



Preparation, Detection, and Planning Strategies for Emerald Ash Borer

Photos by Steve Cothrel except where indicated

Following a discovery by a private citizen, the Canadian Food Inspection Agency confirmed Emerald Ash Borer (EAB) in the Oakville, Ontario's Iroquois Ridge South Community in July, 2008. This would seem to confirm our early speculation that the EAB population had been building undetected for several years in this neighbourhood—not unlike the pattern throughout EAB's range to date. The next month, we began treating approximately 100 ash street and park trees with TreeAzin. Today, the only ash trees which are alive and healthy in this neighbourhood are those which we treated. Our treatment results indicate a 99.9 % efficacy rate.

But where else was EAB in Oakville and at what levels of infestation? With no formal urban forestry support program in place in Canada and Ontario, lower tier municipalities like ours were on our own to find out. I did not realize at the time that we would play a role in creating the detection and delimitation surveys to answer these questions. My understanding is that the current Canadian Food Inspection Agency (CFIA) guidelines for detecting EAB, published in 2006 and 2007, miss three out of four infested ash trees because they rely on visual survey techniques that often only show late stage infestations.

How were we going to reliably map EAB in time to manage it? Should we treat more trees? Should we follow the CFIA protocol successfully employed for Asian Long-Horned Beetle at the City of Toronto in 2003 and begin sanitizing the host and replacing the canopy?

Furthermore, where are Oakville's 177,300 public and private ash trees located? *Fraxinus* represents 9.3% of the Town's urban forest, according to our 2005 Urban Forest Effects Model Project with the U.S. Forest Service. The ecological services these ash trees provide include \$108,300 in annual pollutant removal and contribute towards the Corporate Urban Forest Canopy objective outlined in the Town's Official Plan. As the town's urban forester I had a sinking feeling in the pit of my stomach that the future for EAB was going to be like that described to me by some of my colleagues in southwestern Ontario: chaos.

Was this Dutch Elm Disease (DED) all over again? Ironically, I gained confidence by speaking with some of the people involved with success stories of DED; specifically the city of Fredericton, New Brunswick which



After removing most of the large old ashes along streets, Upper Arlington, Ohio is beginning to remove younger trees before ash mortality overwhelms the City's limited staff.

saved approximately 80 % of its elm canopy (I am also aware of similar successes in the District of Columbia and Winnipeg, Manitoba). If they could do it, perhaps we could too?

The town retained BioForest Technologies as our EAB consultant. BioForest developed an EAB Emergency Response Plan that Council approved in the fall of 2008. It outlined the following key areas for the town to build in order to fight this long-term battle: (1) Inventory; (2) Strategic Management Plan; and (3) Budget. All three components need to complement each other in order to be effective. It also stressed that this insect should



In Upper Arlington, Ohio, crews remove large ashes in active-use park areas to protect public safety.



Large ash selected for removal prior to showing obvious symptoms or signs of infestation.

be managed on an ecosystem level. This explains our current initiatives to try and obtain coordinated support from senior levels of government as well as hosting a regional level EAB task force.

Implementation of the Plan began in 2009. Town Council approved \$250,000 for a Town tree inventory, Phase One, which would add the 13,800 ash street and park trees into a tree layer on the corporate GIS linked to Forestry's CityWorks asset management system. Council also approved \$50,000 for Phase Two: TreeAzin treatments and Phase Three: \$100,000 to begin underplanting part of the ash canopy.

Throughout 2009, as Forestry staff began to notice changes in the ash canopy over parts of Oakville, I braced for the public outcry that never came.

In early 2010, BioForest staff introduced us to Canadian Forest Service (CFS) Researcher Dr. Ryall who needed a location to further test a new EAB early warning system; we jumped at the chance to partner with CFS. By spring, Oakville was the first municipality in Canada to



This tree in Cook County, Illinois, showed no EAB signs as late as August 2008 but was completely dead by the winter of 2009. Photo by Mike Moore

complete a community-wide EAB distribution map using a combination of our staff arborists and assistance from contractors.

