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Item No. 15.1.1
Halifax Regional Council
May 31, 2022
July 12, 2022

TO: Mayor Savage and Members of Halifax Regional Council

SUBMITTED BY: Original Signed by
Jacques Dubé, Chief Administrative Officer

DATE: April 11, 2022

SUBJECT: Integrated Pest Management Strategy, Pesticide By-law Repeal, and Rodent Control Rebate

ORIGIN

March 10, 2020 Halifax Regional Council motion (Item No. 15.1.2):

MOVED by Councillor Nicoll, seconded by Councillor Mancini

THAT Halifax Regional Council direct the Chief Administrative Officer to: 1. Develop an Integrated Pest Management Strategy as outlined in the Discussion section of the staff report dated January 22, 2020; 2. Initiate the process to repeal By-law P-800, Respecting the Regulation of Pesticides, Herbicides and Insecticides; and,

MOTION PUT AND PASSED

September 22, 2020 Halifax Regional Council motion (Item No. 11.4.1):

MOVED by Councillor Mancini, seconded by Councillor Whitman

THAT Regional Council request a staff report examining the possibility of a pilot program providing rebates for rodent control on residential properties.

MOTION PUT AND PASSED

LEGISLATIVE AUTHORITY

The Halifax Regional Municipality Charter provides Council with the power to make policies and by-laws for a variety of purposes.

Purpose of Act
2 The purpose of this Act is to
(a) give broad authority to the Council, including broad authority to pass by-laws, and respect its right to govern the Municipality in whatever ways the Council considers appropriate within the jurisdiction given to it;

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(b) enhance the ability of the Council to respond to present and future issues in the Municipality; and
(c) recognize that the functions of the Municipality are to
(i) provide good government,
(ii) provide services, facilities and other things that, in the opinion of the Council, are necessary or desirable for all or part of the Municipality, and
(iii) develop and maintain safe and viable communities.

Policies
59 (2) The Council may adopt different policies for different areas of the Municipality.
(3) In addition to matters specified in this Act or another Act of the Legislature, the Council may adopt policies on any matter that the Council considers conducive to the effective management of the Municipality. 2008, c. 39, s. 59.

Business and Industrial Development
71(2) The Municipality may not grant a tax concession or other form of direct financial assistance to a business or industry.

Municipal Expenditures
79A(1) The Municipality may only spend money for a municipal purpose if (a) the expenditure is included in the Municipality's operating budget or capital budget or is otherwise authorized by the Municipality; (b) the expenditure is in respect of an emergency under the Emergency Management Act; or (c) the expenditure is legally required to be paid

RECOMMENDATION

It is recommended that Halifax Regional Council:

1. Approve the Integrated Pest Management Strategy;
2. Direct staff to develop an educational campaign to provide guidance to property owners on how to mitigate rodent issues on private property;
3. Adopt By-law R-109, amending By-law R-100, the *By-law and Ordinance Repeal By-law*, as set out in Appendix B – Amending By-law R-109;
4. Adopt the Amending Administrative Order, as set out in Appendix C – Repeal of Administrative Order 23;

BACKGROUND

On March 10, 2020, Regional Council passed a motion directing staff to develop an Integrated Pest Management Strategy as outlined in the discussion section of the staff report dated January 22, 2020 and to initiate the process to repeal By-law P-800, Respecting the Regulation of Pesticides, Herbicides and Insecticides. On September 22, 2020, Regional Council passed a motion to request a staff report examining the possibility of a pilot program providing rebates for rodent control on residential properties.

Integrated Pest Management

Integrated Pest Management (IPM) is a holistic, ecological decision-making model to help prevent and manage pest damage. This is done by using a combination of preventive practices and carefully selected control strategies and treatments to reduce the impacts of pests on people, property, and the environment. The goal of an IPM Plan is to use effective, economical, and environmentally sound methods to keep pests at acceptable levels, with an ongoing emphasis on reducing pesticide use, implementing preventive

measures, and the use of alternative control measures. The principles of an IPM Plan include using a combination of appropriate strategies to address the pest problem and applying pesticides only when necessary according to set pest thresholds. As outlined by NS Environment and Climate Change (NS ECC) and other jurisdictions that have implemented IPM Plans, typical components include establishing criteria, identification, thresholds, monitoring, treatment, and evaluation of the program. Further, the risk of invasive species in HRM is increasing with climate change and with a changing climate there are affects on species life cycles that allows for spread into new areas, creates favourable conditions for spread from warmer regions, and adds pressure to native species that are adapted to Nova Scotia's historic climate[1].

Pesticide By-law

In August 2000, By-law P-800, the Pesticide By-law was approved by Regional Council with the intent to protect the health of humans and the environment. Administrative Order 23, the Exclusion List to the Pesticide By-law was also approved in August 2000. At that time, the use of pesticides was not regulated by the Province. When the Pesticide By-law was adopted, staff implemented a permit program and an education and awareness campaign. These efforts, along with an enforcement strategy from 2001 until 2009, successfully decreased the use of pesticides. By 2010, the number of applications and permits for pesticides dropped from 3,500 in the first year of the program to 47 applications due to the availability of acceptable alternative products.

In 2010, the Provincial *Non-essential Pesticides Control Act* prevented the sale of 2,4-D (2, 4-Dichlorohenoxyacetic acid) products. The only exception is for the management of invasive species which include Giant Hogweed and Japanese Knotweed. In 2014, a supplementary staff report suggested that By-law P-800 achieved the desired outcomes of having industry change product offerings, industry changing lawn care practices, and the Province of Nova Scotia enacting legislation to remove consumer products from the shelf. As a result, the By-law no longer offered any practical protection for residents with respect to the environment or human health. It further suggested that the provincial legislation made the By-law redundant and unnecessary. Inquiries related to pesticides are referred to NS ECC and By-law P-800 is no longer enforced due to the adoption of provincial legislation. Pesticide use is restricted and controlled by Provincial regulation which reduces Halifax Regional Municipality's ability to regulate pesticides in practice.

Rodent Rebate

Municipalities in Ontario have been exploring rodent rebates to homeowners. A rodent rebate program financially compensates residents and/or building managers for a specified percentage of costs associated with rodent removal. In recent years, rebates have been offered in Niagara Falls, St. Catherines, Welland, Town of Lincoln, and Fort Erie. The Peel Region Regional Council approved a year-long pilot project for a pest control subsidy and monitoring strategy on October 8, 2020. As pointed out by an urban rodent expert, the root causes of pest infestations need to be managed, which requires hiring experts, creating local partnerships, and continued monitoring for to monitor how climate change affects the behavior of mammals. Mild winters linked to climate change are increasing rodent populations as rodents do not hibernate, providing more opportunities for rats to reproduce during the year. [2]

[1] Issues Brief (February, 2021). Invasive Alien Species and Climate Change. International Union for Conservation of Nature: https://www.iucn.org/resources/issues-briefs/invasive-alien-species-and-climate-change.
[2] Isai, V. (October 15, 2020). *A 'rat rebate' is coming to Peel Region*. The Pointer. The Star. https://www.thestar.com/news/canada/2020/10/15/a-rat-rebate-is-coming-to-peel-region.html

DISCUSSION

Integrated Pest Management

An IPM strategy (Appendix A) has been developed as an overall strategy for HRM operations. The strategy was developed using best management practices developed by other jurisdictions and experts in integrated pest management and outlines a general strategy for dealing with pests on HRM property. The IPM is meant to be a "living" document, to allow for flexible, adaptable approaches to pest management and to allow for specific species to be added over time. Future management plan development should include pests that cause harm to human health (e.g. ticks, giant hogweed, and wild parsnip), property (Japanese knotweed), the urban forest (Emerald Ash Borer), and other species as identified.

Consultation with Operations staff from the Parks and Recreation Business Unit and the Public Works Business Unit has identified the biggest issue that HRM Operations faces is a lack of external property owner involvement in invasive species management. In order for an IPM strategy to be successful, it needs to be truly holistic and involve all property owners adjacent to HRM properties. Individual management plans for invasive species on HRM property may not be effective if adjacent property owners (private, Federal, and Provincial) are not managing invasive species, which render HRM efforts ineffective. To remedy this situation, there are a variety of factors to consider:

- Provincial Government – according to Operations staff, the Provincial Government does not consistently treat invasive species on their property. There are many examples of harmful species (such as Giant Hogweed) in the Provincial ROW that are untreated and infecting HRM and private property.
- Private Land Owners – HRM has limited authority to order private land owners to remove invasive species from their properties, and further investigation is required. Staff could explore whether By-law N-300, the *Nuisance By-law*, could be amended to include invasive species.
- Halifax Water – invasive species are often present in ditches, using chemical treatment may be difficult due to interests of other parties (Halifax Water). This makes it difficult and costly to treat species. Treatment by hand (manual removal) can be expensive. Greater coverage of removal can occur with chemical methods.
- Dangerous and Unsightly Properties – HRM has a By-law to deal with Dangerous and Unsightly properties. Noxious weeds such as Giant Hogweed and Wild Parsnip could be considered under this By-law, but Compliance does not have the resources or expertise to exercise this option. This would need to be properly resourced but this may be a component to treat invasive species in a holistic manner. However, it does not address Provincial properties as they are not subject to HRM regulations. Also, the definition of Dangerous and Unsightly is determined by the Halifax Charter. At this time, plants do not fall under that definition.
- The Council Motion is limited to HRM operations. All comments presented above are valid and critical to the success of treating invasive species. However, a legislative approach involving an IPM for external property owners is out of scope of the Council Motion.
- Municipal Operations does not have the staff resources to develop and enforce individual management plans. As invasive species continue to spread, even asking for more resources or money will not improve the problem if a community-wide approach is not enforced.
- Lack of contractors – previous contractors that follow the strictest protocols are not always available, which forces staff to undertake this task following protocols and PPE, etc. This takes away from other duties they need to perform.
- HRM has concurrent initiatives such as naturalization that could directly conflict with some invasive species management practices, such as mowing. However, this could be mitigated by focusing intensive management on infestations of invasive species. (However, it should be noted that many invasive species, e.g. Japanese knotweed, need to be removed completely by the root – mowing will only increase spread). Managing these dense stands of invasive species would be beneficial to naturalization efforts, by clearing space for and promoting the growth of desirable native species.

Additionally, initiatives like naturalization allow for more healthy stands of native species, which can be beneficial in preventing the spread of invasive plants.

An initial IPM strategy has been developed (see Appendix A). Additional funding may be required to fill in any gaps and create additional species-specific management plans. One species-specific management plan is completed and attached to the report (see Appendix D) for the Emerald Ash Borer. These funding requests should be made by the responsible business units through their operations as they identify problematic locations and monitor the pests at these locations, and as new invasive species arrive in Halifax. As Business Units begin to develop and implement the management plans, they should identify and request any additional required funding through future staff reports and budgeting processes. The costs to implement these plans will be identified and addressed in future staff reports to be considered by Council.

Staff can reach out to external organizations, such as the Nova Scotia Invasive Species Council (NSISC), for resources regarding identification of invasive species and advice for best management practices. There is ample opportunity to partner with external groups including the Ontario Invasive Species Council and NSISC to develop a more detailed pest management strategy, or to implement specific elements such as internal training, public outreach and inventory management.

