From: [redacted]

To: Lou Stubecki

Cc: canopy-research-team@

Subject: Report: Vulnerability of Urban Canopy to Asian Longhorned Beetle

Lou,

Thank you for asking me to write this report on the vulnerability of the urban canopy to the Asian Longhorned Beetle. I have looked at the tree data on the Trees for Seattle website and have compiled this report detailing the number and composition of the vulnerable trees in our Urban Canopy. Around 35% of the trees in our Urban Canopy are vulnerable to ALB infection, and this number does not vary much between each council district. I have attached the full report, which contains recommendations on steps that should be taken to reduce the impact of the ALB. Please read this report and let me know of any further research or information you would like for me to do.

Thank you,

[redacted]

Vulnerability of Urban Canopy Cover to the Invasive Asian Longhorned Beetle

Executive Summary:

The Asian Longhorned Beetle (ALB) is an invasive species of beetle that can infect and kill trees. Although the ALB is currently limited to the East Coast, in the near future it poses a threat to the Urban Canopy of Seattle. Several genera of trees that, combined, make up 34.7% of King County's urban canopy are vulnerable to ALB infestation. A large part of the issue is due to the genera Acer (Maple), Betula (Birch), and Fraxinus (Ash) being overrepresented in the Urban Canopy.

The recommendation of this report is that fewer vulnerable trees are planted, especially those of the genus Acer, Betula, or Fraxinus. Reducing planting of these trees in favor of trees more resistant to the Asian Longhorned Beetle can greatly reduce the potential impact that the ALB can have on the Seattle Urban Canopy by the time the ALB arrives on the West Coast. In addition, close monitoring of vulnerable trees in the event that ALB spreads to the West Coast is necessary to understand the spread of the beetle in Seattle and take measures against infected trees.

Introduction:

The Asian Longhorned Beetle (ALB) is a small beetle that feeds on the bark of diverse species of tree. The ALB is endemic to northeastern Asia, but has recently become an invasive species in North America.[1] The ALB has a fast growth cycle and feeds on many types of trees, including Maple (Acer), Birch (Betula), and Elm (Ulmus), which are some of the more common trees in the Seattle Urban Tree Canopy. Infections only become apparent after 4-5 years and cause tree death after 10-15 years. There is currently no effective treatment for ALB infected trees.

Although the ALB has so far only been observed in the eastern United States, all states are considered at risk.[2] The ALB has the potential to impede the Urban Canopy Cover goal and there is little that can be done after cases are reported. It is therefore vital that proactive measure are taken to reduce the impact. This report looks at the seven council districts in Seattle, assesses their vulnerability to the ALB based on tree count and diversity, and then offers recommendations for steps that can be taken to reduce the risk posed by the ALB.

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[1] https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/asian-longhorned-beetle/asian-longhorned-beetle

[2] https://www.invasivespeciesinfo.gov/profile/asian-long-horned-beetle

Methods:

Seattle was divided into its seven council districts:

Figure 1: The seven council districts of Seattle 1: West Seattle, 2: Beacon Hill/ Columbia City/ Rainer Valley, 3: Capitol Hill/ Central District, 4: U-District/ Eastlake /Ravenna, 5: North Seattle, 6: Ballard/ Freemont/ Green Lake, 7: Queen Anne/ Downtown/ Magnolia.[3]

Tree species and location data were gathered from the Trees for Seattle Urban Forest Resilience map and from City of Seattle Geodata.[4] In each district, trees were counted

[3] https://www.seattle.gov/neighborhoods/neighborhoods-and-districts

[4] https://data-seattlecitygis.opendata.arcgis.com/datasets/trees //Accessed 4:15PM 5.28.20

by genus and sorted into two categories, “vulnerable” and “not vulnerable”, based on their genera’s susceptibility to the ALB. Trees of the following genera:

- Fraxinus (Ash)
- Betula (Birch)
- Ulmus (Elm)
- Koelreuteria (Golden raintree)
- Platanus (Sycamore)
- Acer (Maple)
- Aesculus (Horsechestnut)
- Cercidiphyllum (Katsura)
- Albizia (Mimosa)
- Sorbus (Mountain ash)
- Populus (Poplar)
- Salix (Willow)

Were considered vulnerable to ALB infection, while trees of other genera were not considered vulnerable, and have not been known to experience ALB infection. Genera susceptibility was determined according to USDA recommendations.[5] Full data is shown in appendix 1.

All data processing was done using Microsoft Excel. District vulnerability was determined using the percentage of vulnerable trees over total trees. The percent composition of the vulnerable trees was calculated by dividing the population of the vulnerable species over the overall population in each district and overall.