The distribution map showed that we had only one EAB epicenter—which was a relief—but I was surprised by the widespread distribution of the previously undetectable low level distribution of EAB population. Our hard work was beginning to show promise. The combination of this project, our Inventory Project, our 2005 UFORE Project and the pest management decision support system of BioForest made me feel, for the first time, confident about the future with EAB. In my opinion, those municipal urban forest managers who are either using an out-of-date method or no systematic method to map EAB in their community need to stop wasting time; adopt the Ryall method.

Our improving understanding of the biology of EAB motivated us to follow up on BioForest's recommendation to inventory private ash trees (representing 57%



The term “alligator banding” coined by Bryon Doerr and colleagues describes the look of an EAB-infested tree, shortly before death. Photo by Mike Moore

In Upper Arlington, Ohio, trees are retained if residents offer to pay for and arrange treatment. However, before treatment permits are issued, the City evaluates the trees to make sure they are worth the effort, as many old ashes already have serious defects.

of Oakville’s ash trees and 80% of Oakville’s treatable ash canopy) using hyperspectral imaging technology (HSI). We were influenced by the success of the City of Milwaukee’s HSI Project in 2009.

In July, 2010, a plane collected data from Oakville with a specialized spectrometer calibrated with local ash tree spectral signatures. The objectives of this project include mapping all of the 177,300 ash trees, an updated canopy cover analysis on the heels of our 2005 UFORE Project, and—most promising for EAB management across the continent—an attempt to identify a spectral pattern to EAB infestation. The U.S. Forest Service is partnering with Oakville in this latest effort. Please see www.oakville.ca/eab.htm for more information about our EAB preparation and planning strategies.

—John McNeil, R.P.F., Manager of Forestry, Oakville, Ontario

Following the discovery of EAB in nearby Michigan in 2002, Upper Arlington, Ohio quickly suspended planting of ash trees. We did so primarily because of reports that EAB was traveling in nursery stock, and we wanted to give the USDA’s “fire wall” eradication program time to work.

By 2005, it was clear that eradication was a pipe dream. The City tree commission began to discuss the grim prognosis with staff so all options could be carefully weighed. Ultimately, the commission and staff concluded that prophylactic removal was probably best. A series of public meetings followed in 2006 to solicit

public opinion. It goes without saying that some residents took strong exception to our suggestions.

It helped tremendously that urban foresters from the Ohio Department of Natural Resources, Division of Forestry attended our meetings and provided an expert opinion (i.e., an opinion from outside Upper Arlington). To add to the fun, at least one member of City Council took extraordinary interest in the details, demanding to see every public record pertaining to EAB. Because a code change was part of the proposed policy, all interested parties had ample time to make their views known.

By the end of 2006, the City Council passed the necessary code changes, and the commission adopted an EAB management policy that featured three strategies.

1. Street trees: the City began removing 10% of its 750 ash trees per year, with the goal of removing all untreated ashes within 10 years. Residents were encouraged to treat trees at their own expense if desired. The 10-year plan was designed to phase removals in a manageable fashion while finishing around the time EAB mortality began.
2. Park trees: the City began planting seed trees around wooded areas dominated by ash. Park trees will be left to die, fall, and decay in natural areas. Ashes with valuable targets nearby will be removed as they die. A few special commemorative and memorial ash trees are being treated by City contractors.
3. Private trees: the code change strengthened the City's ability to condemn dead & unsafe trees as public nuisances. In a community where the City will force property owners to mow lawns that exceed 6 inches tall, the council agreed that dangerous trees merited similar enforcement. The code now allows the City to assess owners 150% of the City's removal costs to provide an incentive for property owners to do the necessary work themselves. Public education has been constant to encourage private ash owners to prepare their own plans and finances.

By phasing street tree removals over 10 years, the City hoped to complete the work without supplemental budgetary appropriations. However, with EAB mortality underway now (only 5 years into our plan), 10 years may be too long. We expect the damage in 2011 to be shocking, and we know that enforcing private property cases will be very time consuming.

It's also worth noting that Upper Arlington is a mature suburb with good species diversity. Diversity is increas-

ing annually as we replace every ash we remove, but we have no subdivisions or neighborhood streets dominated by ashes as some communities do. This makes removal a more palatable option as well as a permanent remedy. We also knew fairly quickly that complete infestation was in our immediate future, so early detection and delineation of EAB was not on our agenda. Our solution may not be for everyone, but the most important message is to plan now, so you are prepared when (not if) EAB arrives at your doorstep. That day may arrive sooner than you think.