Rodent Control

Rodent management is a complex issue and requires expert knowledge of rodent biology, risks associated with rodenticides, IPM practices, and rodent control devices. Management control programs face challenges due to this complexity. A key component to a rodent management program is public education, to inform the public of methods to mitigate rat populations.[3]

At the local scale, HRM has various Business Units and agencies that have been dealing with rodent issues. Rodent issues are cross-departmental, involving Public Works, Parks and Recreation, Building and Compliance, Development Engineering, Solid Waste, and Halifax Water. Rodent management current practices are as follows:

- HRM practices for municipal baiting occur as required in rights-of-way related to municipal construction projects, parks and sports fields and municipal buildings.[4]
- With respect to unsightly premises, Development and Municipal Compliance respond to private properties with food sources such as garbage or unkempt properties by issuing notices for the property owner to clean the property.
- With respect to By-law M-200 complaints, M-200 requires property owners to bait and deal with rat issues in tenant occupied premises.
- In 2017, Administrative Order 2016-003-ADM, Respecting Construction Site Management, was amended to implement rodent control in the form of pre-baiting for a period of 10 to 14 days prior to demolition or major construction. This was repealed and replaced by AO 2018-005-ADM in 2020; pre-baiting must begin a minimum of 14 days prior to demolition or major construction.
- In 2020, during a review of the Administrative Order, staff recommended that the Construction Management Plan (CMP) must include a Rodent Control Plan. The Rodent Control Plan must be prepared by a rodent control company and include a plan to show the location of the rodent control devices, a schedule for maintenance and inspections, and regular reports to the Municipality.[5]
- Solid Waste has a robust sorting and collections program to mitigate potential food sources for

[3] http://www.idph.state.il.us/envhealth/pcmunicipal_rodents.htm
[4] https://www.halifax.ca/sites/default/files/documents/city-hall/regional-council/170207rc1441.pdf
[5]Staff Report (February 3, 2020). Mitigation of Development and Construction Impacts – Update to Administrative Order 2016-003-ADM. https://www.halifax.ca/sites/default/files/documents/city-hall/regional-council/200225rc1517.pdf#:~:text=Administrative%20Order%202016-003-ADM%20%E2%80%93%20Respecting%20Construction%20Site%20Management%3A,private%2C%20where%20work%20is%20expected%20to%20occur%20within

rodents. Through their educational campaigns, they routinely educate the public on how to properly sort, manage, and store waste to discourage rodents. If food waste is properly sorted into the green bins, the food source for rodents is unavailable as they are unable to access the bins. In the upcoming years, Solid Waste may also review garbage carts as part of the overall waste strategy.

- Halifax Water's practices include conducting rodent control activities on Halifax Water projects, which aligns with the municipality's policy to control rodent populations during development activity. Halifax Water does not regularly bait catch basins or sewers due to the environmental impacts. Bait has a poisonous nature, which can discharge into nearby lakes or the Halifax Harbour.

The geography of Halifax as a port city creates a challenge to eradicating rodent populations. Halifax Business Units and agencies are managing the mitigation of rat populations by baiting as necessary, issuing orders of compliance for unsightly properties, and pre-baiting for rodents as part of construction activity. Discussion with staff indicate that construction activity appears to be one of the largest contributors to disturbing rat populations. However, the Construction Management Plans associated with construction activity was implemented to address and mitigate this problem.

To further expand and strengthen municipal efforts to date, attention could focus towards public education to further reduce habitat and food sources as suggested by leading experts. Urban rodentologist Dr. Bobby Corrigan is a leading expert on urban pest control, advising municipalities around the world on the management of rat populations. An ideal rat environment includes two components: food source and habitat.[6] Corrigan's approach to significantly decreasing rat complaints focuses on keeping parks, building foundations, alleyways, and streets clear of food sources. With decades of field expertise and data, Corrigan's pest prevention methods focus on removing opportunities for pests to take refuge in buildings and public places. Community effort is also key in pest prevention.[7] Measures for proactive rodent control should include a public education campaign to rodent proof buildings, eliminate harbourage, and remove food and water by properly storing garbage in rodent proof containers. Reducing rodent habitat and food sources focuses on the cause of the problem. A "Rat Rebate" program may treat the symptoms of a rodent infestation, not the cause.

Jurisdictional Scan of "Rat Rebate" Programs

As illustrated by other regions, "Rat Rebate" programs are administered and enforced by by-law compliance officers. The leading municipalities (Town of Lincoln, City of Niagara Falls, St. Catherine's, and Welland) follow similar approaches.

Most of the regions have a consistent approach with all or most of the following components:

- Eligibility – For residential property owners for the exterior of the property only (interior pest control is not eligible). A property must not have food sources, water sources, tall grasses and weeds, bird feeders, vegetable gardens, dog feces, or waste (debris, rubbish, refuse, sewage or garbage arising from residential uses) prior to applying for the program.
- Inspection – Before applying for the rebate program or hiring an exterminator, a by-law enforcement officer must inspect the property to determine non-conformities and suggest natural tactics to remove rats from the residential property.
- Licensed Exterminator – if the natural tactics suggested by the by-law officer are not successful, residents may choose to hire a licensed exterminator for removal of rats from the exterior. The contractor fills out a contractor rebate form. Exterminators that are not licensed or pest control products purchased by the property owner from retail outlets are not eligible.
- Proof of payment - receipts from the contractor must be submitted in order to be considered for the rebate process.
- Application – when the exterminator has completed the work, the resident can fill out the rebate

[6] https://www.cbc.ca/radio/ideas/rats-the-planet-s-most-tenacious-survivors-with-a-lot-to-teach-humanity-1.5776900
[7] https://nysipm.cornell.edu/about/we-give-awards/2016-excellence-ipm-award-winners/robert-corrigan/

form and apply for the rebate program.
- Rebate – 50% (to a maximum of $200) once per year.
- In the Region of Peel, it is estimated that a "rat rebate" program will cost approximately $500,000. Half of the money is earmarked for the rebate and the remaining $250,000 is required for staffing to develop a regional pest management strategy and abatement measures at construction sites.[8]

Within the Halifax context, consultation with staff from Building and Compliance indicate that Halifax's municipal structure is not equivalent to by-law officers in other regions. The Building and Compliance division is not resourced nor contains the expertise to effectively implement a "Rat Rebate" program as it is primarily set up to focus on inspections and does not house the expertise required for this type of pest management or rodent control. Currently the municipality does not track complaints related to rodents. Discussions with Building and Compliance staff indicate that rat complaints are relatively low compared to other issues related to minimum building standards.

Staff have looked into the possibility of providing "rat rebates" for residential property owners. Under the Charter, HRM does not have the authority to provide a rebate to a business or industry. However, if the "rat rebate" program is deemed a municipal purpose and properly budgeted, HRM may have the authority to provide "rat rebates" to individual residential property owners. A "rat rebate" program could be offered by the Municipality with a view of advancing health, safety, welfare and good government. The program as a greater scheme would need to be designed to fit under the purposes of the Municipality, have a municipal purpose, and be budgeted for under the operating or capital budget.

Of note, HRM has recently initiated a process to permit the keeping and raising of egg-laying hens and/or chickens in all residential zones[9]. Chicken/hens and their shelter, feces and feed can provide a source of food for rodents if not properly mitigated. Other potential sources of food for rats include pet food left outside, spilled birdseed from bird feeders, and fruit and vegetable gardens. Activities such as egg-laying hens and fruit and vegetable gardens can have positive impacts from a food sustainability and urban food/self-sufficiency perspective. Therefore, a "rat rebate" program has to be balanced with other initiatives and efforts that are being promoted by the municipality. As illustrated by the jurisdictional scan, properties that have food sources to attract rodents are not eligible for the rebate program. These same activities are encouraged by Halifax making the rat rebate program a competing interest.

If Council chooses to pursue managing rodent populations in a more formalized manner such as a rodent management plan and "rat rebate" program, given the complexity of rodent management, a consultant who is an expert in rodent control should be hired to develop a management plan and determine the effectiveness of a pilot rat rebate program in conjunction with the management plan. Municipal staff do not have the expertise to develop this type of complex management program. Based on costs seen in other jurisdictions, it can be estimated that the development of a "rat rebate" program for the first year could potentially be approximately $500,000. Staff are not recommending a rat rebate program, however if considered in the future this program would impact the tax rate by approximately - .006 increase to the tax rate and a 1.62 increase to the average residential tax bill.

Repeal of By-law P-800 (*Respecting the Regulation of Pesticides, Herbicides and Insecticides*) and AO 23 (*Respecting Pesticides, Herbicides And Insecticides Excluded From The Pesticide By-law*)

As discussed in the background, the Pesticide By-law P-800 was approved as a measure to protect people and the environment before there were Provincial regulations in place to restrict the usage of pesticides. When the Province restricted and regulated pesticides, HRM staff brought forward a repeal of P-800 as it

[8] Isai, V. (October 15, 2020). *A 'rat rebate' is coming to Peel Region*. The Pointer. The Star. https://www.thestar.com/news/canada/2020/10/15/a-rat-rebate-is-coming-to-peel-region.html
[9] Staff Report (June 12, 2019). Case 22227: Amendments to HRM Planning Documents to Enable Egg laying Hens and/or Chickens in All Residential Zones https://www.halifax.ca/sites/default/files/documents/city-hall/regional-council/190730rc1515.pdf

was considered to be redundant. The timeline is as follows:

- RC (January 11, 2011) considered an information report dated December 17, 2010 that staff and the ESSC should work together to review and recommend amendments for P-800 and AO 23 with respect to the Provincial enactment.
- ESSC (February 3, 2011) considered an information report dated January 20,2011 outlining staff's position that the new Provincial regulations rendered the municipal program redundant.
- RC (May 24, 2011) considered a Recommendation Report (dated April 19, 2011) recommending inclusion of FeHEDTA (a selective herbicide) in AO 23. Council did not endorse FeHEDTA but passed two other recommendations with respect to aligning AO23 with the Provincial Allowable List and endorse policy that HRM operations not use FeHEDTA for municipal turf care operations.
- RC (June 7, 2011) a Motion of Reconsideration was made to have Council endorse FeHEDTA as the Municipal Solicitor advised Council that the motion of May 24, 2011 was out of order. The Charter states a by-law must not be inconsistent with an enactment of the Province.
- RC (March 18, 2014) gave first reading to By-law R-107 to consider a list of by-laws recommended for repeal which included P-800.
- RC (April 15, 2014) removed P-800 from the list of by-laws to be repealed and deferred the recommendation of the repeal of P-800 and AO23 to ESSC.
- ESSC (January 8, 2015) considered an information report dated November 27, 2014. This report clarified that the *Provincial Non-essential Pesticides Control Act* sets restrictions on the sale and use of pesticides in Nova Scotia with two exceptions: 1) If the pesticide is on the allowable list as set out in the regulation and 2) If regulations exist allowing the sale and use of pesticides in certain circumstances. The sale and use of pesticides is permitted in certain circumstances as long as the pesticide is used for one of the exceptions set out in the Exceptions Regulations. The Charter states that a by-law must not be inconsistent with that Provincial enactment. However, it would not be a conflict if Council regulates the use of pesticides not on AO 23 if a permit is obtained for use of a restricted pesticide. Therefore, HRM could enact a permitting program on the *Exceptions Regulations* for Invasive Species[10]. This would not apply to species such as chinch, white grub, dandelions and cosmetic weeds as they are not excepted under the regulations. This would require a new municipal service as it would be a new permitting program and different from the previous permitting program. The information report further pointed out that HRM had not been regulating invasive species in accordance with the existing By-law. Further, the report stated that a decision not to revoke the By-law will require development of a permitted program by the Business Unit.