[5] https://www.aphis.usda.gov/aphis/resources/pests-diseases/asian-longhorned-beetle/About-ALB

Data/Results:

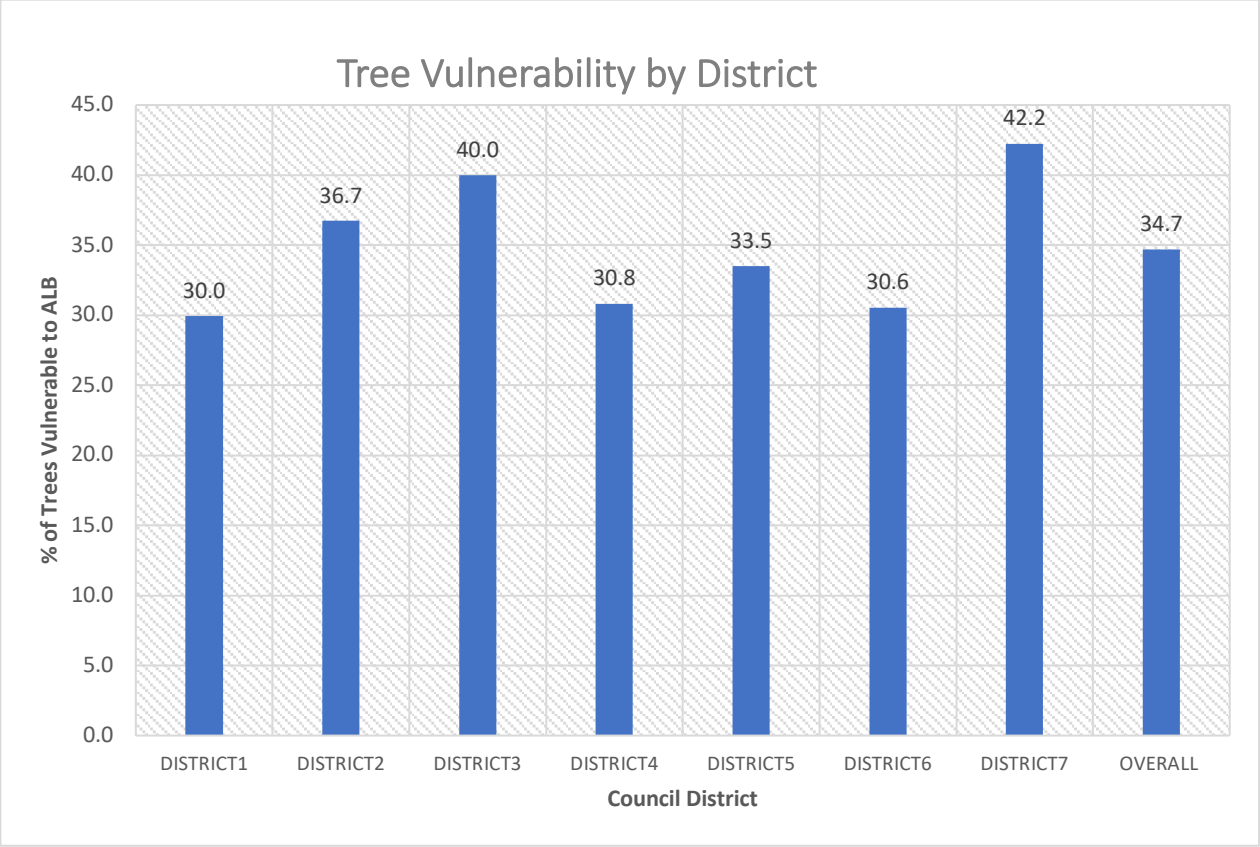

Figure 2: Percent Vulnerability by Council District

Seattle has, on average 34.7% of its trees susceptible to ALB invasion. District 1: West Seattle, is the least vulnerable with only 30.0% of its trees potentially vulnerable; District 7, Queen Anne/Downtown/ Magnolia is the most susceptible with 42.2% of its canopy composed of vulnerable species. Overall, the vulnerability of each district is relatively uniform, with no more than a 12.2 percentage point difference between the least and most vulnerable districts.

