

The Impact of Heat: A Western Redcedar (*Thuja Plicata*) Case Study

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Context

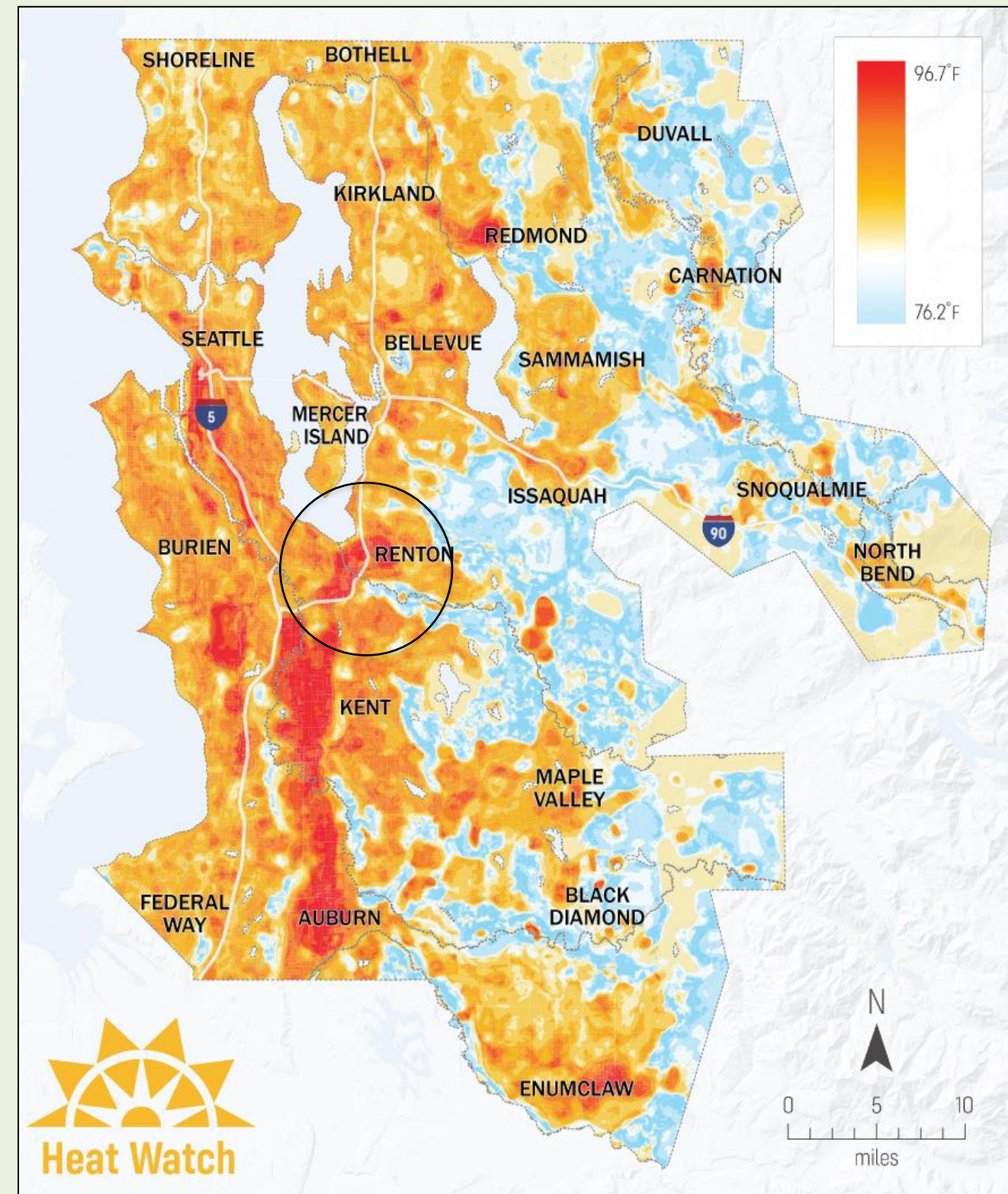
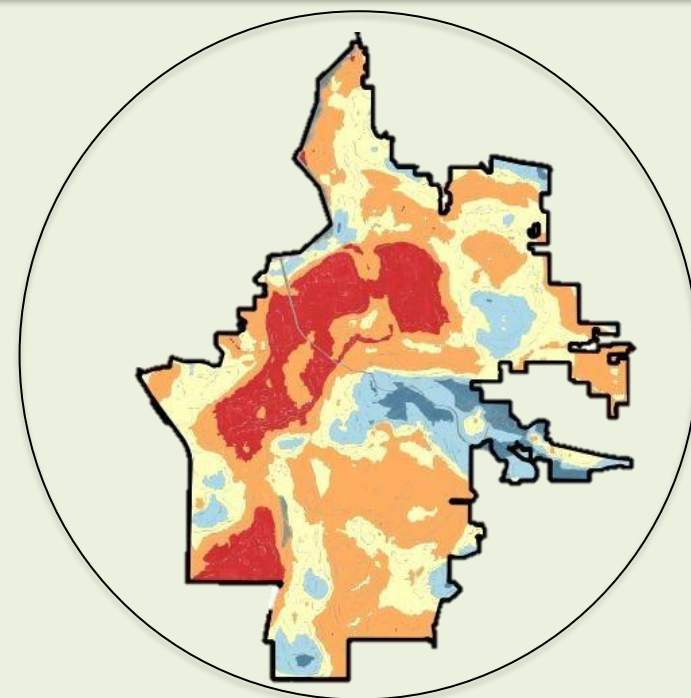