Current Status of By-law P-800

By-law P-800 has not been repealed and staff have not been funded or directed to develop a permit program for invasive species. Although P-800 has not been repealed, by-law compliance staff have been unable to enforce the By-law as a new permitting system would be required. Therefore, Council must decide whether to repeal By-law P-800 or direct staff to enforce the P-800 through the development of a new permitting system.

In the staff report dated November 27, 2014, the estimated program budget could potentially have a one-time cost of $50,000 to develop the program and then an annual cost of $175,000 to $400,000 for the

[10] For example, some municipalities in New Brunswick, if they have IPM accredited staff, have enacted such a program: https://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/land_waste/content/pesticide_management/what.html#municipalities

education and permitting program. This type of program would require a permanent Subject Matter Expert due to the complexity of Invasive Species.

Options

There are two options for the Committee to consider in light of the information presented in this report with respect to the repeal of the By-law P-800:

1. Regional Council could repeal By-law P-800 and AO 23; or
2. Regional Council could defeat the motion to repeal P-800 and AO 23. If the motion to repeal P-800 is defeated, Council will need to direct staff to amend P-800, update AO 23, develop a permitting program to enforce the By-law, and appropriately resource and fund the permitting program.

Additional considerations for Council:

1. The repeal of P-800 and AO 23 is considered a legislative housekeeping matter. The By-law has not been enforced for over 10 years.
2. Staff is not endorsing the use of pesticides through the repeal of By-law P-800. With development of the IPM strategy, staff are focusing on clarifying best management practices through an integrated approach to limit the use of pesticides on HRM property and only use pesticides under certain circumstances with a focus on human and environmental health. Pesticides continue to be regulated by the Province through the provincial enactment. The IPM strategy will also be available for public use.
3. The clauses of By-law P-800 involving the establishment, administration, maintenance of the Pesticide Registry and notification requirements for the Pesticide Registry, prohibition of pesticide applications within 50 metres of a registered property, and notice to commercial applicators of pesticides (Sections 7 to 10 inclusive) were no longer applied after April 1, 2003 as regulated by Section 5(2) of P-800. There is no designated “inspector” on staff to enforce the By-law. By-law staff have confirmed the registry no longer exists.
4. AO 23 for allowable pesticides has not been updated and is out of sync with Provincial regulations. Pesticides that are permitted by the Province are not permitted for use by HRM operations due to By-law P-800 and AO 23. For example, HRM staff are not able to use pesticides on any sport field or ball diamond that would enable better maintenance of the field due to the restrictions of By-law P-800 and AO 23. Elsewhere in the Province, these pesticides can be used as the Province has approved them.
5. If P-800 and AO 23 are not repealed, the By-law and AO will need to be regularly amended to assess its compatibility as the Provincial regulations are updated. HRM staff are not qualified to determine the safety of particular pesticides and would need to defer to the Province for advice. However, Council could keep the By-law in place should the Province endorses a pesticide that is not wanted by HRM. In addition, the Charter of Governing Principles for Regulation AO seeks to remove administrative burden from operational processes and practices to save costs and improve regulatory compliance. Repealing By-law P-800 will assist the municipality with its regulatory improvement goals to reduce “red-tape” caused by unnecessary rules, administrative processes and practices that have no net value for delivery of the public service. The By-law is not currently providing a public service.
6. Each spring, staff is inundated with calls with respect to the maintenance spraying of CN rail lands. This maintenance activity is allowed under the Federal jurisdiction. Whether or not By-law P-800 is repealed, the Municipality does not have authority to override Federal jurisdiction.
7. By-law compliance officers receive complaints from 311 when residents observe substances that are being sprayed. Calls are referred to by-law compliance and are then redirected back to the Province who regulates pesticides. This leads to confusion by the public. Staff must continually explain to the public that the By-law cannot be enforced at this time. Responding to these complaints that cannot be addressed by the municipality takes time away from staff performing their required duties.

Conclusion

An integrated pest management strategy will allow HRM operations to formalize practices that are currently reactive and piecemeal. Through an integrated approach, HRM operations will work towards approaches that are proactive and consider human and environmental health. However, there are limitations to this approach, as adjacent land owners are not subject to these practices. It may be difficult to manage pests without a community-wide approach as that is out of the scope of this report. Staff will continue to work with outside partners, including the Nova Scotia Invasive Species Council to develop species-specific management plans and education resources.

The repeal of By-law P-800 and AO 23 is not an endorsement of the usage of pesticides; rather, it is a housekeeping item to remove a by-law that is no longer enforceable. Keeping By-law P-800 may become an administrative burden as the municipality will have to continually amend the By-law to be compatible with overriding provincial regulations if it is not repealed.

Rodents are considered a complex and cross-departmental issue. Controlling rodent populations should focus on the reduction of food sources and habitats. Municipal efforts to date have focused on controlling rat populations through a variety of strategies by various Business Units and agencies. However, further work at a community level would assist in these efforts through strategies to rodent-proof buildings, eliminate harbourage, and remove food and water sources through rodent proof containers. Offering monetary compensation on private property could be permitted under the authority of the Charter, but it is not a recommended approach as it may not be the most effective means of controlling rodent populations and it conflicts with other municipal interests (i.e. allowing egg-laying hens). As a port city, eliminating the rodent population is not a realistic goal. However, municipal and community-wide efforts to reduce habitats and food sources may bring the rodent population to a more tolerable level. Halifax could support community efforts through an education campaign outlining methods of rodent proofing buildings and decreasing rodent access to food supplies.

FINANCIAL IMPLICATIONS

The development of an overall IPM strategy was handled within the existing budget envelope for D935 and is a flexible strategy to allow the development of species-specific management plans. The development of an education campaign can also be prepared with D935's current budget and resources. Additional costs may be associated with the development and implementation of individual species management plans for the various Business Units, which would be requested in future budgets.

By adopting By-law R-109 and repealing P-800, the cost avoidance is an estimated budget of $500,000. To create a new program could potentially have one-time start up costs of $50,000 - $100,000, plus annual operational costs of $175,000 to $400,000 for the education and permitting program and the potential hire of subject expert(s). This is not currently in the Budget and would impact the tax rate by approximately - .006 increase to the tax rate and a $1.62 increase to the average residential tax bill.

RISK CONSIDERATION

Environmental, human health, and operational risks will decrease with the implementation of a strategic approach to pest management in the form of an IPM strategy. The alternative option of continuing with the current informal HRM practices to deal with pests may have higher financial, operational, health, and environmental risks due to an uncoordinated approach to dealing with pest species. Important to note is that the overall strategy is to deal with public lands and not private lands. As invasive species exist on private land, public land can continue to be threatened by species existing on private land that can spread and reduce the effectiveness of an IPM strategy that is focused on public land.

COMMUNITY ENGAGEMENT

No community engagement was required.

ENVIRONMENTAL IMPLICATIONS

An IPM Plan minimizes risk and hazards to human health and the environment by taking an integrated approach for preventative and corrective measures to reduce problems caused by pests while reducing the risks related to pesticide use. An educational campaign can help support the reduction of rodent populations. If By-law P-800 and AO 23 are repealed, the Provincial regulations will continue to reduce environmental impacts associated with pesticide use. These implications are discussed in further detail within this report.

ALTERNATIVES

1. Regional Council may choose to not approve the Integrated Pest Management Strategy.

2. Regional Council may choose not to direct staff to create an educational campaign with respect to ways to mitigate rodent populations.

3. Regional Council may choose to investigate a formalized rodent management plan and “rat rebate” program;

4. Regional Council may decline to adopt By-law R-109, amending By-law R-100, the *By-law and Ordinance Repeal By-law*, as set out in Appendix B. This will result in status quo.

5. Regional Council may choose to decline to adopt the Amending Administrative Order, as set out in Appendix C.This will result in status quo.

6. Regional Council may choose to direct the CAO to develop a permitting program under By-law P-800, and appropriately resource and fund the permitting program.

ATTACHMENTS

1. Appendix A: Integrated Pest Management Strategy
2. Appendix B: Amending By-law R-109
3. Appendix C: Repeal of Administrative Order 23
4. Appendix D: Emerald Ash Borer Management Plan

A copy of this report can be obtained online at halifax.ca or by contacting the Office of the Municipal Clerk at 902.490.4210.

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Appendix A

Integrated Pest Management Guidelines

Prepared: Spring 2022

HALIFAX

Table of Contents

Integrated Pest Management Strategy

Introduction to Integrated Pest Management

For the purpose of this strategy, a pest is a plant or animal that has a destructive impact on one or all the following: built infrastructure, natural assets and/or human health and safety. Some of these species are invasive to Nova Scotia, but some, such as black-legged ticks, are not. Invasive species are defined as harmful, non-native species whose introduction or spread threatens the environment, the economy or society, including human health. An invasive plant often lacks natural enemies or other forms of competition to keep it in check; therefore, it can quickly increase its range and form dense stands that completely take over an area in a short amount of time[1].

Figure 1:"giant hogweed" by antefixus21 is licensed under CC BY-NC-ND 2.0

Integrated Pest Management (IPM) is a holistic, ecological decision-making model to prevent and manage pest damage below specific thresholds (unacceptable levels) using a combination of preventative practices and carefully selected control strategies and treatments with an ongoing emphasis to reduce pesticide use.

An integrated pest management approach includes many benefits such as:

- Promotion of healthy plants and plant structures
- Promotion of alternative pest management strategies that are sustainable
- Protection of non-target species
- Reduction of environmental risk associated with pest management
- Reduction of contaminated air and ground water
- Reduction of pesticide use
- Reduction of issues related to pesticide residuals
- Reduction of exposure to pesticides
- Increase the cost-effectiveness of pest management programs

[1] Ontario Invasive Plant Council (March 2015). “Creating an Invasive Plant Management Strategy: A Framework for Ontario Municipalities”: https://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/PlantManagementStrategy_2015_March172015_D3_PRINTFINAL.pdf

Principles

Integrated Pest Management is based on the following principles:

- Minimizing human health and environmental risks.
- Following an ecological approach to pest management by integrating preventative measures and applying alternative control technology before considering pesticides; pesticides are considered a last resort.
- Considering operational feasibility and cost-effectiveness in decision-making.
- Demonstrating a leadership role by promoting a pest management approach that is integrated and environmentally-sound.
- Following a flexible approach that allows changes to best practices as conditions change or new strategies evolve.
- Ensuring that any HRM Contractors for pest management follow an IPM philosophy and best practices.