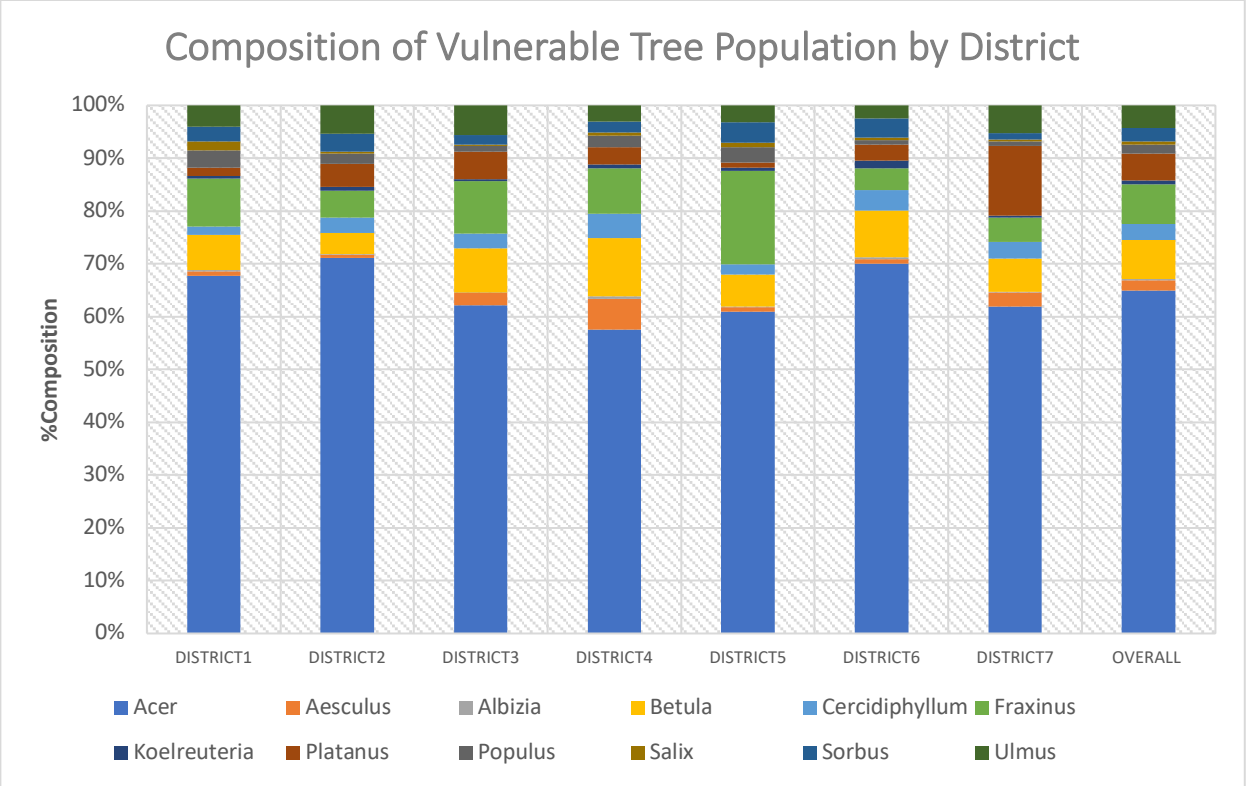

Figure 3: Percent Composition of Vulnerable Trees by District

The composition of each district is relatively uniform, with the majority of the vulnerable trees being of the genus Acer (Maple), Betula (Birch), or Fraxinus (Ash). These three genera make up 79.8% of all vulnerable trees. Overall, trees of the genus Acer represented 22.5% of the Urban Canopy. Trees of the genus Betula and Fraxinus both represented 2.6% of the canopy. Each of the nine other species represent less than 1% of the Urban Canopy each. Overall, the majority of vulnerable trees are of the genus Acer, with genus Betula and Fraxinus contributing to most of the other vulnerable trees. In District 7, trees of the genus Platanus (Sycamore) are also a concern, making up 13.2% of vulnerable trees in that district.

Conclusion:

Seattle's Urban Canopy remains vulnerable to the ALB, with 34.7% of the trees vulnerable to infestation. The vulnerability is in large part due to three genera of trees, Acer, Betula, and Fraxinus being overrepresented; together they make up 79.8% of all vulnerable trees. The findings from this data suggest that it is necessary to diversify Seattle's Urban Forest away from these vulnerable trees.

For newly planted trees, decreasing the amount of these three trees planted in favor for more resistant trees would decrease the vulnerability of the Urban Forest to ALB infections. Reduction of vulnerable species not only decreases the percent of trees

vulnerable, but also reduces the rate of infection by reducing the density of vulnerable trees, making it more difficult for the ALB to cross infect other trees.

In addition, close monitoring of the vulnerable trees is necessary. Infection by ALB is slow, with many trees surviving for 10-15 years after initial infection. These trees will gradually deteriorate in health and dead, falling branches could pose a hazard to both people and property. Yearly observation of infected trees, and a program of cutting down and replacing them with less vulnerable trees will be necessary when the ALB spreads to Seattle.

Appendix:

	Acer	Aesculus	Albizia	Betula	Cercidiphy	Fraxinus	Koelreuter	Platanus	Populus	Salix	Sorbus	Ulmus	Total Vulnerable:	Total:	% Vuln
DISTRICT1	5019	63	24	488	121	673	38	110	246	124	213	295	7414	24750	30.0
DISTRICT2	6144	53	12	344	252	436	60	383	161	36	289	468	8638	23514	36.7
DISTRICT3	6213	239	9	825	282	993	44	522	109	21	185	555	9997	25005	40.0
DISTRICT4	4030	405	35	774	320	600	49	230	152	47	146	211	6999	22719	30.8
DISTRICT5	2592	33	6	259	81	754	25	42	125	35	164	136	4252	12694	33.5
DISTRICT6	7047	88	37	894	391	415	144	302	84	58	362	246	10068	32951	30.6
DISTRICT7	6237	260	11	638	322	464	35	1327	83	37	129	522	10065	23839	42.2
OVERALL	37282	1141	134	4222	1769	4335	395	2916	960	358	1488	2433	57433	165472	34.7

Appendix 1: Vulnerable Trees categorized by genera and district