Final Report- Addendum

Results and recommendations towards a conservation plan for the Town of Hudson

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From:

eco²urb

To:

HUDSON

Addendum

Following the formal submission of the report submitted by Eco2urb in January 2020 to the Hudson Town council, a request has been issued for ancillary analyses to facilitate conservation planning. Specifically, forest connectivity and resilience have been identified as the two most imminent environmental issues for the town. The objective is to identify forests that are vulnerable to future biotic threats that fall within key conservation corridors. As the emerald ash borer has recently been observed in Hudson and has had an important negative impact on forest composition in Greater Montreal, the Town council has requested that the analysis focus on the vulnerability of ash-dominated stands. The contents of the present addendum can be used as a model for analyzing geospatial data to address environmental challenges impacting Hudson.

Methods

To identify natural areas that contribute positively to landscape connectivity and that are vulnerable to the emerald ash borer, a critical biotic threat, we began by consolidating the following geospatial layers:

- Regional connectivity
- Local connectivity
- Functional diversity
- Ash species dominance

Each layer grades forested areas (upland forests, forested wetlands) in terms of their contribution to landscape connectivity (regionally, locally) or forest resilience (functional diversity, ash species dominance). Further details on the methods employed to generate each layer are included in the main body of the report (Section 2.6). The one exception would be the variable *Ash species dominance*, which was originally a component used to calculate the variable *Vulnerability to current and future biotic threat*s. It relates the proportion of the forest stand dominated by ash trees (*Fraxinus americana*, *Fraxinus nigra*, *Fraxinus pennsylvanica*.), as determined using basal area data collected at sampling sites (Section 2.5.3.2.). As the objective of the current analysis was to identify areas that exhibit high biotic vulnerability, the variable *Functional diversity* was inverted as functionally diverse forests tend to be more resilient. Additional components previously used to rank forest resilience (*Drought resistance*, *Waterlogging toleranc*e) focus on abiotic as opposed to biotic threats and so were omitted from the current analysis.

The four variables were then analyzed together with the decision support tool, Zonation, as had been done previously to prioritize Hudson's natural areas for conservation (Section 2.7). Variables were assigned equal weights in the analysis. We omitted the hierarchical removal mask used to dictate whether certain natural features in the landscape should be given high conservation values by default. This was done to assess spatial priorities independently from the existing network of conserved land in the town.

Results

Data relating to regional connectivity (Section 3.3.2.1.), local connectivity (Section 3.3.2.2.) and functional diversity (Section 3.3.4.1.) are summarized in the main body of the report. Results specific to the vulnerability of forest stands to the emerald ash borer are provided below (Figure A1), as is the spatial prioritization of forest vulnerability and connectivity variables (Figure A2). Forests dominated by ash trees tend to be concentrated in eastern Hudson, along the waterfront and in treed wetlands (Figure A1). Those exhibiting high biotic vulnerability and high forest connectivity are similarly concentrated in eastern Hudson, specifically in Como forest (Figure A2).
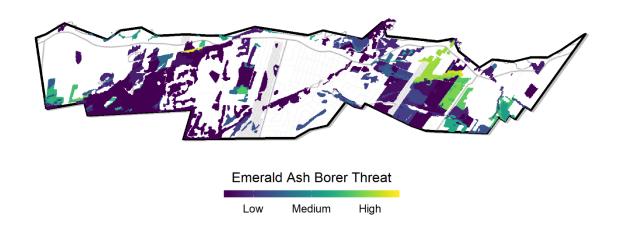

Figure A1. Distribution of forest stands vulnerable to the emerald ash borer.
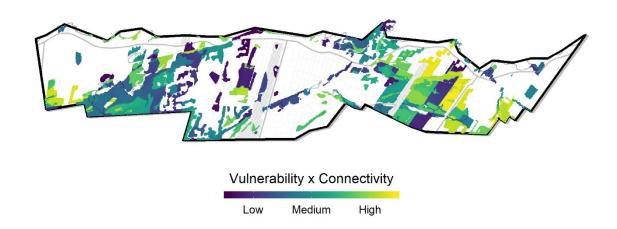

Figure A2. Priority forest stands exhibiting high biotic vulnerability and high forest connectivity.

Discussion

Strategic resilience planning requires managing natural resources in anticipation of biotic and abiotic threats. In the context of the current addendum, we identified forested areas vulnerable to the emerald ash borer that, if lost, could have an important and negative impact on landscape connectivity. Treed swamps dominated by ash species (e.g. *Fraxinus pennsylvanica, Fraxinus nigra*) are especially critical in this regard as they secure linkages between terrestrial and aquatic environments and are already underrepresented in southern Québec.

Although the broader conservation planning analysis in the main body of the report presents the most comprehensive assessment of co-benefits associated with natural areas in Hudson, focusing on its subcomponents can facilitate the implementation of landscape planning initiatives. We provide the following action items for natural areas with high landscape connectivity and biotic vulnerability:

Track the spread of biotic threats

Continued biomonitoring is essential to quantifying the propagation of biotic threats, such as the emerald ash borer, in the urban forest. Tools including pheromone-based traps and branch sampling are available through the Canadian Forest Service (CFS) for monitoring. Additional forestry inventories can help map the full extent of vulnerable tree species (e.g. ash), as reference data used here focused on tree composition at sampling sites.