Rationale

The risk of invasive species in HRM is increasing with climate change. A changing climate affects species' life cycles and allows spread into new areas, creates favourable conditions for spread from warmer regions, and adds pressure to native species that are adapted to Nova Scotia's climate[2]. This applies to some problematic native species that are harmful to human health, such as blacklegged ticks. Blacklegged ticks, which is the only tick species in Nova Scotia that can be a carrier for Lyme disease, require a minimum number of days with above-freezing temperatures to increase their life cycle. Warming temperatures have allowed tick populations to increase and move northwards[3].

Invasive species and problematic pest populations in HRM will likely become more of a problem over time. Implementing an IPM strategy now allows the municipality some time to create species-specific guidelines and manage populations in an ecologically-responsible manner.

[2] Issues Brief (February, 2021). Invasive Alien Species and Climate Change. International Union for Conservation of Nature: https://www.iucn.org/resources/issues-briefs/invasive-alien-species-and-climate-change.

[3] Constible, Juanita (April 26, 2018). "A New Reality: Climate Change and Lyme Disease in Canada", NRDC: https://www.nrdc.org/experts/juanita-constible/new-reality-climate-change-and-lyme-disease-canada.

Figure 2: "Emerald Ash Borer" by USDAgov is licensed under CC BY-NC-ND 2.0

Purpose

In lieu of a formal IPM strategy, business units have taken a piecemeal approach to pest management through operations and maintenance.

Key business units include:

•Parks and Recreation
•Transportation and Public Works (TPW)
•Solid Waste
•Corporate & Customer Services

IPM guidelines communicate municipal roles, responsibilities and initiatives for pest management to the public and is a tool for public education. They inform residents about current and alternative pest management practices. The education campaign will focus on publishing the IPM guidelines on the website and through social media. Additional education measures may take place to targeted audiences on individual species as outlined in individual management plans. The IPM guidelines will be updated as required and management plans for additional species will be added as needed.

Prioritizing Pests and Invasive Species

The following table has been adapted from the Ontario Invasive Plant Council[4]. The risk rating will assist HRM staff in prioritizing species for control. Each category is described below and either a 0, 1 or 2 can be assigned to the species for each category based upon its impacts and biology. For each species, the total score will determine its risk rating of very high (4-8), high (3), moderate (2) or low (1). Species that rank High or Very High should be further investigated and a pest management plan developed and implemented. HRM recognizes that pests and invasive species will continue to enter the municipality. The purpose of this table is to prioritize our response to those threats.

[4] Ontario Invasive Plant Council (2015). Creating an Invasive Plant Management Strategy: A Framework for Ontario Municipalities: https://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/PlantManagementStrategy_2015_March172015_D3_PRINTFINAL.pdf

Score	Human Health & Safety	Ecosystem	Infrastructure	Recreation & Aesthetics	Persistence
2	Immediate and detrimental effect on human health	Impacts sensitive/rare ecosystems (e.g. riparian areas and wetlands, etc.)	Direct impact on infrastructure (e.g. roads, buildings, underground utilities, etc.)	Direct impact on recreation and aesthetics	Removal requires a trained professional
1	Potential impact on human health	Impacts forested ecosystems (e.g. shade tolerant)	Indirect impact on infrastructure (e.g. creates hazard trees)	Impedes recreation access and/or impacts viewscapes	Requires 3 or more repeat manual treatments
0	No direct impact	Primarily impacts disturbed sites	No significant impacts	No significant impacts	Removal typically requires only 1 to 2 repeat manual treatments

Federal and Provincial Roles and Responsibilities

Managing invasive species is a shared responsibility between all levels of government. The following table outlines federal and provincial legislation and departments relevant to invasive species management.

Level of Government	Legislation/Department	Description
Federal	Pest Control Products Act	Aims to protect human health and safety and the environment by regulating pest control products
	Canadian Food Inspection Agency	Coordinates programs to prevent the introduction and movement of invasive species between borders, and assists with education and monitoring within Canada
	Fisheries Act	Provides a full suite of regulatory tools to prevent the introduction of aquatic invasive species into Canadian waters and to control

		and manage their establishment and spread, once introduced.
	Migratory Birds Convention Act	Aims to protect migratory birds, their eggs, and their nests
	Species at Risk Act	Aims to protect species of conservation concern in Canada. The federal government must be consulted before any pest control actions impact federally protected species.
Provincial	NS Endangered Species Act	Aims to protect species in NS that have been assessed and determined to be at risk of extinction.
	Non-essential Pesticides Control Act	Prevents the sale of 2,4-D products, with the exception for the management of invasive species including Giant hogweed and Japanese knotweed.

Identification / Inventory

The first step in managing pests is to identify their location and population size and create a record of the siting. An up-to-date inventory is essential to understand the severity and scope of the problem and the resources required for management. Field and operations staff are encouraged to use the web-based iNaturalist app to identify and track invasive species. Using iNaturalist will provide data on location and automatically adds the sighting to an inventory of citizen science observations. The NS Invasive Species Council already maintains an iNaturalist group for sightings of invasive species in Nova Scotia. Another benefit of iNaturalist, is that it helps the user identify the species based on the submitted photo. For additional identification resources, please refer to Fact Sheets from the NS Invasive Species Council or the Ontario Invasive Plant Council.

Eventually, other means of tracking invasive species may be implemented in the province, such as EDDMapS – Early Detection and Distribution Mapping System – a program designed to capture spatial invasive species data. Until then, it is recommended that HRM staff use iNaturalist to identify the location of pests in the municipality.

Figure 3: "Wild Parsnip" by milesizz is licensed under CC BY-ND 2.0

Monitoring

Once the existence and location of a pest or invasive species is submitted to iNaturalist, the population should be monitored and the following additional information should be collected:

- Location
- Type of Pest
- Stage of growth or development
- Pest population (number of pests or pest density)
- Reason for treatment
- Outcome (acceptable threshold after treatment for pests)

Please send the above information by email to the HRM Environment Specialist at emma.bocking@halifax.ca.

Thresholds

The threshold that triggers pest management varies and is species-specific. Pests and invasive species that have severe human health impacts such as Giant hogweed, may have zero tolerance while other pests that are simply a nuisance may have a higher level of tolerance. It may not be possible to eradicate all pests, and there may be levels in which the pest can be tolerated. Please refer to specific pest management guidelines (when available) for more information about the management threshold for that species.

Thresholds may be defined and recorded as:

- Acceptable levels of the pest
- Confirmed presence of the pest
- Percentage or proportion of leaves damaged on a particular plant
- Percentage of plants affected on a site
- Number of pests or pest colonies counted
- Most effective time to treat pests

Treatment Practices

To determine treatment practices, treatment type should be selected and non-chemical treatments should be prioritized. If pesticides are identified as the best tool for managing the pest, treatment must be an approved chemical and applied with careful timing and precision

according to the manufacturing instructions and by qualified professionals. Please refer to individual management plans for each pest for guidance on removal practices. For example, treatment by manual control of invasive plants with mature seeds can lead to the plant spreading.

Table 1: A description of various treatment practices

Treatment Type	Description
Preventative/Cultural Measures	Pest problems are prevented or minimized through design of the site and cultural practices could include disease resistant materials, irrigation, fertilizing, top dressing and planting of native species.
Environment Control	Reduce the effects of a pest that will not negatively affect the desired plan through modification of the environment.
Manual Control	Pest is removed by hand. Protocols for PPE should be clearly identified and followed.
Physical and Mechanical Controls	This measure is primarily associated with the use of mechanical equipment to maintain a tolerable threshold. For example, pruning diseased branches from trees.
Biological Control	The use of registered biological agents that are specific to the target species having no negative impact to the environment. This application is administered through the federal government and should not be attempted without guidance.
Chemical Controls	The use of chemicals only when it has been identified as the best strategy for achieving an acceptable threshold. Preference is to be given to control products with low toxicity. Application techniques should be focussed and target specific when available such as back-pack or hand-held sprayers or low volume closed-system applicators (shrouded applicators).

Figure 4: "japanese knotweed" by dankogreen is licensed under CC BY 2.0

Evaluation

After a pest has been treated, follow-up is required to see if the treatment was effective. Evaluation is dependent on the type of pest and the situation. Evaluation may validate the effectiveness of the selected treatment or may determine that a different treatment option should be selected in the future. Please refer to the specific pest management guidelines for relevant evaluation protocols, when available.

Integrated Pest Management in HRM

The current focus for pest management in HRM is on species that cause issues with health and safety, recreation, property damage, and the health of the urban forest. A management plan for the Emerald Ash Borer is currently available (Appendix D). This document and associated online resources will be updated as new plans are released. Best management practices for several of the below species have been developed by the Ontario Invasive Plant Council (see Table 2).

Management plans for the following species are complete or are currently in development:

Table 2: Status of HRM-specific species management plans

Species	HRM Management Plan Status	Additional Resources
Emerald Ash Borer	**Complete: See Appendix D: Emerald Ash Borer Management Plan**	• Natural Resources Canada: Emerald Ash Borer FAQ
Blacklegged ticks	In Progress	• www.etick.ca/
Giant hogweed	In Progress	• Giant hogweed BMPs (Ontario Invasive Plant Council)
Wild parsnip	In Progress	• Wild parsnip BMPs (Ontario Invasive Plant Council)
Japanese knotweed	In Progress	• Japanese knotweed BMPs (Ontario Invasive Plant Council)

This is a living document; business units may add additional species management plans as required. The management plans are flexible and can be modified as conditions change.

Conclusion

An IPM strategy seeks to reduce the amount of pesticides being used and increase health of the environment. However, it must be recognized that under certain circumstances and conditions, controlled use of pesticides should be considered and used only in accordance with a formal IPM strategy. This strategy document provides guidance to develop responsive and adaptive management plans for specific species. Some of these strategies may involve coordination and collaboration with other jurisdictions, including Nova Scotia Environment and Climate Change, Natural Resources Canada, academic researchers, and non-for-profit groups such as the Nova Scotia Invasive Species Council.

Appendix B
(Amending By-law)

HALIFAX REGIONAL MUNICIPALITY
BY-LAW R-109
RESPECTING THE AMENDMENT OF BY-LAW R-100
THE BY-LAW AND ORDINANCE REPEAL BY-LAW

BE IT ENACTED by the Council of Halifax Regional Municipality pursuant to *Halifax Regional Municipality Charter* that By-law R-100, the *By-law and Ordinance Repeal By-law*, as amended, is further amended by adding the following immediately after Item number 9 of Schedule "E":

10	P-800	Pesticide By-law

Done and passed in Council this day of , 2022.

_____
MAYOR

_____
MUNICIPAL CLERK

I, Iain MacLean, Municipal Clerk for the Halifax Regional Municipality, hereby certify that the above-noted by-law was passed at a meeting of the Halifax Regional Council held on , 2022.