Figure 1. Thermal map of King County displaying surface temperatures in the evening. Constantine, D. (2021, June 23).

- Urban heat islands tend to exist in lower income neighborhoods – often with people of color – exacerbating issues with pollution
- Hotter summers are having a harmful, inequitable impact within King County. (fig. 1)
- The Western Redcedar, a species native to the Pacific Northwest found on many urban roadsides, is experiencing gradual decline. The purpose of this study was to explore heat as a potential cause.

Figure 2. A Thermal map of modeled near-surface temperatures in Renton, WA between 7–8 pm on July 27, 2020, circled on figure 1.



Results



Figure 4. From left to right, Western Redcedars in King County that A) displayed full health in an area of surface temperature 76°F on average, B) displayed tree dieback and a thinning canopy in an area of surface temperature 80°F on average, and C) displayed severe heat damage.

- 74% of the observed trees displayed signs of heat damage from an extreme heat event at least in the lower canopy, across all temperatures and marked on a scale from “low” to “severe”
- Severe heat damage was regularly present on trees located in areas of higher average temperatures (fig. 4)
- There is a weak positive correlation of heat with tree dieback (fig. 5) defined by thinning canopy (fig. 3)

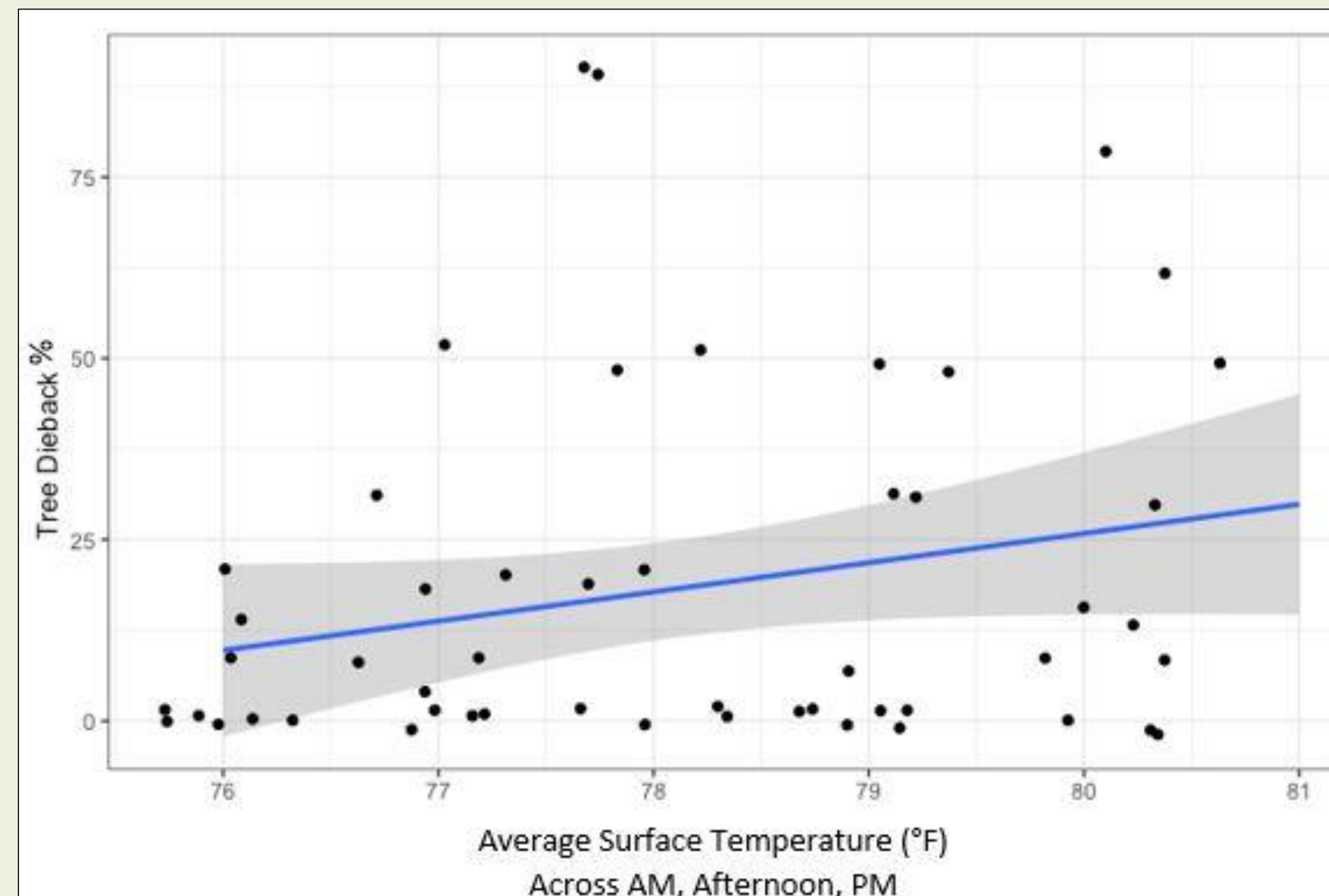


Figure 4. Positive trend line displaying average tree dieback, or gradual death, percentage of Western Redcedars in Renton as surface temperature averaged across times of day increases. This data consists of 50 trees collected at areas of 76°–80°F average surface temperatures and was plotted via RStudio, with the shaded region being confidence interval and the points scattered from their original Y-axis for readability.

Results cont'd

