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Participatory Mapping of Tree Equity, Preferences, and Environmental Justice in Portland, OR

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Participatory Mapping of Tree Equity, Preferences, and Environmental Justice in
Portland, OR

by
Katharine Vezin Gregory

A thesis submitted in partial fulfillment of the
requirements for the degree of

Master of Science
in
Geography

Thesis Committee:
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Portland State University
2023

Abstract:

Studies have shown that marginalized communities do not have the same access as more privileged groups to urban tree canopy cover due to historic and current processes of discrimination and disinvestment. This study explores the lived experiences, narratives, and values related to trees and greenspaces for residents of Portland, OR, through participatory mapping focus groups. It uses an environmental justice and urban political ecology framework to examine how values, lived experiences, and narratives compare for Portland residents across neighborhoods, socio-economic status, and racial or ethnic identity and how the changes that matter to residents can inform more just urban greening practices. Both mapping and qualitative data results showed that participants mostly valued trees in similar ways, but with some differences that were specific to racial and ethnic groups. Participants also had different lived experiences of tree canopy, based on whether they lived in a wealthier and more densely treed part of Portland, or in a low-income area with fewer trees. Memory and knowledge of Portland's history played a significant role in shaping narratives about tree inequity, informing how recognition justice can be achieved by incorporating historic injustices and community memories into restoration practices that rectify past injustices in urban environments. Narratives about tree planting intersected with other concerns such as transportation safety, housing, and development, while tree maintenance narratives illustrated limited to no maintenance responsibility from the city and concerns about the inequitable burden of maintenance, indicating that procedural and restorative justice practices are needed. These values, lived experiences, and narratives, both different and shared, demonstrate that future policy

needs to prioritize recognition and restorative justice practices in tree planting and other urban greening projects.

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Table of Contents:

Abstract:.....	i
Acknowledgements:.....	iii
List of Tables:	ix
List of Figures:	x
1. Introduction.....	1
1.1 Research Questions and Objectives	3
2. Literature Review.....	4
2.1 Environmental Justice and Urban Political Ecology.....	4
2.2 Environmental Justice and Urban Tree Politics	8
2.3 Community Based Tree Research.....	12
2.4 Significance of the Study	16
3. Study Area Background.....	17
4. Research Methods:.....	21
4.1 Participatory Mapping for Land Use Planning, Urban Forests, and Collaboration	21
4.1.1 Participatory mapping of rural and urban forests	23
4.1.2 Environmental Justice and Participatory Mapping	25
4.2 Data Collection.....	28
4.3 Data analysis	34
5. Results:.....	38
5.1 Values, Lived Experiences, and Distributive Justice	38
5.1.1 Valuing Outdoor Spaces vs. Other Neighborhood Amenities.....	39
5.1.2 Tree Values	42
5.1.3 Lived Experiences of Trees and Outdoor Spaces.....	46
5.2 Memory, History, Recognition Justice, and Restorative Justice.....	51
5.3 Intersecting Tree Planting Narratives and Restorative Justice	57
5.3.1 Tree Planting Along Major Corridors and Transportation Safety Issues	59
5.3.2 Tree Planting and Houselessness	65
5.3.3 Development, tree canopy loss, and restorative justice	68
5.4 Maintenance Concerns and Responsibility Narratives.....	72
5.4.1 Maintenance Concerns.....	73

5.4.2 Inequitable Maintenance Burden	75
5.4.3 Inequitable power relationships	77
6. Discussion:	80
6.1 Limitations	91
7. Conclusion	94
References:	98
Appendices:	108
Appendix A: Participatory Mapping Worksheet	108
Appendix B: Examples of data collection maps	113

List of Tables:

Table 1: Gender identities of all participants	30
Table 2: Racial and Ethnic identities of all participants	30
Table 3: Ages of all participants	30
Table 4: Average time lived in neighborhood for all focus groups.	31
Table 5: Breakdown of total focus group participants.....	33
Table 6 From the Title 11 Tree Code, Table 50-2	89

List of Figures:

Figure 1 Study Area.....	17
Figure 2 Study Area Close Ups.	29
Figure 3 Important tree locations	47
Figure 4 Tree Perceptions, Areas with Lack of Trees vs. Areas with More Trees	48
Figure 5 Tree Concern locations.	58
Figure 6 Desired tree planting locations.	58
Figure 7 No Tree Planting	59

1. Introduction:

Studies have demonstrated the innumerable amenities trees and greenspace provide to urban residents. These amenities include health and wellbeing benefits, stronger sense of community, aesthetics, spirituality, animal habitat and ecosystem benefits, higher property values, and cooler temperatures (Maco and McPherson, 2003; Kirkpatrick et al., 2012; Searmans, 2013; Namin et al., 2020). Research has also shown an overall decline in urban tree canopy across the United States (Nowak and Greenfield, 2018), including in my study area, Portland, OR, over the last five years (City of Portland, 2022). Furthermore, trees are not equitably distributed in most major US cities, and as a result some communities, usually communities of color and low-income communities, experience higher exposure to poor environmental conditions such as air pollution and urban heat (Namin et al., 2020; Hoffman et al., 2021; Lane et al., 2022; Nardone et al., 2021). Academic discourse increasingly criticizes the apolitical nature of urban greening research and the need to incorporate critical theories that reveal the historic and ongoing processes that perpetuate inequity and marginalization (Heynen et al., 2006; Grove et al., 2020, Anguelovski et al., 2020; Schell et al., 2020). Urban greening projects such as tree planting are not viable or just solutions if they misalign with community values, conflict with identities, and further displace vulnerable populations from healthy urban environments and decision-making processes (Koo et al., 2019; Ordóñez-Barona, 2022; Riedman et al., 2022; Drew-Smythe, 2023).

This research seeks to identify the values, narratives, and lived experiences of community members in Portland, Oregon, related to trees and urban greenspace to inform

more just and inclusive tree-related policy and practices. Five focus groups with a participatory mapping component were conducted with residents of several areas of Portland with different socio-economic backgrounds. This design provided a comparative analysis between residents from a privileged neighborhood with abundant trees and residents from neighborhoods with lower-income and marginalized residents and fewer trees. The participatory mapping component provided a means for participants to connect their values, lived experiences, and narratives to place, allowing for further reflection and qualitative spatial data outputs in addition to transcripts of focus group conversations. Results showed that while many values were similar among the participants, some values varied in ways that reflected different race and class identities. Lived experiences were different between participants from neighborhoods with histories of investment and privilege versus neighborhoods with histories of disinvestment and marginalization. Narratives among groups revealed similar themes, including concerns about historic injustices and inequitable wealth distribution contributing to current tree inequity, the complexity of housing development and tree removal and planting, and the inequitable maintenance burden of trees in the right of way. Differing narratives also emerged related to the intersection between trees and transportation safety, as well as trees and the housing crisis.

I analyzed participatory mapping and qualitative data results using an environmental justice framework informed by urban political ecology to determine how past and current injustices can inform restorative and just tree-related policy and practices that center the needs and desires of community members. Analysis of results using four tenets of environmental justice (distributive, procedural, recognition, and restorative

justice) revealed the importance of including all forms of justice but especially restorative justice practices in urban tree planting, maintenance, and other greenspace policies. The range of values, lived experiences, and narratives warrant policies that are nuanced and inclusive, that seek to undo the production of difference and exclusion, and that ask communities most affected by environmental injustice what kinds of changes matter to them.

1.1 Research Questions and Objectives

This study seeks to determine how past and current injustices can inform restorative and just tree-related policy and practices and ultimately share the visions of community members so that urban environments can reflect their values. The research and analysis conducted for this study were guided by three questions:

1. What are Portland residents' values, lived experiences, and narratives related to trees, tree planting, tree maintenance, and urban greening?
2. How do tree-related values, lived experiences, and narratives differ between Portland neighborhoods with different histories and demographics?
3. How can Portland residents' values, lived experiences, and narratives inform more just tree planting and tree maintenance practices?

2. Literature Review:

2.1 Environmental Justice and Urban Political Ecology

This research contributes to existing work on community values, tree planting and maintenance, and urban greenspace by incorporating an environmental justice and urban political ecology framework. Urban political ecology provides a framework through which to critically examine processes of spatial exclusion and material production of difference in urban environments. Similarly, environmental justice not only addresses the unequal exposure of vulnerable communities to environmental harms, but also the systems and processes that continue to produce these inequalities and how to address environmental injustice through restorative and emancipatory means. Cross-pollination across these two fields has enabled more critical examination of unequal exposure to environmental harms and ongoing processes of exclusion and a lens through which the politics of urban tree-human relationships can be explored.

Urban political ecology (UPE) is a subdiscipline of geography that explores the ways human-environment relationships are mediated and shaped by uneven power distributions, with a particular focus on urban spaces (Heynen, 2014). It is a critical framework for analyzing the ways that urban spaces are conceptualized as “unnatural” and how the “natural” resources within them such as clean air, clean water, and healthy ecosystems and green spaces become unevenly distributed. Cities are incredibly complex places where residents are surrounded by “the artificial” and patterns of spatial marginalization through exposure to toxins are particularly acute (Heynen et al., 2006). UPE has an agenda to address the unequal power relationships that denaturalize the city

and dictate the prioritization or marginalization of social groups through spatial processes. This involves more inclusive environmental practices that establish more equitable distributions of power. UPE has evolved to incorporate feminist, Black, and queer geographies and a continued effort to reveal the spatial processes of difference. In an exploration of “abolitionist” ecologies, Heynen (2016) states that UPE should engage with historic processes of discrimination against Black, indigenous, and other people of color to understand how spatial stratification of urban environments has evolved.

Urban political ecology has its roots in critical Marxist theory and thereby deeply examines the production of difference and marginalization, but it works in concert with environmental justice theory, which has its roots in activism but similarly examines the ways people of color and other marginalized groups are disproportionately exposed to environmental harms and degradation (Pulido, 2017; Pellow, 2016). Researchers began finding connections between class status, air quality, and land and water contamination during the 1970s, which sparked social movements that addressed inequitable exposure to a range of environmental harms for low-income communities as well as communities of color (Pellow, 2016). EJ activism and research evolved simultaneously to study and contest how “marginalized communities are disproportionately affected by ecologically harmful infrastructures [...] as well as by the negative consequences of ecologically harmful practices, such as climate change/disruption and pesticide exposure” (Pellow, 2016, p. 222).

Critical environmental justice involves expanding EJ to address all forms of social inequality and to incorporate a multi-scalar and temporal approach instead of focusing on one place and time (Pellow 2016). It also pushes beyond working with the state and

toward anti-authoritarian frameworks and beyond humans to more-than-human natures. Dismantling governmental and species hierarchies delegitimizes existing power structures and creates space for positive change and more environmental equality (Pellow, 2016). EJ provides a critical framework that does not just view people of color and other social groups as marginalized, but as devalued, erased, and rendered disposable through inequitable exposure to environmental harms that causes illness and early death (Pulido, 2017). Such an approach “contends that these threatened bodies, populations, and spaces are *indispensable* to building socially and environmentally just and resilient futures for us all” (Pellow, 2016, p. 224). For environmental justice to be successful, academics and activists must engage with race, environmental racism, and racial capitalism to acknowledge the power of white privilege and white supremacy in the production of environmental injustice (Pulido 2015, Pulido 2017).

Several iterations of EJ commonly referred to in critical EJ work are distributive justice, recognition justice, procedural justice, and restorative justice (Bell and Carrick, 2017; Whyte, 2017; Pellow, 2018; Svarstad and Benjaminsen, 2019). Distributive justice addresses the unequal burden of pollution, poor air quality, toxins, and other environmental harms for communities of color and other marginalized groups. However, distributive justice has been criticized for its failure to recognize the forms of power that continue to perpetuate inequity, like who is involved in the decision-making processes that determine how environmental injustices are addressed (Bell and Carrick, 2017). Often the people who are more privileged, and who experience more environmental benefits than burdens, are more involved in decision-making than people who experience environmental burdens like toxins or poor quality (Bell and Carrick, 2017). Unjust power

distribution is why environmental justice activists and scholars look beyond the distributive qualities of justice and examine the “fairness and process of environmental policy-and decision-making” (Bell and Carrick, 2017, p. 101). Procedural justice examines how power, especially exercised by governing bodies, dictates who has a voice in decision-making and who is excluded from those processes. This is relevant for environmental justice because of the need for governing bodies to implement protective, preventative, and reactionary policy that addresses poor environmental quality or environmental harms that are caused by disinvestment or extractive capitalist practices. But scholars have also noted the difficulty of actually achieving procedural justice because of the one-size-fits-all approach of environmental policy and the challenge of including non-state actors in decision-making in ways that actually shift power (Bell and Carrick 2017).

Recognition justice seeks to address some of the pitfalls of distributive and procedural justice. The critique that recognition justice poses for distributive and procedural justice points out the “sameness or strict equality” that these paradigms often adhere to (Whyte, 2017, p. 113). Assigning policies or measures equally across space and populations may check the box of justice in the procedural world, but it fails to acknowledge difference. Addressing the production of difference, both socially and spatially, is crucial for achieving environmental justice, which recognition justice seeks to do (Whyte, 2017). It centers the current and historic experiences of marginalized communities “by the state and society at large, [which] is crucial for increasing the status and power of these groups—and concomitantly, decreasing the injustices that they may suffer” (Svarstad and Benjaminsen 2019, p. 4). However, decolonial work may still be needed in addition to

recognition justice. Understanding how historic and systemic exclusion and racism have shaped environmental injustices is crucial, but implantation of justice solutions also must address the needs of communities experiencing environmental burdens.

Restorative justice is called for by critical race and indigenous scholars to wholly shift the power to create envisioned and desired environmental futures to afflicted communities. It calls attention to environmental injustices that have occurred because of white settlers taking land and projects of removal, erasure, genocide, devaluing, and displacement (Pulido 2017; Gilio-Whitaker 2019). In the context of urban environments, restorative justice can help identify when attempts to create better environmental conditions, such as urban greening projects, environmental remediation, and sustainability projects, perpetuate existing injustices and recognize where reparations are needed (Anguelovski et al. 2020). Overlap exists between these forms of EJ, so different types of implementations may address multiple paradigms. This study explores how distributive, procedural, recognition, and restorative justice emerge in discourse about urban tree-human dynamics in Portland, OR, to inform more equitable practices, policies, and methods for healthy and diverse human-environment communities.

2.2 Environmental Justice and Urban Tree Politics

The politics of trees and urban greening have been explored through a range of environmental justice lenses. Investigation of environmental justice in the context of urban trees began with more distributive justice centered approaches. Studies conducted in Milwaukee showed the inequitable distribution of urban trees in relation to race and

ethnicity and unequal tree access for rental properties, indicating injustice in tree planting programs that mostly involved owner-occupied households (Heynen, Perkins, and Roy, 2006; Perkins, Heynen, and Wilson, 2004). Inequitable distribution of trees is not only true for canopy coverage overall, but also the proliferation of street trees in the public right of way (Landry and Chakroboty 2009). Distributive justice can begin to uncover inequities in urban trees and greenspace, however it does not capture the nuances of how communities may experience or perceive these amenities. Black residents of Atlanta have gained proximity to urban greenspace in the past decade because of displacement of Black residents from inner-city areas to the outskirts of the city where there are more trees (Koo et al. 2019). However, residents reported a preference for living in more walkable neighborhoods over more vegetated areas, but were blocked from walkable areas due to high housing prices (Koo et al., 2019). A study in Toledo, OH, found that although areas with more people of color and low-income residents were highly vegetated, the vegetation in these areas tended to be overgrown and on vacant or abandoned properties (Berland et al., 2020). Residents of these areas viewed untended vegetation on vacant lots as a disamenity rather than an amenity because it signified lack of attention and increasing disinvestment by local government agencies (Berland et al., 2020). Undoing these legacies of disinvestment involves the inclusion of community values and narratives in the assessment and tending of urban vegetated areas through other forms of justice.

Academic discourse increasingly examines the ways historic segregation and racist policies such as redlining have contributed to urban environmental inequities. This discourse exemplifies distributive and recognition justice by exploring the relationship

between areas that were redlined on historic Homeowners Loan Corporation (HOLC) maps and modern urban tree canopy (Locke et al. 2021, Namin et al. 2020, Nardone et al 2021), urban heat indices (Hoffman et al. 2020), and health disparities (Lane et al. 2022). HOLC maps were created in the 1930s to justify the provision of housing loans to white and affluent homeowners, while blocking Black and other people of color from obtaining and accruing property through the stratification of neighborhoods by race and class. Neighborhoods were ranked from A to D: A – “Best” (for white and affluent homeowners), B – “Still Desirable,” C – “Definitely Declining”, and D – “Hazardous” (for the confinement of Black residents to disinvested areas). Research has found lasting impacts from this racist practice result in fewer trees, hotter temperatures, and more air pollution in formerly C and D-zoned areas (Locke et al. 2021, Hoffman et al. 2020, Namin et al. 2020, Nardone et al 2021, Lane et al. 2022). Undoing these legacies of racism in urban environments is imperative for achieving justice, and doing so requires an approach beyond distributive justice.

Procedural and recognition justice move beyond a distributive justice approach to reveal other environmental inequities that occur in urban greenspaces. Outdoor spaces have been coded as white through exclusionary practices and discourse and communities of color have been left out of decision-making processes and urban greening projects (Finney 2014, Grove et al. 2020). In Baltimore, MD, Black residents live in neighborhoods with more trees and parks than white residents, but Black residents only moved into those neighborhoods because of “white flight” to the suburbs, inheriting a landscape built by white homeowners who had the power to plant trees and otherwise shape their neighborhood (Grove et al. 2020). Segregation prevented Black residents

from using nearby recreation areas like parks and golf courses for many years (Grove et al. 2020). Both power in decision making and an understanding of historical processes allow for recognition of injustice and can reveal deeper opportunities to address them create more equity in tree and greenspace access.

Restorative justice practices that recognize the needs and wants of communities are imperative for enabling equity in urban environments (Anguelovski et al 2020, Schell et al. 2020). Urban greening and tree planting projects can feel alienating for communities if these projects cause loss of sense of place, are disempowering because they are misaligned with cultural values, part of gentrification processes leading to displacement, or contribute to mistrust between communities and government entities (Kitchen 2012, Anguelovski et al. 2020). Grove et al. (2020) found that in predominantly Black neighborhoods in Baltimore, residents did not want trees because of legacies of disconnection and mistrust with local government. These residents felt the city should prioritize other types of investment and improvement and would not maintain the trees they planted or parks they built (Grove et al. 2020). If city governments only look at the distribution of urban tree canopy to determine tree planting or maintenance programs, they will likely overlook the desires of communities where they choose to plant, perpetuating mistrust.