_____
Iain MacLean
Municipal Clerk

Appendix C

HALIFAX REGIONAL MUNICIPALITY
ADMINISTRATIVE ORDER NUMBER 23
RESPECTING PESTICIDES, HERBICIDES, AND INSECTICIDES
EXCLUDED FROM THE PESTICIDES BY-LAW

BE IT RESOLVED by the Council of the Halifax Regional Municipality that Administrative Order 23, the *Pesticide By-law Exclusion List* Administrative Order is repealed.

Done and passed in Council this day of , 2022.

_____
MAYOR

_____
MUNICIPAL CLERK

I, Iain MacLean, Municipal Clerk for the Halifax Regional Municipality, hereby certify that the above-noted administrative order was repealed at a meeting of the Halifax Regional Council held on , 2022.

_____
Iain MacLean
Municipal Clerk

Appendix D: Emerald Ash Borer Management Plan

Halifax Regional Municipality

Prepared:

Spring, 2021

Section 1 Background

Section 1.1 Background

In 2012, Halifax Regional Municipality (HRM) approved a comprehensive plan, the Urban Forest Master Plan (UFMP), which provides direction for planning, programming and regulatory activities related to managing and enhancing the urban forest cover in HRM. The goal was to ensure the ongoing sustainability of HRM's urban forest for it's multiple environmental, social, cultural and economic benefits.

The Urban Forest Management Plan falls under the Council Priority Areas of Healthy, Livable Communities and Economic Development, with the specific outcomes of environmental resilience; an increase in environmental benefits received by residents through tree planting, protection and maintenance programs; supporting community recreation, leisure, health and mental health though access to safe and sustainable green infrastructure; as well as making Halifax a better place to live and work by way of livable green communities where green infrastructure supports economic development.

As identified in the UFMP, invasive species pose a challenge to the management of the HRM Urban Forest. Invasive species pose a risk to native vegetation and degrade ecosystems, contribute to habitat loss and are a major threat to the urban forest. As documented in the UFMP, the urban forest provides many benefits such as air quality benefits, biodiversity, carbon sequestration, economic, energy use, health, hydrological, and many others.

The Emerald Ash Borer is a highly destructive invasive wood-boring beetle that has been present in Canada since 2002. It has killed a large number of ash trees in North America and poses a major economic and environmental threat to urban and forested areas across Canada. Historically, across Canada, Emerald Ash Borer has resulted in complete mortality of Urban Ash populations, with significant costs to municipalities with respect to removal, replacement and lost value. Eradication efforts have not been successful and very few tools for mitigation exist.

In fall of 2018, it was observed that several ash specimens in DeWolf Park in Bedford were in a state of declining health. Given the observed symptoms and known spread of EAB, tests were conducted, and the presence of EAB was confirmed. Over the next several months, HRM worked with federal, provincial, and non-governmental organizations to complete a site characterization, implement restrictions, and develop a restriction zone. While HRM does not have as large a population of Ash as many other central Canadian municipalities, it does have significant exposure in many newer neighbourhoods.

Section 1.2 Integrated Pest Management Strategy

Halifax Regional Municipal Council approved a motion on March 10, 2020 to create a an Integrated Pest Management Strategy. Staff with Energy and Environment are currently creating an overall IPM strategy. The Emerald Ash Borer Management plan is anticipated to form a chapter of the overall IPM as it is developed.

Integrated Pest Management (IPM) is a holistic, ecological and economic decision-making model to prevent and manage pest damage below specific thresholds (unacceptable levels) using a combination of preventative practices and carefully selected control strategies and treatments. The goals of an IPM Plan include using effective, economical, and environmentally sound methods to keep pests at acceptable levels with an ongoing emphasis to reduce pesticide use, implement preventative measures, and utilize alternative control measures. The principles of an IPM Plan would promote using a combination of appropriate strategies to address the pest problem and apply pesticides only when necessary according to set pest thresholds. Typical components of an IPM plan include establishing criteria, identification, thresholds, monitoring, treatment, and evaluation of the program.

Purpose:

Protection of the urban forest depends on continued management of the urban tree canopy through maintenance, removal, planting, and pest management programs. As all efforts to prevent the spread of EAB have been unsuccessful to date, and few treatment options exist the following plan considers best management practices and experiences from other jurisdictions to guide the efforts of the Halifax Regional Municipality in mitigating the effects of EAB.

Section 2 Introduction

2.1 Biology

The EAB is a non-native, invasive insect that infests and kills healthy, true ash trees in the Fraxinus family. The species include but are not limited to: Fraxinus Americana (white ash), Fraxinus quadrangulata (blue ash), Fraxinus nigra (black ash), Fraxinus pennsylvanica (green ash), Fraxinus profunda (pumpkin ash) and Fraxinus manchurica (Manchurian ash), all of which are present in Halifax. Although the EAB is known to infest other species, such as elms and walnuts, in its native range, it is only known to infest ash (Fraxinus spp.) in North America. The uncommon Fraxinus quadrangulata (blue ash) is the only native North American ash species that has shown some resistance to EAB infestation.

2.2 Mortality, Signs and Symptoms

Research and experience have identified that there is an exponential increase of EAB populations over a period of 5 to 10 years. In the first 2 to 4 years, the rate of dieback is slow with an exponential increase in years 4 to 8. As the food source diminishes, the beetle population levels will decline. The management plan will need to consider the best way to manage and compensate for the losses expected to occur over the life cycle of the EAB and the mortality rate of the Ash.

Although EAB populations may grow quickly, it is unlikely there will be any detectable signs of the pest's presence in the first three to four years. Trees are often severely infested by the time the signs and symptoms are apparent. Signs are the physical damage from the insect's direct attack whereas symptoms are the tree's physiological response from the attack.

Signs can include: woodpecker and squirrel feeding, foliage feeding, emergence holes, and larval galleries. Symptoms can include: crown dieback/chlorosis, epicormic shoots, stress (surplus of seeds, oystershell scales) and bark deformities.

Signs

Woodpecker and squirrel feeding

As woodpeckers are insectivores, a portion of their diet consists of extracting wood-boring insects from under the bark of trees. An increase in activity in the crowns of ash trees by woodpeckers may indicate the presence of EAB as well as the presence of irregular shaped light-brown holes and peeling bark. Peeled back / ragged strips of bark can also indicate squirrels that have been feeding on larvae. These signs can indicate that woodpeckers and squirrels have been feeding on insects but does not necessarily mean they've been feeding on EAB.

Foliage Feeding

During maturation, adult EAB undergo a feeding stage prior to reproduction which may last several weeks. The leaves become ragged as the EAB chew on the leaves. However, other insects can also chew holes in ash tree leaves.

Emergence Holes

Adult EAB emerge from chambers from where they develop. The emergence hole is a D-Shaped hole created by the adult EAB as they chew their way out of the tree. The presence of D-shaped exit holes is a strong indicator for the presence of EAB, as this shape is required to accommodate the shape of the EAB (flat back and rounded underside). Although the D-shaped holes are not unique to EAB, they are unique to metallic wood-boring beetles.

Larval Galleries

The typical feeding patterns for EAB are Serpentine (S-shaped) galleries that are initially quite narrow and then widen as the larvae mature and grow larger. Frass (sawdust-like excrement) can be seen after the bark has peeled away and can be seen easily on the outer sapwood. Galleries with high levels of infestations can criss cross in all directions and may also have scar tissue around the edges. Galleries may indicate the presence of EAB, but other boring insects can also create these type of galleries.

Symptoms

Crown Dieback/Chlorosis

The vascular system of the tree can be damaged as EAB larvae feed under the bark of the host tree. As a result, the leaves are unable to transfer nutrients to the rest of the tree which can cause chlorosis (discoloured foliage) and dieback (death of portions of the crown). Continued feeding of larval populations on the host tree eventually leads to girdling and subsequent death.

Epicormic Shoots

Trees that are under stress can react by producing epicormic shoots as a reaction to wounds caused by EAB feeding on the tree. Although epicormic branching can occur on EAB-infested

trees, the presence of the shoots can result from any stress or damage and may not be solely a response to EAB. The most common cause of epicormic shoots is usually mechanical damage.

Stress (Seed Surplus / Oystershell scales)
Trees that are under stress from insect attacks often produce a surplus of seeds or oystershell scales as a response to the attack. These symptoms may not clearly indicate EAB, but it can indicate the tree is under stress and EAB may be present.

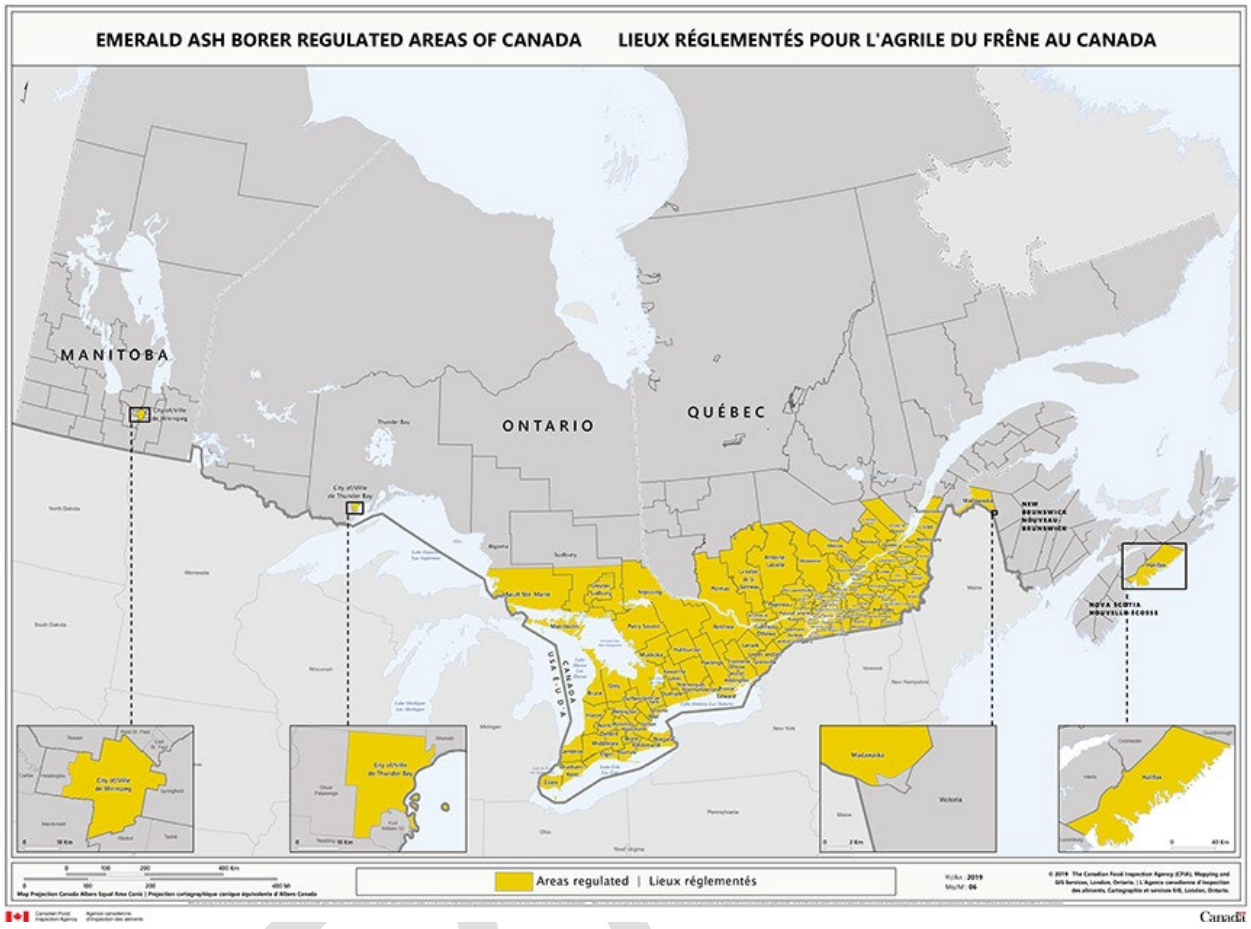
Bark Deformities
As EAB tunnel under the bark of host trees, the tree can cause a wound response, resulting in scar tissue, bark discolouration, swelling, and on occasion, splitting near the wound site. Often the only symptoms of EAB infestations in the first two years of attack are the vertical splits, weeping, and staining of bark and bark swelling. The tree otherwise appears quite healthy. Cracks can also be caused by frost damage from the winter.

