles, the wind pressure against a tree per square foot of frontal area would not simply double, but quadruple(Coder 2008).

For example, from Table B, if wind velocity is 30 miles per hour, the wind pressure applied to the front aspect area of a tree is 2.4 pounds per square feet. If storm wind velocity then accelerates and levels off at 60 miles per hour or 2 times the original strength, the wind pressure is now at 9.5 pounds per square feet. Table B shows a small increase in wind velocity can have great impacts on wind pressure applied to a tree. Research has shown that structural tree safety factors are completely consumed at approximately 94-96mph or (~24 lbs/ft2)(Coder 2008) (Clanet et al. 2016)
Table B

Estimated wind pressures in pounds per square feet (lbs/ft²) calculated under standard conditions for various wind velocities in miles per hour (mph).

<table>
<thead>
<tr>
<th>wind velocity (mph)</th>
<th>pounds per square feet (lbs/ft²)</th>
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<tbody>
<tr>
<td>5</td>
<td>0.1</td>
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<tr>
<td>10</td>
<td>0.3</td>
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<td>250</td>
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<td>275</td>
<td>199</td>
</tr>
</tbody>
</table>

Wind pressure in pounds per square foot = \((0.015 \times \text{wind speed in mph} - 0.45)\)^2

Source Coder 2008

The tree damaged conditions that I previously described in aftermath compared to the NOAA data from the Memorial Day Tornados confirms the previous findings in the research conducted by Coder 2008 (Coder 2008). Table C of the article shows the previous research conducted (Coder 2008) and it compares the data to the Enhanced Fujita Tornado Scale providing the category or “EF” number of a tornado, wind velocity range of a 3-second gust, mid-point velocity range wind pressure value, tornado description term, an estimated tree impacts.

Table C

<table>
<thead>
<tr>
<th>category</th>
<th>wind speed range (mph)</th>
<th>mid-point wind pressure (lbs/ft²)</th>
<th>tornado damage descriptor</th>
<th>tree impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF0</td>
<td>65-85</td>
<td>15</td>
<td>light damage</td>
<td>small limbs break, large branches break</td>
</tr>
<tr>
<td>EF1</td>
<td>86-110</td>
<td>25</td>
<td>moderate</td>
<td>trees uproot, trees snap</td>
</tr>
<tr>
<td>EF2</td>
<td>111-135</td>
<td>40</td>
<td>considerable</td>
<td>trees debarked, only branch stubs remain</td>
</tr>
<tr>
<td>EF3</td>
<td>136-165</td>
<td>60</td>
<td>severe</td>
<td>trees destroyed</td>
</tr>
<tr>
<td>EF4</td>
<td>166-200</td>
<td>88</td>
<td>devastating</td>
<td></td>
</tr>
<tr>
<td>EF5</td>
<td>&gt;200 mph</td>
<td>&gt;105</td>
<td>incredible</td>
<td></td>
</tr>
</tbody>
</table>

Source Coder 2008
These same conditions seen in Table C were confirmed in my inspection of trees affected by the Memorial Day Tornados compared to the weather data from NOAA.

**Structural Thresholds Of Trees**

In addition to wind speed and pressure values, Table D of this article also shows the two critical mechanical thresholds in trees, T1, and T2 (Coder 2008). Coder’s research (2008) showed the first limiting threshold in trees is called (T1). T1 is reached when wind speeds approach and exceed 56 miles per hour (~8 pounds of wind pressure per square feet). T1 is where the drag reconfiguration in a tree has been reached and cannot significantly be reduced any further without tissue loss (i.e., the front impact of the wind on a tree has been minimized). Up to this threshold level, leaves are blown back against the wind, then rolled, creating less drag or resistance. With increasing wind velocity, peripheral twigs and branches are reconfigured in the crown as they fall back and are bent against the wind. Finally, all crown reconfiguration through reduction of wind resistance occurs. Any more reduction in wind resistance will mean the breaking of twigs and branches. With increasing wind pressure, more crown tissues are pushed back by the wind, until complete elastic flexure (tissue will return to original position when calm) is reached. After this point, inelastic flexure (permanent tissue creep from mechanical overload) and tissue breakage processes are initiated.