—*Steve Cothrel, Superintendent of Parks & Forestry, Upper Arlington, Ohio*

The City of Bowling Green, Ohio created its EAB Management Plan in January 2005. To prevent an EAB infestation and stabilize future City budgets, the plan calls for the removal and replacement of 662 public ash trees over 8 to 10 years. In 2010, the City received a Western Lake Erie Basin Grant for the removal and replacement of EAB infested ash trees on City-owned property. The grant is from the Ohio Division of Natural Resources (ODNR) Division of Forestry for \$22,500, which the City of Bowling Green matched. A total of 200 public ash trees will be removed and replaced with non-ash tree species. All city-owned ash trees will be removed by 2014.

Bowling Green is on the front line of EAB planning, mitigation, and management. We cooperate with the USDA Forest Service, APHIS EAB Task Force, Ohio Department of Agriculture EAB Coordinator, ODNR Division of Forestry, and The Ohio State University (OSU) Extension.

In July of 2007, OSU Extension EAB Coordinator Amy Stone contacted the City of Bowling Green about partnering with OSU on an EAB research project to save the North American ash. City administration granted approval to assist and cooperate on the EAB research project, and the utilities department director and water pollution control superintendent set aside acreage for the research site. The initiation EAB Research genetic study will be complete by end of 2010. OSU has decided to extend the study from 2011-2013.

The City of Bowling Green cooperated on a second OSU EAB research project focused on EAB treatments for urban ash trees that began in May 2008 through May 2010 (results should be published in the fall of 2011). A total 64 ash trees are involved in the research project. OSU is expanding the EAB Treatment research from 2011-2013.

Tree planting diversity has been the number one goal with the breakout of EAB. The City has tried to use the 10-20-30 rule of tree planting since 2004—no more than 10% of a species, 20% of a genus, and 30% of a family. In 2004, the initial GPS tree inventory data



Large ash removals can be costly, so ash tree owners must be educated to budget for EAB just like municipalities must.

showed that Bowling Green has 33% of the total tree population as maple. By 2010, however, maple trees represented 21.6% of the urban forest. In 2004, crabapples comprised 13% of the urban forest, but in 2010, they comprised 10%. Pear trees that made up 8.6% of the City-owned trees dwindled to 5.9% of the total tree population.

—*David S. Bienemann, Municipal Arborist, City of Bowling Green, Ohio*

Be Prepared. It is a simple motto that can be followed and encompass a whole host of actions. When it comes to dealing with the inevitable impact of EAB in your community, being prepared for it is most important and beneficial.

Back in 2003, after EAB was first discovered in Ohio, ODNR Division of Forestry Urban Foresters began working with communities and their tree boards to help get the word out about EAB and educate the public. Ohio already had experience with DED and gypsy moth, which offered several techniques that communities could utilize to prepare for EAB. In northwest Ohio where EAB was first discovered, tree commissioners placed post-

ers and signage about EAB and not moving firewood in key locations such as campgrounds, parks, rest areas, and local bulletin boards in offices, meeting halls, and even grocery stores. ODNR provided communities with items such as a map with their assigned area to hang posters, a list of talking points and tips, a vial with EAB larvae for show-and-tell, a letter with a USFS EAB fact sheet, and a sample press release to publicize the community's participation in the effort. It got community volunteers accustomed to identifying high risk areas, talking about EAB, and answering common questions about the pest.

Many communities began publishing regular articles in local newspapers and media, on their websites and utility bills, and even tagged ash trees in high profile locations for EAB Awareness Week. They also required mandatory EAB inspections in their pruning and removal contracts. Over time, there was multi-agency coordination between ODNR, Ohio Department of Agriculture (ODA), and Ohio State University (OSU) Extension. Many informational open houses and town hall meetings were held for both green industry representatives and the general public to help educate and answer questions about EAB. All of this has been done

so that people can be on the lookout for EAB in their community, know what to expect when it comes to dealing with EAB, and then be able to manage its impact without having too many complications.