Section 3 Roles and Responsibilities

Every level of government as well as private property owners are responsible for the management of EAB.

Section 2.1 Federal

Emerald Ash Borer is a Federally regulated pest. The Canadian Food Inspection Agency (CFIA), under the Plant Protection Act, is Canada's designated lead in the development of regulatory policies relating to invasive pests. While it is essential that all stakeholders work closely together, the CFIA will ultimately make the decision as to whether a pest will be contained.



Currently a Ministerial Order is in place that defines a regulated area as the ~~extend~~ extent of the Halifax Regional Municipality. To slow the spread of the emerald ash borer (EAB) to new areas, the CFIA uses measures to control the movement of potentially infested materials. People who move regulated materials from a regulated area without the permission of the CFIA could face fines and/or prosecution

Section 2.2 Provincial

Provincial governments are responsible for the creation and enforcement of environmental protection policy, which includes provincial woodlands. While provincial governments do not have the authority to put in place legislation which would conflict with federal law, they are able to extend and enhance existing legislation.

Section 2.3 Municipal

The Halifax municipal government has worked closely with the Federal Government (CFIA) at all stages, from detection to the implementation of this plan. Now that site characterization has concluded and the restricted boundaries set, the Municipality, responsible for all trees on municipal land, will play a major role in the management of this pest within Halifax.

Legislative authority for the management of the Urban Forest can be found in Section 77(1) of the Halifax Regional Municipality Charter which states:

The Municipality may
(a) remove dead, dying or diseased trees on public and private property;
(b) recommend and encourage (i) the proper pruning, protection and repair of privately-owned trees in the Municipality,
(ii) the planting of trees of suitable species at desirable sites within the Municipality.

Section 2.4 Private Property Owners

The responsibility of the maintenance, treatment, and removal of trees on private property rests with the property owner. Dead Ash trees that have been infested by EAB are a liability that must be dealt with in a timely manner, as the trees can become dry and brittle in a relatively short period of time following death. Therefore, public education and communication is critical in the management of EAB to ensure that the public can identify EAB and actions to be taken by property owners for treatment and tree selection for replanting after the removal of the Ash. The urban canopy can be further preserved through a proactive approach on private lands.

Section 4 Management Strategy

Section 4.1 Purpose

Due to the significant threat that the Emerald Ash Borer poses to the Municipality's urban forest, HRM staff identified the need for a management plan to address the impacts of Emerald Ash Borer as outlined in an information report sent to the Environment and Sustainability Standing Committee on December 6, 2018. The intent of this management plan is to reduce the environmental, safety and financial impact associated with this pest by strategically managing the municipality's urban forest.

Economic, Social, Environment impacts

As EAB spreads, there will be economic, social, and environmental impacts as Ash trees are lost. This loss can impact the urban forests and the associated benefits of green infrastructure.

Environmental Impacts

Trees provide numerous environmental benefits such as improved air quality, reducing the heat island effect, supplying oxygen, removing air pollution, carbon sequestration, improving water quality, and remediating soils to name a few. As Ash are lost from EAB infestations, the reduction of urban tree canopy will have a negative effect on the environment.

Social Impacts

The loss of Ash trees in terms of social impacts can be measured primarily in terms of loss of environmental benefits and community aesthetics. As trees quickly die and are removed, this can cause greater impact in some areas where there are high numbers of ash, resulting in a

decline in property values. Some studies have shown that loss of trees is correlated with decline in quality of life and increases in crime.

Economic Impacts
As identified in the Owen Sound EAB Management Plan, a study conducted by the Journal of Arboriculture and Urban Forestry, EAB will cause an estimated economic impact between $0.5 and $1 billion for the loss of Canadian street trees over the next 30 years. By using treatments to slow the spread, the study shows that the overall costs can be reduced. These estimated costs are for the treatment of EAB and do not include the general economic benefits of trees such as increased property values, energy savings, carbon sequestration, and pollution and runoff reduction from existing trees.

Components of an EAB Management Plan
In order to allow the preservation of high value trees and time to slow the spread of EAB where possible, this detailed EAB Management plan is structure to preserve the urban forest. Further, a stage approach will allow time to consider and introduce additional measures in the future as control measures are improved over time.

An effective and efficient EAB Management Plan will include the following elements:

- Identification / Inventory
- Monitoring
- Treatments (& Research)
- Public Education and Communication
- Evaluation

Section 4.2 Identification / Inventory

Certified arborists from Urban Forestry identify pests associated with trees. For the Emerald Ash Borer, Urban Forestry has worked with the Canadian Forest Service (FCS) and the Canadian Food Inspection Agency (CFIA) to conduct a characterization of the infestation to determine its extent. The characterized work is now complete, and these agencies continue working with monitoring. As noted in the *Emerald Ash Borer – Next Steps* (Appendix A) staff report, EAB has been positively identified in DeWolf park in Bedford. Current work includes limited sampling of Ash trees in sections of the ROW, parks, and open spaces.

A crucial component of the identification stage of the EAB management plan is a tree inventory to estimate the costs associated with different strategies and develop a targeted, proactive approach to monitor, treat, remove, and replace Ash trees. Current estimates indicate the inventory of Ash on HRM streets to be between 7,000 and 9,000 (5% of the street tree inventory); this number does not include the Ash in parks and natural areas. Loss of up to 5% of the street tree inventory over the course of the next 10 years would not go unnoticed, and in some neighbourhoods, Ash can represent up to 30% of the total street trees. Many parks throughout the Municipality also have large Ash populations, and these trees would also be targeted by the management plan.

In the Fall of 2019, pursuant a recommendation in the staff report *Emerald Ash Borer – Next Steps* (Appendix A) staff began conducting an inventory of street trees on the peninsula. Inventory work will need to continue into future years to capture all street and park trees across the municipality. This information will inform future budgets and assist with work planning associated with EAB management and Urban Forest asset management in general.

Section 4.3 Monitoring

In the case of the EAB, the CFIA has been monitoring its distribution for the past 10 years by installing traps across the Municipality. EAB was recently officially identified in DeWolf Park, Bedford. Urban Forestry and CFIA continue to monitor EAB.

Continual monitoring is important to identify hot spots of EAB as well as the progression of the pest throughout the municipality. As sites are identified, treatments can be determined to suppress insect populations.

Section 4.4 Treatment or Removal

Prevention

HRM Forestry has actively been promoting diversity in the selection of tree species during planting to reduce monocultures and reduce the severity and spread of infestations. The cyclical pruning program has been implemented to increase public safety and maintain tree health by reducing the likelihood and severity of pests and disease. Public education is an important tool to assist with pest management through cultural practices, such as movement of wood (e.g. moving firewood). Infested trees are selectively removed to prevent further spread of disease. Public Education is further explored in Section 4.6.

Physical (Pruning / Removal)

Physical pest control refers to pruning intervention to retain safety; it can also refer to tree removal. Removal of infested specimen can reduce the population of beetles in an area slowing, but not eliminating, the spread of the beetle.

As trees are removed, there must also be a strategy for disposal options for these trees.

Pesticides and Bio Control

In Canada, Tree-Azin™ has gained full registration in Canada as an insecticide (a bio-pesticide) for the treatment of EAB larvae. The pesticide can provide up to two years protection from EAB through injections into the tree that is distributed throughout the canopy.

FraxiProtec™ is an experimental biological control strategy. An insect trap has a pouch containing a fungus, *Beauveria bassiana.* As the EAB come into contact with the fungus, it enters the insects abdominal cavity and kills them in approximately five days.

HRM has already engaged with the Canadian Forest Service to trial FraxiProtec™ isolate of *Beauveria bassiana.*

Section 4.5 Replanting

The replanting strategy will be dependant on the site and would follow a staged succession approach. The strategy will be further developed as the tree inventory is completed. As Ash trees are removed, they will need to be replaced at a one-to-one ratio within the Right-of-Way with alternate species of similar size and form.

In the case of parks, and across naturalized areas of the municipality, alternate approaches may be more suitable to re-establishing urban canopy. Fore example, work is currently ongoing through Dalhousie University to characterize Natural White Ash populations in riparian areas of tributaries to the Bedford basin. This work will educate the development of site specific management strategies to mitigate the impact of canopy loss over watercourses of know aquatic significance.

Section 4.6 Public Education

Urban Forestry also plans to develop a community outreach and public education strategy for EAB to provide timely and accurate information with respect to the EAB.

The EAB program must also include a public education and outreach program as Ash trees exist on private lands. To keep the public informed in high-risk areas, information will be available on the website. Additionally, door hangers, posters, and social media can be utilized to educate the public. This campaign should involve a Communications Plan with Corporate Communications in order to develop an effective strategy.

In the spring of 2019, a public participation survey was conducted to identify the type of assistance / involvement the municipality could have with private homeowners affected by EAB. Participants were asked the question:

> *"What assistance, if any, would you like from the municipality in managing the Emerald Ash Borer Beetle in trees on your own property? Please be as specific as possible"*

There were 309 descriptive responses. There was a range of opinions, from people wanting to have no interference/assistance with their private property, to those that would like partial assistance and work with the municipality, to those who expect the municipality to bear the full responsibility/cost of EAB on private property. There was also a range of support for whether or not pesticides should be used. There were many who strongly opposed or supported the use of pesticides.