Sensitize the public

The primary vector for the propagation of the emerald ash borer is the transport of firewood. We recommend educating the public on the risks inherent to moving firewood as well as fines levied by the Canadian Food Inspection Agency for the transport of infested materials.

Implement a SLAM strategy and gradually replace ash trees

As is the case for ash trees throughout the greater Montréal area, Hudson's ash trees are likely to be entirely lost to the impacts of the emerald ash borer. Strategies and efforts undertaken by the city of Montréal have been inspired by SLAM (Slow Ash Mortality) guidelines as proposed by McCullough et *al.* (2009) and Mercader et *al.* (2011). Management options as outlined by SLAM, whether through the removal, girdling or treatment of ash trees, aim to reduce mortality rates resulting from emerald ash borer infestation. We recommend implementing a SLAM strategy in Hudson while simultaneously planning for ash tree replacement by diversifying the canopy.

Improve the functional diversity of the forest canopy

Most of Hudson's forests are characterized by low to medium tree functional diversity (Section 3.3.4.1.), making them vulnerable to biotic threats as the loss of any species has a greater impact on stand composition than in more diverse forests. Efforts to improve the resilience of the urban canopy in Hudson would aim to diversify its constituting tree species with Functional Groups 3-8, as listed in Table 5. These include the following tree genera: apple (*Malus sp.*), basswood (*Tilia sp.*), birch (*Betula sp.*), cherry (*Prunus sp.*), hawthorn (*Crataegus sp.*), hickory (*Carya sp.*), oak (*Quercus sp.*), poplar (*Populus sp.*), willow (*Salix sp.*), spruce (*Picea sp.*), and walnut (*Juglans sp.*). These also include species such as red oak (*Quercus*

rubra), Scots pine (*Pinus Sylvestris*), and white cedar (*Thuja occidentalis*). Diversification efforts can target areas identified through the current analyses (Figure A2).

The selection of species for sites should be made in coordination with private property owners, forestry services, urban planners and a team of biologists. Eco2urb is in the process of developing analytical tools to design tree planting initiatives that optimize functional diversity and connectivity with neighboring stands. Additional organizations specialized in tree planting in the Montérégie region include Earth Day Canada and Nature-Action Québec.

Treat affected trees, where appropriate

Effective biocontrol programs are available for treating affected trees against biotic threats, such as the emerald ash borer. For instance, parasitic wasps are used to control emerald ash borer populations, as are naturally occurring pathogenic fungi. The use of parasitic wasps for the control of emerald ash borer is generally recommended for closed woodlands rather than urban forests. In urban environments, the strategic use of an insecticides such as *Tree-Azin* can help slow ash mortality rates. More information on possible treatments can be found in McCullough et *al.* (2009) and Mercader et *al.* (2011). Our analyses (Figure A2) indicate priority areas for treating and surveying affected trees.

Conclusion

Natural resource management is an iterative and dynamic process. Analytical tools and geospatial data developed by Eco2urb can be used to inform broader conservation planning efforts as well as first steps towards implementation. In a context of global environmental change, an evidence-based approach to managing natural resources will help secure ecosystem resilience in the long and short term.

   Taking data from our analyses and working with a partner NGO may be the best way forward to implementing the conservation recommendations outlined in our report. In this regard, two suitable partner organizations would include the Conseil régional de l'environnement (CRE) de la Montérégie as well as Nature Action Québec (NAQ). CRE Montérégie provides support services in conservation planning at the regional scale, public concertation, mediation and outreach. They are financed by the MELCC and can provide financial insights into funding opportunities available for land acquisition and sustainable development in Hudson. NAQ, on the other hand, has been working on building a green corridor extending through the Vaudreuil-Soulanges MRC, connecting forested areas from Ile Perrot to Rigaud. They work closely with private property owners to characterize natural areas (e.g. inventory rare species), assign conservation easements and restore disturbed forests and wetlands (e.g. control buckthorn spread). NAQ has built partnerships with multiple organizations (e.g. COBAVER-VS, MRC Vaudreuil-Soulanges, MELCC) to ensure that conservation planning reflects regional and federal land resource regulations. Working with either or both CRE Monteregie and NAQ can help establish blue and green corridors in Hudson. They can also help develop municipal guidelines that promote canopy diversification through planting strategies based on improving tree functional diversity. We can provide data analyzed in the context of our report to partner organizations as well as expertise and consulting services in resilience planning.

References

McCullough, Deborah G.; Siegert, Nathan W.; Bedford, John. (2009). Slowing ash mortality: a potential strategy to slam emerald ash borer in outlier sites. Proceedings of the North American symposium on Invasive Forest Species. January, 2009. Annapolis, Maryland.

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