Concerns about gentrification, or “the production of space for progressively affluent users,” have also been connected to tree planting and urban greening projects (Hackworth 2002, p. 815; Wolch et al 2014, Curran and Hamilton 2018, Donovan 2021, Riedman et al 2022, Oscilowiz et al 2022). Gentrification has the potential to result in loss of trees due to development, new trees and parks as part of property development, as well as the

displacement of residents due to the influx of more affluent populations (Wolch et al 2014, Anguelovski et al. 2018, Riedman et al 2022). For Greenpoint in Brooklyn, NY, Curran and Hamilton (2018) propose the concept “just green enough,” which encompasses the idea that small-scale eco projects implemented by neighborhood residents result in green amenities and biodiversity without the implications of gentrification. However, this work still results in a second tier of environmental wellbeing for vulnerable neighborhoods and methods need to be explored for greening historically disinvested areas to their full and equitable potential without risk of displacement. Not only must the historic and systemic causes of inequitable access to trees and urban greenspace be uncovered, but also emancipatory methods for creating more resilient futures for all. This study builds on existing justice and tree-related research by demonstrating that restorative justice practices are needed to undo legacies of environmental injustice in urban socio-ecological systems.

2.3 Community Based Tree Research

This study builds on existing literature that explores community values around trees and greenspace to inform urban tree programs and policy. Previous studies have explored the tree characteristics that urban residents prefer, such as aesthetics, food production, provision of shade or habitat, or whether the creation of debris or maintenance costs are barriers for tree planting, and how resident preferences align or are overlooked by municipal programs (Pataki et al. 2013, Conway et al. 2016, Dawes et al. 2018). It is important to acknowledge “the role of human preferences for specific plant attributes as an important and even dominant factor that structures the composition of [urban]

ecosystems” (Pataki et al. 2013, p. 17). Understanding the preferences and values of community members when implementing tree planting programs can help create urban forests that are both diverse and equitable (Dawes et al. 2018). The methods for this study included questions about tree-related values, as well as amenities and disamenities associated with trees, to better understand what community members appreciated and desired for their neighborhood.

The many environmental amenities that trees provide have been recognized by municipalities across the United States and have driven an uptick in urban forest planning and proliferation (Seamans 2013). However, as literature on justice and urban trees and greenspace has shown, tree distribution and practices are not equitable. More recent studies have called for an exploration of disamenities that community members associate with trees, who participates in tree planting programs, why people may not want trees, and barriers to tree planting (Roman et al. 2021, Carmichael and McDonough 2019, Riedman et al. 2022, Drew-Smythe et al. 2023). The most common disamenities associated with trees found by Drew-Smythe et al. (2023) were tree roots damaging infrastructure, and tree branches dropping and damaging property or causing injury, suggesting that trees themselves are not usually the problem, but poor tree placement and poor tree care can lead to dangerous issues that make residents wary of trees. Addressing maintenance concerns may make tree planting more feasible for residents with different race and class identities.

Reaching communities who have different tree and greenspace values and needs is a common challenge of community-based urban environment research. Few studies have explored the perspectives of demographically, ethnically, or culturally diverse people,

which need to be included in urban forest planning to undo legacies of exclusion by incorporating procedural, recognition, and restorative justice tenants (Ordóñez-Barona et al. 2022). One study on the cultural ecosystem benefits of urban greenspaces found that perceptions and values of those greenspaces were shared by ethnically diverse users, but more research is needed in the urban forest context on the different of lived experiences of diverse groups (Edwards, Larsen, and Church 2022). Another challenge for urban forest justice is understanding, including, and meeting the needs of low-income community members. Renters often form a portion of low-income groups, and studies have shown that renters who may want trees near their homes, face barriers to tree access because landlords are not willing to plant trees due to the maintenance involved (Riedman et al. 2022). Tree planting programs are more likely to target owner-occupied households, but a 2015 Indianapolis study suggested that the success of newly planted trees is positively correlated with prevalence of renter-occupied households (Vogt et al 2015). Renters may be willing to maintain trees if property owners agree to plant trees on their properties. This study sought to include participants with a range of race and class identities to address the need for more inclusion of these groups in urban forest research. Including participants with different identities and experiences is also part of going beyond an “unequal distribution” framework to an environmental justice framework that acknowledges the existence of difference (Whyte 2017).

Different types of urban green infrastructure programs engage different community members. For example, in Philadelphia, PA, participants in tree planting programs had different socio-economic backgrounds and motivations from participants in green stormwater infrastructure programs (Conway et al. 2022). Residents of lower-income

neighborhoods and with less available planting space were less likely to be involved in tree planting, indicating the need for different outreach strategies and solutions for smaller properties with limited planting space (Conway et al., 2022). Tree planting practitioners in Philadelphia have also reported how resident mistrust of government entities due to legacies of disinvestment leads to lack of participation (Riedman et al., 2022). Residents often like trees and want more of them, but do not seek tree planting because it is connected to larger narratives about lack of attention and care from municipalities (Carmichael and McDonough, 2019).

Barriers to tree planting in Philadelphia encountered by Riedman et al. (2022) include resident concerns about the various risks and costs associated with trees and possibility of neighborhood development and gentrification leading to displacement. Communities of color and low-income residents faced larger barriers because of “legacies of historical tree disservices and municipal structural disinvestment” (Riedman et al. 2022, p. 1). Similarly in Detroit, residents opted out of having trees planted because of long histories of lack of care and neglect from both the city and non-profit organizations that were very much alive in participants’ memories (Carmichael and McDonough, 2019). In this case, a local non-profit organization assumed responsibility for tree maintenance when the city was not meeting community needs, but the organization could not keep up with the work. The responsibility and burden of tree care fell to residents, who then developed knowledge about how to care for local trees but were still excluded from city processes. These residents wanted shared decision-making power because of the time and care that they had put into the space around them and because they wanted to maintain ownership and sense of place in the greenspaces of their community (Carmichael and McDonough,

2019). Better understanding of community values, lived experiences, and narratives about urban trees and greenspace, which is what this study seeks to find, can help reveal barriers to community involvement and tree planting programs and foster more inclusive practices that allow community members to shape their own urban environments.

2.4 Significance of the Study

This research builds on existing participatory mapping and environmental justice work to improve human-environment relationships in Portland, OR. It provides a unique contribution to geography by investigating and analyzing individual and community perspectives on urban trees and greenspace, going beyond the large-scale and quantitative analyses of urban environmental conditions that have been conducted previously. It also draws from and aims to push forward critical theories about how to create more inclusive, just, and emancipatory urban greening practices. Participatory mapping as a means for communicating the needs and values of community members regarding the urban forest has not been done in Portland, so this study will provide a unique tool for collaboration between residents, local government agents, organizations, and academics. This method allows for a multitude of values and narratives to emerge that can inform the larger conversation about neighborhood identity and equitable environmental amenities.

3. Study Area Background

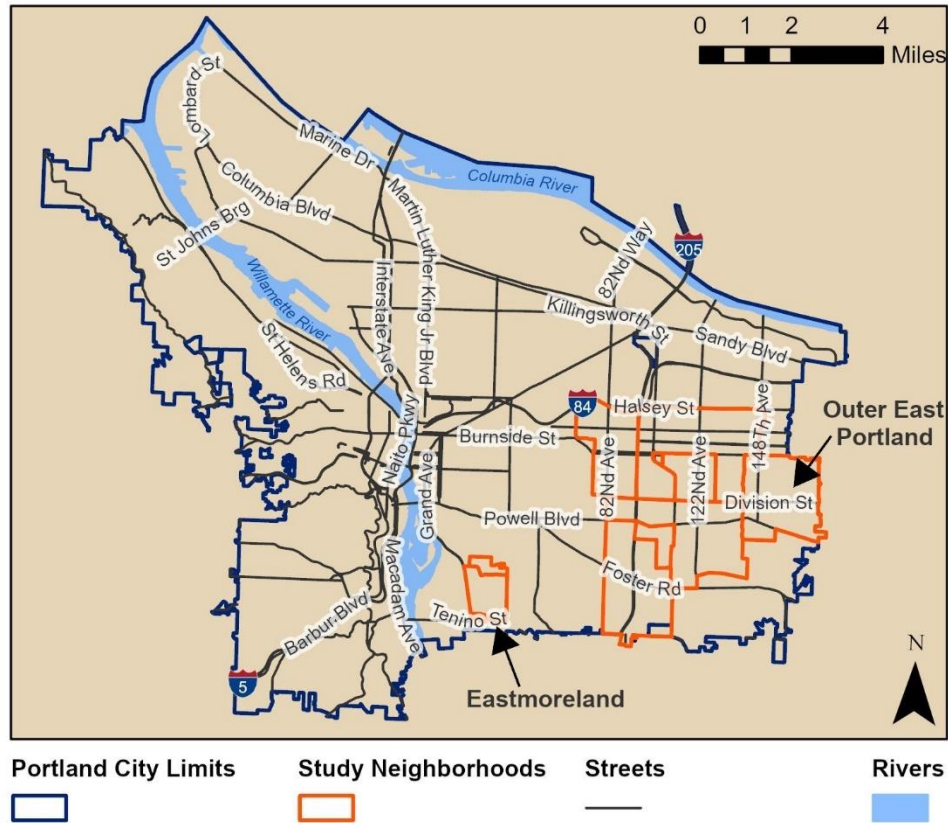


Figure 1 Study Area: Map showing the study area of Portland, OR, and the specific neighborhoods where participants were recruited.

Portland, Oregon, (see Figure 1) has become a hotbed for urban greening, tree planting, and environmental justice related studies (Donovan and Mills, 2014; Goodling et al., 2015; McClintock et al., 2016; Mahmoudi et al., 2020; Donovan et al., 2021; Nascimento and Shandas, 2021; Donovan et al., 2022). Portland is one city where HOLC graded areas “C” and “D” are associated with less tree canopy coverage and greenspace as well as hotter temperatures (Hoffman et al., 2020; Namin et al., 2020; Nardone et al., 2021). Redlining and related racist practices led to the confinement of Portland’s Black and African American populations to the Albina area after WWII (Gibson, 2007).

Segregating these communities into one part of the city meant that this area experienced disinvestment and the devaluing and erasure of its residents. Since the 1990s, urban renewal projects and gentrification in Albina have led to the displacement of vulnerable residents, particularly residents of color, to outer East Portland, where development has been more sporadic and fewer codes upheld (Gibson, 2007; Goodling, 2015).

Environmental disparities go beyond the legacy of redlining in Portland. Portland's modern agenda aims to uphold the identity of a "green" and "sustainable" city, which has continued to perpetuate neighborhood inequity in a multitude of ways including urban greening (Gibson, 2007; Goodling et al., 2015). Goodling et al. (2015) describe how "a 'sustainability fix' (While et al., 2004)—in this case, green investment in the city's core—ultimately contributed to the demarcation of racialized poverty along 82nd Avenue" (p. 2). The area generally east of 82nd Street was annexed to the city mostly in the 1980s and 1990s and has a history of sporadic development and poorly upheld codes (Goodling et al, 2015). The 82nd St corridor is a colloquially agreed-upon separator between the wealthier neighborhoods of inner Portland and the lower-income neighborhoods of Outer East Portland, where access to urban greenspace and other "sustainable" amenities is less abundant, and where many of Portland's residents of color and low-income residents live. Urban gardening practices and transportation projects follow similar patterns of socio-economic stratification and spatial differentiation between reinvestment occurring in Portland's "green" and urban core and displacement of poverty to the outskirts (Mamoudhi et al., 2016; McClintock et al., 2020).

Eco-gentrification and its consequences for displacement and further environmental inequity are of rising concern in Portland. Donovan et al. (2021) found that tree planting

is associated with increasing housing prices in Portland. While the increase in housing prices is marginal and is delayed by about 6 years because of trees needing time to grow, it still raises concerns about how tree planting may contribute to or be part of larger gentrification processes (Donovan et al., 2021). Gentrification has the potential to displace vulnerable residents, often people of color and low-income residents, from their homes due to increasing housing prices and rent costs (Hackworth, 2002). The demolition of existing homes and property and development of new buildings often leads to the removal of trees. Whether trees are planted in neighborhoods that need more of them or planted to replace trees that were removed by development, they are part of larger processes that position “disinvested” neighborhoods as areas ripe for capital investment, putting residents at risk of displacement (Riedman et al., 2022).

The inequitable distribution of green amenities is something the City of Portland is aware of and working to address (City of Portland, 2021). Assessment of Portland’s tree canopy and monitoring of public trees became a central focus with the City of Portland’s first Urban Forest Master Plan (Gronowski et al., 2004). Research conducted on planting and distribution of street trees revealed an overall gradient of more street trees in the western parts of the city and declining toward the east (Poracsky and Banis, 2005). In addition, where there are fewer overall vegetated areas, street trees make up a higher percent of overall tree canopy, making them important for the provision of shade, cooling, and other amenities. Participation in Portland’s urban forest management has also gained attention and focus. New homeowners who already have street trees and have higher education are more likely to participate in tree planting programs, indicating inequitable implications of Portland’s tree planting programs (Donovan and Mills, 2014).

The City of Portland’s 2020 Tree Planting Program prioritizes neighborhoods with less than 25% tree canopy coverage, higher population of low-income residents, and higher population of color, many of which are in East Portland. Portland Parks and Recreation department conducted several studies in 2017, including citizen surveys and focus groups with underrepresented communities. The study found that Portland residents agree trees are important, though refugees and immigrants felt disconnected from Portland’s trees because they had more knowledge about trees from their own countries, and limited financial resources and time to care for trees (Disalvo et al., 2018). Other barriers to resident engagement and support of tree planting were fears and concerns about damage to infrastructure (City of Portland 2021, p. 12). In a similar study, Nascimento and Shandas (2021) found that there was “a significant correlation among tree canopy, resident income, and sense of ownership for urban forestry” and that “the inclusion of cultural ecosystem services can better address existing environmental injustices” (p. 1). Community outreach that aims to identify and address specific priorities in East Portland and other low canopy areas is crucial for understanding how tree planting, tree care, and urban greening can best support Portland’s residents. Acknowledging historic segregation, modern gentrification and displacement, and ecological values and identities is necessary for creating more equitable access to urban trees and greenspace.

4. Research Methods:

4.1 Participatory Mapping for Land Use Planning, Urban Forests, and Collaboration

This research is also informed by participatory mapping research that uses mapping to add a spatial context for community values related to trees and greenspace. Participatory mapping has been used to gather preferences on about how to maintain, protect, or develop urban greenspace and urban forests, identify specific services and disservices associated with urban greenspaces to inform planning, and investigate where participants prefer or contest tree planting (Tyrvaainen et al. 2007, Kangas et al. 2008, Ives et al. 2017, Brown et al. 2018, Baumeister et al. 2020, Jones et al. 2020, Baumeister et al. 2022).

Human ecology mapping is a method that has arisen to address gaps in socio-spatial data that can inform planning and management related to land use, ecosystems, and the environment (McLain et al., 2013). This form of mapping was developed by social scientists, community leaders, and indigenous groups, has been heavily informed by citizens and stakeholders, centers collaboration, and aims to “represent the agenda of the community” (Corbett, 2009, p. 7). Participatory mapping is one form of human ecology mapping that seeks “to map the diverse and complex connections between humans and landscapes” (McLain et al., 2013). It has been used by indigenous groups to represent meaningful places, define boundaries of traditional land, and articulate local ecological knowledge (Corbett, 2009). It has also been used by urban and rural communities to communicate sense of place, cultural values associated with land, and socio-ecological identities that can inform land management and policy in urban and rural areas. McLain et al. (2013) reflect that in order to implement successful land

management, managers need to understand and engage with the ecological values of communities. Conflict, lack of environmental stewardship, and negative responses to proposed management can arise when community sense of place is disrupted. Top-down land management also perpetuates imbalance of power in decision making. Participatory mapping, when implemented with reflexivity and collaboration, can provide an avenue for enabling community power and agency (McLain et al., 2013).

Many different types of methods and combinations of methods have been used in participatory mapping practices. Mail-in and online surveys have been conducted to assess values associated with urban landscapes and zoning (Tyrvaainen et al., 2007; Brown et al., 2018). Interviews with key informants have been used to ask more in-depth questions about the locations participants identify on maps (Donovan et al., 2009; Raymond et al., 2009). Focus groups and workshops have also been used, often in mapping exercises that are collaborative and have one mapped output for the group instead of one map for each individual (Farnum and Krueger 2008). Some studies provide a predefined list of values for participants to choose from, while others collect qualitative data and inductively define values in the analysis process (Cacciapaglia et al. 2012, Gunderson and Watson 2007). Participatory mapping has also been conducted through combined methods, such as community workshops to design mapping studies followed by semi-structured interviews, open mapping workshops followed by interviews with key informants, and following the mapping process with meetings to review and interpret results (Bishop et al. 2022, Fagerholm et al. 2012, McLain et al 2017). When participatory mapping engages communities throughout project design, implementation, and analysis, focus can be placed as much on the process as the outcome, barriers

between researchers, “experts,” and community members are broken down, and power is more evenly distributed.

Participatory mapping has been implemented in numerous ways to inform land management and land use planning and to enable community agency. Through a project exploring public participation in natural resource management decisions, Wright et al. (2009) explore how mapping can be used for the mutual learning of scientists, GIS practitioners, and community members, dissolving barriers between scientists and citizens. Map makers must have awareness of the power they hold and find ways to disperse that power through the creation of shared narratives. Brown et al. (2018) give voice to members of a coastal community in California by conducting an internet survey of mapped place values, preferences for zoning types, and opposition to zoning types to demonstrate how sense of place correspond or conflict with proposed new land use zoning. Outcomes were intended to support local government decisions about zoning updates, it is unclear whether suggestions were adopted. There is also no description of participant involvement in the development or analysis of the mapping process.

4.1.1 Participatory mapping of rural and urban forests

More specific applications of participatory mapping related to forest landscapes include land management and planning in national forests. Cervený et al. (2021) used participatory mapping to explore values around road usage in the Mount Baker-Snoqualmie National Forest. Roads are public forest throughways and road conversions or closures can cause disruption and conflict with users. Data was collected through

workshops and online engagement. Once data was compiled, participants were asked to review the maps and ensure they captured values and priorities. These sessions helped build trust between researchers and community members, though it is unknown how directly the data collected during the mapping process informed road planning outcomes. McLain et al. (2017) conducted participatory mapping with communities in and around the Olympic peninsula to better understand how management of the Olympic National Forest interacts with social and cultural values in this landscape. Researchers hoped results could help inform planning, but discovered through the analysis process that participants had other agendas besides locating landscape values because of political tensions around several proposed land management changes. This work serves as a reminder that participants may not always have the same agenda as researchers and that involving community members at more stages of the project could have better addressed community needs.

Research using participatory mapping to inform management of urban forests and urban greenspace has also been conducted. An early example by Tyrvaenen et al. (2007) involved a mail-in survey sent to 1000 residents in Helsinki, Finland, to assess what kinds of benefits from greenspace and urban forests are important to people and how these benefits are linked to particular areas. Researchers concluded that participatory mapping is a simple yet effective way to gather social data from many different groups to inform land use planning decisions about how to maintain, protect, or develop urban green space. Kangas et al. (2008) conducted similar work to inform urban forest management in Hyrynsalmi, Finland, but used a combination of surveys and public meetings which resulted in significantly different datasets that were difficult to compare and interpret.