The best tool available to municipalities is having an EAB Management Plan. The ODNR Urban Forestry Program developed a template for such a plan. Similar to any emergency response plan, an EAB Management Plan is a written document outlining a municipality's objective and the approaches it will use to manage the current or anticipated impact on its urban forest resource. It is a blueprint that administrators and residents can follow with a high degree of confidence, rationality, and order. It allows a community to efficiently and effectively respond to EAB and be able to mitigate the financial burden and ecological impact of this insect. Also, ODNR requires that communities have a written, accepted EAB Management Plan to qualify for their ash reduction grants. They have the sample Plan template on their website along with copies of community plans from throughout the state: www.dnr.state.oh.us/tabid/5073/Default.aspx.

As the EAB urban forester for ODNR, I was involved with assisting communities throughout Ohio in dealing with EAB and was involved in the projects mentioned above. I also helped to develop the template for the EAB Management Plan and assisted many communities throughout Ohio in creating their own plan. Now that I am working as an urban forester for the City of Cincinnati, having that city council-approved plan already in place has been quite beneficial.

Due to outlier infestations, EAB is spreading rapidly across our city and county. The City of Cincinnati has been forced to increase the amount of ash tree removals it has completed over the last couple years. As issues or questions arise regarding our department's actions on things such as ash tree removal, canopy replacement planting, wood utilization and disposal, and the budget involved, it has been a wonderful tool to be able to refer directly back to the Plan and show that the decisions we make as urban forest managers are not arbitrary; they have been well thought out and planned.

—*Marianne Prue, Urban Forestry Specialist, City of Cincinnati, Ohio*

Protecting our resources against invasive species is vital to all ecosystems, including urban forests. EAB can go unnoticed in any environment for up to three to five years before damage is visible. As a result of this ability to remain obscure, the need for earlier detection is mandatory in order for management agencies to react and/or plan with as much notice as possible. To date, most recent attempts of early detection have

been found inaccurate, costly to administer, and for the most part, ineffective. In Illinois, where EAB was initially thought to be confined to Lily Lake, the insect has been found in quick succession in many outlying counties as well as Chicago.

As a research technician for The Morton Arboretum, one aspect of my job is to conduct studies on trap trees and monitor EAB infestations. I noticed that abundant woodpecker damage preceded EAB findings. Nothing else attacks an ash canopy the way that birds do while feeding on EAB larvae! This bird activity closely resembles the imagined result of a machine gun being emptied into a tree canopy.

My focus became the Forest Preserve District of Cook County, Illinois, with land holdings of mixed ecosystems totaling close to 70,000 acres. Operations within the County included hanging purple panel traps, mapping the preserves on ash density, and tracking current EAB infestations along with identifying the declining ash trees and any causal agents. While working closely with Cook County staff members John McCabe and Mike Moore, unconfirmed (dependent on Illinois Department of Agriculture confirmation) EAB positives were becoming easier to spot. We began noticing subtle decline symptoms among the ash trees.

Those subtle symptoms, seen before woodpecker damage, include graying of the bark, drooping and/or thin canopy, a dry brittle look, and "alligator banding," a term we coined. Alligator banding likens the severely scratched bark to the underbelly of an alligator (see photos). These symptoms are widespread in dozens of communities that are currently being monitored by local and Illinois State agencies, including the Illinois Department of Agriculture (IDA).

At the Morton, I used a one-mile satellite web or grid and monitored for subtleties in ash appearance as described above, resulting in the majority of EAB finds confirmed. From original known infested communities, the insect could be tracked in up to 14 nearby towns, townships, and preserves in November, 2009 alone. December 2009 to February 2010 yielded an additional 20 to 24 finds. Further monitoring continues by The Morton Arboretum and the IDA.

Developing this survey technique has aided sampling and advanced survey not only in my work, but also within other agencies requesting detection help. This protocol is responsible for many unofficial, positively sampled EAB detections to date, with confirmation dependent on the limits of an overburdened State agency. Early detection methods empower urban forestry professionals to manage the EAB fallout.

—*Bryon Doerr, Resource Technician, Forest Preserve District of Cook County; Research Technician, Morton Arboretum* 