The second constraining threshold in trees (T2 in Table D) is reached when a tree is confronted with speeds around 94-96 miles per hour (~24 pounds of wind pressure per square foot) (Coder2008)( Clanet et al. 2016). At T2 is when the mechanical safety factors of tree structure have been reached their maximum for most trees in common situations. At this threshold, major damage is being initiated, and resistance success by trees against increasing wind pressure is only through the position of the tree, buffering of wind loading by surroundings conditions, or having been challenged by these wind forces over many seasons.

<table>
<thead>
<tr>
<th>Wind Speed (mph)</th>
<th>Wind Pressure (lbs/ft)</th>
<th>Tree Damage Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>1.1</td>
<td>root / soil interface fractures initiated</td>
</tr>
<tr>
<td>40</td>
<td>4.2</td>
<td>major stem &amp; crown sway – branch failures</td>
</tr>
<tr>
<td>60</td>
<td>9.5</td>
<td>stem breakage – uprooting</td>
</tr>
<tr>
<td>90</td>
<td>21.5</td>
<td>major tree failures</td>
</tr>
<tr>
<td>125</td>
<td>41</td>
<td>catastrophic tree losses</td>
</tr>
<tr>
<td>&gt;160</td>
<td>67</td>
<td>massive tree destruction</td>
</tr>
</tbody>
</table>

Sources Coder 2008
Lessons Learned

Tree failures are likely occurred in the direct path of Tornadoes EF-1 or higher

Trees in the direct path of a tornado of EF-1 or greater are likely to fail. The wind pressure created by these types of a tornado is too great for most structurally sufficient trees to withstand.

Tree damage and loss will be variable

Tree damage and loss will be variable due to size and rotation as well as the duration of the exposure. Certain tree species will likely be more vulnerable to failure than others.

Proper Tree Care Matters

My observations found a common trait among the survivor trees. If the subject was in good health and structural condition prior to the weather events, and it was not in the direct path of an EF-1 tornado it was a likely candidate to survive if it was a species native to an area that experiences similar weather and wind events.

Excurent versus Decurrent

Trees with an excurrent growth habit (strong central leader) will likely sustain fewer injuries than those species with decurrent (broad and wide shaped) canopies (Dunster et al., 2013). However, decurrent species with a history of surviving tornado that contain 60-90 degree branch angles are excellent candidates to be survivor trees, if they are not positioned in the path of an EF-1 or greater tornado. The lack of failures seen in the tree species White Oak group (Quercus), Red Oak (Quercus rubra), Bald Cypress (Taxodium distichum) and trees trained as central leader trees demonstrated that excurrent habits in trees are essential to surviving winds.

Tree Architectural Design

Trees with unbalanced canopies or with long branches like Maples or trees with growth patterns that result in weak structure or imbalances are said to have poor architecture. Trees with architectural problems can be traced, in some cases, to a lack of pruning or plant selection. Trees combining poor architecture with other defects have very high failure potential.

Reference Sources


Coder, Kim. 2008. Storm Wind Loads & Tree Damage


Texas Tech.2004 “Recommendation for an Enhanced Fujita Scale”


Texas Tech.2004 Softwood Tree Failures


http://www.weather.gov (Collected on June 17, 2019)

https://www.weather.gov/iln/20190527_trotwood (Collected on June 17, 2019)

https://www.weather.gov/iln/20190527_beavercreek (Collected on June 17, 2019)

https://www.weather.gov/iln/20190527_westmilton (Collected on June 17, 2019)


**EARN .5 CEUs – FOLLOW THIS LINK TO TAKE THE QUIZ**

To receive continuing education unit (CEU) credit for home study of this article after you have read it, click on the link to take the quiz. A passing grade is 8/10 correct answers. The quiz will be available until April 30, 2020. The New England Chapter ISA will collect your results and submit them directly to ISA. Questions, contact Heather Leff at 978-844-0441.