More recent studies have used participatory mapping to identify specific benefits associated with different kinds of parks in Melbourne, Australia, (Brown et al. 2018), evaluated both ecosystem services and ecosystem disservices to inform urban greenspace planning in Brisbane, Australia (Ives et al. 2017). Two similar studies conducted in Germany by Baumeister et al. (2020, 2022) discovered ecosystem disservices including that some participants found tree planting in certain locations disruptive and human impacts on urban forest and woodland areas were often considered disservices. Jones et al. (2020) used participatory mapping to compare the cultural ecosystem values associated with a current greenspace area and with proposed changes to the greenspace area. More positive values were associated with the proposed changes, and the authors concluded that participatory mapping was an effective way to inform decision making in urban greenspace planning.

4.1.2 Environmental Justice and Participatory Mapping

Environmental justice has also been addressed through participatory mapping projects, which is what this study aims to do. Wilson et al. (2015) describe the development of a tool called the Environmental Justice Radar, an online mapping program through which South Carolina citizens can report environmental justice concerns. This tool is a way to improve participation in local environmental decision-making and a means to keep improving participatory mapping techniques for environmental justice issues. The researchers gathered feedback from stakeholders and continue to improve the EJ Radar tool. This work addresses distributive justice as well as

procedural justice by not only identifying where environmental hazards or issues are located, but giving citizens a voice in the creation of tools and in environmental decision-making. Raymond et al. (2016) used participatory mapping to analyze environmental justice in the context of urban “blue space” (areas near water) planning in several Finnish cities. Data was gathered on the types of activities people participated in near blue space and the socio-economic identities of participants (based on income, age, and family type) and researchers concluded that land managers need to know who is participating in what kinds of activities in certain places in order to equitably strategize urban planning. However, this research does not ask community members to participate in decision-making or in the creation of mapping projects, which calls for greater efforts to commit to multiple forms of justice in participatory mapping.

Recent research has shown how participatory mapping can go beyond informing land management to serve communities by acting as site for knowledge sharing and collaborative action. Participatory action mapping is a methodology that combines the mapping techniques described above with participatory action research. It involves deep commitment of researchers to the communities engaged in mapping practices so that mapping can both address the needs of the public and critically evaluate the mapping process (Boll-Bosse and Hankins 2018). In a study conducted by Boll-Bosse and Hankins (2018), a local community expressed interest in mapping, were the ones to choose what should be mapped to address social issues (locations where arson had occurred and instances of mold infestations), and then the resulting process was flexible, iterative, and reflective. In a similarly critical project, Bishop et al. (2022) attempt to demonstrate how maps can act as boundary objects between different communities, in this case indigenous

communities in Canada and scientists, to communicate knowledge about oceanographic features. The researcher deeply acknowledges their positionality as a white settler and also addresses the role Western cartography has played in colonization, “how it has been defined and positioned as a tool of state power, [and] its role in mapping what was wrongly defined as terra incognita” (Bishop et al. 2022, p. 60). Throughout this participatory mapping research, researchers remained open and flexible. Methods included open workshops as well as qualitative interviews, and while some knowledge expressed by participants could not be spatially rendered, the research still demonstrated the power of maps to recontextualize knowledge and data and communicate across different cultural identities. These methods demonstrate the power of participatory mapping projects that are collaborative, reflexive, and engage deeply with the power dynamics involved in the process of mapmaking.

This study seeks to build on existing environmental justice mapping work by incorporating forms of justice beyond distributive justice. Achieving more just urban greening and tree planting practices means including people in decision-making processes so that a range of narratives and needs are represented. Mapping provides a place-based platform through which participants can share and co-create knowledge about the place where they live, giving participants power to tell their own narratives. In this way, participatory mapping can address urban environmental injustice by providing a means through which decision-making processes can be shared, ongoing processes of exclusion can be revealed, and injustice can be addressed through inclusive, restorative practices.

4.2 Data Collection

To capture the shared values and community knowledge of Portland residents related to urban trees and greenspace, I conducted five focus groups that had a participatory mapping component with a total of 26 residents. The focus groups included residents from several different Portland neighborhoods. This comparative design allowed for cross-examination of how values, lived experiences, and narratives about trees and urban greenspace vary for Portland residents from neighborhoods with different demographics and historical conditions. The neighborhoods were chosen based on a GIS analysis that identified areas with different environmental and socio-economic conditions. Factors included tree canopy coverage, temperature, proximity to industrial areas, Homeowners Loan Corporation grade (from historic redlining maps), education, income, and housing tenure. Four of the five focus groups were conducted with residents of outer East Portland, which was identified as an area with less tree canopy, higher temperatures, and lower socio-economic status. One focus group included members of the Hazelwood neighborhood and the three others included members of several neighborhoods in the area (Montavilla, Mill Park, Powellhurst-Gilbert, and Rockwood). Eastmoreland was identified as an area with abundant tree canopy and higher socio-economic status. Eastmoreland is also a historically wealthy area and was graded “A” and “B” on HOLC maps, while Outer East Portland was not included on these maps because it was annexed to the city several decades after the maps were drawn. Figure 2 shows the geographic extent of the maps provided to participants for participatory mapping, as well

as the Eastmoreland and the Outer East Portland locations where participants lived:

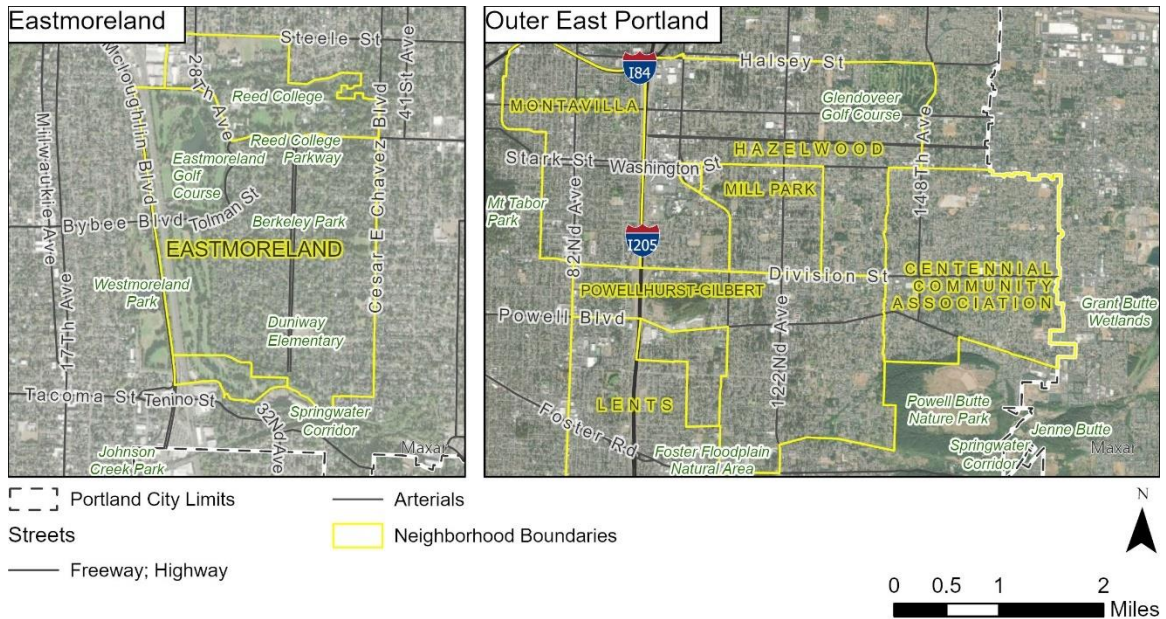


Figure 2 Study Area Close Ups: Zoomed in maps of the neighborhood study areas, Eastmoreland and Outer East Portland.

I conducted focus groups between August and December of 2022. Participants were recruited through outreach to neighborhood associations, through local organizations including the Asian and Pacific American Network of Oregon (APANO) and the Rosewood Initiative, postings on Nextdoor.com, and flyers at local libraries and community centers. The majority of attendees for the Eastmoreland and Hazelwood focus groups were members of a neighborhood association, while members of the other focus groups did not express such an affiliation. Each focus group had between 4 and 6 individuals. The Eastmoreland and Hazelwood focus groups took place at parks near participants' homes: Westmoreland Park and Gateway Discovery Park, respectively. The remaining three Outer East Portland focus groups were held in a classroom at the East Portland Community Center, which I chose because of its accessibility to the East

Portland Area by proximity and public transit. Compensation of a \$50 gift card and a meal was provided to all participants. A total of 26 people participated in this study with age, gender, and racial/ethnic identities shown in Tables 1-4:

Table 1: Gender identities of all participants

Gender Identity	Count	Percent
Men	8	30.8%
Women	18	69.2%

Table 2: Racial and Ethnic identities of all participants

Racial/Ethnic Identity	Count	Percent
Asian or Asian American	12	46.2%
Latino/a or Hispanic	2	7.7%
White	10	38.5%
Other	1	3.8%
Prefer not to answer	1	3.8%

Table 3: Ages of all participants

Age	Count	Percent
18-25	3	11.5%
26-35	3	11.5%
36-45	6	23.1%
46-55	3	11.5%
56-65	5	19.2%
66-75	4	15.4%
75 or above	1	3.8%

Prefer not to answer	1	3.8%
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Table 4: Average time lived in neighborhood for all focus groups. For the Outer Southeast - Cantonese focus group, not enough participants responded to the question to provide an average number.

Average Time Lived in Neighborhood	Years
Eastmoreland	23.2
Hazelwood	15.3
Outer East Portland - English	1.2
Outer East Portland - Rohingya	4.6
Outer Southeast - Cantonese	--*

*Not enough of the Outer Southeast - Cantonese participants shared how long they had lived in their neighborhood to report an average.

Focus groups were moderated by myself, Kate Gregory, as the graduate student conducting the research project, and with assistance from my advisor, Dr. Jola Ajibade (Eastmoreland focus group), and Nahal Rastegarpour, our undergraduate research assistant (all other focus groups). Each focus group had three parts: mapping on individual maps of participants' neighborhoods, word association with photos, and mapping on a map of the entire city of Portland as a group. Participants were given a worksheet with instructions and questions for each step, and conversation about and beyond the mapping instructions was encouraged, which produced rich qualitative data. The focus groups were audiotaped and transcribed.

We started each focus group by handing out 22" x 17" maps of the participants' neighborhood and the surrounding area and asking them to identify familiar places on the maps by placing pink dots on their house, grocery stores, libraries, etc. This exercise was more for helping participants get oriented in the map than for data collection, though it yielded interesting discussions about what people value about their neighborhood. For the

next part of the exercise, we asked participants to place blue dots on outdoor places that they valued and to label them with letters corresponding with a list of values from the worksheet. Then, participants used a green marker to circle the blue dots, and other outdoor locations, where trees make that location important to them. This order of tasks aimed to gradually narrow the conversation from urban greenspaces to trees. The worksheet also had several short exercises on which participants ranked amenities, disamenities, and types of trees to stimulate thought and conversation around the meanings and values participants associated with trees. The next mapping exercises involved marking tree concerns with orange dots, places where participants wanted trees to be planted with green dots, and places where participants did not want trees to be planted with red dots. Each of these had a list of reasons that participants could use to label the dots they placed on the map. To break up the mapping exercises, we did a word association exercise in which we gave participants photos of streets in parts of Portland with differences in tree canopy and had participants shout out words they associated with each photo. The final exercise involved a 36" x 48" map of the whole city, displaying areal imagery, streets, parks, city limits, and neighborhood boundaries. First, participants circled areas that they considered to have many or "enough" trees in green, and then they circled areas that they considered to have a lack or "not enough" trees in red. To close, we asked them to reflect on why they thought those discrepancies existed to encourage conversations about uneven distribution of wealth, investment, and development and how that affects trees and tree canopy (See Appendix A for the complete list of questions).

Two of the focus groups were attended by interpreters who translated for non-English speaking participants. Languages spoken by participants included Cantonese and

Rohingya. The Rohingya focus group was conducted with significantly different methods because participants had a lower level of English and map literacy. Instead of using the maps, we asked several questions about what they value about Portland, what they value about the trees and greenspace in their neighborhood, and what kinds of change they would like to see in their neighborhood. The interpreter asked each question and then translated the response of each individual consecutively, so it took more time to get through each question than with the other groups. There also was not as much back and forth conversation that could be captured with this method, however the focus group still produced qualitative data that was analyzed alongside qualitative data from the other focus groups. The Cantonese focus group had two members who did not speak English, and the interpreter translated for these participants using simultaneous interpretation. One participant was not able to read the map so a total of four maps was produced from this focus group. Table 5 also shows how the focus groups will be referred to in this text. “Outer East Portland” refers to all groups in that area, and the specific focus group will be referred to by neighborhood (Hazelwood) or language (Cantonese, English, or Rohingya). There are several prominent groups in Portland who are not represented in this study, including Black, Indigenous, and Latinx community members. Future work should engage these groups because they may have different values, lived experiences, and narratives from the participants represented in this study.

Table 5: Breakdown of total focus group participants, languages spoken, and maps produced.

Focus Group	Total Participants	Language	Maps Produced
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Eastmoreland	6	English - All	6
Hazelwood	4	English - All	4
Outer East Portland -- English	5	English - All	5
Outer East Portland-- Rohingya	6	Rohingya - 5 English - 1	0
Outer East Portland -- Cantonese	5	Cantonese - 2 English - 3	4

Throughout the recruitment and fieldwork process, I maintained awareness of my positionality as a white researcher and how that may have affected participation and results. I am a white person who lives in a relatively affluent neighborhood, and therefore had a different identity from some participants. It was important to maintain open and supportive communication throughout the participatory mapping exercises to establish relationships and trust with participants. I also have had positive experiences with trees, tree planting, and urban greenspace in my life and lived in areas with many environmental amenities because of my privileged identity. It was important to recognize throughout the research how my life experiences have shaped my beliefs about the environment and how these might differ from others. Throughout data collection and analysis, I was aware of my bias toward the importance of trees and environmental amenities and remained open minded to other perspectives.

4.3 Data analysis

I analyzed the qualitative data from the focus group discussions using MAXQDA 2022 (qualitative data analysis software). All participant names were changed to

pseudonyms in the focus group transcripts before they were uploaded to MAXQDA for confidentiality. Coding of the data was both inductive and deductive, with codes emerging from themes present in the data and from existing literature (Dilley and Wolf 2013, Pataki et al. 2013, Conway 2016, Avolio et al. 2018, Dawes et al. 2018, Anguelovski et al. 2020, Baumeister et al. 2020, Schell et al. 2020, Baumeister et al. 2022). A combination of inductive and deductive allowed for the coding to be informed by existing literature, while allowing for other themes present in the data to arise. Initial coding of the data included deductive codes as well as open coding of themes to determine inductive codes. Deductive codes from existing literature included preferences for tree services like aesthetics, fruit bearing, shade, and habitat provision, disservices like maintenance costs and excess debris, participant knowledge about the history of their area, and sentiments toward local government entities. The combined inductive and deductive codes were then grouped into several overarching themes which included: shared values about the amenities trees provide, opposing values about tree size and other disamenities, lived experiences of residents in densely versus sparsely treed areas, concerns about trees, transportation amenities, and safety in public spaces, concerns about tree canopy loss due to development, lack of proper care and response from local government entities, memories of living in Portland or other places with more trees, and narratives about historic factors that have led to inequitable tree distribution. After regrouping themes, the data was coded again to ensure that the themes accurately represented the perspectives and conversations of participants. Further work on this project will involve sharing themes with participants so that they can correct and comment on the analysis process.

I analyzed the participatory mapping data using ArcGIS Pro. To prepare the data for analysis, I digitized all of the points and polygons drawn by participants so that the data could be mapped and analyzed. I separated the data into two feature classes: one point feature class for participants' important outdoor locations, concerns, and locations where participants did or did not want trees planted, and one polygon feature class for the areas participants circled that had important trees (on individual maps) or "enough" trees and "lack" of trees (city-wide maps). For the individual mapping, most participants used the dots provided to map their values, concerns, and tree planting locations. However, some also drew lines or polygons to signify a larger area than just the dot. In these cases, I measured the length of the longest side of the polygon, rounded that number to the nearest 1000 ft, then divided that distance by 1000 and drew that number of points (distributed evenly across the polygon). If a polygon was wide enough on its shorter side to span two blocks or more, I doubled the points and placed one on either side of a dividing street. For example, a polygon with length 3,375 ft spanning two blocks will have 6 points evenly distributed. The purpose of changing lines and polygons into points was to be able to analyze values, concerns, and tree planting locations all together in one point dataset.

For both the point and polygon datasets, Eastmoreland was analyzed alone and all of the Outer East Portland focus groups were analyzed together. To analyze the point data, I used kernel density analysis on each point type (important outdoor location, concerning location, tree planting area) to determine areas where these values, concerns, and requests were densest. For Eastmoreland the search radius was 500 ft and for Outer East Portland the search radius was 1000 ft because of the difference in size of each area.

I did not use kernel density on points that represented “no tree planting” areas because there were not enough points to warrant using the tool. Instead, these were mapped on their own (see Results section). To analyze the polygon data, I created a “fishnet” dataset, which is a grid of 10 ft by 10 ft squares across the entire study area. Then I spatially joined each dataset (important tree locations, areas with “enough”/more trees, and areas with “not enough”/lack of trees) to the 10x10 fishnet, to determine how many participants circled each area. The results show the density of where participants had similar tree values and agreed on areas of more and fewer trees.

Results from this study reflect the perspectives and experiences of residents from Portland neighborhoods with unique histories and conditions and therefore are applicable to the Portland, OR, context. Research methods would need to be repeated to determine results applicable to other areas. However, results do shed light on dynamics between urban areas with different socio-economic and environmental conditions that exist in many US cities.

5. Results:

Analysis of the combined qualitative and mapping data revealed several main themes. The first theme addresses Portland residents' values and lived experiences related to trees as well as how these differ for residents of neighborhood with different histories and demographics. Participants overall valued trees and the amenities they provide, though there were some differences in how participants valued fruit trees and big trees. While participants all desired trees, they had very different lived experiences of trees in their neighborhoods, with Eastmoreland participants experiencing a dense and forest-like feel, and East Portland participants describing general lack of trees, revealing distributive justice issues. The second theme explores how participants' memories of places they'd lived before, memories of Portland from a decade or more ago, and knowledge of Portland's history shaped their perceptions of tree inequity and how that should be rectified, which I analyze through a recognition and restorative justice lens. The third theme explores the multitude of narratives that emerged between the groups related to tree planting, which include trees along major corridors, transportation safety, houselessness, and concerns about development and tree canopy loss. These narratives demonstrate the need for restorative justice practices. Finally, the fourth theme focuses on participant narratives related to tree maintenance and particularly concerns about the inequitable burden of tree maintenance, which has implications for procedural justice.