The 309 responses can be grouped into four major themes:

1. Information / Knowledge
2. Identification / Monitoring
3. Funding / incentives
4. Policy / regulation

Information / Knowledge
Respondents indicated that they had a lack of knowledge of EAB and had the following suggestions:

- Provide information on the identification of Ash trees
- Provide information on the signs / symptoms of EAB infestations
- Provide information on how to reduce/control/avoid the spread of EAB or preventative measures
- Identify problematic areas or regions where Ash are present and notify owners
- Keep the public updated on best practices
- Explain / provide guidance on options for treatment and recommend actions
- Provide robust, easily available information
- Identify where / who can help private landowners
- PSAs – social media, newspapers, radio, TV ads
- Guidance on appropriate trees to plant (replacement trees)

Identification / Monitoring
Respondents indicated that municipal staff should become more involved and provide support for private land matters involving Ash trees:

- Municipal staff should identify and inspect Ash trees on private property
- Municipal staff should provide guidance to owners, conduct assessments and monitor trees of private property owners

Funding / Incentives
Respondents indicated that owners would welcome financial assistance to manage EAB:

- Subsidies for treatments, removals, and maintenance (trimming)
- Financial assistance (loans) for treatment and removal of trees that can be repaid through taxes
- Pilot studies on private properties to test new strategies
- Tree removal at cost/discounted/free through city contractors
- Provide options available at a reasonable cost
- Municipality to purchase pesticides in bulk and provide to owner at a reduce cost
- Free trees or low cost of replacement trees available to owners for replanting that contain diversified species
- Use an emergency fund for a municipal-wide funded program with no cost to the taxpayer
- Financial support for low income landowners
- Disposal service / location for infested tree or tree cut in advance of infestation
- Cost sharing program between the owner / municipality to deal with management of EAB on private property
- Compensation for those with infested trees

Policy / Regulation

- The Municipality should work with other agencies to reduce the spread of EAB (e.g. restrict movement of nursery stock, firewood, etc)
- Registration program for authorization for the movement of wood

While not all of these suggestions are feasible or under the jurisdiction of the municipality, these comments can provide HRM guidance on how to focus efforts for private property owners and the issue of EAB management on private property.

Section 4.7 Evaluation

As the treatment plan is implemented, continuous monitoring of EAB will be required to measure the success of the plan. Further adjustments may be required overtime.

Section 5 Recommended Management Plan Option

The EAB management plan for Halifax will be an effective, responsible, and financially viable approach to managing the impact and spread of EAB.

Section 5.1 Treatment and Removal/Replacement

The recommended management plan will involve a combination of treatment or removals. While most Ash trees would undergo staged removals and replanting, allowing the transition of the Urban Forest away from Ash to other suitable species through an active replacement program, some trees with the greatest potential for return on investment would be considered for treatment.

Treatment of Ash will focus on trees with the greatest cultural, environmental, and economic value. The use of injectables would be limited to trees in good health and with a long life expectancy. Treatment using FraxiProtec™ will continue on an experimental basis until the product is registered in Canada; It is hypothesized that this product will provide broad protection of ash trees against EAB, however, testing is ongoing to validate efficacy. Loss of untreated trees in parks and open space is more manageable with staged removals.

When the economic benefits of trees are considered, the following observations can be made:

- The break even period between removals and treatments extends to approximately 20 years and longer for larger diameter trees.
- Under status quo (“do nothing”), the recognized benefits that the Ash tree component of the urban forest provides will be completely lost at the end of the 10-year period.
- A treatment / removal approach is likely to optimize the retention of tree benefits

Section 5.2 Public Support of Management Approach

A public participation survey on the Urban Forest Master Plan and Emerald Ash Borer was conducted in the spring of 2019. Over 600 participants provided their opinions on forest management practices. The survey indicated that of those that answered the question, 52% of participants completely supports the municipality’s urban forest initiatives and 26% mostly supported the municipality’s urban forest initiatives. A small percent were opposed (2%) and a

portion did not know or have enough information to make a decision (20%). See Figure 1 below.

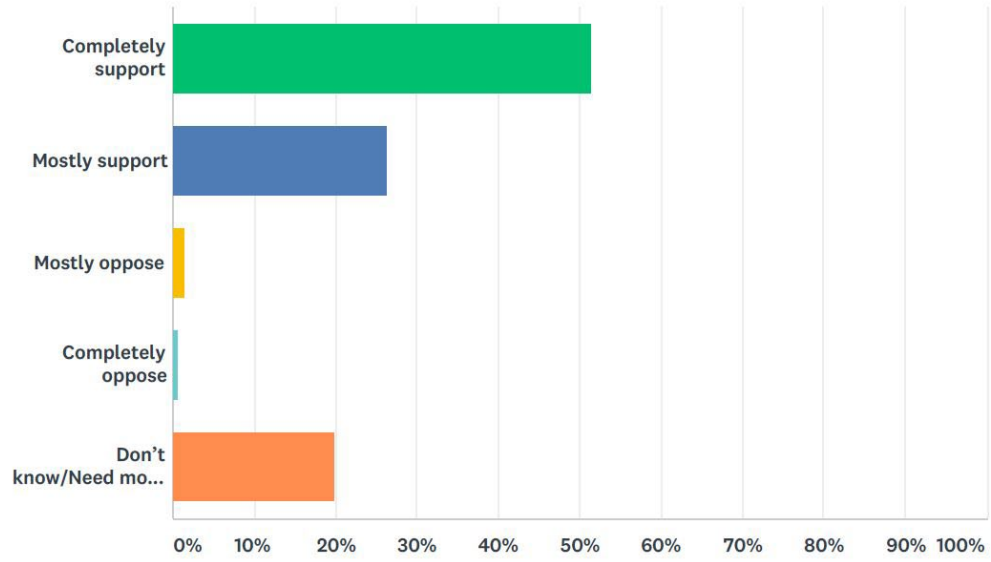


Figure 1: Participant's support for the Municipality's urban forest initiatives

The survey indicated that the majority of participants (65%) have heard of the EAB beetle. See Figure 2 below.

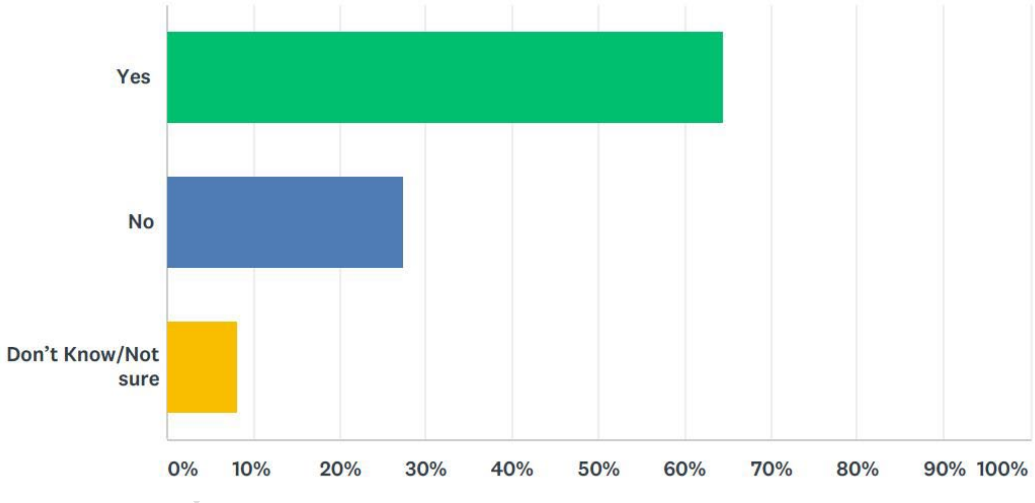


Figure 2: Participant's awareness of the EAB beetle

In response to the question of the importance of HRM to take actions to lessen the damage caused by these beetles on public and private property, the majority of participants believed it was critically important to take action on public property (66%) and private property (54%). Others identified that it was important, but not critical to take action (28% on public property and 34% on private property). A small segment believed that it was not very important, not at all important, or were not sure. See figure 3 below.

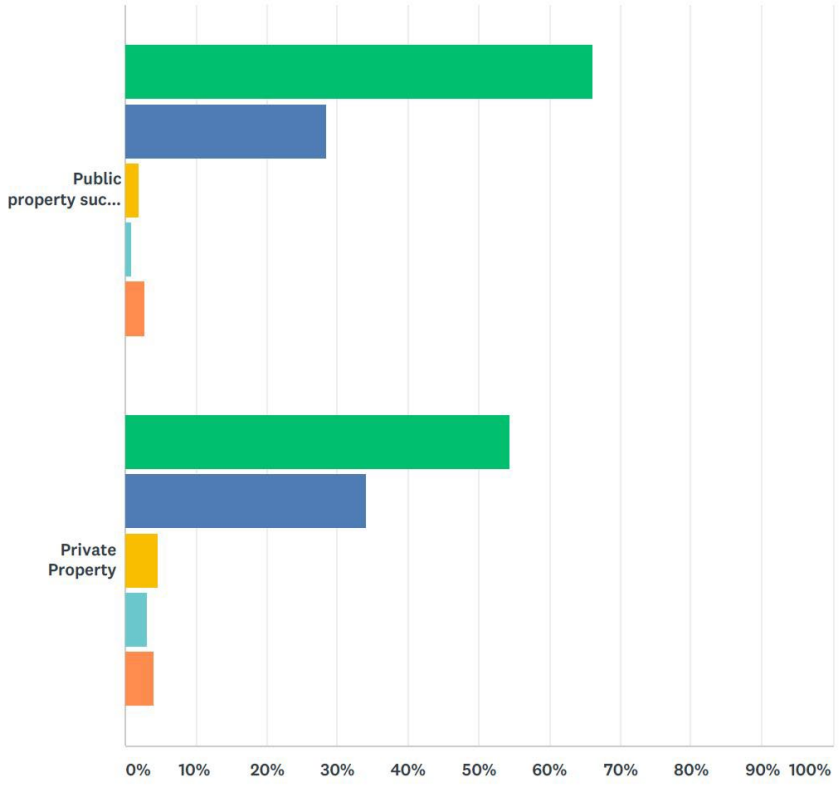


Figure 3: Participant's response to taking actions to lessen the damage caused by EAB

A majority of participants completely support (62%) or mostly support (31%) the use of public (municipal funds) to combat this issue and protect the municipality's urban forest (see Figure 4 below.)

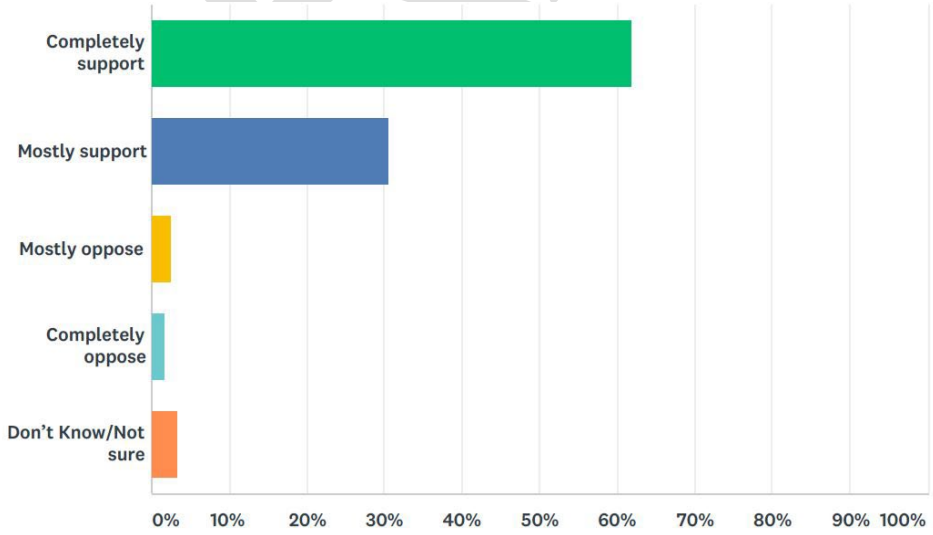


Figure 4: Participant's response to using municipal funds to combat the issue and protect the urban forest

When participants were asked if they were supportive of a “status quo” approach – meaning to not take action and letting nature to run its course (resulting in a large, lump sum cost in the future) – participants were generally not supportive of this option (65% mostly disagree or completely disagree). See figure 5.