41st Annual Community Tree Conference – UMass Amherst

March 10, 2020. UMass Extension’s Landscape Nursery & Urban Forestry (LNUF) program, in collaboration with the UMass Department of Environmental Conservation (ECo) and the USDA Forest Service’s Urban Natural Resources Institute (UNRI), hosted the 41st annual Community Tree Conference at UMass.

This year’s conference theme, “Challenges and Opportunities for 2020: What’s New in Arboriculture & Urban Forestry?” intended to keep attendees up to date on changes and pressing issues in the industry. Our keynote speaker, Ed Carpenter, CEO & President of North American Training Solutions, opened the conference a talk on tree worker safety and updates to the ANSI Z133 safety standard.

Many educational talks followed, from invasive species discussions to an iTree presentation. Student scholarships and recognitions were awarded.

For more than 40 years, the UMass Community Tree Conference has helped practitioners increase their knowledge, earn continuing education units, and improve their professional practice. The conference would not be successful and a valuable experience for attendees without the support of our collaborators (ECo, LNUF, UNRI), and we are grateful for the ongoing support of student scholarships from MAA, MATWFA, and NEC-ISA.

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I hope you are all doing well and coping with this unprecedented event that we find ourselves in. I believe that by taking care of ourselves and loved ones around us, we’ll get through it all.

Here are some updates about the Council of Reps and ISA: An ISA Task Force has been reviewing CoR Policy and By-Laws. We on the CoR Executive Committee (CoR EC), are especially awaiting the decisions/outcomes around the following two items:

1) CoR EC elections historically occur at the CoR face to face meeting at the ISA Annual Conference, but we have proposed doing it via an electronic election prior to that meeting, to save time, and to enable the new EC members to be more “involved” with our Annual face to face meeting. We have proposed that nominations be collected in May and a formal electronic election be done in June.  
2) ISA CoR By-Laws state that the CoR EC be made up of 3 people, but sometime in the past, the CoR EC grew to 5 people. The current CoR EC has recommended keeping the EC at 5 people – to help acclimate newer EC members, allow for the staggering and rotation of their current two-year terms and also serve as a “training platform” for potential future ISA BOD members.

The Task Force is in the process of making recommendations to the ISA BOD on these and other items, and once complete, the ISA BOD will roll out their decisions to the CoR EC.

CoR members took part in a Town Hall style conference call on February 5th, where ISA Executive Director Caitlyn Pollihan answered questions about ISA Operations, membership, International shipping, credentialing, books/products and potential growth plans. It was well attended and now we are exploring having another of these calls in June with ISA President Paul Johnson and President Elect Anne Beard. I’ll keep you all updated on the outcome of the Task Force recommendations and everything ISA as things progress. Please stay safe and healthy!!

TREE FUND UPDATE  
TREE Fund Liaison: Kristina Bezanson kbezanson@umass.edu  

Tour des Trees:  
59 riders have registered! For those considering signing up, please do so now, before we sell out. There are only about 25 more spaces available, and many veteran riders have expressed interest in riding this year.

Webinars:  
TREE Fund has a webinar coming up next week, on Thursday, March 26th at Noon (Central Time), "Why Do Tree Branches Fail?" presented by Greg Dahle, Ph.D. To register please visit

Grants:  
We are happy to announce the list of our Fall 2019 Grants:  

Skiera:  Dr. Jason S. Gordon, University of Georgia Research Foundation, Inc., "Engaging underserved populations in community tree management activities"  
Duling: Dr. Brian Kane, University of Massachusetts-Amherst, "Comparing the efficacy of pull tests versus expert opinion when assessing decay and likelihood of tree failure"  
Kimmel: Dr. Andrew Millward, Ryerson University, "Advancing non-invasive tree root detection by creating a training data set of GPR tree root signatures"  
Kimmel: Dr. Fahad Rasheed, University of Agriculture, Faisalabad, Pakistan, "Contributing for a breathable future: Characterizing the efficiency of local tree species for controlling particulate matter in Faisalabad district "  
SATF: Mr. Matt Follett, University of Montreal, "Evaluation of load distribution in removal operations: a comparison of techniques and equipment"
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heather.green.94@gmail.com