- Trees displayed signs of stress in addition to heat damage
- Tree dieback is not a result of extreme heat [events] alone, further research is needed and may look different for other species
- Established, older trees have the most impact on pollution and heat mitigation
- Protection of existing mature trees may arguably take more priority than planting new trees
- Air pollution and heat are related issues, tackling mitigation in both can be significant in alleviating their impacts

Significance

- Extreme heat events will hit urban heat islands and communities already vulnerable to climate change the hardest, potentially furthering inequity
- We need trees in our urban environments to improve human and natural ecosystem well-being
- The loss of native tree species will harm the biodiversity of a region in the long run
- The Western Redcedar's needle composition can alleviate bad air quality that is made worse by heat
- We are certainly on the path of rising temperatures; learning how to make our urban and natural ecosystems resilient and preparing for unknown scenarios can only benefit us and the move toward environmental justice

Acknowledgements

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Research Questions

Is there a relationship between heat and Western Redcedar dieback?
How does rising heat impact the urban canopy?

Methodology

- I partnered with Forest Health Watch to collect qualitative data through iNaturalist on Western Redcedars within Renton, WA, a city within King County inequitably impacted by heat
- Conducted data analysis through QGIS and the R programming language to find trends in damage, temperatures, and dieback
- Researched scholarly literature on the impacts of humans and climate on tree health, urban heat islands, and the composition of Western Redcedar alongside other native species



Figure 3. A Western Redcedar experiencing dieback