5.1 Values, Lived Experiences, and Distributive Justice

This section explores and compares the values that participants held about their neighborhood, values they associate with trees, and the specific lived experiences of trees

in their neighborhood. When participants were asked what they valued about their neighborhood in general, the groups answered differently from each other, with some valuing their neighborhood for the trees and greenspace, and others expressing more values related to sense of community and other amenities. Many positive values related to trees were shared between the five groups, such as aesthetics, shade, air quality, and health benefits. However, some group members valued certain qualities of trees in different ways, such as the size and fruit bearing capabilities of trees. The lived experiences of trees were also quite different, especially between Eastmoreland and the remaining focus groups in Outer East Portland, with Eastmoreland participants describing an abundance of trees and Outer East Portland participants describing a general lack of trees. The disparities between these two areas described in the focus groups demonstrates how the material production of inequality has played out in Portland's neighborhoods and aligns with previous literature on locations that have and have not had access to green amenities (Heynen, Perkins, and Roy, 2006; Heynen, 2016; Goodling et al. 2015). It calls for reconciliation of green amenity disparities through redistribution of these resources, and a redistribution of power so that residents are included in decision-making process that determine what types of trees are planted and in what spaces.

5.1.1 Valuing Outdoor Spaces vs. Other Neighborhood Amenities

The answers the five groups gave when asked to share what they like about their neighborhood depict the differences in what they value about the area where they live and what makes their neighborhood unique. For Eastmoreland participants, the abundance of

trees drew many of them to the neighborhood. Olivia, said, “What we love here are the trees. We moved because of the trees” (Olivia, Eastmoreland). Another participant, Sarah, said:

I think a big reason why, Jeff, my husband and I moved to this neighborhood was the trees, the beautiful street trees and walkability. And the fact that the neighborhood is surrounded by trees with Johnson Creek on the south, the golf course to the west, and the Reed College campus to the north (Sarah, Eastmoreland).

The number of trees in and around the neighborhood make it ideal for walking in a cool, protected area. Many participants used the word “liveability” when describing the environment provided by the trees in Eastmoreland. Imbued in many of these statements was the inherent and unquestioned desirability of having trees in the area where you live. The Eastmoreland participants described other desirable qualities about their neighborhood, like sense of community, but mostly discussed how they valued the trees and outdoor spaces.

In contrast, Outer East Portland participants reported that what they valued about their neighborhood was the diversity, the sense of community, and abundance of ethnic food options. Dawn reported that affordability first drew her to the area, but said that “now that I’ve settled in, I really love the diversity of my community” (Dawn, Hazelwood). As an Asian-American, Sharon described moving to Portland and wondering “where are all the Asian people?” and that she felt more comfortable with the diversity in Hazelwood (Sharon, Hazelwood). Participants from the Rohingya OEP focus group reported the importance of having community and living close to each other. Two

participants, Hayma and Zarni, described how many of the participants became neighbors after they met at the Rosewood Initiative and enjoy visiting each other:

Hayma: I'm really happy when I go to their house to visit.

Zarni: Because they are coming to Rosewood Initiative that's why we connected and we are old friends. (Hayma and Zarni, Outer East Portland, Rohingya)

Outer East Portland participants also expressed the importance of proximity to ethnic food stores and restaurants, with one participant from Hazelwood remarking that those are the places she prefers to go to in her neighborhood. Participants from the Outer Southeast - Cantonese focus group also reported going to Asian markets close by: "Most of the markets that I go [to are] on 82nd because that's [where] all the Asian markets [are]" (Hui, Outer Southeast - Cantonese).

Participants from the Outer East Portland focus groups mentioned the parks and greenspaces they visited in their area, especially Mount Tabor and Powell Butte parks, which are sizeable parks with many trees and walking paths. At the same time, several reported leaving the area where they live to spend time outdoors. Christine from the Outer Southeast - Cantonese focus group reflected:

Christine: I go climb mountains [...] yeah, Mount Hood.

Kate Gregory: Great. So not as many like places in town that you [go to]?

Christine : No (Christine, Outer Southeast - Cantonese)

Dawn from the Hazelwood focus group described taking public transit across town in order to visit Forest Park. These examples demonstrate that there are myriad qualities people may value about their neighborhood, and in neighborhoods where there are fewer trees, participants mostly discussed how they valued other amenities. Especially in neighborhoods with fewer trees, tree programs and policy should ask residents whether they want trees in their neighborhood and ensure that tree planting occurs in the context

of the neighborhood qualities and amenities they already value. This also highlights the importance of anti-displacement strategies to ensure people can stay in the neighborhoods where they feel a sense of community.

5.1.2 Tree Values

The five groups shared many values related to trees, such as the shade, temperature cooling, health benefits, gathering space, habitat, stormwater management, and other ecosystem services trees can provide. The most commonly mentioned positive values were aesthetics, benefits for wellbeing, shade provisioning, and improving air quality. Aesthetic preferences ranged from the visual appeal of “greenness” as well as of flowering trees. A participant from the Outer Southeast - Cantonese focus group remarked, “I love the cherry blossom trees around” (Christine, Outer Southeast - Cantonese). Rohingya participants described the combined aesthetic and wellbeing benefits of trees: “This is really beneficial for the goodness of the eyes [...] the green tree is giving to you energy for the eye” (Nilar, Outer East Portland, Rohingya). Most focus group participants highly valued trees and did not question their desirability, but there was more nuance in the desirability of certain kinds of trees.

Participants disagreed on the desirability of fruit trees, especially in the right of way between the street and sidewalk. Some participants valued fruit trees because of the food and foraging opportunities they provide. The importance of community orchards was discussed by participants of the Hazelwood focus group. Dawn from the Hazelwood focus group said, “I definitely want free fruit as I walk through the neighborhood”

(Dawn, Hazelwood). One Eastmoreland participant, Michelle, expressed that she preferred fruit trees in the right of way. However, other Eastmoreland residents disagreed and said that fruit trees are messy and difficult to deal with when they are in the right of way because they drop debris on the sidewalk and require more maintenance. Outer Southeast - Cantonese focus group members expressed dislike for fruit trees as well because they attract pests and because of the possible danger of gathering fruit so close to the street. Hui reported, "I don't like fruit trees. They get lots of sugar ants" (Hui, Outer Southeast - Cantonese). Margaret agreed, saying, "By the sidewalk, the fruit tree somebody will pick up the [fruit]. They don't even care about the traffic [...] by the sidewalk, the native tree is better. Not by the sidewalk" (Margaret, Outer Southeast - Cantonese). It is possible that better maintenance of fruit trees, and more support from governing entities for this maintenance, could improve resident relationships with fruit trees.

Another topic on which participants expressed conflicting viewpoints was the size of trees. In several cases, participants aligned tree size with magnitude of amenities provided. For example, Thiri from the Rohingya focus group said, "If you have a big tree it's really good for the oxygen. If your neighborhood has big tree, you will be healthy" (Thiri, Outer East Portland, Rohingya). Similarly, Sharon described how newly planted trees cannot replace older trees that may have been cut down for development because "it is not the same as a 50-60 foot tree" (Sharon, Hazelwood). Margaret from the Outer Southeast - Cantonese focus group said she liked big trees on her property for privacy, but did not like big trees along roads or next to driveways because they block line of sight and drop branches in the road, causing safety issues. Other Outer Southeast - Cantonese

focus group participants expressed dislike for big trees in the right of way. Hui said, “I don’t like really big trees because the leaves fall and then you have to clean them. Street trees are ok, but not the massive, big trees. There’s lots of planning with that” (Hui, Outer Southeast - Cantonese). A conversation with Christine from the Cantonese group revealed a similar sentiment:

Christine: For myself, I don't like a big tree. If the tree is too big and tall it will block the view. So, I don't want a big, tall tree.

Kate Gregory: If it were a smaller tree or like maybe a flowering tree would you prefer that?

Christine: Not a very big one, just like something I can plant by the sidewalk, not very big. (Christine, Outer Southeast - Cantonese)

Zarni from the Royingya focus group expressed dislike of big trees near her home, not because she does not like trees at all but because of fear of trees falling on her house. It is important to note the different preferences participants had for trees on their private property versus trees in the right of way, and the safety concerns involved in their sentiments. The collage of preferences expressed demonstrates the complex and conflicting interests of community members in the ecology of the urban spaces around them. It is especially important to shift control of space to racially minoritized groups that have experienced exclusion from the making of outdoor urban spaces.

These findings align with prior studies on the importance of asking community members their tree type preferences to support community values in public tree planting (Bunge et al. 2019, Conway 2016, Pataki et al. 2013). There also needs to be more representation of ethnic groups and immigrants in sustainability planning (Ordóñez-Barona et al. 2017, Ordóñez-Barona et al. 2022). Eastmoreland participants expressed their concern for loss of big trees in their neighborhood as they aged, suffered pest

infestations, or otherwise declined in health. For these residents, trees are an indicator of design and care, and they want to preserve that quality of their neighborhood. They also have the ability to protect and preserve the space where they live because of the wealth and resources available to them. The different race and class identities of these groups makes it doubly important to include the perspectives of groups that are underrepresented in decision-making.

Concerns about big trees reflect the power differences between focus group participants, between Eastmoreland and Outer East Portland but also along race and class lines. Eastmoreland participants, and some East Portland participants who are mostly white, more affluent, or associated with a neighborhood association, still desire big trees even though they are concerned about existing trees or want more of them. These participants looked to either the city or neighborhood funding sources (Eastmoreland) to address their concerns. Even though they may mistrust or dislike the actions of the city, they did not see this as a reason not to have big trees. In contrast, the Cantonese and Rohingya participants who expressed dislike of big trees concluded that they did not want them at all. Big trees would not pose as much threat to safety if they were better maintained, but these participants did not discuss better maintenance as a possible solution, suggesting that they have no expectation that tending big trees in their area is something the city would take responsibility for. For these participants, dislike of big trees signifies a gap created by long-lasting government neglect and misalignment with community needs (Riedman et al 2022).

5.1.3 Lived Experiences of Trees and Outdoor Spaces

A main difference between the Eastmoreland and Outer East Portland groups was in how they identified and described the density of trees in their neighborhood. Participatory mapping results show a higher density of areas where trees make a location important for Eastmoreland participants than the Outer East Portland participants. The density of important tree locations is shown in green in Figure 3 for the Eastmoreland focus group and the combined East Portland groups (Hazelwood, Outer East Portland - English, Outer Southeast - Cantonese). The highest value for Eastmoreland was 11, meaning an area was circled 11 times (some people drew overlapping circles), and the highest value for Outer East Portland was 7. These differences represent the concentration of important tree areas in Eastmoreland, versus more dispersed trees in Outer East Portland. Important tree locations in Eastmoreland overlap with both parks and residential areas, where more of the important tree locations in Outer East Portland overlap with parks and not as much with residential areas.

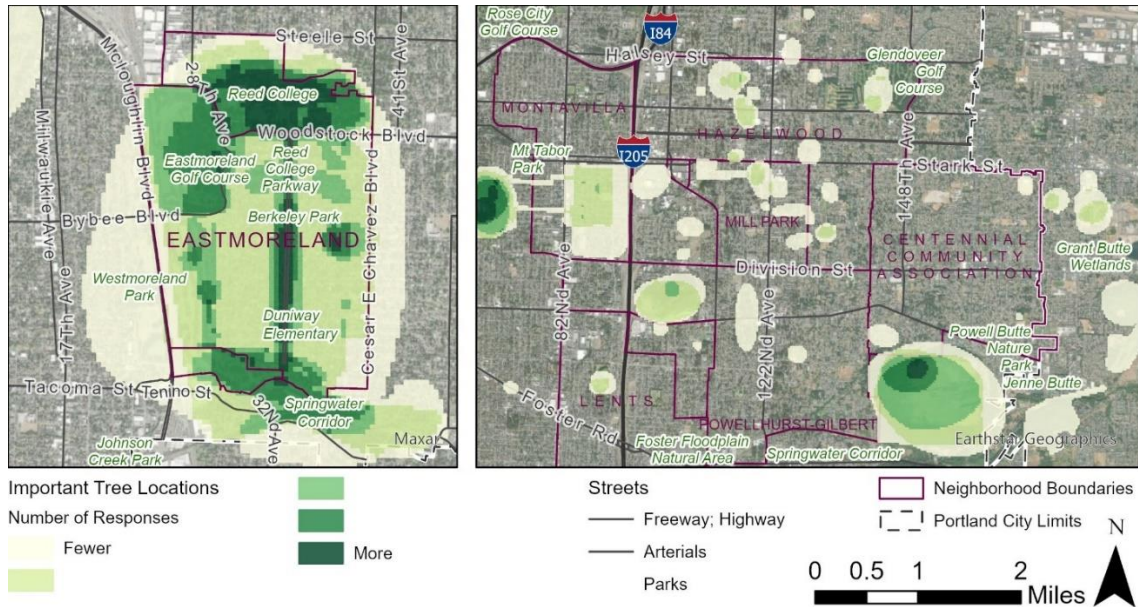


Figure 3 Important tree locations: Combined participatory mapping results for areas that participants valued because of the presence of trees. In Eastmoreland, residents valued many areas in the neighborhood because of trees, some circling the entire neighborhood on their maps. In Outer East Portland, important tree locations overlap mostly with parks and not as much with residential areas as in Eastmoreland. Aggregated using fishnet method.

The mapping exercise with maps of the entire city in which participants circled areas with more or “enough” trees versus areas with lack of or “not enough” trees also demonstrated tree cover discrepancies. Figure 4 shows where participants perceive and experience more tree canopy versus lack of tree canopy. The shades of green represent where participants perceive more forested areas, which are mostly on the west side of town and in Inner East Portland. The shades of red and orange represent where participants perceive lack of trees, which is mostly in the downtown and industrial areas along the Willamette and Columbia Rivers as well as in Outer East Portland. Participants also identified a lack of trees along major boulevards in Outer East Portland. While these representations of tree cover are obviously not perfect renderings of Portland’s tree

canopy, they represent participant perceptions of how trees are distributed. But these mapped perceptions add another dimension to tree canopy maps by displaying the colloquially and socially agreed upon locations with not enough trees. They also represent how participants experience the urban forest and draw particular attention to areas where people feel protected by the amenities trees provide, versus exposed to heat.

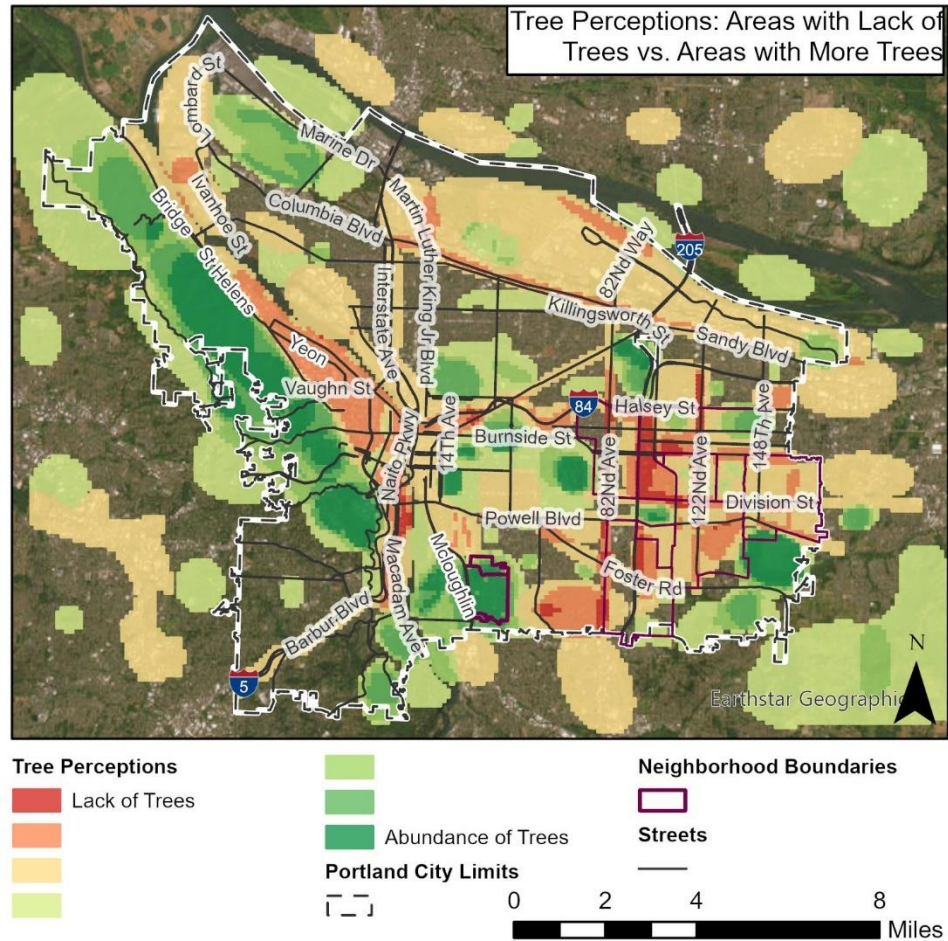


Figure 4 Tree Perceptions, Areas with Lack of Trees vs. Areas with More Trees: Combined participatory mapping results for areas identified as having more trees, or significant tree cover, versus lack of trees and minimal tree cover. The shades of green represent locations participants circled to indicate where they perceived more or an abundance of trees. The shades of orange represent locations participants circled to indicate where they perceived lack of trees. Aggregated using fishnet method.

Conversations about participants' neighborhoods also revealed discrepancies between these areas. Eastmoreland participants described how trees proliferated throughout the entire neighborhood, with density like a forest:

Richard: Well, really, I mean, it's the entire neighborhood.

Michelle: The whole neighborhood its like a forest. [...] When you when you come from [...] Westmoreland [...] all you can see are trees, you really can't see many houses. It looks like you're going into a forest.

Richard: Well, or if you do Google [...] and look at Eastmoreland it's highly green.

Sarah: Or if you fly into the city, you know it's--

Michelle: It's the densest. (Richard, Michelle, and Sarah, Eastmoreland residents)

Hazelwood and Outer East Portland - English participants described some parts of their neighborhood as having trees, but an overall lack of trees or areas with a forested feel.

Lucas described how the "whole East side" is "pretty bad" because of lack of trees

(Lucas, Outer East Portland - English). "General lack of trees" was described alongside comments about living in a heat island and locations without trees being hot, especially the major corridors (Dawn, Hazelwood). Participants mentioned parks and streets with trees, but also the need to leave the immediate area where you live to seek out areas with more trees, for example having to "go off the main roads and into the neighborhoods so get that overhead greenness" (Dawn, Hazelwood). Portland's Heritage trees, which are trees throughout Portland that are considered historic and are preserved, came up when participants were discussing lack of big, old trees:

Patricia: Also...take a look at the Heritage tree map.

Kate Gregory: Yes, I've seen it.

Patricia: It's a black hole.

Dawn: It's crazy.

Sharon: We don't have any.

Patricia: It's a black hole in the east neighborhoods. (Patricia, Dawn, and Sharon, Hazelwood)

Hazelwood participants expressed frustrations that the locations of heritage trees as well as more forested areas “tracks with the wealth” (Jake, Hazelwood). While Hazelwood and Outer East Portland - English participants did not paint a picture of a neighborhood completely lacking in amenities, describing gratefulness for diverse community and available food, they did refer to the neighborhood as less wealthy and home to more low-income residents, with significant discrepancies in the tree cover and green infrastructure available to provide the amenities they valued.