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doak.marasco@davey.com

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rharper@eco.umass.edu

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dean_charter@verizon.net

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sean.redding@eversource.com

ISA CoR REPRESENTATIVE – Anne-Marie Moran
amfmoran@gmail.com

CERTIFICATION LIAISON – Julie Coop
julie.coop@mass.gov

TREE FUND LIAISON – Kristina Bezanson
kbezanson@umass.edu

CONNECTICUT REP – Greg Lukos
glukos@hvmaster.com

MAINE REP – Mike Hughes
hughesarborandlandmgmt@gmail.com

MASSACHUSETTS REP – Jonathan Webb
jwebb@mountauburn.org

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swheeler@cityofnewport.com

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<th>ARBORIST, PLANT HEALTH CARE TECHNICIANS, TRAINEES</th>
<th>LICENSED ABORIST/SALES PROFESSIONAL</th>
<th>PLANT HEALTH CARE TECHNICIAN</th>
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<td>STAMFORD, CT</td>
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**Tree Specialists** is seeking a Climbing Arborist, Crew Leader, Plant Health Care Specialist and an Arborist Trainee to apply go to: https://www.treespecialists.com/about/careers.php

**Collins Tree Service** is seeking a Tree Climber/Arborist. Contact: Bill Collins, Collins Tree Service, Inc., 60 Merrimack Street, Hookset, NH 03106, 603-485-4761 info@collinstree.com

**Nelson Tree Service** is growing our utility line clearance crews in MA. Ground persons, Trimmer Climbers, Bucket Operators. Apply here: http://nelsontree.ourcareerpages.com/

**Gallagher Tree Service** of Cornish, NH is hiring Crew Members! Send resumes and a cover letter to info@gallaghertreeandlandscape.com. We look forward to growing with you.

**Henderson’s Tree & Garden Service** is seeking an Experienced Tree Climber. Contact: Allison Sanborn, Administrator, 1542 Route 14, White River Junction, VT, 05001, 802-296-3771 www.hendersonstreeservice.com

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WHEN & WHERE  
Upcoming Calendar SPRING Events 2020

AREA ISA CERTIFICATION EXAMS

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</tr>
<tr>
<td>Aug 24</td>
<td>Cooperative Ext.</td>
<td>S. Paris, ME</td>
</tr>
<tr>
<td>Sept 18</td>
<td>111 West Street</td>
<td>EssexJunction, VT</td>
</tr>
<tr>
<td>Oct 4</td>
<td>Doubletree</td>
<td>Manchester, NH</td>
</tr>
<tr>
<td>Dec 7</td>
<td>UMAINE</td>
<td>Orono, ME</td>
</tr>
</tbody>
</table>

For information and scheduling of ISA exams in New England, contact Julie Coop at julie.coop@mass.gov.

IMPORTANT 2020 NEW ENGLAND CHAPTER DATES

May 30, 2020 – New England ISA TCC  
Aerial Rescue – Date TBD

CANCELLLED DUE TO COVID-19

August 17-19 – TRAQ - Deadline 7/17

August 20 – TRAQ Renewal – Deadline 7/20

October 4-6, 2020 – New England ISA Conference & Trade Show – Doubletree by Hilton, Manchester, NH

ISA Exams  
CPR, AED & First Aid  
Earn CEUs  
Great Education and Networking Opportunity

SPRING HAPPENINGS (EARN CEUs)

For complete listing & for more detailed information, visit our CALENDAR at www.newenglandisa.org/events

Apr 1  
POSTPONED to August 5th  
UMass Extension: The Invasive Plant Issue and Invasive Plant Identification (A3)

Apr 2  
FREE Webinar - Diagnosis in Practice

Apr 7  
POSTPONED  
TCIA - CTSP Workshop  
- Windsor CT

Apr 8  
FREE Webinar - Eastern: Invasive Forest Pest Q & A - Purdue University

Apr 10  
POSTPONED  
Massachusetts Arborists Association - MCA Arborist Exam.

Apr 15  
POSTPONED to August 19th  
UMass Extension Developing an Invasive Plant Management Program (B)

: heather@newenglandisa.org  
: 978-844-0441