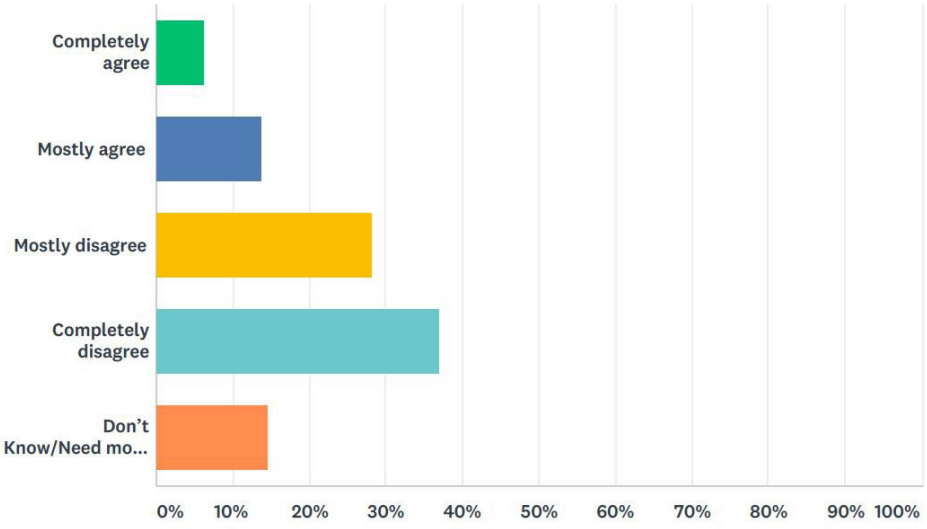


Figure 5: Participant’s response to following a status quo approach

An alternative approach, using a sustained budget for ongoing management including removal of infested trees and the treatment of trees that can be saved to preserve the native ash tree population was supported by the participants (79% completely agree or mostly agree). This alternative would require an on-going budget and increased workloads for staff. See Figure 6 below.

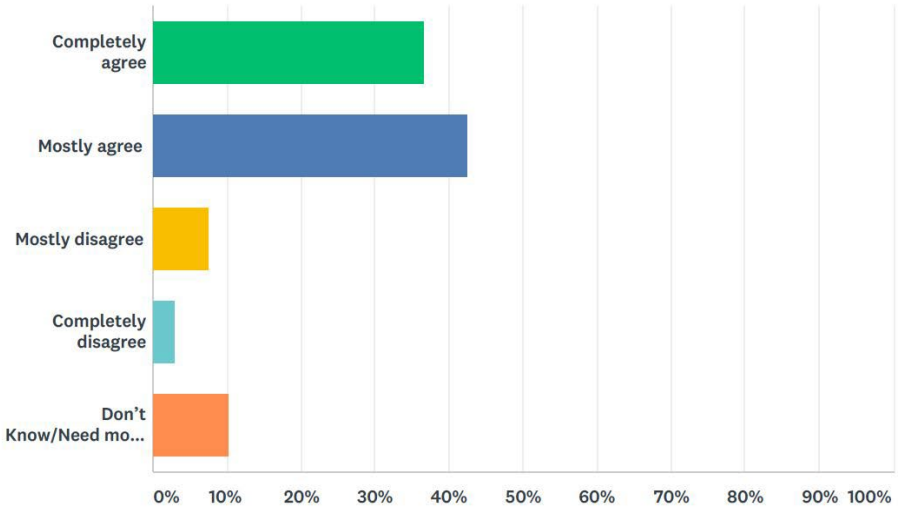


Figure 6: Participant’s response to a treatment / removal strategy

Participants were also supportive (68% completely agree or mostly agree) of a strategic approach to treat and preserve the best quality trees while removing affected trees to manage the outbreak. This strategy would transition the municipality's urban forest from Ash trees to another type of tree and would require sustained funding and continual work. See figure 7 below.

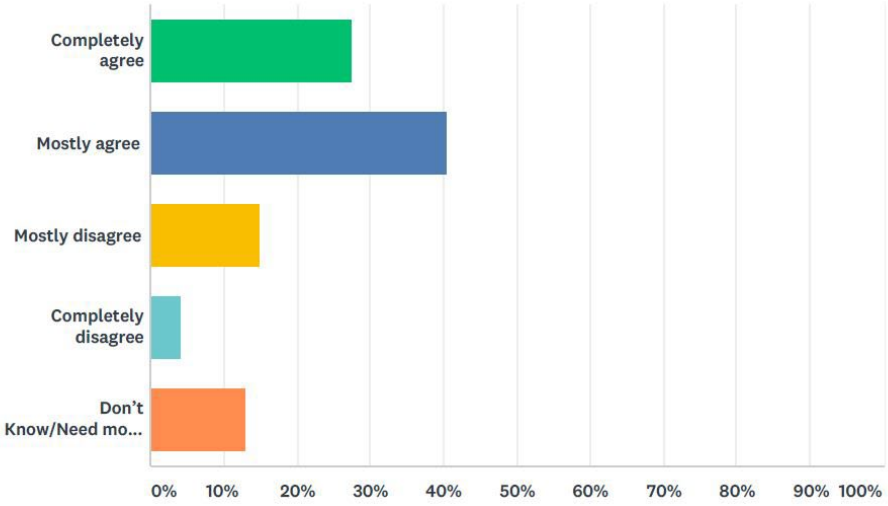
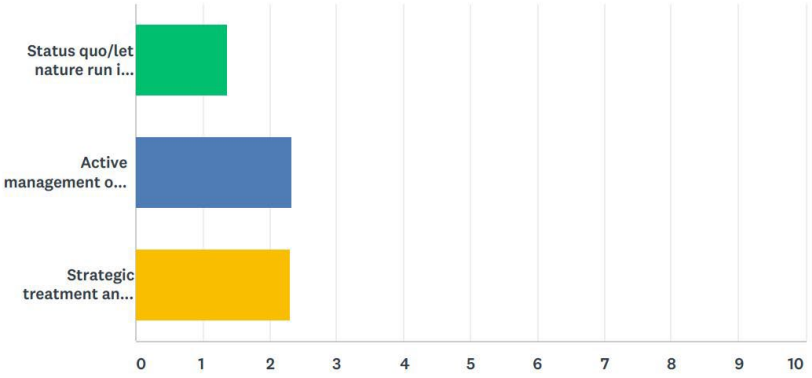


Figure 7: Participant's response to a strategic approach to treat and preserve best quality trees and remove affected trees

In terms of ranking the approaches to managing EAB, the number one ranked approach is active management of the infestation (46%) a strategic treatment and removal (41%), followed by status quo (13%). See figure 8 below.



	1	2	3	TOTAL	SCORE
Status quo/let nature run its course	12.94% 62	10.44% 50	76.62% 367	479	1.36
Active management of the infestation	46.15% 222	40.12% 193	13.72% 66	481	2.32
Strategic treatment and removal	40.82% 198	48.45% 235	10.72% 52	485	2.30

Figure 8: Participant's response to a treatment / removal strategy

Section 6 Plan Implementation

Section 6.1 Proposed Financial Costs

Current estimates indicate the inventory of Ash on HRM streets to be between 7,000 and 9,000; this number does not include the Ash in parks and natural areas. The average cost to remove and replace a street tree is approximately $1,500, which puts removal and replacement cost estimates between $10.5 million and $13.5 million for the street tree inventory alone.

The cost for treatment of Ash using available products approved by the Pest Management Regulatory Association are still unknown. As treatment can be expensive and not guaranteed, this information will inform a program of treatment, and guide decisions as to which trees may be selected for treatment, why and for how long.

Within the first two years of implementation of a management plan, costs are anticipated to be lower as the infestation is in its initial stages. These costs would be centered around inventory work and a selective treatment, removal and replanting strategy.

The funding request could range upward to 1 million in total with potential increases in subsequent years to service removal and replacement programs.

Implementation of the EAB management plan will commence in 2020 with a continuation of an inventory of trees. At the same time branch sampling, trapping and public education and outreach would continue.

Section 6.2 Timeline

Year 1-3: Tree inventory conducted.

As of November 2019, work has already begun on the Inventory, with much of the peninsula of Halifax completed. Work will continue in 2022 and beyond a staged approach to eventually complete the inventory of street and park trees requiring active management.

Years 2/3: Utilize tree inventory to confirm number of Ash trees, review strategy, and assess costs for operational planning to prioritize removal of high-risk trees and treatment of high value trees. Branch sampling, trapping, and public education will continue. Replacement trees within ROWs will be phased within existing tree planting tenders. Replacement trees within parks will investigate options to allow transition of the urban forest such as natural regeneration of other species, promoted growth of non-Ash species, and strategic planting through accepted management practices. Through this approach, a proportion of Ash trees will be preserved, the problem becomes more manageable, and the associated costs will be spread over a longer period of time. This strategy is promoted by The Society of Municipal Arborists position paper on EAB which states that: “an integrated approach that utilizes treatment along with removal of low-grade Ash trees is the best management strategy.”

Years 3+: Research suggests that EAB infestation follows a 10-year wave as host trees are either treated or succumb. Insect populations decline within the 10-year wave. After 10 years, it is expected that the EAB populations will decline and will also be reduced through natural predators and other biological controls. The EAB management plan will require a lifespan of 10 years. The EAB management plan suggests the most effective method to help reduce costs over the 10 years and cost calculations will be adjusted as further information is obtained from the tree inventory. Continued review of the plan is required to ensure the strategy is effective.

Section 6.3 Summary

The recommended option to best manage the short-term and longer-term treatment of EAB involves a management strategy that combines treatments, removals, and replanting's. Through this strategy, the best ash trees are retained and treated to preserve the benefits of these trees while also strategically staging the removal of poor quality, undesirable, small, dead or dying trees. As trees are removed, the urban forest can transition, diversity, and offer the ability to provide less treatment commitments over time. The survey results indicate that the general public appears supportive of a strategy that includes treatments and removals and to use public money to combat this problem.

Acknowledgements and Resources

Parks and Open Space, City of Own Sound, Community Services Department. Howard, J. (2014). *Emerald Ash Borer Management Plan*. https://www.owensound.ca/en/resourcesGeneral/Documents/Environmental-Information---EMERALD-ASH-BORER-MANAGEMENT-PLAN.pdf

Government of Canada (January, 2007). *Survey Guide for Detection of Emerald Ash Borer*. Co-published by Natural Resources Canada – Canadian Forest Service and the Canadian Food Inspection Agency.

FraxiProtec. https://www.fraxiprotec.com/en/