Despite expressing nuanced values about tree size, most Cantonese and Rohingya focus group members still desired more trees in their neighborhoods. Ling said, “I usually [go] to Friends of Trees, and plant trees in my neighborhood because I like our neighborhood to have a lot of trees (Ling, Outer Southeast - Cantonese). San from the Outer East Portland - Rohingya group described a discrepancy in trees at the parks where she visits:

My neighbor has a park but not tree, so if your neighborhood park if you have a lot of tree and a lot of flower, playground and the garden, that make more happy than simple park. I should be want to change for the neighborhood park, more colorful, more flowers, more garden, more tree. (San, Outer East Portland - Rohingya).

Zarni agreed, and elaborated on the relationship between wealthy areas and trees and how she would like that to change:

I would like to see change. As I compare to the richest people [...] then compared to my location [...] I didn't see any tree in there. [...] I have a smaller tree throughout this area [...] I will ask them, my government, for every area to then plan for the tree because our resources is very, very short as the tree. So, I go to the visit other places, wherever richest people living and there's a lot of green in their area. They have a big tree as well. We don't have that much. So other government can do that. There will be the plan for the tree a lot, we have a space to plant the tree. (Zarni, Outer East Portland - Rohingya)

In this sentence Zarni describes the desirability of big trees and how they represent an established, wealthy area. She would still like to have bigger trees in her area even though she may not want them directly next to her own house. The Outer East Portland - Rohingya participants also described their area as dirty, insinuating a sense of neglect that went along with having fewer trees.

The differences in tree abundance between Outer East Portland and more wealthy areas of Portland noted by participants aligns with Goodling et al.'s (2015) description of Portland's "sustainability fix," a process in which investment in green amenities in inner Portland has contributed to "the demarcation of racialized poverty along 82nd Avenue" (p. 2). Fewer greenspaces and green amenities exist in East Portland, where many of Portland's residents of color and low-income residents live, which also represents a distributive justice issue (Pellow, 2016). The material production of urban tree inequality is perpetuated through political processes that dictate who has access to and control over the locations of green amenities (Heynen 2014). Incorporating tree-related values, such as the types of trees that are desirable and why, along with lived experiences helps move beyond a distributive justice framework to a procedural one by including the needs, wants, and visions of underrepresented community members in decision-making.

5.2 Memory, History, Recognition Justice, and Restorative Justice

Memories about Portland, or other places participants had lived, and knowledge of Portland's history played a significant role in shaping participants' viewpoints on the distribution of trees and how tree canopy needs to improve. For Cantonese and Rohingya participants, memories from places where they lived before or grew up played into their

perspectives on trees in Portland. For Eastmoreland and Hazelwood participants, who had on average lived in Portland longer than other participants, had memories of Portland's past and knowledge about historic development that influenced their perspectives on current tree distribution. Outer East Portland - English participants also referenced historic effects on Portland's trees with a conversation about "Stumptown," a nickname given to Portland because of the deforestation that occurred to make space to build the town.

Memory was most present in the Outer East Portland - Rohingya focus group, during which participants referenced their memories of living in places with more trees and flowers, and valuing trees because of the memories they have. Zarni compared her memories of trees in Malaysia with Portland:

Zarni: I see one [difference] between Malaysia and Portland [...] Malaysia has a lot of parks and gardens [...] and different kinds of trees. When I go to the Portland Park, I didn't see that much flower and not that much tree [...] So that would need to be changed in Portland. (Zarni, Outer East Portland - Rohingya)

Another participant, Nilar, described how she loves trees because of her memories playing around trees of all sizes when she was younger. The Outer East Portland - Rohingya group also described identifying as farmers and being part of more rural communities in the places they're from. Nilar said she was happy to find out that a member of the local Rohingya community has a farm in the Boring area. She said when she visits it reminds her of back home. Maiah agreed, and described the "more green" area in Boring being a more appealing place than the 82nd St area (Maiah, Outer East Portland - Rohingya). Outer Southeast - Cantonese participants also brought up memories. For example, Margaret described that she thought trees needed to be improved

in Portland because there are fewer trees here than where she lived before moving to town: “Before, I live in Lincoln City. In Lincoln City the trees [are] better than here” (Margaret, Outer Southeast - Cantonese). Memories of other places strongly influence narratives about lack of trees in Portland for these participants. Participant identities and values are connected to these memories and so ensuring they have the ability to shape landscape they live in now to match these imaginaries, or create another outcomes they want, is imperative for achieving recognition and restorative justice.

Participants from Eastmoreland and Hazelwood shared in-depth knowledge of how the history of East Portland has influenced the lack of trees in the area. Participants that had lived in town for two decades or more shared memories of how East Portland has changed. The stories describe how East Portland had more old, tall trees in the past, but late annexation, lack of attention from the city after the area was annexed, changes in tree type preferences, and inconsistent codes or upholding of codes has led to a decline of the former canopy. The piecemeal development also led to haphazard placement of underground water and utility lines, which continues to prevent trees from being planted in backyards and right of way planting strips alike. These descriptions of East Portland’s history and the shared concern for the future of tree planting in East Portland demonstrate a mutual desire for justice that recognizes the need to rectify historic injustices.

Participants from both focus groups offered descriptions of the greater proliferation of tall trees in East Portland before annexation. Sharon described how when she first moved to Hazelwood, “there were a lot more trees and everybody said how beautiful it was,” which she said was true because “everybody had probably 30, 40, 50

foot fir trees in their yards” (Sharon, Hazelwood). But over time, trees “either fell over or they got cut down and [no one ever] replaced them with anything of that stature” (Sharon, Hazelwood). Sharon named a preference for ornamental or fruit trees from about the 1980s to 2000s as part of the reason for changes in tree stature, but according to her and many other participants many other factors are also at play. Similar to Sharon, Michelle from the Eastmoreland focus group described her memories of several decades ago, when what would become the East Portland area was characterized by bigger lots and tall trees. Once the land was turned over to the city, big apartment buildings took the place of what had been open space (Michelle, Eastmoreland resident).

These descriptions about pre-annexation trees were accompanied by references to haphazard design due to different county standards, followed by fragmented development once the area was annexed to the city. Pre-annexation East Portland was described as an area where “there were no regulations of any sort” and because there were “Multnomah county design standard[s] [...] it was more of anything goes” (Jeff, Eastmoreland; Patricia, Hazelwood). When the city annexed East Portland, despite protest from residents, they upheld the standard of providing sewer lines to properties with septic. However, due to the different lot sizes and county development, many sewer lines ended up being built through people’s backyards (Jake, Hazelwood). More sewer lines went in underneath the right of way. Patricia described that in one area of Hazelwood, the city “put some sort of a utility line right in the parkway and so trees cannot be planted in this neighborhood. They didn't plan it correctly” (Patricia, Hazelwood). The historic implementation of utility lines continues to prevent tree planting in many parts of Hazelwood and East Portland in general. These descriptions align with Goodling et al.’s

(2015) conclusions about how poor planning, failure to uphold codes, and overall disinvestment in the areas east of 82nd street has manifested in continued environmental decline. Sharon mentioned one option for rectifying some of the challenges created by the haphazard placement of utility lines when she said, “At some point [...] after they tear up the street enough times, you're going to move the line over,” indicating that the city could take responsibility for making tree planting possible along streets (Sharon, Hazelwood). Similar to participants’ conversations about tree planting in the right of way, better communication between city bureaus about shared public spaces could help address this issue.

The topic of historic disinvestment in East Portland did not come up to the same extent in the Outer East Portland - English focus group, but history was still part of the conversation. One participant asked how East Portland had become so devoid of trees:

Mark: Were there no trees out here initially or they just got rid of them all or they died or what?

Lucas: It was referred to as Stumptown. Yeah. They cut them all down.

Shannon: Yeah, I mean, this was all old growth, temperate rainforests when White settlers started cutting everything down to build a port city. (Mark, Lucas, and Shannon, East Portland residents)

Acknowledging how White settler colonialism shaped the landscape of Portland is another way to frame the importance of re-vegetating formerly forested areas. However, the “Stumptown” story participants described is a common myth associated with Portland’s history. This narrative assumes the land Portland was built on was “untouched” before White settlers arrived, obscuring the land management practices of Indigenous peoples who cleared trees for agriculture (Hedberg, 2015). Some clear-cutting did occur to begin building the city, but trees were planted by White settlers as well to

shape the landscape to reflect their values (Hedberg, 2015). Overlooking Indigenous land management and impacts on land is another example of how White environmental ideals have overshadowed those of others. It is further reason to pursue recognition and restorative justice practices that center the needs of communities of color and Indigenous communities, which would involve reparations, land back, and Indigenous sovereignty.

Understanding how historic factors shape modern environmental inequity is crucial for addressing environmental injustices, and so is knowing what kind of change matters to community members. Eastmoreland and Hazelwood participants expressed frustration that historic disinvestment in East Portland has led to less overall canopy and restricted tree planting. They demonstrate a desire to recognize and rectify the marginalization and devaluation that has occurred in the past to create the circumstances of the present. The Outer East Portland – English focus group conversation about “Stumptown” reveals how White environmental ideals and narratives continue to shape resident perspectives on tree inequities and calls for recognition of the original stewards of this land. The memories Outer East Portland - Rohingya and Outer Southeast - Cantonese participants shared also show the importance of recognizing the kinds of urban landscapes that feel meaningful to people because of the places they have lived. Taking history and memory into consideration when creating tree-related policy can help incorporate recognition and restorative justice, main tenets of environmental justice, into environmental and other infrastructure projects (Pellow 2016, Grove et al. 2020).

5.3 Intersecting Tree Planting Narratives and Restorative Justice

Most focus group participants wanted more tree planting in their neighborhoods. Figure 7 shows the density of green dots that participants used to mark locations where they would like trees planted, and Figure 6 shows the density of orange dots that participants used to mark areas where they had tree-related concerns. Comparing the maps reveals that the areas where people were concerned about trees often overlapped with areas where they wanted trees planted. For many areas where tree planting and concerns overlap, participants were concerned about tree loss and wanted them to be replaced, or they thought there weren't enough trees in those areas and thought more should be planted. There were only two participants who placed red dots on their maps (see Figure 8) indicating places where they did not want trees planted, but these examples present a narrative that is important because it conflicts with what most other participants said. This perspective was only expressed by members of the Outer Southeast - Cantonese focus group, which represents a unique cultural perspective that would not have been captured if focus groups were only conducted with neighborhood association members.

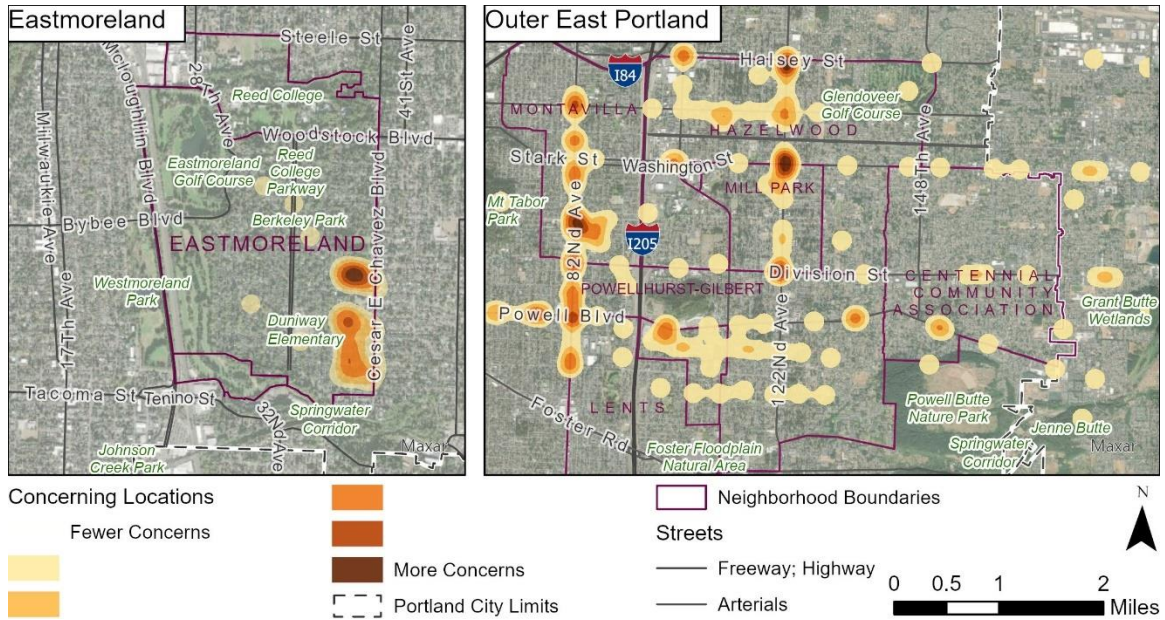


Figure 5 Tree Concern locations: Participatory mapping results for areas where participants were concerned about trees. Light green to dark green areas show the density of areas where participants placed orange dots for tree concerns. The Eastmoreland points are concentrated in the Berkeley Addition, where participants were concerned about tree loss from property development. The Outer East Portland points are concentrated around major corridors, where participants were mostly concerned about lack of trees, or about tree safety (Outer Southeast - Cantonese group). Aggregated using kernel density.

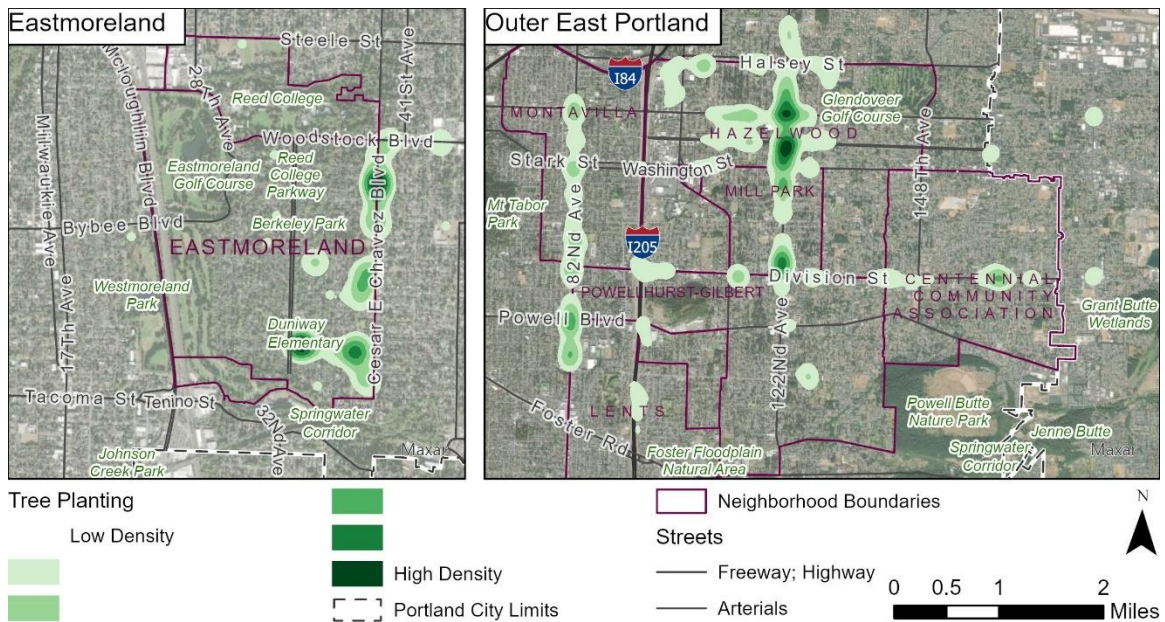


Figure 6 Desired tree planting locations: Light green to dark green areas show the density of tree planting points placed by participants. The Eastmoreland points are concentrated in the Berkeley Addition and along Cesar Chavez, a major street, where participants want trees to be planted so that canopy is not lost from property development. The Outer East Portland points are concentrated around major corridors, where

participants want trees to be planted to provide shade and other amenities. Aggregated using kernel density.

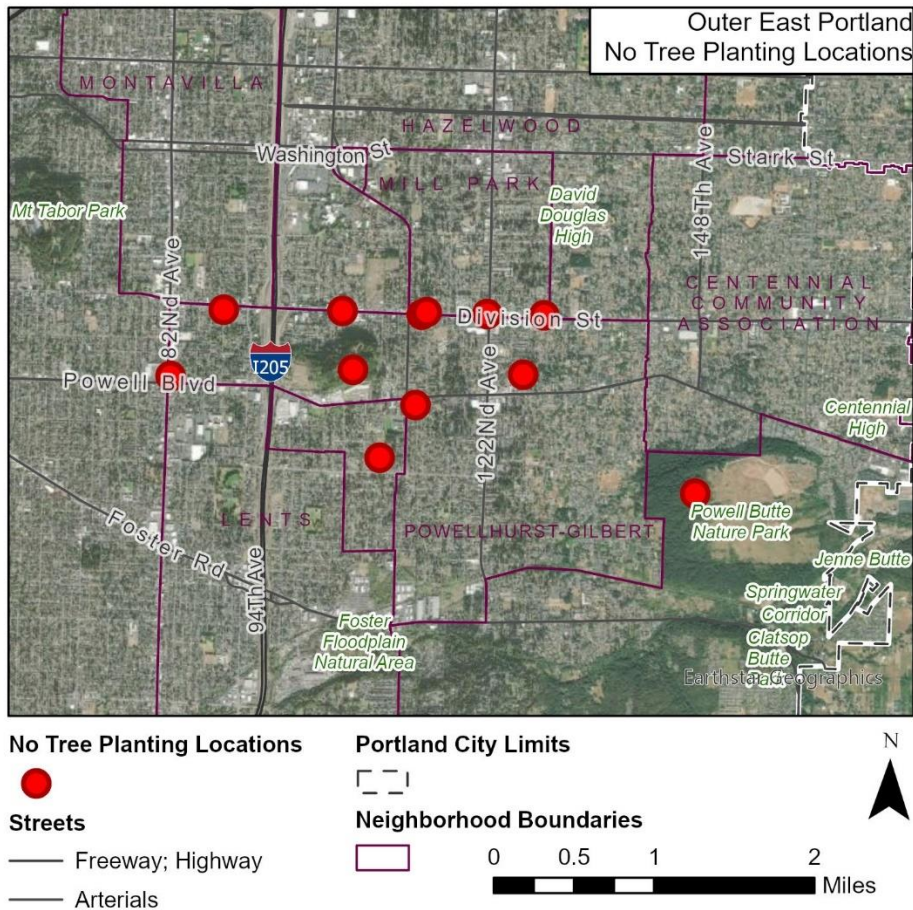


Figure 7 No Tree Planting: Locations where participants placed dots representing places where they do not want trees planted (Outer Southeast - Cantonese focus group).

5.3.1 Tree Planting Along Major Corridors and Transportation Safety Issues

A common discussion between focus groups was the importance of tree planting along major corridors. Participants commonly mentioned and mapped locations along major north-south roads, including 82nd Street, 122nd Street, and Interstate 205, and east-west roads, including SE Powell Boulevard, SE Division Street, SE Stark Street, SE

Glisan Street, and NE Halsey Street. Major corridors are spaces that present a complex intersection of interests because they have a lot of car traffic, often are high speed roads, are usually lined by businesses, and have public right of way areas that are often narrow and yet contain many public amenities like water utilities, sidewalks, powerlines, bus stops, and more. There were several conflicting narratives between participants about trees along major corridors that reflect the complexity of these spaces and the importance of collecting different perspectives. The first conflicting narrative was whether trees make streets feel safer or more dangerous, and the second was whether business owners should take more responsibility for tree planting along major roads because they are in charge of maintaining the right of way adjacent to their property.

Regarding transportation safety, the dominant narrative among participants was that trees make streets safer for cars, bikers, and pedestrians. Eastmoreland participants expressed concerns about the danger of major roads near their neighborhood such as Cesar Chavez Blvd, as well as their concerns about safety on streets in the Outer East Portland area like SE 122nd St, SE Division St, and SE Powell Blvd. One participant described how Powell Blvd was improved to make space for a sidewalk, but all the trees that were there in the past got taken out and it still a dangerous area for pedestrians and cars: “they created sidewalks finally because Powell was so dangerous. But now they took out any kind of trees” (Michelle, Eastmoreland). Her comment also represents the complexity of providing safety amenities in narrow public right of way spaces, and governing entities (likely the transportation bureau of the city) may not always know the best way to balance and prioritize safety amenities in these spaces according to residents.

The narrative connecting trees and safety was particularly strong for Hazelwood and Outer East Portland - English focus group participants, which also spoke to their lived experiences navigating major roads with high traffic and few trees. Some participants mentioned the possibility of improving safety for cars, bikes, and pedestrians by planting more trees, and making space for trees in the public right of way. Jake from the Hazelwood focus group said he “would love to see [...] big arterial roads have a ton of trees going all the way down, and great bike infrastructure [...] because it's so unsafe” (Jake, Hazelwood). Mark from the Outer East Portland - English focus group shared a similar sentiment, also proposing that space for cars be reduced to make room for trees:

“I just think maybe if they could reduce some of the space devoted to cars, they could utilize some of that for trees. [For example], median strips with trees or plants and in front of buildings [...] and focus more on getting people on bikes or on public transportation (Mark, Outer East Portland - English).

Participants also described how they felt local governing entities, in this case the Oregon Department of Transportation (ODOT), were unwilling to make changes in right of way areas to create safety, both with built infrastructure and with trees. The City of Portland is responsible for maintenance and tree planting in most right of way areas, but ODOT maintains the right of way surrounding freeways like Highway 84, which is the area participants are referring to here:

Sharon: 122nd underneath that when you're coming up from Fremont and you come up under 122nd. That is bleak.

Patricia: It is horrid.

Sharon: And it's also not safe.

Patricia: I don't ever go there.

Sharon: And then the 102nd one. The sidewalk is 18 inches wide. [...] It's not only a little softening with greenery and a bigger sidewalk would help it. ODOT said "we don't have money to do that." I almost said, "but you have money to expand I-5" (Sharon and Patricia, Hazelwood).

Sharon and Patricia avoid this area that feels unsafe and unfriendly because of narrow sidewalks and lack of trees. “Greenery” not only makes a place safer, but also more welcoming, and they see this as something ODOT overlooks and fails to prioritize. This narrative is connected with feelings of mistrust from government entities. Participants feel neglect from entities like ODOT and the city for not listening to requests for trees, which is amplified by the fact that for them, trees are connected to safety, so if these entities are not planting trees, then they are not demonstrating care about the wellbeing of residents.

In contrast, a few participants from the Outer Southeast - Cantonese focus group expressed not wanting trees along major corridors because trees can block line of sight and be a disturbance. Similar to their concerns about big trees, Cantonese participants described how trees may make it more difficult for drivers to see. Margaret said she thought streets should be made wider, not the right of way as other participants suggested, and that planting trees was not necessary:

From I think around 82nd to 122nd, there this high rate of accidents. I don't think there is necessarily [a reason] to plant some trees there. We need to make it wider and wider and even right now already reduce the speed (Margaret, Outer Southeast - Cantonese).

Christine agreed and commented that she felt there are already “too many cars around” as well as people and that more trees would be “more disturbing” (Christine, Outer Southeast - Cantonese). The different opinions presented by these participants represents how the lived experience of safety is very personal and how it may be influenced by cultural perspectives.

These findings inform the larger conversation on how trees influence road safety, either empirically or through perceptions of drivers and pedestrians. Until the past two decades, research on road safety found that trees made driving more dangerous, but more recent work has determined that especially in urban contexts trees can change perceptions of safety and are associated with fewer car accidents, fewer speeding incidents, and reduced pedestrian injury (Dumbaugh and Gatis, 2005; Wolf and Bratton, 2006; Mouratidis, 2019; Zhu et al. 2021; Cai et al. 2022). However, other recent work has found more nuance associated with urban street trees and road safety. Marshall et al. (2018) found that in Denver, CO, tree canopy covering the road reduced accidents overall, but wealthier neighborhoods experienced far fewer accidents while low-income neighborhoods experienced more accidents along roads with more trees. An assessment of pedestrian perceptions in three Massachusetts cities did not find a universal association between street trees and safety, suggesting that different cultural experiences may impact perceptions of fear or safety when walking (Coleman et al., 2021). These studies inform the findings of this research, showing that different socio-economic and cultural backgrounds may influence safety perceptions. These combined findings call for further research that investigates the transportation and road safety needs of marginalized groups.

Reconciling the opposing experiences and perspectives that trees have on road safety is difficult, but highlights the importance of engaging with different groups to incorporate the variety of opinions, experiences, and values into programs and projects. It is also important to prioritize the voices of people who have not had a say in city planning processes. One possible way of reconciling the perspectives represented here is to find out if there are specific blocks where people would not like trees, or if better

maintenance of trees along major roads could make those places feel safer. Also, perhaps a combination of slower speeds and wider right of ways would achieve the changes Outer Southeast - Cantonese participants are looking for, but involving them in the process could ensure that they are aware of how changes would affect these streets and be able to give input.

The role of business owners to plant and maintain trees in the right of way strip in front of their property was another topic that came up in discussions about trees along major roads. For participants who did not want trees along major roads, it was not important for business owners to plant trees. Christine from the Outer Southeast - Cantonese focus group said that in addition to trees being a disturbance along major roads, there is “no need for big trees in the business area” (Christine, Outer Southeast resident). Her specification of big trees insinuates that smaller trees would be better in her view. Investigating whether smaller trees that protect the sidewalk align with preferences would be important for future studies. For participants who felt there should be more trees along major roads, the role of business owners in planting and maintaining trees was important. Participants from the Hazelwood and Outer East Portland - English groups discussed the car dealerships along 82nd Street, saying that the owners of those businesses did not want to plant trees because it would block the view of cars in sales lots. For businesses along major roads in general, participants said there is usually space to plant trees, but business owners also do not want to deal with maintenance:

Along 122nd you absolutely must put trees. It's so awful. There's actually space for a lot of trees because the building is set back but people don't plant because they gotta maintain them. And it's like, oh, come on. It's not that hard to do. (Sharon, Hazelwood)

Business owners may have a different perspective, but in Sharon’s view, maintaining trees outside your business should be feasible, perhaps because those businesses have enough capital and should reinvest in the area they gain capital from. Sharon also described a similar phenomenon in northeast industrial areas of Portland, which is mostly businesses and lacking trees: “You get past I-84 and it’s bleak, bleak, bleak because it’s all the industrial area. And all those people say, ‘Oh, we don’t want trees’” (Sharon, Hazelwood). In all of these examples, participants blame lack of trees in industrial or commercial areas on the property owners, which reflects the complexity of the mix of public and private spaces in urban areas and how that can impact the urban forest. Even in public spaces like the right of way, private entities influence whether trees get planted and maintained. Making changes to tree planting and maintenance programs to enhance tree canopy along major corridors and in commercial or industrial areas could address these concerns.

5.3.2 Tree Planting and Houselessness

Another topic that came up when participants were discussing tree planting and their concerns about trees in Portland is houselessness. The houselessness topic was especially prevalent in the Outer East Portland - English and Outer Southeast - Cantonese focus groups. Several perspectives emerged, ranging from how public spaces with more trees attract more houseless populations and, in the process, become less desirable areas to visit, to how tree (in)equity is tied up with systemic issues that also contribute to houselessness. Addressing systemic issues through procedural, recognition, and

restorative justice approaches could lead to more equitable futures for both trees and housing.

A number of concerns emerged regarding treed public spaces being or becoming occupied by members of the houseless population and these combined factors creating a degraded space. One participant from the Outer Southeast - Cantonese focus group, Margaret, described wanting more trees along the bike path next to I-205, but she fears that trees would lead to an even higher houseless population. She said she used to take her children biking on this path, but that she has not been there for the past two years because the number of houseless people feels dangerous. Margaret worries that “if we have more trees there, maybe [we would have] more homeless there” (Margaret, Outer Southeast - Cantonese). Other participants did not elaborate on this point or indicate that they agreed or disagreed, but this unique perspective is still interesting to note.

Participants from the Outer East Portland - English focus group, Mark and Dmitri, shared ideas about how areas with poor tree and infrastructure maintenance overlaps with areas where houseless people live, reinforcing the idea of the presence of houselessness making an area degraded. Dmitri described a park where “tree roots are destroying the older sidewalk [and] nobody really cared about this place. It was a bunch of homeless people living and they are just messy there” (Dmitri, Outer East Portland - English). Mark was concerned about intentional vandalism or fires impacting trees, which does not necessarily mean houseless people are part of that vandalism, but insinuates that maltreatment of public spaces makes them undesirable.

Participants from the Outer East Portland - English focus group discussed how the inequitable distribution of trees and tree health intersects with systemic issues that also

perpetuate houselessness. This discussion emerged out of participants sharing their frustration that trees are blamed for having illnesses or causing infrastructure damage when in fact their wellbeing is affected by lack of support and care in a harsh urban environment. Daniel explained, “[For example] with root damage, it's more of an effect not a causation. I see it more that way [...] if we could better support the trees and nature, less of this would happen” (Daniel, Outer East Portland - English). Making urban environments more supportive to trees and ecosystems is connected to addressing issues that are “contributing to deforestation or development” and other systemic inequity (Daniel, East Portland resident). For example, building housing that removes trees and is not financially accessible to much of the population. Daniel described the importance of “providing resources for houseless folks” such as safehouses, but the group discussed how addressing houselessness does not exist in a vacuum, and it is important to “connect human and societal problems with nature” (Daniel, East Portland resident). Developing and building infrastructure in ways that do not support human or ecosystem life is unjust.

These combined narratives tell a story about how the marginalization of space and people coincide and co-constitute each other. Houseless populations degrade the value and desirability of a space by occupying it, and so the provision of amenities to those spaces, including trees, is questioned. At the same time, degraded spaces are attractive to un-housed residents and so the production of marginality is compounded by the hyper-visibility of houselessness and poor environmental quality. However, the underlying issue is not the occupation of these areas by unhoused people, but housing inequality and the failure to provide basic housing amenities to Portland’s unhoused residents. Daniel is

calling for the unification of basic housing and environmental amenities so that the provision of housing can also be connected to the provisioning of greenspace.

5.3.3 Development, tree canopy loss, and restorative justice

Another shared concern between focus groups was the potential for loss of tree canopy as development continues in Portland. These conversations illustrated a spectrum of ways that trees intersect with development and housing projects. Eastmoreland participants described their frustration with new single-family homes in their neighborhood taking up too much space on private lots to allow for trees and proposed setback requirements or multi-family housing with shared greenspace. Hazelwood participants discussed the importance of providing trees for multi-family and affordable housing in low-income neighborhoods. Outer East Portland - English participants discussed their concerns about trees loss intersecting with larger systemic issues and development.

The Outer East Portland - English focus group discussed “growth and development as the causes of fewer trees” and the implementation of new buildings causing trees to be cut down (Daniel, East Portland resident). For Outer East Portland - English participants, this was a similar narrative to the intersection of tree inequity and larger systemic challenges like houselessness. Shannon described this concept in the context of development more specifically:

We expect the trees to conform to us instead of building around it, especially if it's already there, and you're trying to build a housing development or anything, you know, don't look at the tree as a nuisance. It's like life and it's there and, you know,

make accommodations for it. But we're, I think, we're a long way from, you know, as a whole, looking at nature that way (Shannon, Outer East Portland - English).

Housing and development are often prioritized over the ecological amenities that already exist in a space. These developments often overlook the connections that community members may have had with outdoor spaces (Anguelovski et al. 2020). In addition, one Portland study shows that areas with bigger, older trees have lower mortality and cardiovascular disorder rates, with rates increasing in areas with smaller, younger trees, demonstrating the importance of preserving existing older trees instead of cutting them down and replacing them with young trees (Donovan et al. 2022).

Eastmoreland and Hazelwood participants were concerned about this as well, and discussed specific concerns about ensuring space for trees when new development is occurring. For example, these residents described the importance of implementing policies for developments on private properties that leave enough space for trees instead of building to the edge of a lot. Jeff from the Eastmoreland focus group described how the city has implemented some rules about building setbacks from the edge of a lot, but it is not enough to ensure trees get planted. He said, “So the city has ideal setbacks, [but] of course [developers] push everything up to the sidewalks and that’s somehow desirable. So there’s no greenspace between [the building] and the sidewalk. It doesn’t work for apartments, it’s fine for commercial but it’s absurd for much beyond that” (Jeff, Eastmoreland). Eastmoreland participants also described concerns about new single-family housing going up in the Berkeley Addition of their neighborhood that took up so much space on the lot that there was no room to plant trees, or even for a right of way strip wide enough to accommodate trees according to the city’s 3-foot rule (see Figure 3):

Chris: I live in [the Berkeley Addition], which is [...] where trees are just gradually going, you know. They'll take down a small older house, build a massive new one or several massive new ones that come within 10 feet of the edge of lot with no trees. The trees on the on the street as well go. So, it's just [...] gradually losing [trees] (Chris, Eastmoreland resident).

Several participants referred to the loss of trees in the Berkeley Addition (part of the neighborhood with different zoning and development rules) as “deforestation.” Sarah explained that development in this area is a huge concern for Eastmoreland residents adding, “the city is no longer, not just requiring, they're telling developers not to put in any trees” (Sarah, Eastmoreland). The zoning rules in this area make it easier for properties to be redeveloped and do not require a right of way strip large enough to fit trees, especially large ones. Participants expressed a preference for smaller houses or multi-family units that took up a smaller part of the lot and allowed for greenery that would provide shade and better aesthetics. Chris described the possibility of multi-family units with shared greenspace, referring to an existing apartment building with a yard and garden. One narrative at play here might be the importance of maintaining neighborhood character by keeping Eastmoreland green and forested, but these participants are also concerned about overall deforestation for Portland’s longterm tree canopy health, as well as interconnected issues such as housing. They shared that the new houses being built in the Berkeley Addition are expensive, which does not help address the financial exclusivity of Eastmoreland. From what these participants are saying, multi-family housing with greenspace, and that does not disturb street trees, would be desirable over large single-family homes, which could help integrate less privileged populations into this historically exclusive and densely treed area.

Hazelwood participants were upset by recent changes in city code that allow tree removal when new multi-family and affordable housing units are being built and do not require those trees to be replaced on the same lot. They blamed developers for pushing the city to implement this code that does not require green amenities for multi-family and affordable housing units, which they said was “a great disservice to the residents” (Sharon, Hazelwood). Affordable housing is something that was extremely important for Hazelwood participants, but the way affordable housing units are being built with little space for trees is concerning:

Patricia: We're not disputing [affordable housing] we're disputing the rules that [the city is] using. Allowing the developments to go to the very edges is the property and with very little room to put anything.

Sharon: They can go up a story and put the green space around it. We don't have a problem with that.

Patricia: Yeah, it's just the way they're developing. That's what we have a problem with, and we sit on the neighborhood association board, and we sit there and development after development crosses our board, and it's just really sickening to, you know, okay, "we're chopping down all the trees." One after the other. (Patricia and Sharon, Hazelwood)

Hazelwood residents want trees as well as other infrastructure, which is different from the conclusions of Grove et al. (2020), who found that residents of lower income areas did not want trees because they preferred other infrastructure. Restorative justice shows the importance of centering the voices of marginalized communities who have not been involved in environmental planning to rectify past and current inequity, which is especially relevant here due to the piecemeal planning and disinvestment history of East Portland (Anguelovski et al. 2020, Schell et al. 2021, Goodling et al. 2015).

Outer Southeast - Cantonese, and Outer East Portland - Rohingya groups did not explicitly discuss concerns for tree loss due to development, possibly because they have

lived in their neighborhoods for less than 12 years and may not be as aware of recent changes. However, they will likely be impacted by changing urban landscapes. Both groups expressed appreciation for many amenities available in their neighborhoods and for Portland in general, and have a sense of community where they live. Both groups want more trees in their neighborhoods as well, so future development policy should ensure established trees can remain and more trees can be planted. Curran and Hamilton (2018) caution that tree planting and urban greenspace projects may contribute to gentrification and loss of sense of place, and therefore should only take place in small-scale, community led settings. But the combined viewpoints of these participants suggest that more trees are needed in areas that are currently lacking, particularly for multi-family, low-income, and affordable housing. Not providing these amenities, or providing them to a lesser extent, perpetuates a second tier of environmental quality. Anti-displacement policies provide one solution to ensure that increased investment in these neighborhoods, including green investment, to not result in the displacement of residents so that they can continue to build community and identity in the places that matter to them.

5.4 Maintenance Concerns and Responsibility Narratives

Tree care, health, and maintenance are especially complex in urban environments. Trees planted in the right of way may encounter infrastructure constraints such as sidewalks, underground water and other utilities, and overhead powerlines, often resulting in damages to both infrastructure and trees. Property owners are responsible for

maintaining the right of way adjacent to their lot, including sidewalks and trees. Costs associated with these types of maintenance can be extremely expensive, a disproportionate burden for low-income households, creating a barrier for both homeowners and renters whose landlords may not be willing to care for trees (Riedman et al., 2022). Conversations about maintenance revealed that the Eastmoreland Neighborhood Association is able to cover costs for tree planting and monitoring, while other focus group members did not have that resource. Financial resources and connections with organizations and associations revealed differences in the power that each focus group had to care for trees and express their maintenance concerns with governing bodies. These findings have implications for the kinds of justice that can adequately address inequitable maintenance burdens.

5.4.1 Maintenance Concerns

Participants' concerns about trees highlighted the complexity of providing enough resources to maintain healthy trees in urban areas. Concerns were not just about trees themselves, but the challenges involved with maintaining trees and the complexity of infrastructural and other conditions trees interact with. Lucas from the East Portland focus group said he is most concerned about root damage near sidewalks or housing infrastructure. If tree roots damage the sidewalk, adjacent property owners are responsible for sidewalk repair, which is expensive. Participants were also concerned about tree health, including the health of new trees along main roads and trees affected by disease and pest infestations, and tree species issues such as planting trees with enough

species diversity, non-invasive species, and species that are resilient to warmer temperatures and changing climate.

Maintenance of trees in the right of way also dominated participant conversations about their tree concerns. Imbued within these conversations was a desire for the city to step in and provide higher quantity and quality of tree maintenance. Eastmoreland residents described their concerns about public tree maintenance along major corridors as well as in their own neighborhood. Outer Southeast - Cantonese focus group maintenance requests were related to the size of trees and tree safety. Hui described big trees in the Mill St and 89th St area as an area with poor maintenance. Christine's maintenance request was that branches be cut so they are not "falling everywhere" (Christine, Outer Southeast - Cantonese). Challenges with financial resources for maintenance was also a main concern for participants. Hazelwood residents were concerned with homeowners not being able to maintain trees and told stories about their experiences or neighbors' experiences having to pay for unduly expensive tree maintenance. Mark from the East Portland focus group described: "Maintenance costs money. [...] Sometimes it's cheaper to maybe just get rid of a tree" (Mark, East Portland resident). Tree removal is also costly, which this participant may not have known, but this comment reveals maintenance as a reason many residents may not want trees. Participant narratives painted a complex picture of how the burden of maintenance causes some people to not plant trees, which also contributes to tree distribution issues. Improving financial investment in tree maintenance could significantly improve tree distribution and perspectives on public trees in Portland.

5.4.2 Inequitable Maintenance Burden

Concerns about the unequal burden of maintenance falling to the adjacent property owner was especially present in the Outer East Portland - English, Eastmoreland, and Hazelwood groups. The Outer East Portland - English participants were concerned about the inequitable consequences of poor tree and infrastructure maintenance:

Shannon: This maintenance/pruning, it definitely makes me think about equity. And that is, in my opinion, how trees do become a problem for some people.

Lucas: I mean, root damage is also an issue just because homeowners are expected to fix sidewalks. They're on the hook for the sidewalks. So, it's not the roots [...] it's the roots damaging sidewalks, and water, and sewage pipes. Which the homeowners have to fix.

Dmitri: If the roots damage the sidewalks, the people with disabilities [...] might not have the access. (Shannon, Lucas, and Dmitri, Outer East Portland - English)

Tree maintenance is an inequitable burden for low-income residents, and poor maintenance of infrastructure damaged by trees inequitably affects people with disabilities. Participants were concerned about both unequal financial burden and unequal physical access to treed sidewalks.

Hazelwood participants saw the lack of maintenance in their neighborhood contrast with more maintenance in wealthier neighborhoods. These participants described how they felt the city maintains trees in wealthier parts of the city with more trees, while neglecting the Hazelwood area. Jake explained:

You notice when you go into sort of the inner Eastside neighborhoods with some of the wealthier older homes, there's trees lining all the streets, there's lots of trees, but it's like, okay, so the city will pay to maintain the trees in those neighborhoods but not in our neighborhood. Like, come on, let's go (Jake, Hazelwood).

Eastmoreland participants provided the opposing opinion that especially after recent changes in codes, the city is not maintaining trees in their neighborhood either. But the

legacy of planning decisions that led to more trees in Eastmoreland and other wealthy neighborhoods manifest as a lasting sense of neglect for Hazelwood residents.

Eastmoreland participants' concerns extended to other areas of Portland, especially areas with low-income residents and renters. They perceived the lack of trees in low-income areas as a product of the city leaving the burden of maintenance to residents, with residents not being able to maintain trees in the right of way strip. Sarah and Olivia described their concerns about rows of public trees in lower income neighborhoods:

Sarah: There's one on Southeast 77nd off of Woodstock going north for example, so that's a lower income neighborhood. In fact, most of these are lower income neighborhoods. And [the city is] doing nothing. So those allees are just being destroyed.

Olivia: Yeah, because the neighbors there don't have extra income.

Sarah: No, they don't have the, they don't have the, no (Sarah and Olivia, Eastmoreland residents)

The city's neglect has consequences for tree canopy by putting maintenance responsibilities on property owners.

Property owner responsibility for tree maintenance also negatively affects renters, who usually do not have a say in tree planting on their property. Sarah from the Eastmoreland focus group hypothesized that the number of absentee landlords, especially in lower-income areas, affects tree distribution and access for renters. From a previous job in real estate, she remembered that "there wasn't any interest" from landlords and while tenants would say, "We'll water the trees," they could not get buy in from landlords, which she thinks "is a condition that exists a lot in this city that relates to the absence of trees" (Sarah, Eastmoreland). Jake from the Hazelwood focus group agreed that areas with more renters have fewer trees due to lack of interest in maintenance. He

blamed this neglect on the fact that “the city doesn’t care as much cause it’s more renters, as opposed to homeowners, and it’s poor” (Jake, Hazelwood). Many of the Outer East Portland - Rohingya participants were renters and while one person was allowed to do some gardening outside, another person expressed frustration at not being able to have any trees, and not having much space for plants inside either. As a landless ethnic group, it is extremely important for the Rohingya to influence their immediate surroundings so that they can establish sense of place. If landlords did not have to worry about the maintenance of trees adjacent to their property, trees would be more feasible in right of way strips near apartments.

5.4.3 Inequitable power relationships

Participants had different amounts of power to influence the kind of tree maintenance they wanted in their neighborhood. Those who had lived in their neighborhood for longer, are wealthier, experience race and class privilege, and do not face language barriers had higher financial capacity to care for trees and to communicate with local governing entities. While the city currently attempts to enact fair maintenance policies that ensure trees in the right of way will be maintained for three to five years after they are planted (and prioritize tree planting in low-income neighborhoods with more people of color), they may not be enough to address inequitable maintenance burdens and resulting consequences for tree planting and health. This calls for measures that go beyond procedural justice to incorporate inclusive and power-shifting restorative justice practices.

For the Eastmoreland and Hazelwood groups, the city, private companies, and other entities were more likely to be blamed in discussion as the responsible parties for poor maintenance and unequal maintenance burden. This is interesting given that most participants from these groups were part of a neighborhood association. These participants even described instances when they had expressed their concerns to local government entities such as ODOT or the City of Portland. Other focus group members expressed discontent with maintenance practices, but rarely described contention with the city or in-depth knowledge of city practices. This has larger implications for inequitable differences in civic participation and engagement opportunities and how residents are able to develop knowledge and share opinions about local tree policy. It demonstrates the difficulty in involving underrepresented residents in discussions with state actors so that decision-making processes can be more just.

Eastmoreland participants described frustration that changes in attention and funds from the city have led to less maintenance that could affect the longevity of tree canopy in Eastmoreland and all over Portland. The difference between this group and the other neighborhood groups is that the Eastmoreland Neighborhood Association has the ability and funds to take on some of the responsibility themselves. The financial privilege held by these residents allows them to address maintenance issues in their neighborhood, and to maintain the livability and neighborhood character provided by healthy, large trees. Several participants shared their knowledge about this during the focus group:

Olivia: All these trees there [at Reed College] belong to the city, however.

Sarah: They don't maintain them.

Olivia: They don't maintain them?

Jeff: Right.

Olivia: So, I don't even know who is maintaining them.

Sarah: The Neighborhood Association. (*At the same time as Jeff*)

Jeff: The Neighborhood Association, to the extent that they're being maintained.

(Olivia, Sarah, and Jeff, Eastmoreland residents)

The Eastmoreland Neighborhood Association has taken numerous actions to preserve the existing tree canopy including watering public property trees that the city owns but does not maintain, creating an online interactive map of all trees, their conditions, and areas missing trees, a neighborhood tree committee and fund to pay for the planting of new trees.

The difference in communication with governing bodies and financial capacity that can both lead to better tree maintenance demonstrate a difference in power that may perpetuate environmental injustices. The fact that residents of lower income and historically disinvested neighborhoods, represented by the four focus groups besides Eastmoreland, do not have the same capability and feel overlooked by the city speaks to the need for government entities to establish trusting relationships with these residents by listening to their needs. Achieving this may involve replacing the one-size-fits-all policies that have been common in procedural justice practices with policies informed by restorative justice practices. Such an implementation will require policy that takes the financial capability of neighborhoods like Eastmoreland into account and prioritizes maintenance in communities that do not have those resources. Another approach, centered in both procedural and recognition justice, would involve the city taking responsibility for maintenance of all public trees for their lifespan, but feasibility of this undertaking would need to be assessed.

6. Discussion:

Results from this study illustrate the complex socio-ecological and socio-political relationships between humans and trees in urban environments. The values, lived experiences, and narratives participants shared provide insight into how inequitable tree distribution, maintenance, and planting practices have developed in Portland, how these are perpetuated, and how tree planting and care needs to change to meet resident needs and preferences to enhance livability, sense of belonging, and wellbeing. While there were several areas of disagreement about the type and size of trees, participants overall valued trees and the amenities they provide. Whether they lived in a densely or sparsely treed area, participants agreed that tree distribution in Portland is inequitable, broadly identifying Outer East Portland and commercial and industrial areas as lacking trees. Historical narratives showed how areas of poor policy implementation and disinvestment (Outer East Portland), as well as areas of current development, correspond with declining tree canopy and other tree-related concerns (Goodling et al., 2015). Conflicting narratives about trees in the right of way and on public property, and the complex set of interests that public trees intersect with, reveal how existing trees and current tree planting programs are not currently meeting resident needs. Maintenance was also identified as a major barrier to more equitable tree distribution and health, aligning with previous research (Riedman et al. 2022). The disparities in the distribution, health, and maintenance of trees that participants identified are a result of not only distributive injustice, but also lack of procedural, recognition, and restorative justice.

Distributive justice issues are represented by discrepancies in number of trees and amount of tree canopy reported by focus group participants both in focus group discussions and through participatory mapping (Bell and Carrick, 2017; Pellow, 2018). These findings align with similar work on unjust tree distribution patterns in urban areas, and studies on Portland's gradient of more tree canopy in Western parts of the city to less tree canopy in Eastern parts of the city (Porascky and Banis, 2005; Landry and Chakrobarty, 2009). There were some differences in the ways participants valued trees, but they still desired trees in areas of Portland that lack green amenities. Participants appreciated trees for their ability to provide shade and cooling, their aesthetics, habitat provision, and stormwater management, aligning with previous work on urban greenspace values (Tyrvainen et al., 2007; Pataki et al., 2013; Conway et al., 2016; Dawes et al., 2018; Carmichael and McDonough, 2019). But the lived experiences and actual access to these amenities was different because Eastmoreland residents described how they benefitted from being surrounded by trees while Outer East Portland residents described feeling a general lack of trees, exemplifying the inequitable distribution of trees along race and class lines found by Heynen, Perkins, and Roy (2006). Narratives about uneven urban environments speaks to the main tenants of urban political ecology, in which social inequality is reproduced through material environments, in this case through the creation of areas with lesser environmental quality due to poor tree distribution and maintenance (Heynen, Perkins, and Roy, 2006; Heynen 2014). Human agency over urban environments contributes to this inequality in the ways that preferences shape different areas and who has (currently and historically) had the power to shape the environment in their neighborhood (Pataki et al., 2013).

The City of Portland's Urban Forestry Plan acknowledges the injustice in tree distribution and seeks to address it through priority tree planting neighborhoods, which are neighborhoods with low-income residents, higher population of color, and low tree canopy (City of Portland, 2020). However, the community members engaged in this study expressed ongoing frustration with or mistrust of the city, knowledge and memories that influence their tree-perspectives, and a complex set of needs for urban environments, indicating that a tree planting plan solely focused on distributive justice will perpetuate the disconnect between the city and underrepresented residents as well as injustice in Portland's urban environment. These findings align with similar studies that demonstrate how the disconnection between government actions and community needs is a barrier for more equitable tree planting and maintenance (Carmichael and McDonough 2019; Berland et al., 2020; Riedman et al., 2022).

Implementing just and equitable tree and greenspace policy requires including underrepresented community members in decision-making processes (Pellow, 2016; Anguelovski et al., 2020; Schell et al., 2020). Participants discussed the city as a perpetrator of inequitable tree distribution and maintenance issues, but there were differences in how each group was able to voice or address their concerns. The Eastmoreland group had the power to shape their environment through financial resources that are not available to the other focus group participants. The Eastmoreland and Hazelwood groups both had in-depth knowledge of city processes, likely because many participants were part of neighborhood associations or other organizing committees. However, the different outcomes for these two groups, due to Hazelwood residents experiencing long-term neglect and lack of financial resources for trees and

maintenance, represent how procedural justice and the equal implementation of policy fails to equitably meet community needs (Bell and Carrick, 2017).

The prevalence of homeowners in Eastmoreland versus renters in Outer East Portland and how property ownership status affects access and control over resources is also reflected in this study (Perkins, Heyen, and Wilson, 2004; Heynen, Perkins, and Roy, 2006; Riedman et al. 2022). Mullenbach et al. (2022) call out how the “contemporary manifestations of uneven development [including], for instance, private control of city planning” reflects “White ideals of nature and economic growth,” often resulting in an exclusion of BIPOC community values (p. 5). Eastmoreland participants’ control over their immediate environment reflects how the production of race and class identities contributes to different amounts of power over urban spaces. The differences that were found between environmental ideals and values of groups with different race and class identities reinforces how decision-making should not just be based on the perspectives of White and wealthy groups that have had historic and current power over environmental outcomes.

Addressing power differentials requires policy and programs that move beyond the typical “equal” implementation of procedural justice (Bell and Carrick, 2017). This work involves inclusion of low-income, people of color, and other marginalized groups in decision-making, but also the incorporation of recognition and restorative justice to give these groups priority and power to create the outcomes they want. One instance where these paradigms could be useful is in addressing tree maintenance issues. Concerns about tree maintenance were discussed by focus groups with more wealthy, White, and civically engaged participants, but not as much by the Cantonese and Rohingya focus

groups. These groups expressed their dislike and concerns about big trees, at times contributing to a sense of lack of safety especially along main roads. Dislike of trees due to danger of injury or damage from falling branches has been found in other studies (Drew-Smythe et al., 2023). Studies have also shown that people do not want trees because of lack of care from municipalities, demonstrating the need for long-term tree care programs (Riedman et al., 2022). Prioritizing tree maintenance in Outer East Portland and other neighborhoods with similar socio-economic demographics and histories, instead of applying maintenance policy equally throughout Portland, could provide a possible solution if long-term tree care throughout the whole city is not financially or otherwise feasible. Such a solution would recognize the historic and current capabilities of more privileged residents to maintain trees in places where they live and restore environments in places with less privileged residents to reaffirm sense of place (Whyte, 2017).

More collaboration with communities of color and immigrants in Portland is needed to determine if better maintenance would address tree concerns, or if planting big trees along major corridors would lead to more distrust of local government. Planting smaller trees in these neighborhoods along with maintenance prioritization could be another solution. Further work involving BIPOC communities is needed, including with the Rohingya community in Portland, especially because mapping data was not collected for this group but also because of their traumatic history. The Rohingya are a landless ethnic group that has undergone severe trauma, displacement, and relocation (Milton et al., 2017; Tay et al., 2019). Redistribution of power to enable more just practices should include more involvement of groups like this in decision-making. Rohingya participants

reported that they had never been asked their values and perspectives or given the opportunity to share what they would like to change before participating in this study, giving even more weight to the importance of their inclusion.

The memories and historical knowledge of focus group participants contributed to their understanding of unjust tree distribution in Portland, calling for recognition and restorative justice practices. Critical race and indigenous scholars call attention to historic processes contributing to devaluing and displacement and the need to shift power so that communities afflicted by environmental injustices can create the environmental conditions they need and want (Pulido, 2017; Gilio-Whitaker, 2019). Participants' narratives about memories, historic events, and change contributed to their perception of Outer East Portland as lacking trees and environmental amenities. These narratives reinforce who should be prioritized in restorative urban greening practices so that residents can have sense of place and healthy environmental conditions (Grove et al., 2020; Carmichael and McDonough, 2019).

For Rohingya focus group participants in particular, memories of places where participants had lived before informed their desires for urban greenspace changes and tree planting. Because of the trauma this ethnic group has endured, establishing sense of place and community is even more important (Milton et al., 2017; Tay et al., 2019). Knowledge of Portland's history shaped participants' views on not only inequitable tree distribution, but how poor planning of Outer East Portland is still a barrier for tree planting. Participants shared concerns about lack of attention from governing entities and lack of power for residents, which has manifested in the lived experiences of East Portland residents not matching what they value and want, or require for their wellbeing.

Restorative greening practices should recognize how haphazard development has impacted tree canopy decline in East Portland, as well as a host of other impacts of disinvestment such as lack of urban gardens and mobility issues (Goodling et al., 2015; McClintock et al., 2016; Mahmoudi et al., 2020). Practices must aim to implement programs and policies that require space for trees and provide more maintenance.

Recent studies have found that tree planting, or other kinds of urban greening and environmental remediation projects, are not always the solutions that disinvested and marginalized communities want (Berland et al. 2020; Grove et al., 2020; Anguelovski et al., 2020). One goal of this study was to find out if Portland residents from neighborhoods with fewer trees and histories of disinvestment wanted tree-related interventions. Overall, the Outer East Portland participants did want trees planted. They wanted other amenities and improvements as well, such as affordable housing and safer streets, but trees were ranked an important contributor to urban environments. The concept of “just green enough” would not be adequate in the Portland context, given that Outer East Portland participants are asking for more trees and better maintenance so that they can experience the same socio-ecological benefits received by residents of wealthier neighborhoods (Curran and Hamilton, 2017). Developing multi-family and affordable housing complexes that have fewer or smaller trees enables a second tier of environmental quality and perpetuates environmental injustice.

Restorative justice aims to recognize the needs and wants of communities and acknowledges that top-down implementation of “green” projects can feel disempowering, contribute to loss of sense of place, perpetuate mistrust of government entities, and can be part of development processes that lead to displacement (Kitchen, 2012; Anguelovski et

al., 2020; Grove et al., 2020; Mullenbach et al., 2022; Riedman et al., 2022). Participants of this study are asking for more trees, so there is still potential for the implementation of tree planting and maintenance programs to have these outcomes because of historic cycles of investment, gentrification, and displacement (Anguelovski et al., 2018). Outer East Portland participants described what they value about their neighborhoods besides trees, such as the ethnic food stores available and sense of community. As greening projects are implemented, other strategies such as rent control and anti-displacement measures should be put in place. Mullenbach et al. (2022) reflect on the movement of (mostly White) environmental ideals from conservation efforts in the exurban to socio-ecological configurations in urban areas, which if enacted intentionally could counteract historic legacies of oppression. But they also caution that without intentional work by urban conservation researchers and practitioners, “racism and colonialism may simply adapt to a new context by rescaling privilege and expulsion to the urban scale” (Mullenbach et al., 2022, p. 3).

In contrast to the multi-family housing projects and development in Outer East Portland, Eastmoreland represents a historically wealthy area that has not experienced as much development, which reinforces power differentials between this group and the other focus groups. Grove et al. (2014) call the power differences that dictate control over the amount and quality of vegetated spaces the “ecology of prestige.” New housing developments in Eastmoreland are a threat to the neighborhood’s “green” character because of the changes in city code and potential for tree removal, as well as a threat to the control residents have over the nearby environment, though residents will likely need to accept changes if they want abundant trees to be more accessible for marginalized

Portland residents. Eastmoreland participants agreed that multi-family housing should be more available in their neighborhoods, and that trees should be required along with these developments. While there is new development, the housing being built is not affordable and upholds Eastmoreland's impenetrability for lower income households. Requiring trees for new development could also contribute to further exclusivity in Eastmoreland, for example by making housing costs higher, so policies to keep housing affordable based on income may also be necessary.

The implementation of requirements for tree space on sites with new development further accentuates the differences in how the current city code affects Eastmoreland and Outer East Portland. Table 6 below from Title 11, the City of Portland's Tree Code (section 11.50.050) outlines the amount of space that must be allocated to trees on a new development site or development impact area depending on zoning type (residential, industrial, commercial, institutional, or other). The development impact area refers to any proposed site improvements, which includes development such as buildings, parking, and even landscaping areas, and any space required for storage of materials, construction, or excavation (City of Portland, 2023). For a development impact area, Option A must be implemented, meaning that 40 percent of a one to four family residential site must be available for trees, and 20 percent of a multi dwelling residential site must be available for trees. The On-Site Tree Density Standards also outline the number of required trees per square foot: 1 large tree per 1000 square feet, and 1 medium or 1 small tree per 500 square feet. Preserved existing trees can count toward the requirement as well. But these percentages indicate that for areas with significantly more multi-family housing units and apartments and susceptibility to more of these developments like Outer East Portland, the

lesser allocation of 20% applies to more properties, which contributes to fewer trees overall, possible loss of trees, and a failure to meet the needs outlined by Outer East Portland community members in this study.

Table 6 From the Title 11 Portland City Tree Code, Table 50-2: Determining Required Tree Area, section 11.50.050

Development Type	Option A	Option B
One to Four Family Residential	40 percent of site or development impact area	Site area minus building coverage and proposed development
Multi Dwelling Residential	20 percent of site or development impact area	
Commercial/Office/Retail/Mixed Use	15 percent of site or development impact area	
Industrial	10 percent of site or development impact area	
Institutional	25 percent of site or development impact area	
Other	25 percent of site or development impact area	

In the past there were no greenspace or tree planting requirements for multi-family units, so the allocation of 20% minimum space for trees on multi-family unit development sites is an improvement. But there are also a number of ways developers are exempted from these requirements, for example if there is not enough space to plant a required tree, developers or property owners can pay a fee to have a tree planted in the same watershed, but it will not guarantee trees on the site where they were removed (City of Portland, 2023). Based on the narratives and experiences of Outer East Portland participants, there is a need for policy that goes beyond minimum tree space requirements to achieve restorative justice goals. Places like Eastmoreland have historically far surpassed minimum tree planting requirements which contributes to the existing canopy.

They also have not endured the same impacts of multi-family unit construction and gentrification that Outer East Portland experiences. Meeting Outer East Portland community needs through a restorative approach would involve ensuring that developments are intentional and affordable, providing housing but also preventing gentrification and possible displacement. Developments also need to have minimal impact on existing trees, leaving them if possible, and meet at least the minimum tree space requirements if not more. The right of way strip adjacent to the street must be at least three feet wide in order to plant trees, so if a new area is developed the right of way strip should either be kept if it is wide enough or built to match these requirements and trees should be planted to fill the space. In this way, community definitions of restorative justice can be better integrated into development practices.

This work builds on previous efforts by the City of Portland to inform tree-related policy by incorporating community perspectives, however the unique data collection method used in this study provides new insight (Nascimento and Shandas, 2021). Participatory mapping provided a platform for identifying how values are connected to place as well as similarities and differences between these values (McLain et al., 2013; Cerveny et al., 2017). Place-based discussions about tree-related concerns revealed participants' attitudes about tree maintenance, knowledge about the city's history, and even triggered memories of how places used to be, demonstrating how mapping can provide an avenue to share concerns about lack of environmental stewardship and dissent with management practices (McLain et al., 2013). Top-down decision making perpetuates imbalance of power, but participatory mapping provides an avenue for communication of desires for urban spaces that can enable community power and agency

(McLain et al., 2013). This project captured not only resident concerns, but also the kinds of changes that participants imagined and desired for their neighborhoods and for Portland in general. Asking community members what they want and implementing changes that matter to them aligns with recognition justice, restorative justice, and emancipatory urban greening goals (Whyte, 2017; Anguelovski et al., 2020; Schell et al. 2021). Not everyone in this study had map literacy, so future studies should provide opportunities for people to learn to read maps or incorporate other map-making practices. These improvements would further align this study with the goals outlined by Boll-Bosse and Hankins, such as incorporating reflexivity and collaboration into participatory mapping practices (2019).

6.1 Limitations

This study engaged participants with a range of race, class, and immigrant identities. However, there are still populations who were not involved, notably the Black and Indigenous communities of Portland. Future work should explore community engaged work with these groups because of the particular injustices that have occurred throughout Portland's and Oregon's history affecting Black and Indigenous populations. Engaging these groups will likely bring to light other perspectives that were not held by the participants of this study. Although this work included three participants with Latinx identities, they were part of discussions with participants of other racial identities, mostly White. Studies have shown the importance of conducting focus groups with participants of shared racial identities in order to create a safe space for participants (Leon-Perez,

2021; Cerveny et al., 2023). It is possible some opinions were overlooked or not included because of being in a predominantly White group. The presence of participants who were part of a Neighborhood Association could also possibly add bias to the results. I have attempted to account for this bias by recognizing the high involvement and knowledge that these participants hold about their neighborhood and assessing how that contributes to power differences between participants. Also, there were no participants who vehemently disagreed with tree planting and tree-related efforts in their neighborhood. Instead, there were differences in the kinds of trees people wanted planted and the perceived dangers from trees, which accentuated the differences in investment and amenities provided to participants' neighborhoods. Missing from this study are people who do not want trees planted at all or are not interested in tree planting conversations and efforts. While it may be difficult to recruit participants with opposing or indifferent tree values, further work will attempt to engage this population. Another possible limitation is that some information was lost in translation when conversations were being interpreted during conversations with non-English speakers.

The participatory mapping data collection and analysis processes had limitations as well. As already mentioned, none of the participants from the Rohingya focus group were able to create maps due to English and map literacy. One participant from the Outer Southeast - Cantonese focus group also had this barrier. Future work should reengage these participants with map-literacy learning opportunities so that they have the option and ability to do the participatory mapping portion of the research. The mapping results are also skewed by how participants drew their polygons and how many dots they chose to place for one important place or concern. The mapping outputs should be viewed with

the understanding that they are symbolic of participants tree-related values, lived experiences, and narratives, but not exact. The size of the groups may also affect participatory mapping outputs. The smaller group size of 4-6 people allowed each person's perspective to be heard, but if groups had been larger, it's possible the mapping outcomes would have looked different. For example, locations that are important because of trees or areas where people are concerned about trees could have been more dispersed or had fewer spatial patterns.

Engaging both residents and local government staff in conversations about the participatory mapping results is outside the scope of this research. Researchers also cannot guarantee that the desired neighborhood change identified through this work will occur. But future work should follow through on participatory mapping and research outcomes to ensure communities receive the kinds of just and inclusive green investment they need.

7. Conclusion

This study identifies how community values, narratives, and lived experiences related to trees and greenspace can inform more just and inclusive urban greening practices in Portland, OR. The five focus groups targeted participants from neighborhoods with different socio-economic demographics and histories with the expectation that members of these different neighborhoods, would have different values, narratives, and lived experiences of trees so therefore different policies would need to be implemented to achieve justice in urban greening projects. Results showed that while many values and narratives were similar, participants also held different values, narratives, and lived experiences due to varied cultural backgrounds and historic and ongoing social and spatial marginalization. I argue that these different lived experiences demonstrate the importance of incorporating procedural, recognition, and restorative justice into urban greening and tree related policy to implement changes that are meaningful to communities and rectify past and current environmental injustices. This research contributes to a growing body of literature that examines the different needs, values, and experiences of marginalized communities and incorporates political and critical frameworks to create more just and inclusive futures through restorative practices. It also seeks to provide more context for equitable urban greening and tree-related policy and programs in Portland, OR.

Several key findings from this study inform whether existing tree planting and maintenance policies and programs can achieve more just urban forests in Portland. First, this study found that tree maintenance, and especially the inequity of tree maintenance for

low-income households, is a major barrier for tree planting. Poor maintenance of trees may also contribute to lived experiences and narratives of dangerous trees and dislike of big trees. Currently, the City of Portland only maintains trees for their establishment period, which is between 3 and 5 years depending on the tree species (City of Portland 2020). Providing maintenance for the entire lifespan of every tree in Portland would be a tremendous undertaking and likely require more funding than the Parks and Recreation Department, which funds Urban Forestry, currently has. In its 2023 Tree Plan, the City of Philadelphia has suggested that tree planting, monitoring, and maintenance programs move from Parks and Recreation to the Water Bureau, which has funding from public utility taxes (City of Philadelphia, 2023). Moving Portland's Urban Forestry department to the Bureau of Environmental Services (BES), which is hosted by the Water Bureau and is currently responsible for tree planting in stormwater management contexts, could provide more funding to tree planting and maintenance programs, helping to achieve restorative justice goals. This would only work if rolling tree maintenance into the Water Bureau would only minimally impact utility bills for residents. Steps should be taken to avoid implementing a regressive tax that disproportionately affects low-income residents. Considering that the goal of maintaining all trees for their lifespan is lofty and may perpetuate procedural justice ideals of equality and sameness, prioritizing the maintenance of trees in neighborhoods with less privileged groups and histories of disinvestment is a vital goal.

There are a couple of other possible avenues for providing more equitable tree maintenance. Currently, developers of new properties are required to pay a fee if they remove a tree for new development (City of Portland, 2023). These funds could

specifically be allocated to the maintenance of trees for affordable housing developments or other multi-family and low-income housing. Another possible funding source is the Portland Clean Energy Fund, who could contribute some of their funds to tree maintenance in low-income neighborhoods. They are also well situated to collaborate with community organizations on annual or bi-annual workshops and trainings related to tree maintenance. Another step the City could take is to ensure the maintenance of damaged trees and infrastructure damaged by trees in the event of a natural disaster. Ensuring the maintenance of trees in these instances where the property owner or resident is not at fault would help remove inequitable burdens from low-income residents.

Secondly, current policies do not require trees for new affordable housing developments. Lack of trees for low-income housing represents a mismatch between resident concerns and current policy. If the Urban Forestry department is able to increase funding, another use for those funds would be providing the financial resources needed to plant trees on affordable housing lots. Additionally, this study suggests that renters may be willing to maintain trees when landlords are not, but renters do not have the same access to trees as homeowners because of landlord-renter power relationships. The City of Portland's current "Opt-Out" program notifies residents that a tree will be planted in the adjacent right-of-way strip unless they decline, which does have negative consequences for tree maintenance responsibilities but may make it more likely for renters to gain tree-proximity.

Future studies should include more participants who identify as low-income, renters, people of color, or as immigrants or refugees. While this study included participants with these identities, more work is needed to better understand how to ensure

restorative and just practices in urban tree planting and maintenance. Based on the current findings, this study calls for policy change that rectifies historic and current injustices by centering the needs, preferences, and narratives of marginalized communities to enable restorative and equitable urban environmental futures.

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Appendices:

Appendix A: Participatory Mapping Worksheet

Participant Name:

PSU Coupled Natural-Human Systems Research Project
Participatory Mapping Exercise
August 2022
Graduate Student Researcher: Kate Gregory
Advisor: Dr. Jola Ajibade

Project Goals: This research project aims to explore the relationships that residents of different Portland neighborhoods have with outdoor spaces and trees. Through a participatory mapping exercise, we will explore values and perspectives related to trees, desires around tree planting, areas with more or fewer trees across Portland, and discuss what kinds of change you want in your neighborhood or in Portland more broadly.

Part 1: Trees in your neighborhood

1. Orient Yourself in the Map:

Identify places that are familiar to you. This could be your house, a grocery store, a park—anything to help you know where you are when looking at the map. Place a **pink dot** on several places (this information will be kept confidential).

2. Important Outdoor Places:

Are there outdoor areas in your neighborhood that are important to you or where you spend a lot of time? Examples could be a park, other public greenspace, a street where you walk, your yard, or anywhere else that's outside. Mark the location(s) with a **blue dot**.

*Are there specific values you connect with each place? Label the dots with any of the corresponding letter(s) of values listed below:

- a. Recreation
- b. Exercise
- c. Sense of belonging
- d. Social relations
- e. Cultural heritage
- f. Wellbeing
- g. Ecotourism
- h. Aesthetics

- i. Education
- j. Inspiration
- k. Food foraging/gathering
- l. Spiritual/Religious values
- m. Other reasons (please specify):

3. Trees in Important Places:

Of the locations you selected above, do trees contribute to their importance? Circle your blue dots with a **green marker** where there is a tree making that space important to you. You may also circle any other locations with trees that are important to you in green.

What kinds of benefits or services do you associate with trees? Rank your top 5:

Regulate temperature and provide shade	Build community and improve relations
Filter pollution	Improve neighborhood aesthetics
Manage storm rainwater and erosion control	Inspiration for art, literature, and education
Decrease noise pollution	Recreation
Provide food	Ecotourism
Spiritual value	Improve mental and physical wellbeing
Other (please specify:)	

What kinds of disservices do you associate with treed areas? Rank your top 5

Allergen	Pest infestations
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	Water requirement		Maintenance/Pruning
	Roots damage sidewalks, water/sewage pipes, other infrastructure		Would prefer other amenities in this area If so, what amenities? (Please specify):
	Drop litter (fruit, seeds, etc. on ground)		Other (please specify):

4. Tree Concerns:

Place **orange dots** on the map where you are concerned about tree health, damage or potential damage to infrastructure due to trees, poor tree maintenance, or tree removal. Label the dot with the number(s) that corresponds with the concern(s):

- a. Tree health
- b. Damage to infrastructure
- c. Potential damage to infrastructure
- d. Poor tree maintenance
- e. Tree removal
- f. Other (please specify):

5. Tree Planting:

Place **green dots** on the map where you think trees should be planted in your neighborhood.

*Why do you want trees planted? Label your green dot with the corresponding letter(s):

- a. Regulate temperature and provide shade
- b. Build community and improve relations
- c. Filter pollution
- d. Manage storm rainwater and erosion control
- e. Decrease noise pollution
- f. Provide food
- g. Recreation
- h. Improve mental and physical wellbeing
- i. Improve neighborhood aesthetics
- j. Spiritual value

- k. Inspiration for art, literature, and education
- l. Ecotourism
- m. Other (please specify:)

What kinds of trees would you want planted? Rank from 1 (highest preference) to 4 (lowest preference):

___ Native ___ Shade ___ Fruit ___ Flowering

Are there any areas where you don't think trees should be planted or don't want trees planted? Place a red dot on the map in these places. Label the dot with the corresponding letter(s).

- a. Allergen
- b. Pest infestations
- c. Water requirement
- d. Maintenance/pruning
- e. Roots damage sidewalks, water/sewage pipes, and other infrastructure
- f. Drop litter
- g. Would prefer other amenities in this area. If so, what amenities?
- h. Other (please specify)

Mapping Break: Tree Canopy Word Association

Looking at the photos of these different streets, what words immediately come to mind? (See photos provided.)

Part 2: Trees in Portland (Group mapping of the city)

1. Tree Cover (map of all of Portland)

*Draw areas on the map in **green marker** that have more trees than other areas.

*Draw areas on the map in **red marker** that have fewer trees.

Discuss: Focus on 1 red area on the map.

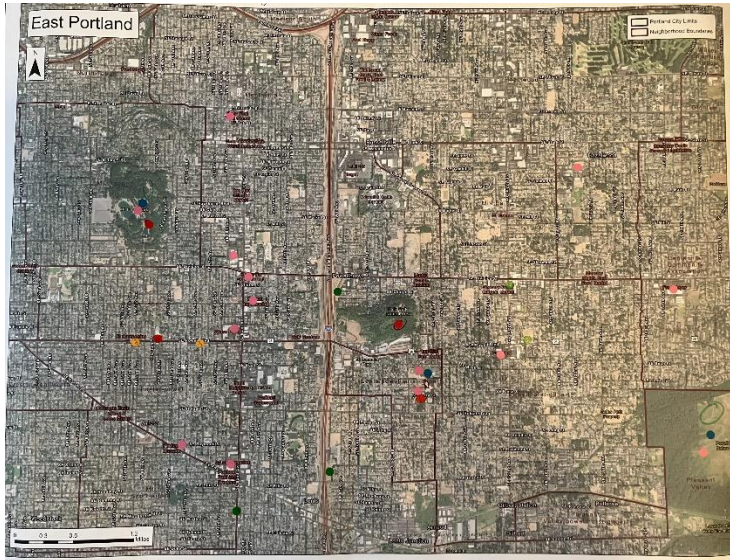
What do you know about this area? Do you know why it doesn't have many trees? What do you think are barriers to having trees here? What kinds of changes related to trees have you seen in Portland over the past years?

3. Follow-Up Questions:

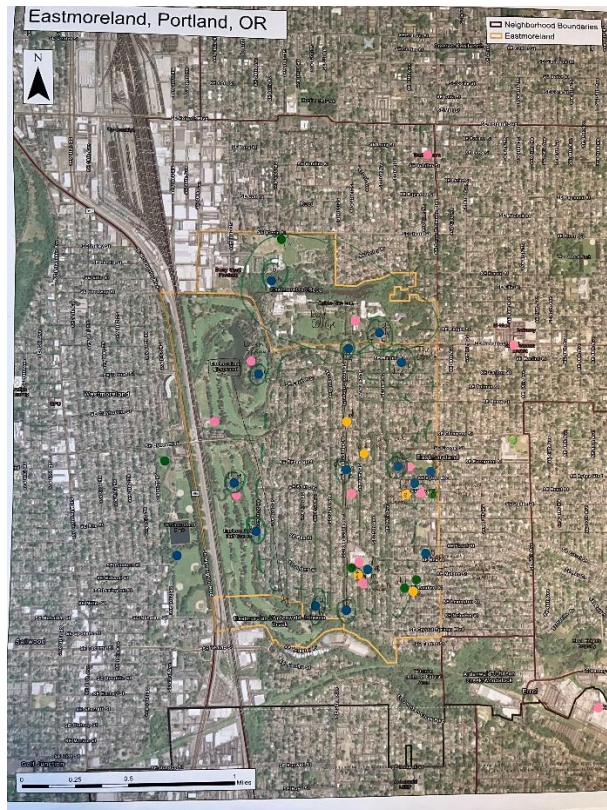
1. What kinds of change related to trees and greening do you want to see in your neighborhood or in Portland?
2. Are there other kinds of investment or development you think should be prioritized?
3. Are you concerned about the distribution or health of trees in your neighborhood in comparison to other neighborhoods?
4. Is there anything else you'd like to share? Do you have any questions or is there something related to this topic that you'd like to know more about?

Appendix B: Examples of data collection maps

Small map of East Portland for individual mapping exercise:



Small map of Eastmoreland for individual mapping exercise:



Large map of Portland for group mapping exercise:

