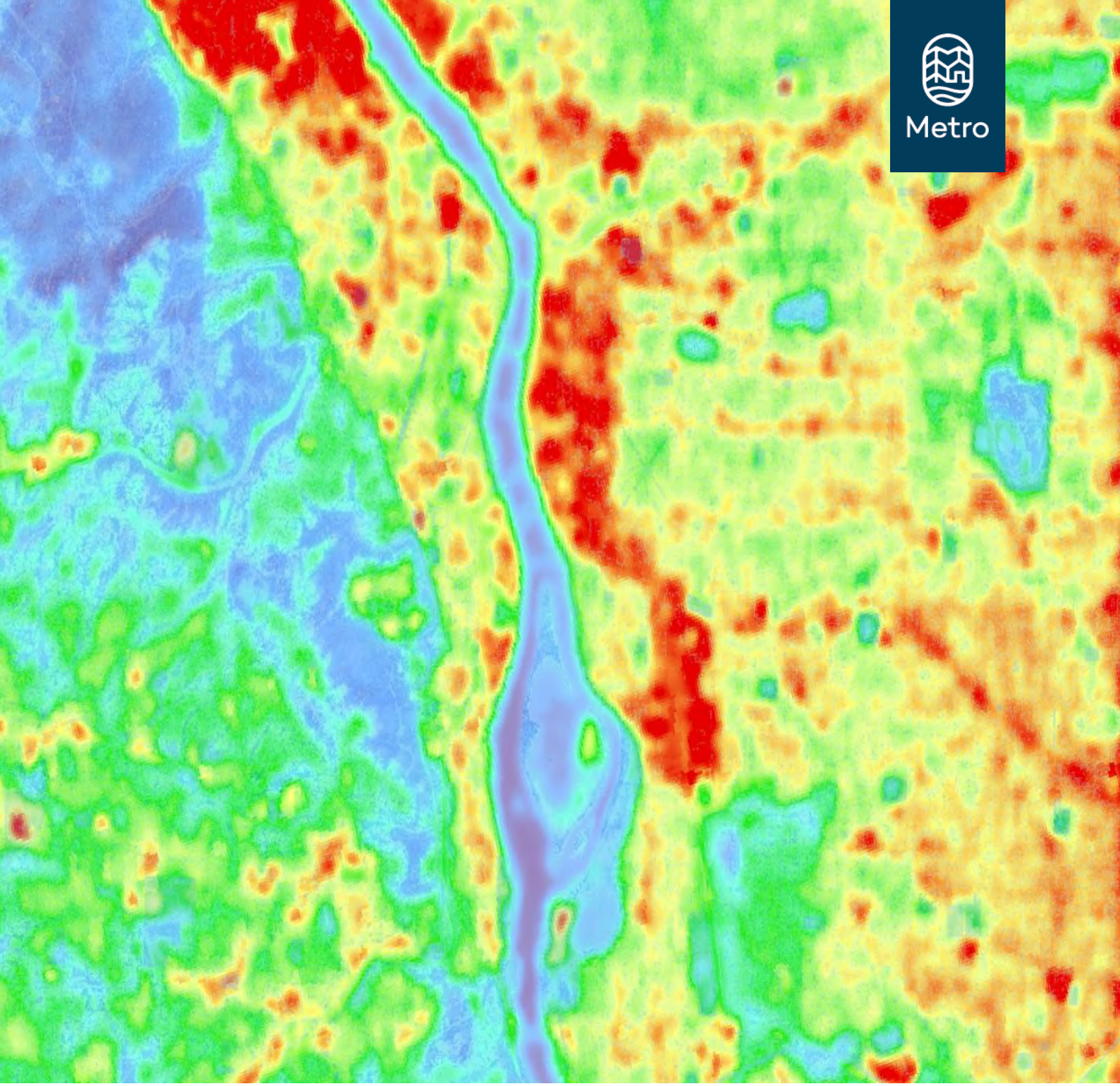

Draft Cooling Corridors Study Report

Building regional resilience to heat in greater Portland

September 2025

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Metro coordinates regional planning and funds new affordable homes and supportive housing services. It manages 19,000 acres of parks and natural areas and the region's garbage and recycling system. Metro also runs the Oregon Convention Center, Portland'5 Centers for the Arts, the Portland Expo Center and the Oregon Zoo.

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Auditor

Brian Evans
600 NE Grand Ave.
Portland, OR 97232-2736
503-797-1700

ACKNOWLEDGEMENTS

Metro Executive Leadership

Marissa Madrigal, chief operating officer, Metro
Catherine Ciarlo, director, Metro Planning, Development and Research
Malu Wilkinson, deputy director, Metro Planning, Development and Research
Ted Leybold, transportation policy director, Metro Planning, Development and Research

Cooling Corridors Study Project Team

Joe Gordon, co-lead, principal GIS specialist, Metro Planning, Development and Research
André Lightsey-Walker, co-lead, senior transportation planner, Metro Planning, Development and Research
Kim Ellis, AICP, climate program manager, Metro Planning, Development and Research
Jai Daniels, associate climate planner, Metro Planning, Development and Research
Isaiah Jackman, graduate research assistant, Portland State University
Shannon Stock, program assistant, Metro Planning, Development and Research
Molly Cooney-Mesker, communications manager, Metro Planning, Development and Research
Lakeeyscia Griffin, senior public affairs specialist, Metro Planning, Development and Research

Cooling Corridors Study Advisors

Tom Kloster, regional planning manager, Metro Planning, Development and Research
Cindy Pederson, research analytics manager, Metro Planning, Development and Research
Jessica Zdeb, principal regional planner, Metro Planning, Development and Research
Lake McTighe, principal transportation planner, Metro Planning, Development and Research
Melissa Ashbaugh, senior transportation planner, Metro Planning, Development and Research
Eliot Rose, senior transportation planner, Metro Planning, Development and Research
Matthew Hampton, senior transportation planner, Metro Planning, Development and Research
Rod Wojtanik, parks and nature planning manager, Metro Parks and Nature
Jonathan Soll, science manager, Metro Parks and Nature
Olena Turula, principal regional planner, Metro Parks and Nature
Lori Hennings, senior scientist, Metro Parks and Nature
Tommy Albo, senior GIS specialist, Metro Parks and Nature
Alice Williamson, senior real estate specialist, Metro Parks and Nature

Regional Work Group Partners

Joey Williams (CAPA Strategies), **Brian Landoe** (City of Portland), **Belinda Judelman** (City of Portland), **Jamie Stasny** (Clackamas County), **Karen Buehrig** (Clackamas County), **Martha Fritzie** (Clackamas County), **Leah Fisher** (Clackamas County), **Mitch Attig** (Clean Water Services), **Shannon Simms** (Mayer/Reed, Inc.), **Brendon Haggerty** (Multnomah County), **Vivek Shandas** (Portland State University), **Kathleen Johnson** (Washington County), **Miranda Seekins** (Washington County), **Andrew Brown** (State of Oregon), **Eric Main** (Oregon Health Authority), **Beatrice Sloan** (Bee Prepared)

Community Groups

Columbia Slough Watershed Council, Community Energy Project, Connecting Canopies, Depave, Northwest Pilot Project, Street Roots, Verde

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How to Use This Report

This report is organized into seven chapters, each building on the previous to provide a comprehensive foundation for future heat adaptation planning in the region. While the outcome of this study is not a policy or investment decision, this report offers a solid foundation of data, research, and recommendations and supporting actions to inform future planning efforts, strategies, and investments.

Whether you are a policymaker, planner, advocate, or community partner, you can navigate directly to the chapters most relevant to your work or read the report in full for a complete understanding of the study's approach and findings.

Report Chapters

The seven chapters are described below.

Chapter 1: Introduction

This chapter describes the purpose and desired outcomes of the project, outlines the study approach, and provides regional policy and implementation context.

Chapter 2: Background Research

This chapter presents findings from research on possible cooling strategies.

Chapter 3: Engagement

This chapter summarizes who was engaged, how input was gathered, and the central themes that emerged from subject matter experts, community members, and stakeholders.

Chapter 4: Analysis

This chapter details the map-based analysis used to identify heat-vulnerable areas and priority locations for cooling strategies.

Chapter 5: Evaluation and Prioritization

This chapter evaluates the costs, benefits, and co-benefits of supporting actions.

Chapter 6: Recommendations and Supporting Actions

This chapter offers recommendations and supporting actions for jurisdictions, community organizations, and other partners to advance cooling efforts.

Chapter 7: Conclusion

This chapter recaps key findings and identifies potential next steps to support regional resilience to extreme heat.

Chapter 1:
Introduction

Why the Cooling Corridors Study?

"Being in a tent feels like being in an oven," shared an unhoused Portlander when asked what it is like to live outside during a heatwave. People living outside in temperatures exceeding 100 degrees Fahrenheit are sometimes forced to take desperate measures when they have nowhere cool to go – baking themselves in mud from the Columbia Slough, digging holes in the ground to find relief, or even stealing cars just to have access to air conditioning.[1]

Extreme heat poses an urgent and growing risk to greater Portland. Like many places in the world, the region is experiencing the impact of climate change in the form of hotter summers, more extreme weather events, and increased wildfire activity. Black, brown, and Indigenous people, older adults, people with low income, and unhoused people are more vulnerable to these changes. These effects on people are compounded by damage to the natural environment and critical infrastructure, such as buckling roads and transit rail lines, and heat-related power outages.

In late June 2021, greater Portland and the rest of the Pacific Northwest experienced record-breaking temperatures that should only happen once every 10,000 years. The region experienced temperatures as high as 118 degrees Fahrenheit for almost a week, creating dangerous conditions for those living without access to air conditioning.[2] The heatwave, often referred to as a *heat dome*, killed 72 people in Multnomah County and resulted in as many as 257 emergency department and urgent care visits for heat illness, significantly higher than the average 83 visits a year.[3]

Over the past decade, the region has become a focal point for urban heat research, generating a robust body of peer-reviewed studies that document the intensifying heat and its disproportionate impacts on vulnerable communities. These studies consistently highlight the uneven distribution of heat across the region and the heightened risks for more vulnerable populations. For instance, a 2018 assessment of heat exposure and access to refuge in Portland revealed clear neighborhood-level differences in exposure during heat waves with East Portland and historically marginalized communities facing the greatest burdens.[4]

1. Cooling Corridors Study community conversation with unhoused community members (2025)
2. Monica Samayoa. (Sept. 2022). Pacific Northwest heat wave was a freak, 10,000-year event, study finds. OPB.
3. Multnomah County. (2022). Final Report: Heath Impacts from Excessive Heat Events in Multnomah County in 2021.
4. Voelkel, J., Hellman, D., Sakuma, R., & Shandas, V. (2018). Assessing Vulnerability to Urban Heat in Portland, Oregon. International Journal of Environmental Research and Public Health, 15(4), 640.

Historically, the Pacific Northwest has had mild summers, ranging in temperature from 60 to 80 degrees Fahrenheit. Due to moderate temperatures year-round, homes across the region, especially older residential buildings, may not have air conditioning systems.[5] To underline this issue, all but four of the 72 heat-related deaths in Multnomah County in 2021 occurred in the people's homes, and almost 68% of those deaths were in homes that either only had access to a fan or no cooling mechanisms at all. The remaining four deaths were people experiencing unstable housing.[6] The absence of air conditioning in some residential buildings and the limited access to cool spaces for those living outside are becoming critical issues as temperatures continue to rise in the region and the number of extreme heat events become more frequent. Extreme heat events are prolonged periods of unusually hot temperatures and high humidity with no overnight relief that pose a threat to health, safety, and infrastructure. Though the entire population exposed to the heat is at risk, these events are especially dangerous to those who are heat-sensitive, including those without access to cooling or hydration,

During the 2021 heat dome, certain groups were disproportionately affected, including older adults, people living alone, unhoused people or people experiencing unstable housing, and people living in warmer areas due to urban heat island effects.[7] The urban heat island effect is a phenomenon where urban and metropolitan areas are significantly warmer than surrounding rural areas because of greater amounts of infrastructure, like buildings and pavement, that absorb and trap heat more than the natural environment. Black, brown, and noncitizen immigrants, and people with low incomes are more likely to live in areas with higher heat exposure due to underlying inequities caused by historic disinvestment, resulting in extensive pavement and little to no access to green space or tree cover. These groups also tend to work in jobs with heat-related health risks, like farm workers or construction workers. Lastly, low-income households, which include disproportionate shares of people of color, face affordability challenges to accessing air conditioning.[8]

Notably, several agencies and groups in the region are already working to respond to the worsening heat crisis. Local governments are implementing initiatives to prepare for and respond to heat events, supply more heat pump cooling units, and build more energy-efficient and climate resilient streets and buildings. Other partners, including community-based organizations, are leading efforts to plant more trees, remove excess pavement, provide education on how to prepare for extreme heat events, and connect vulnerable communities to cooling resources.

5. Gabriela Capestany. (July 2018). Portland among least air-conditioned cities in the US. KGW8.
6. Multnomah County. (2022). Final Report: Heath Impacts from Excessive Heat Events in Multnomah County in 2021.
7. Multnomah County. (2022). Final Report: Heath Impacts from Excessive Heat Events in Multnomah County in 2021.
8. U.S. Department of Commerce. (n.d.) Who Is Most At Risk To Extreme Heat? National Integrated Heat Health Information System.

Metro hopes to build on the vital work that is already happening in the region, coordinating and supporting existing efforts and filling gaps where needed. The Cooling Corridors Study helps Metro better understand the existing work in the region and the region's needs, challenges, and opportunities.

It is clear that the time to act is now. The region needs a coordinated response to rising temperatures that endanger lives, especially the region's most vulnerable community members. Metro's Cooling Corridors Study is an important step in establishing coordinated efforts across greater Portland.

What is the Cooling Corridors Study?

Metro launched the Cooling Corridors Study in July 2024 to build on the growing number of heat-related research projects and initiatives in greater Portland. The study aimed to assess heat risk across the region, identify priority areas, and recommend strategies that Metro and local and regional partners can consider implementing to address the disproportionate impacts of extreme heat on the region's most vulnerable communities, particularly Black, brown, and Indigenous people, older adults, people with low income, and unhoused people.

Desired Outcomes

Four desired outcomes guided the research, engagement, and development of the recommendations and potential supporting actions in this report:

1. Reduce the number of annual heat-related deaths to zero in greater Portland
2. Reduce the number of heat-related illnesses in greater Portland
3. Reduce outdoor temperatures in public rights-of-way, focusing on areas that are disproportionately hot
4. Increase the amount of cooling resources available and enhance accessibility to these resources for all people, especially vulnerable communities, during extreme heat events

Overview of Study Approach

The Cooling Corridors study had four main components: research, analysis, engagement, and recommendations on cooling strategies and future work. The research, analysis, engagement, and recommendations will inform Metro's future planning and will be available to other public agencies and organizations to support coordinated efforts across the region.

Research

The project team conducted a comprehensive review of national and international academic research, guidance documents, tools, and best practices from federal agencies, professional

associations, and government agencies outside of the region, and applicable codes, policies, planning, and programming already underway in the Portland metropolitan area to identify a range of possible cooling strategies to implement in the region.

Analysis

The project team used a map-based assessment using geographic information systems (GIS) data to identify the hottest areas in greater Portland by evaluating the distribution of natural resources (i.e., trees, vegetation, water) and temperature (i.e., surface and air). The environmental patterns were additionally layered with demographic data, including total population and jobs, as well as a heat vulnerability index comprised of data related to age, income, education, race and ethnicity, language, household type and composition, and health and disability status. The analysis was conducted on three geographic scales: pedestrian-level, neighborhood-level, and regional-level. The map-based analysis informed the selection of key areas and corridors in the region to target cooling strategies, which is described in more detail below.

Engagement

The project team focused on engagement of subject matter experts, community groups, public and private partners, and some of the most vulnerable communities to ensure the recommendations were implementable and relevant to community needs and priorities. This involved engaging chief heat and climate officers, community-based organizations doing climate and community resilience-related work, public agencies, private environmental firms, unhoused community members, and older adults. Feedback from all engagement activities informed the study recommendations.

Recommendations on Cooling Strategies

To develop recommendations and potential supporting actions for Metro and local and regional partners, the project team combined the findings from the research, map-based analysis, and engagement. Recognizing there is no perfect way to evaluate a wide range of actions, a consistent approach to scoring actions was applied using a scoring matrix. The criteria used for the assessment included urgency, community priority, and regional priority.

Future Work

This study is Metro's first project focused on heat adaptation and mitigation. The findings and recommendations in this report will help Metro and the agency's local and regional partners to identify steps to take to make the region a place where people can survive and thrive in extreme heat. The data and strategies in the study will inform Metro's future transportation, land use, housing, and parks and nature planning and will be available to partners to support coordinated efforts across greater Portland. Metro's hope is that future policies, planning,

and programs at public agencies across the region support heat mitigation and adaptation efforts, and that interorganizational partnerships form to build community resilience to extreme heat in the region.

What is a cooling corridor?

Unique to the Cooling Corridors Study, Metro's definition of *cooling corridors* is intentionally fluid, recognizing that they can function at multiple scales: from a single transportation corridor providing localized relief to a network of connected corridors that together create a broader regional cooling effect. These corridors are enhanced by trees and vegetation, green infrastructure, and other cooling strategies that connect people to natural spaces and reduce urban heat island effects, improve public health, and ensure everyone, especially vulnerable communities, has safe, equitable access to relief during hot weather.

These corridors will be designed to provide protection from the sun and high temperatures. They will offer safe, comfortable routes for people during hot weather to access their homes and jobs, community spaces, parks, and other natural spaces including waterbodies like the Willamette River and Columbia River. Cooling corridors will be designed to protect community health, especially for those most vulnerable to heat, such as older adults, people of color, people with low income, unhoused individuals, and people with chronic health conditions. In greater Portland, cooling corridors will not be limited to one standard approach. Strategies will complement each other to reduce temperatures, prevent heat-related illnesses and deaths, and ensure equitable access to relief from extreme heat. These corridors will include a range of strategies, like expanding tree canopy, using reflective and permeable pavements, and improving access to shade. These corridors are a foundation for building a cooler, safer, and more climate-resilient future for everyone in the region.

Case Studies

To help ground this study in real-world application, we examined three case studies that demonstrate how other places outside of the region have approached extreme heat through cooling strategies. These examples offer valuable insights into how different communities are addressing similar challenges and help illustrate the range of solutions that could be adapted locally. The case study examples below describe initiatives in the following places: Stuttgart, Germany, Phoenix, Arizona, and Medellín, Colombia.

Figure 1. Aerial image showing the steep hills surrounding Stuttgart, Germany (Trainline).

Stuttgart, Germany is an industrial city that sits in a river valley basin, surrounded by steep hills that can trap both heat and polluted air. To counter this and keep the city cool, the city developed a method to use the hillsides in its favor by restricting new development on certain hillsides so that air can sweep down them and through a series of ventilation corridors that the city created. These ventilation corridors are wide, tree-flanked arterial roads designed to let air flow freely through. In addition to greening corridors, the city widely and strategically applies green infrastructure and constructs buildings, like the Stuttgart City library, that utilize passive cooling design and reflective materials to maintain thermal comfort without using energy. Most of the city's facades are light colors that reflect solar radiation, and all new roofs below a 12-degree slope must have green roofs. The city also uses water to reduce temperatures, maintaining natural features while dispersing large fountains across the city. With over 60% of the city covered in greenery, the city's protection of green spaces and effective heat island management strategies have successfully cooled Stuttgart.

Figure 2. Cool Pavement Program installation near Thunderbird Road and 43rd Avenue in Phoenix, Arizona (Phoenix Street Transportation Department).

Phoenix, Arizona implemented a Cool Corridors program which is meant to create a safe and environmentally conscious network of cool corridors across the Phoenix region, particularly in the most heat vulnerable communities. These corridors are one-quarter to half-mile segments of walkways or trails, adjacent to arterial streets, designed to keep pedestrians, bicyclists, and transit users safe while providing relief from high urban heat temperatures with natural and engineered features. These corridors will address public and private land by including streetscape designs, such as engineered shade structures, green infrastructure, benches, and cool pavement. In 2020, the city started the Cool Pavement Program, selecting neighborhoods each year to receive cool pavement treatment, a lighter-colored treatment applied on top of existing asphalt, that effectively reduces summer surface temperatures up to 12 degrees Fahrenheit compared to conventional pavement during the day.

Figure 3. An example of a tree-lined green corridor in Medellín, Colombia (Meteored).

Medellín, Colombia is another city leading the world in heat mitigation and adaptation work through the city's Corredores Verdes, or Green Corridors, program. The city has reduced temperatures by up to 2 degrees Celsius (3.6 degrees Fahrenheit) through creating an interconnected network of greenery and green infrastructure across the city. Thirty green corridors were identified along Medellin's roadways and waterways. The areas on either side of the selected streets were filled with trees and plants, and other areas like plazas and parks were also enhanced with trees and vegetation. Safe and shaded bicycle and pedestrian paths were a main streetscape design implemented along these identified corridors to allow for further pedestrian and cyclist connectivity to cooler spaces.

Identification of Cooling Corridors and Priority Areas

Metro approached the identification of cooling corridors and priority areas through three geographic scales: (1) pedestrian, (2) neighborhood, and (3) regional.

The **pedestrian scale analysis** evaluates the distribution of street trees across the Metro service area, highlighting areas in the region that have little street tree canopy cover. At this scale, trees, vegetation, and green infrastructure can be more readily planted and employed to provide shade and cooling to people living nearby, or people walking, biking, taking transit, and rolling along a corridor.

The **neighborhood scale analysis** assesses contiguous green spaces (of 10 or more acres), informing more comprehensive implementation of cooling strategies that will help cool larger areas.

The **regional scale analysis** estimates the region's inherent geographic strengths and weaknesses by evaluating features like topography, rivers and other waterbodies, wind patterns, and solar energy.

Measuring Social Vulnerability

The main focus of this study is to identify strategies for cooling the region and protecting vulnerable populations from heat-related illnesses and deaths during extreme heat events. The study aimed to identify strategies that will address the disproportionate impact of heat events on vulnerable populations in the region, particularly people of color, older adults, people with low income, and unhoused people.

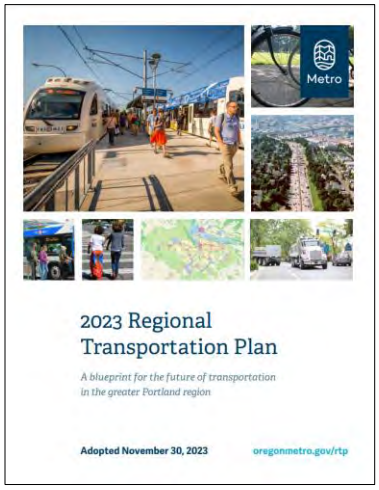
In 2020, the Social Vulnerability Tools project, funded by the Regional Disaster Preparedness Organization (RDPO) and managed by Metro, developed the Social Vulnerability Explorer to provide tools and analysis to better understand which communities in greater Portland experience barriers to emergency services and programs before, during, and after disasters. It is important to note that the original development of the index did not include environmental risk factors but rather served as a generalized vulnerability index.

As part of the Cooling Corridors Study, a refined heat-specific social vulnerability index was developed to help identify areas in the region where the intersection of heat and community may create greater adverse impacts. The following indicators related to heat exposure were included: temperature (i.e., air and surface), vegetation, and tree canopy. Additionally, the set of demographic layers was refined to include those that represented communities with increased sensitivity to extreme heat.

Regional Policy and Implementation Context

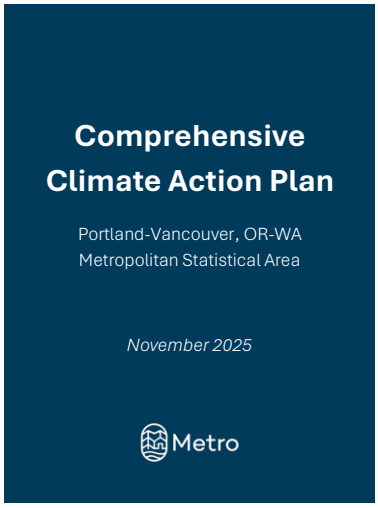
The Cooling Corridors Study aligns with Metro plans, policies, and programs, including:

Metro's 2040 Growth Concept is a long-range plan adopted in 1995 that encourages compact development, protection of agricultural and natural areas, a balanced transportation system, and housing for people of all incomes. Metro's Regional Framework Plan provides guidance and identifies regional land use, transportation, housing, conservation and environmental policies to implement the 2040 Growth Concept.

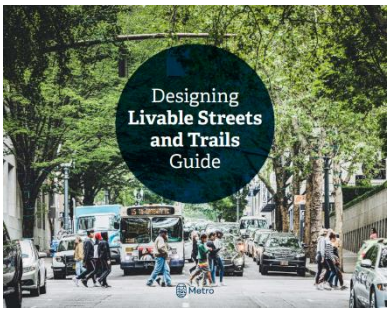


Metro's Regional Transportation Plan (2023) is a long-range blueprint that guides investments in the regional transportation system to improve safety, reliability, mobility, resilience, and equitable access to jobs, services, and housing. The plan includes policies that seek to integrate green infrastructure into the transportation network and protect natural areas and urban tree canopy to avoid and mitigate the negative effects of climate change, natural disasters, and extreme weather events (Chapter 3.2.4.5, Chapter 3.3.1).

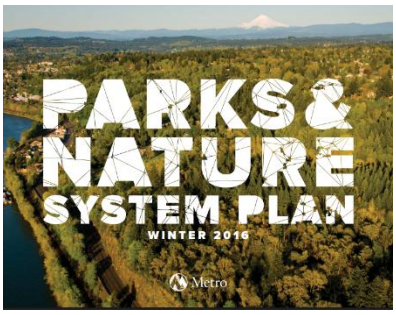
Metro's Climate Smart Strategy (2014) is a regional strategy that identifies transportation-related strategies to reduce greenhouse gas emissions from cars and trucks while supporting goals for cleaner air, healthier communities, and more connected and livable neighborhoods. Though the plan does not specify strategies to help the region adapt to a changing climate and rising temperatures, the strategies it includes can help reduce greenhouse gas emissions that exacerbate climate change and resulting disasters, like extreme heat, in the region.



Metro's Comprehensive Climate Action Plan (CCAP) identifies key actions that the Portland-Vancouver metropolitan area can take to reduce greenhouse gas emissions in the region from all sectors. The CCAP includes a comprehensive greenhouse gas emission inventory, projections of future greenhouse gas emissions, and an analysis of the regional workforce's capacity to support planned actions.



Metro's Designing Livable Streets and Trails Guide was developed to help implement the Regional Transportation Plan and provide guidance for regional streets and trails. Agencies developing transportation projects funded by Metro use the guidelines to plan, design, and construct their projects. One of the guide's design principles is to protect the environment, which can be done by providing alternatives to driving and protecting and enhancing the natural environment along roadways. The guide describes green streets that include design elements like planters, bioswales, street trees, and pervious surfaces, and explains design approaches that recommend how to incorporate these elements.



Metro's Parks & Nature System Plan (2016) outlines the agency's mission and role in the conservation of Metro-owned green spaces and other public green spaces throughout the region. This document reaffirms Metro's commitment to connecting the community with safe and convenient access to natural areas.

Metro offers several different funding programs that can support the implementation of cooling strategies:

- **Local share** funds are for greater Portland's 27 park providers to protect and restore habitat and clean water and to build and care for parks and trails that connect people to nature close to home.
- **Community enhancement grants** can help fund projects that improve the environmental quality of areas near the region's garbage transfer areas, preserve or improve natural areas, or increase public access to natural areas.
- **Nature in Neighborhoods grants** support community nature projects and programs across the region, such as local park improvements, stream or wildlife habitat restoration, and hands-on nature education for people of all ages and backgrounds.
- **Partnerships and social innovation program** funds support projects that can make meaningful progress towards advancing racial equity and climate action while also building a vibrant community where everyone's needs are easily met.
- **Parks and nature community partnerships** financially support community-based organizations and groups as they connect people of color to nature.
- **Large-scale community visions grant program** supports innovative capital projects that bring together nature, job opportunities, affordable housing and safe transportation.

Chapter 2:
Background Research

Overview

This section describes cooling strategies that are employed by governmental agencies across the United States and in other parts of the world. These strategies can be used to mitigate urban heat island (UHI) effects and help communities adapt to higher temperatures, particularly communities disproportionately impacted by extreme heat, such as those that are predominately Black, brown, Indigenous, low-income, older, or unhoused.

Strategies have been divided into eight topic areas:

1. Trees
2. Communication and education
3. Community resilience and adaptation
4. Natural elements (water and wind)
5. Parks and open space
6. Pavement
7. Roofs and buildings
8. Streetscape design

Each topic area describes specific strategies and their benefits and challenges to consider before implementation. Some strategies may include examples from within the Portland metropolitan area or case studies from outside the region.

The project team conducted a review of academic research articles, guidance documents, tools and plans from other places, and local and regional initiatives in the greater Portland region. **Appendix A** shows a spreadsheet containing our research. Many of the strategies and case study examples included were found through the Smart Surfaces Coalition's policy tracker tool. The Smart Surfaces Coalition is a non-governmental organization that conducts data-driven research and develops customized tools that enable cities to make the most cost-effective decisions about implementing smart surfaces, which are strategies, such as cool roofs and pavements, trees, and rain gardens, that help cities withstand extreme heat.

While this research offered a strong foundation for understanding and addressing urban heat and building our recommendations, it was not intended to be exhaustive. The strategies and examples presented here were a starting point. Through engagement, new ideas emerged that were not reflected in this chapter and the strategies were adapted to better reflect the lived experiences, priorities, and needs shared through the full engagement process.

Trees

Trees act as a natural heat mitigation strategy by providing shade, which provides opportunities for people to escape the direct sun and directly reduces surface temperatures and creates cooler microclimates. The cooling effect is achieved by the tree's abilities to intercept sunlight with their canopy, which lowers the temperature underneath them, and to perform evapotranspiration, which is a natural process that cools the surrounding air similar to how sweating cools the human body. Trees are particularly effective as heat mitigators in urban areas where the UHI effect is prevalent. In some study areas, tree canopies have resulted in temperature reductions in the range of 11 to19 degrees Fahrenheit.[9] Trees can also reduce energy use and, subsequently, provide cost savings by reducing the need for air conditioning.

Tree planting programs

Tree planting programs are initiatives aimed at increasing tree canopy cover in urban, suburban, and rural areas. Most tree planting programs are designed to plant trees in neighborhoods or other areas that lack trees or could benefit from the heat mitigation properties that large numbers of trees can provide.

It is extremely important to provide a long-term plan or funding mechanism for any tree planting program to fund the regular care of trees after they are planted and the continued maintenance that is needed to clear fallen branches, cut down dead tree limbs, or address roots pushing up surrounding sidewalk. This is most important in the early years after trees are planted, as maintenance requirements and costs generally decline after a tree becomes established. However, it can be expensive to remove dead, dying, or hazardous trees and pruning trees with large canopies. These programs should consider who will be responsible for the future care, maintenance, and removal of dying or hazardous trees, and avoid placing the entire burden of care on the adjacent property owners without providing resources or assistance.

Public agencies can support tree planting programs by establishing multi-year maintenance plans covering watering, pruning, mulching, and health monitoring for newly planted trees. These plans could establish a budget for the removal and replacement of dead or hazardous trees. Agencies can fund additional urban forestry staff or contract crews specifically responsible for the care, inspection, and removal of public trees, including those planted through programs, or agencies can provide community groups, like neighborhood associations, with training and tools that can help these groups assist with or oversee

9 D. Armson, P. Stringer, A.R. Ennos. The effect of tree shade and grass on surface and globe temperatures in an urban area, Urban Forestry & Urban Greening, Volume 11, Issue 3, 2012.

ongoing care. To track tree health, schedule maintenance, and identify when trees are dying or pose safety risks, public agencies can use geographic information system (GIS) tools and community reporting apps. Lastly, agencies can offer resources, like tree care guides, workshops, and financial assistance, to property owners who live nearby newly planted trees.

Local and regional examples

Portland Parks & Recreation's Urban Forestry team released a Tree Canopy Monitoring Report in 2022 that found that tree canopy in Portland has decreased from 30.7 percent in 2015 to 29.8 percent in 2020 – the equivalent of losing an area the size of Mount Tabor Park every year during that time. Programs, like the City of Portland's Trees in the Curb Zone Pilot Project described earlier, can help combat this loss, referencing the City of Portland's updated approved street trees planting list described earlier to ensure that planted trees are resilient and sustainable.

Adopted in 2023, the PCEF Equitable Tree Canopy Program is a community-centered tree planting program administered by Portland Parks & Recreation and advised by with a community work group convened by PCEF. The program will plant at least 15,000 trees on public and private property starting in 2025. This program identified Portland's most heat-vulnerable neighborhoods and will allocate funds and support for tree planting and maintenance on public land and private residences. The program will maintain planted trees on public property for five years after planting to ensure successful establishment, track health and wellness of a meaningful sample of planted trees, build lasting relationships with community-based organizations, offer tree care resources and communication to tree recipients, and support the development of a diverse, well-trained workforce and contracting community for tree planting and maintenance.

The local community-based organization, Friends of Trees, has volunteer-based programs that grow the region's urban canopy through planting street and yard trees, or restore sensitive natural areas through planting native trees and shrubs. Friends of Trees is one of the planting partners in the City of Portland's Equitable Tree Canopy Program mentioned above. The group also shares helpful resources, including a tree care guide, information on how to plant and prune a tree, and a database of local arborists.

Figure 4. Volunteers from Friends of Trees planting street trees (The Intertwine Alliance).

The Portland Fruit Tree Project provides a community-based solution to a critical and

growing need in Portland and beyond: access to healthy food and the benefits provided by trees including cleaner air, shade, and food. The group empowers neighbors to share in the harvest and care of urban fruit trees to prevent waste, build community knowledge and resources, and create sustainable ways to obtain healthy, locally grown food.

Benefits	Challenges
+ Reduce urban heat by providing shade and cooling the air + Improve air quality by filtering pollutants + Manage stormwater through better soil absorption and reduced runoff + Enhance mental health and community well-being + Support local wildlife and biodiversity	– Require long-term maintenance (e.g., watering, pruning, care) – Can damage infrastructure if not planted properly (e.g., roots affecting sidewalks or pipes) – May not survive if planted in poor conditions or without follow-up care – Can trigger allergies or other health concerns depending on species – Initial costs can be high for planting and early maintenance – The cost of the removal of dying or hazardous trees can be high

Workforce development for tree care

Workforce development programs for tree care can focus on building a skilled labor force capable of planting, maintaining, and enhancing the urban tree canopy. These programs train individuals in arboriculture, tree planting, pruning, pest management, and soil care — all of which are necessary to ensure the health and longevity of trees. Well-maintained trees are more effective in cooling urban areas, absorbing heat, and reducing the impacts of extreme heat on vulnerable populations. These development programs can include training on climate resilience, selecting heat-tolerant tree species, implementing adaptive tree care techniques, and addressing challenges such as drought and increased pests due to higher temperatures. By investing in the skills and education of local workers, communities can ensure that they are well-equipped to meet the growing need for planting more trees.

Workforce development also creates economic opportunities for residents, especially in areas that are disproportionately affected by heat. By creating job opportunities in urban forestry and tree care, communities can not only mitigate the impacts of extreme heat but also address economic inequities, provide jobs, and increase the resilience of local ecosystems.

Public agencies can support these types of programs by offering training and certification programs, partnering with other government agencies and community-based organizations to create apprenticeships, and develop pathways for individuals from underserved communities to enter the tree care industry, providing job placement assistance, mentorship, and support for long-term employment in urban forestry.

Local and regional examples

The Blueprint Foundation is leading the Green Workforce Academy, a five-week pre-apprentice program that provides career training and opportunities for 18 to 25 year-old Black, Indigenous, and other people of color in Portland. Developed in partnership with Native American Youth and Family Center (NAYA), Self Enhancement, Inc., Wisdom of the Elders, and Ecotrust, the curriculum includes caring for fruit trees, restoring natural habitats, and tending to urban gardens in underserved communities.

Figure 6. Participants of the Green Workforce Academy (NAYA).

Friends of Trees' Adult Urban Forestry & Restoration Training Program (AUF) is a 10-week paid training and internship program that offers classroom education, professional networking, and fieldwork to historically underserved communities in greater Portland. After training, AUF matches participants with internships at host sites across the region to gain on-site work experience in urban forestry and natural area restoration.

Friends of Tryon Creek's Green Leaders Workforce Development Program is an opportunity for early-career youth to hone their environmental education, restoration, and professional skills. The program is paid and intended for individuals from marginalized communities.

Wisdom of the Elders, Inc. offers a workforce development program and paid internships that give environmental education, job skills, and career pathway support to people who want to work in the environmental sector. Both opportunities focus on environmental restoration and sharing Indigenous Traditional Ecological Knowledge (ITEK), which encompasses the environmental knowledge, practices, and worldviews of Indigenous peoples that have been gathered and passed down across generations.

Figure 7. Participants of the Wisdom of the Elders, Inc. internship program (Wisdom of the Elders, Inc.).

Benefits	Challenges
+ Creates jobs and economic opportunities	– High initial investment and resource requirements
+ Supports long-term tree sustainability and resilience	– Skill gaps and limited workforce capacity
+ Increases urban tree canopy	– Competing priorities and lack of local support
+ Mitigates UHI and improves cooling	

Tree policies

To aid tree planting programs, public agencies should establish policies centered on expanding and preserving the number of trees in cities. This section shares some examples of tree policies.

Urban tree canopy coverage goals

Public agencies can set targets for expanding the tree canopy in urban areas, aiming to increase the number of trees in certain neighborhoods or across an entire city or region. Setting this policy can drive investment in tree planting programs, guide where and how many trees to plant, align efforts across agencies, and ensure long-term planning and support for growing a healthy urban forest.

Tree planting or tree preservation ordinances

Tree planting ordinances can regulate the number, type, placement, and size of trees when planted, and tree preservation regulations protect mature trees from being removed or

damaged during construction or development, ensuring that valuable trees are preserved for their environmental and aesthetic benefits.

Heat-resilient tree selection guidelines

Trees planted today will experience variability in weather and other stressors, such as shorter and warmer winters, extended periods of drought, more frequent heavy rain events, and increased pressure from pests and diseases. As the climate changes, policies that provide recommendations for selecting tree species that are more tolerant to extreme heat and other conditions can ensure the trees thrive and continue to provide shade and cooling benefits.

Incentive programs for private landowners or developers

These programs offer financial incentives, grants, or tax breaks to private property owners or developers who plant or maintain trees on their land or development sites, encouraging broader participation in urban greening efforts.

Local and regional examples

There are examples of some of these policies in Portland.

- As of September 2025, the City of Portland aims to achieve at least 33.3 percent citywide tree canopy cover, with a goal of expanding to 45 percent and ensuring every neighborhood has at least 25 percent tree canopy cover by 2065. The city prioritizes planting trees in areas with the greatest need for canopy cover, focusing on neighborhoods with lower canopy levels and household income. For example, in the outer east side and inner east side of the city, where many people of color or those with lower income live, trees cover 27 percent and 26 percent, respectively. The goal is to get the outer east side to 50 percent and the inner east side to 45 percent, exceeding the minimum neighborhood-level 25 percent tree canopy cover goal.
- The City of Portland has a tree preservation ordinance that includes requirements for private trees. During development projects, private property owners must preserve and protect at least 1/3 of the non-exempt trees that are 12 inches and larger in diameter located completely or partially on their site and preserve and protect all trees 20 inches and larger in diameter located completely or partially on their site. Any tree removed below the 1/3 requirement, and any tree removed that is 20 inches or larger in diameter, will require payment in lieu of preservation to the Tree Planting and Preservation Fund.
- Through the City of Portland's Treebate program, residents can receive a one-time credit on their combined water bill (sewer, stormwater, water service) for planting a tree in their home's yard or garden. The program runs annually from September 1 to

April 30, and trees must be purchased, planted, and applications submitted during that time.

- The City of Portland's updated approved street trees planting list removes tree species that are not heat-resilient and identifies species that are.

Benefits	Challenges
+ Reduce urban heat and improve comfort in public and private spaces	– May add costs or complexity to development and property management
+ Protect existing trees, which provide established environmental and health benefits	– Require enforcement and maintenance, which can strain agency resources
+ Guide better planning by encouraging the right trees in the right places	– Risk of poor implementation without community engagement or follow-through
+ Encourage participation from private landowners and developers	– Not all species thrive in urban or changing climate conditions without careful selection
+ Improve stormwater management, air quality, and neighborhood livability	– May cause pushback if seen as restrictive or burdensome by landowners or developers

In **Charlotte, North Carolina**, the tree ordinance includes the following provision for preservation: a minimum of 15 percent of a commercial site must be preserved as a "tree save area." If less than 15 percent of the site has existing trees, additional trees shall be planted. Installing and maintaining a living green roof is an alternative to meeting the requirement for 15 percent tree save area, as well as off-site mitigation or payment in-lieu. In **Durham, North Carolina**, an ordinance requires preserved tree coverage area by land type – residential 20 percent, nonresidential 10 percent, urban residential developments 7 percent.

In **Boston, Massachusetts**, the Boston Tree Canopy Ordinance includes protections against removing public shade trees, rules around replacing trees that are removed, and establishes a "Street Tree Stabilization Fund." The ordinance also establishes rules about removing and replacing private trees, as well as penalties for violations of the ordinance.

Source: Smart Surfaces Coalition Policy Tracker (https://smartsurfacespolicy.org/policies/)

Tree canopy and shade equity mapping

Tree and shade equity mapping is a critical tool for identifying disparities in urban tree cover and ensuring that heat mitigation efforts are distributed equitably. This approach uses geospatial data to analyze tree canopy distribution, surface temperatures, and socio-economic factors to pinpoint areas most vulnerable to extreme heat.

By mapping these disparities, public agencies can prioritize tree planting, maintenance, and shade infrastructure in historically underserved neighborhoods, which often experience higher temperatures due to limited greenery. This data-driven approach also helps guide policy decisions, funding allocations, and community engagement efforts, ensuring that all residents, especially those in heat-vulnerable areas, benefit from increased shade and cooling investments.

Local and regional examples

Through a partnership between Metro and the City of Portland, Portland Parks & Recreation developed the Tree Canopy Explorer which is a publicly accessible shade and tree canopy map using Metro's 2019 canopy dataset. The most striking dividing line in Portland's tree canopy is the Willamette River. The maps below show that east of the Willamette, where 80 percent of Portlanders live, tree canopy cover is less than half than on the west side.

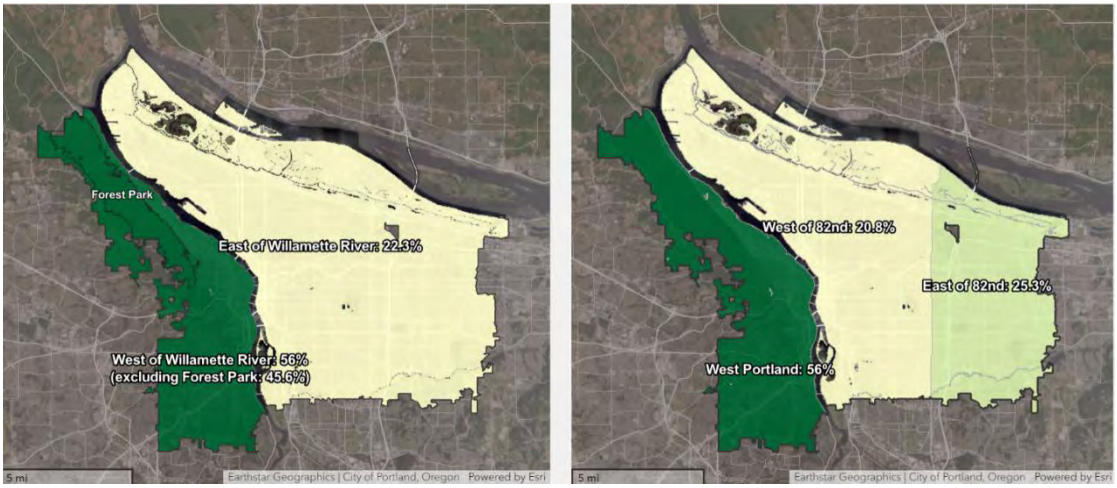


Figure 8. Maps from the Tree Canopy Explorer (City of Portland).

Clackamas County, Multnomah County, and Washington County partnered with CAPA Strategies to conduct a regional heat mapping campaign in 2023. More than 100 people from the three counties volunteered to measure neighborhood temperatures. The result of this project is a tool that allows people to see how heat affects communities differently.

Multnomah County climate plans call for the establishment of "Heat Resilience Focus Areas" in areas in the county with the greatest need and readiness for heat resilience investments.

Benefits	Challenges
+ Quantitative identification of disproportionately affected areas	– May require frequent updates and database maintenance
+ Informed decision-making and resource allocation	– Limited data availability or accuracy
+ Community empowerment	– Risk of oversimplification due to reliance on quantitative elements

Communication and Education

These strategies aim to increase public awareness of heat risks and provide guidance on protective actions community members can take before, during, and after extreme heat events. These strategies include public awareness campaigns, heat safety training in schools and workplaces, and coordination with emergency response and healthcare. To be most effective, these strategies can be tailored to vulnerable populations, such as older adults, outdoor workers, and low-income or unhoused communities. Effective communication strategies leverage multiple channels, including social media, text alerts, community workshops, and partnerships with trusted local community-based organizations. By equipping residents with critical information on how to recognize heat-related illness symptoms, access cooling resources, and adapt their behaviors, these efforts help reduce heat-related illness and death.

The **City of Tucson's** Heat Action Roadmap prioritizes expanding awareness, preparedness, and protective actions through a combination of outreach campaigns, multi-channel communication strategies, and partnerships with community organizations. Their roadmap proposes a wide range of various strategies and actions that support community education and citywide communication including heat safety mobilization campaigns, culturally and linguistically appropriate outreach, diverse communication channels and community collaboration, standardized heat alerts across agencies, digital outreach and interactive tools, education in schools and workplaces, and targeted outreach.

Public awareness campaigns

Public awareness campaigns play a vital role in reducing heat-related risks by educating communities on how to prepare for and stay safe during extreme heat events. These campaigns can provide timely information on heat warnings, cooling center locations, and

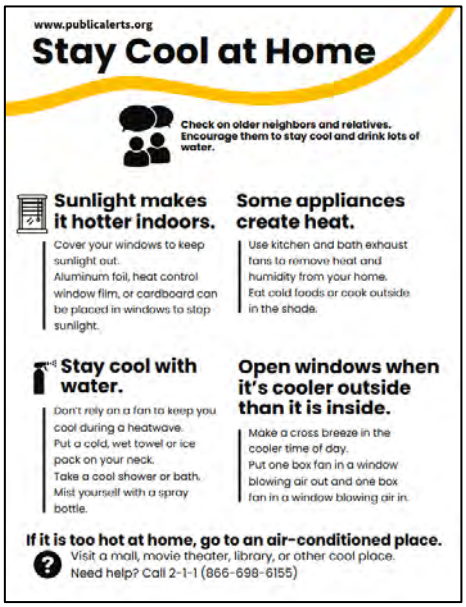
hydration tips through multiple channels, including social media, radio stations, television news channels, and community outreach. Targeted messaging for vulnerable populations, such as older adults, outdoor workers, and those without stable housing or access to air conditioning, ensures that those most at risk can access critical resources. Public education efforts can also promote long-term adaptation strategies, such as tree planting initiatives, home cooling improvements, and emergency preparedness plans. By raising awareness and encouraging proactive measures, these campaigns help communities build resilience against rising temperatures.

To be the most effective, campaigns must be well researched, and messaging must be tailored to different intended audiences. A particular campaign may be effective for one group of people and ineffective for another. To encourage a change in behavior, a campaign must clearly define actionable and achievable calls to act. Campaigns also tend to be more effective when a trusted person, such as a community leader, delivers the information.

Public agencies can effectively partner with community-based organizations (CBOs) to ensure that public awareness campaigns are accessible, culturally relevant, and community-driven. Agencies can develop educational materials, emergency preparedness guides, and resource maps while leveraging the community groups' trusted relationships to distribute information and engage residents. Additionally, agencies can collaborate with CBOs to co-host workshops, gather community input, and tailor outreach efforts to meet the specific needs of at-risk groups. By working together, public agencies and CBOs can expand the reach and impact of heat resilience initiatives.

Local and regional examples

The Regional Disaster Preparedness Organization (RDPO) conducted a comprehensive scan of emergency messaging for extreme heat (and other emergencies) across the region, compiling over 1,200 urgent



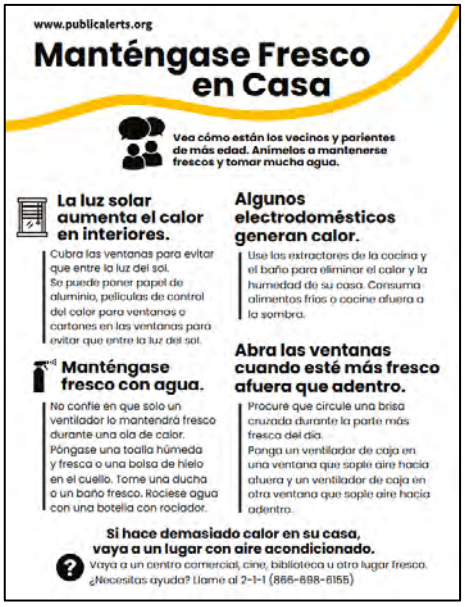


Figure 9. Example fliers to help community members stay cool during extreme heat.

messages available in over 25 languages. The inventory also includes American Sign Language videos, copyright free illustrations, fliers, videos, and audio files on extreme heat. **Figure 9** shows example fliers found in the inventory.

Clackamas County, Multnomah County, and Washington County are responsible for several emergency preparedness and response activities, including the distribution of educational materials and preparedness communications before extreme heat events and emergency alerts during those emergencies.

Benefits	Challenges
+ Can reduce heat-related illnesses and deaths + Enhances emergency preparedness and encourages proactive behavior + Can promote long-term adaptation strategies	– Campaigns may not be universally understood or effective – Creating multiple campaigns tailored to specific audiences increases costs – Awareness may not lead to action or a change in behavior

Heat safety training in schools and workplaces

Heat safety training in schools and workplaces is a proactive strategy to reduce the risk of heat-related illnesses and ensure that students, employees, and administrators can recognize, prevent, and respond to extreme heat conditions. By incorporating heat safety education into daily operations, both schools and workplaces can protect individuals from heat exhaustion, heat stroke, and dehydration, while also maintaining productivity and well-being.

To be most effective, heat safety training should be tailored to the specific needs of different environments. In workplaces, training should focus on high-risk occupations such as construction, agriculture, and outdoor labor, emphasizing hydration strategies, scheduled rest breaks in shaded or cooled areas, proper acclimatization for new workers, and emergency response procedures. In schools, training should prepare educators, staff, and students to recognize heat-related symptoms, adjust physical activities and outdoor schedules during extreme heat, and implement cooling strategies in classrooms and playgrounds.

Public agencies can support heat safety training by developing standardized curricula, providing resources for employers and educators, and establishing regulations that require heat protection measures in workplaces and school settings. Partnerships with labor unions,

worker advocacy groups, and school districts can help ensure that training programs are accessible, culturally relevant, and effectively enforced. By prioritizing heat safety education, schools and workplaces can foster a safer and more resilient community in the face of rising temperatures.

Benefits	Challenges
+ Can reduce heat-related illnesses and deaths	– Implementation cost and resource constraints
+ Enhances emergency preparedness and response	– Training fatigue and competing priorities

Coordination with emergency response and healthcare

Effective coordination between emergency response teams and healthcare providers is essential for reducing the number of heat-related illnesses and deaths during extreme heat events. This collaboration ensures that emergency medical services, hospitals, and public health agencies are prepared to respond quickly and effectively to rising temperatures. Key strategies include real-time data sharing, heat emergency training for first responders, and establishing clear protocols for identifying and treating heat-related conditions.

To be the most effective, coordination efforts must be proactive and adaptable. Emergency response plans should incorporate early warning systems that trigger heat alerts and direct resources to high-risk populations. Healthcare facilities should have surge capacity plans in place to handle an increase in heat-related illnesses, including designated cooling areas and stockpiles of critical medical supplies such as IV fluids and cooling blankets. Additionally, emergency responders and healthcare providers must be trained to recognize early signs of heat stroke, dehydration, and other heat-related conditions to prevent severe health outcomes.

Public agencies can strengthen coordination by partnering with community-based organizations and local health departments to expand outreach efforts and ensure that vulnerable populations receive timely medical assistance. Collaborative initiatives, such as mobile cooling units, home wellness checks, and hydration stations, can extend healthcare access to at-risk groups, including older adults, outdoor workers, and unhoused individuals. By working together, emergency responders, healthcare providers, and community organizations can build a more resilient system that protects public health during extreme heat events.

Benefits	Challenges
+ Faster and more effective medical response	– Logistical and bureaucratic challenges
+ Better protection for vulnerable populations	– Potential for unequal access to resources
+ Increased preparedness and resource efficiency	– Overburdened healthcare systems

Community Resilience and Adaptation

Communities play a vital role in building resilience and adapting to extreme heat through locally driven initiatives that address unique environmental and social needs. Community-level efforts often involve partnerships between local governments, CBOs, and community members to implement interventions. Community-led approaches empower residents to shape solutions that reflect their priorities, such as neighborhood-based heat response networks, outreach programs for vulnerable populations, and culturally informed education campaigns. By combining these approaches, communities can create sustainable, inclusive strategies that reduce heat-related risks and protect public well-being.

Community spaces also play a vital role in building resilience and saving lives during extreme heat events. Spaces like resilience hubs and cooling centers can provide an escape from high temperatures for those who do not have access to air conditioning or outdoor spaces, such as parks, bodies of water, or public fountains or splash pads.

Resilience hubs

Resilience hubs are community spaces that are designed to help people prepare for and respond to extreme weather events, including heat waves. These spaces can serve as cooling shelters, but different from cooling centers, resilience hubs can also provide education about preparedness, emergency response resources, social services, and emergency training. Often, these spaces are aimed at low-income residents and people of color, who are more likely to suffer during heat waves, but they are available to the entire community as needed. Resilience hubs can be located in existing community spaces like schools, libraries, parks, malls, or cultural centers, and typically serve communities year-round.

Public agencies can support the development of resilience hubs through policy changes, funding initiatives, public-private partnerships, coordinated planning and resource sharing, and technical assistance. Agencies can adjust zoning regulations and streamline permitting processes to make it easier for resilience hubs to secure and develop spaces, especially in

vulnerable neighborhoods, and install necessary infrastructure, like solar panels and backup power sources. Agencies can support hubs financially through budget allocation, grant programs, tax incentives, or public-private partnerships. Regional agencies can develop plans that integrate resilience hubs into larger emergency response networks, ensuring that resilience hubs and other resources are strategically placed and well-connected across the region, and facilitate coordination among cities and counties, standardizing best practices for emergency preparedness. Lastly, agencies can foster partnerships with local nonprofits and community groups, offering technical assistance and platforms for collaboration on resilience initiatives and emergency preparedness training.

Local and regional examples

The City of Portland's 2022-2025 Climate Emergency Workplan directs Portland Parks & Recreation and the Portland Bureau of Emergency Management to convert East Portland Community Center into an energy efficient, resilience center for extreme heat and other disasters. The workplan recognizes that emergencies increase existing disparities. Black, Indigenous, and other communities of color, low-income residents, and people with disabilities face disparate risks from disaster. The concentration of communities of color in outer east Portland, which also experiences UHI effects, makes this neighborhood an ideal location to pilot a community center that can provide respite from heat, cold, and smoke during emergencies.

Thrive East PDX, formerly known as EPRC, is a community coalition focused on facilitating and supporting community resilience programs that benefit all residents living in East Portland. From 2024 to 2025, the group has focused on the Community Resilience Hub Initiative, which aims to facilitate place-based community resilience hubs in each of East Portland's thirteen neighborhoods. In 2024, the initiative focused on the Centennial Community Resilience Network (CCRN), a partnership dedicated to establishing a resilience hub in the Centennial Neighborhood and promoting resilience initiatives and projects throughout the neighborhood.

The Getting There Together Coalition's Resilience Hub Locator map, shown in **Figure 10**, provides information about publicly-owned parcels of land in the Portland metropolitan area alongside spatial data such as zoning, transit, parks, schools, community organizations, and census tract demographics. The tool can be used to analyze the development feasibility of the publicly owned parcels for creating resilience hubs. The coalition can build on this tool by clearly identifying the locations of existing resilience hubs and other resources such as cooling centers and green spaces.

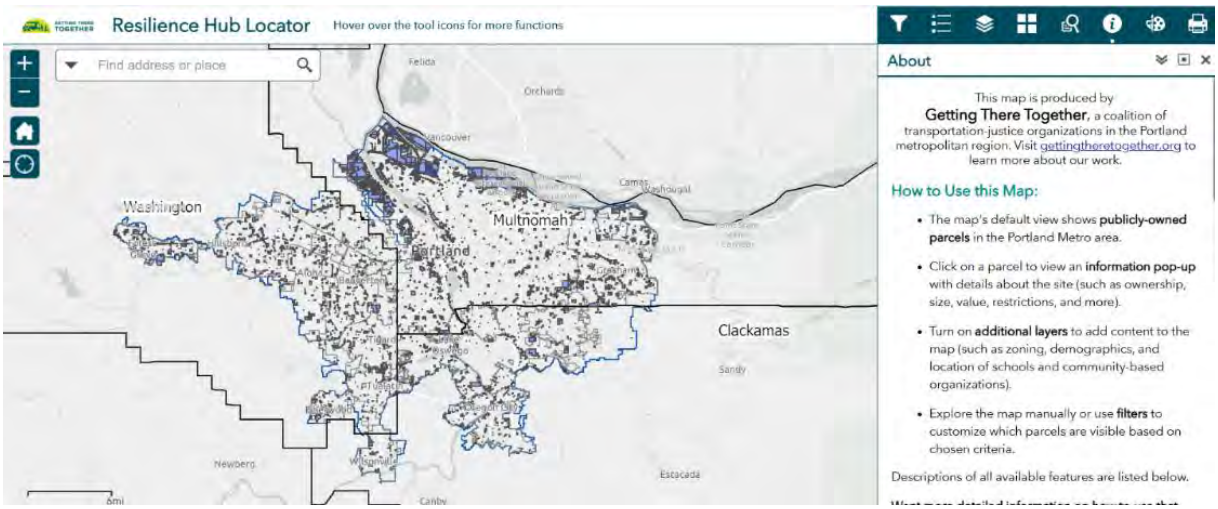


Figure 10. A screenshot of Getting There Together's Resilience Hub Locator.

Benefits	Challenges
+ Provide relief from the heat or cold during heatwaves or snow/ice storms	– Operational funding challenges and limited resources
+ Provide access to critical services (e.g., clean water, food, charging stations, etc.)	– Logistical challenges such as coordination
+ Enhance community preparedness through information sharing, resource distribution, and emergency response training	– Sometimes underutilized
+ Can be an equitable and multilingual distribution point for information and resources	– Needs community-buy in to be successful
+ Help build trust and social resilience within communities	

Figure 11. A rendering of the Lincoln Square Park Municipal Resilience Hub in Oakland, California.

In **Oakland, California**, the City's 2030 Equitable Climate Action Plan calls for the creation of resilience hubs and the enhancement of City facilities to reliably serve as places of refuge for extreme heat and other threats. The plan assigns this action to the Public Works Department and Office of Resilience. The first example of a resilience hub will be called the Lincoln Square Park Municipal Resilience Hub and located in Oakland Chinatown (shown in Figure 11). The hub is set to have the following features: solar panels, backup off-grid power, air filtration, improved heating and cooling systems, a commercial kitchen, shower facilities, broadband, an indoor/outdoor gathering area, chargers for medical devices and phones, and refrigeration for medication on backup power.

Cooling centers

Cooling centers are opened during extreme heat events to provide cool, air-conditioned spaces for community members to escape the heat. These centers are only operationalized during extreme heat events and are not in operation year-round like other resilience hubs. Cooling centers are designed to provide relief from the heat for community members who do not have access to air conditioning, such as those living in old buildings or the unhoused. The centers are often existing spaces in the community, such as libraries, community centers, or other public buildings, that are equipped to provide cooling relief.

Public agencies can offer publicly-owned facilities as locations for cooling centers. Agencies can support public awareness campaigns designed to inform community members, especially those who are most vulnerable to extreme heat exposure like the unhoused and

unsheltered, of existing resources, and provide access to these resources through free transit passes or other means.

Local and regional examples

There are a number of cooling centers in the region. For instance, Multnomah County shares information about cooling center locations and other cool spaces on the agency's website, which includes an interactive map of library branches, pools, community centers, and other cooling centers as shown in **Figure 12**. Clackamas County and Washington County also have websites sharing information on cooling centers and other resources.

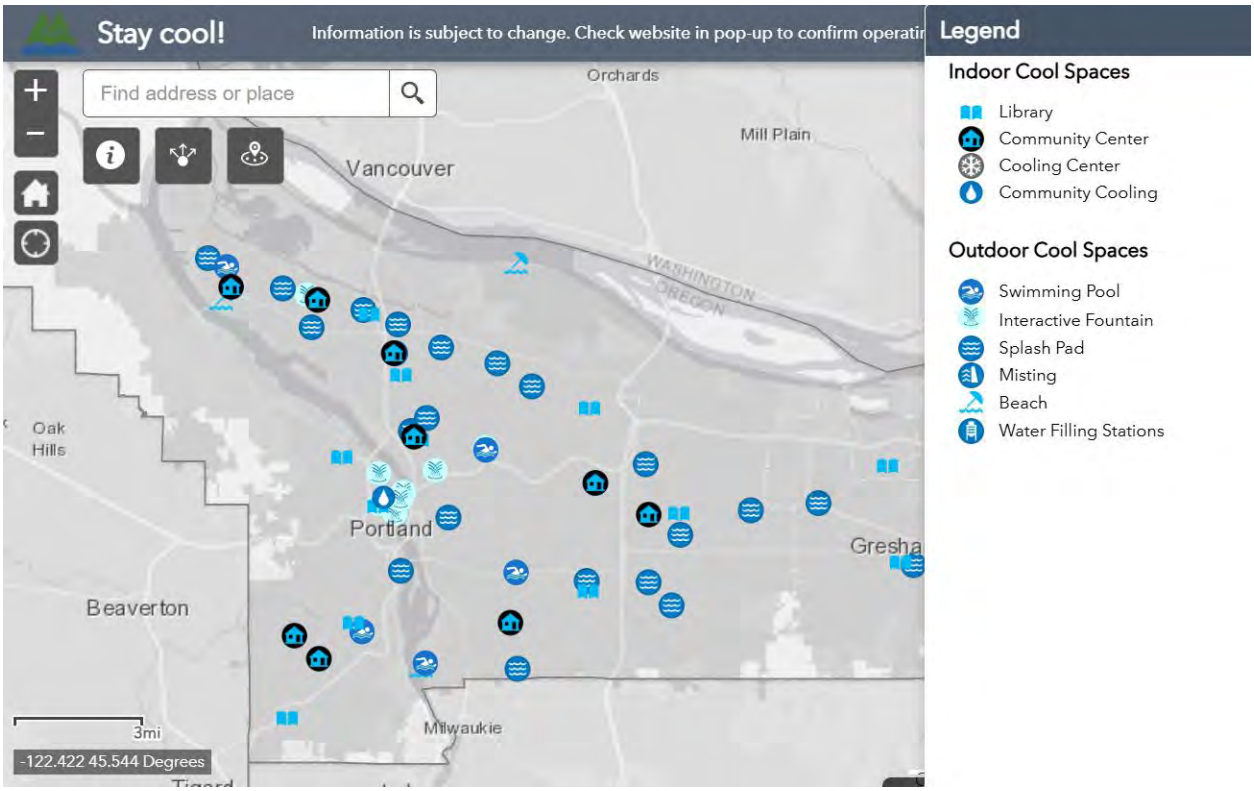


Figure 12. A screenshot of Multnomah County's interactive map.

Benefits	Challenges
+ Provide relief from extreme heat and prevent heat-related illnesses and deaths + Offer access to water or other essential resources during heatwaves + Promote social connectivity	– May be difficult to reach during heat waves –

Community-led adaptation projects

Community-led adaptation projects empower community members to design and implement solutions that address the unique climate challenges they face. These projects prioritize the knowledge, experiences, and needs of the communities most affected by extreme heat, ensuring that adaptation strategies are culturally relevant, locally effective, and equitable. By investing in grassroots solutions, governments and organizations can strengthen community resilience while fostering trust and long-term engagement.

To be most effective, community-led adaptation projects should be inclusive and participatory. This means providing funding, technical assistance, and decision-making power directly to CBOs, neighborhood groups, and residents. Projects may include initiatives such as neighborhood tree-planting programs, heat-resilient community gardens, or cooling infrastructure in public spaces. In addition to physical improvements, these projects can include education campaigns, workforce training in climate resilience jobs, hyper-local emergency response plans, and community-led data collection to inform policy.

Public agencies can support these efforts by removing barriers to funding, offering flexible grant opportunities, and streamlining bureaucratic processes that often limit community-driven initiatives. Strong partnerships between government entities, CBOs, and grassroots organizations can help scale successful projects while maintaining community leadership. By investing in community-led adaptation, cities and regions can create sustainable, locally driven solutions that protect residents from extreme heat while promoting social cohesion and environmental justice.

Benefits	Challenges
+ Locally relevant and culturally appropriate solutions + Flexible and scalable innovations + Opportunity to restore trust in government agencies	– Limited funding – Bureaucratic barriers – Uneven implementation and community capacity challenges – Potential for inequitable distribution

Policy protections for outdoor workers

Those working in industries, like construction and agriculture, that require outdoor exposure are some of the most vulnerable during extreme heat events. Effective strategies that can be used to protect these outdoor workers include implementing mandatory rest breaks, ensuring access to shade and cool water, and establishing heat safety training to help workers recognize and respond to heat-related illnesses. Providing cooling stations at job

sites and scheduling physically demanding tasks during cooler parts of the day can further reduce risk. Additionally, clear heat response protocols help employers proactively protect their workforce. These types of strategies are required by most state-level occupational safety and health groups; however, it is important that workplaces be held accountable for following these important measures.

Public agencies can support this intervention by creating an anonymous way for workers to report unsafe conditions without fear of retaliation. Agencies can help workplaces maintain compliance with state regulations by connecting workplaces with existing free resources, including practical guidance and helpful online training, and developing resources that may not exist but are needed. These connections can be made through public awareness campaigns, or through partnerships with worker advocacy groups to distribute materials in multiple languages and ensure outreach to vulnerable populations.

Local and regional examples

Following the Heat Dome in 2021, Oregon adopted protective heat exposure protection rules. Oregon Occupational Safety and Health (OR-OSHA) requires all employers to address indoor and outdoor heat exposure through annual training, monitoring symptoms, supplying cool water, mandating shade or cooling vests, acclimatization periods, paid cool-down breaks, and two-way communication. Oregon's rule applies to the heat index, factoring in the impact of humidity on workers and is triggered at a heat index of 80 degrees Fahrenheit.

Benefits	Challenges
+ Prevent heat-related illnesses and deaths	– Workplaces may not strictly enforce these measures without strict monitoring

Natural Elements

In addition to parks, open spaces, and trees, other natural elements, like wind and water, can be powerful tools for reducing urban heat and enhancing thermal comfort. Harnessing wind patterns through strategic street and building design can promote natural airflow, improving ventilation in dense urban areas. Incorporating water features, such as fountains, splash pads, and misting systems, can provide localized cooling by increasing humidity and lowering surrounding air temperatures. Additionally, preserving and restoring natural water bodies like streams and wetlands can help moderate temperatures in nearby communities. By integrating wind and water elements into urban design, cities can create cooler, more comfortable spaces that provide relief during extreme heat events.

Wind or ventilation corridors

Researchers are investigating the ability to utilize natural wind patterns through the construction of *wind or ventilation corridors* to provide cooling throughout urban areas and cities. These corridors are being implemented through reserving large stretches of open space while orientating buildings, and other surroundings, to allow wind to most easily flow throughout the corridor.

Public agencies can support this intervention by changing zoning to limit development along key wind corridors. Agencies can also standardize the practice of incorporating wind pattern analysis into climate planning initiatives.

Benefits	Challenges
+ Promotes cooling	– Limited research on effectiveness
+ Re-centers ancient and Indigenous planning practices	– Limited open space available between buildings
	– Implementation requires significant forethought

Beijing, China proposed the use of ventilation corridors within their 2016-2035 City General Plan. The plan envisions a future network of primary corridors of 500 meters or more in width. The City decided that existing buildings in these corridors should not be demolished, yet pathways for wind should be kept as open as possible. Future construction scale, building height, density, and arrangement methods should be limited with these corridors in mind.

Figure 13. Chart showing the proposed wind corridors (The Beijing News).

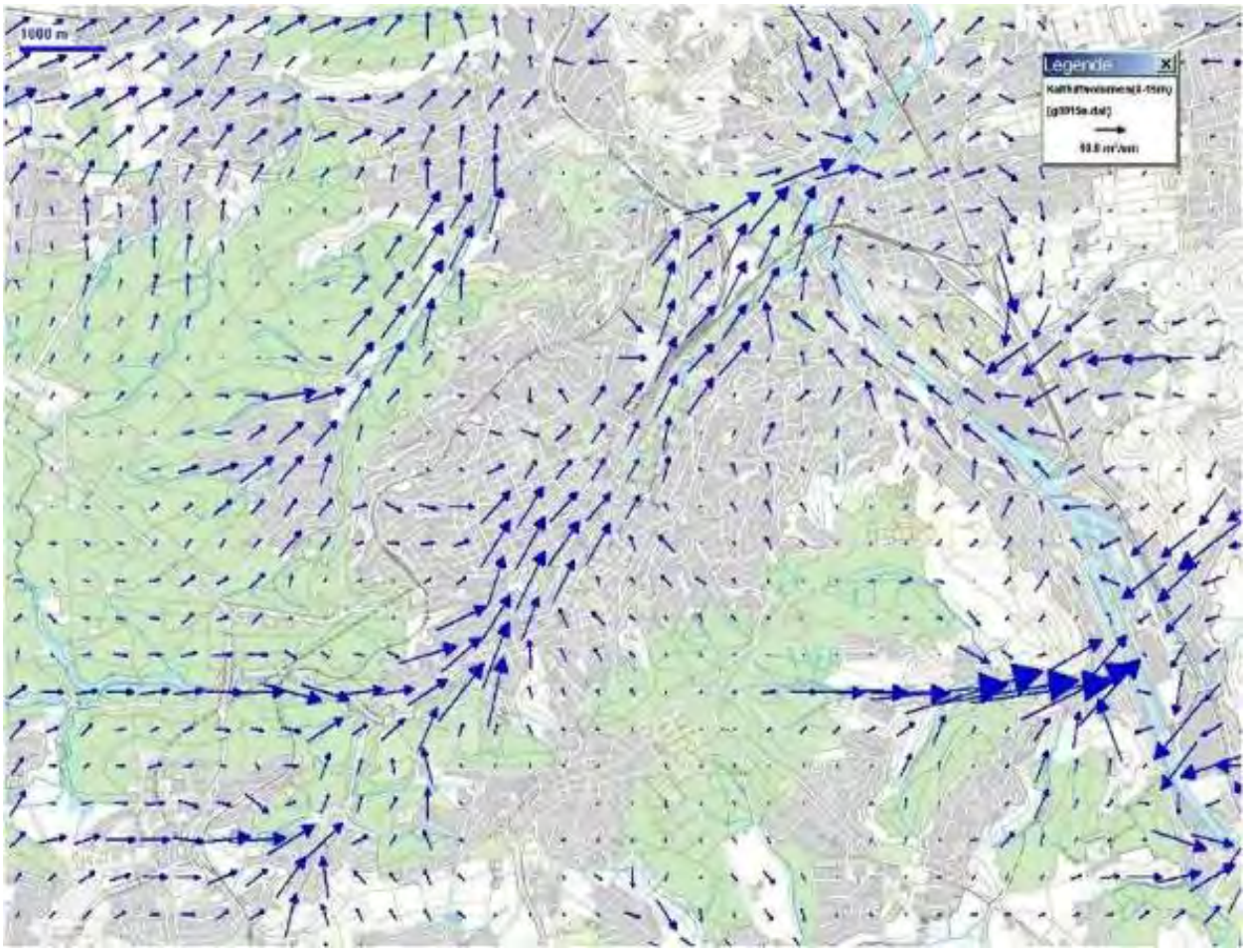


Figure 14. Wind patterns in Stuttgart, Germany (Stuttgart Office of Climatology).

Stuttgart, Germany is leading the international study and implementation of urban wind ventilation corridors. Through zoning regulations, they have limited development along four designated green belts. The green belts were selected based on their existing low-density and ability to channel cooler air from surrounding hillsides into the more developed city areas as pictured in **Figure 9**. Figure 14Within the higher-density urban portions of the corridors, the emphasis is on connecting existing parks and local neighborhoods. The preferred minimum width for these ventilation corridors is 100 meters. Stuttgart has seen the benefits of these corridors, particularly with linking rural areas with the city center, enhancing biodiversity, and supporting the mental well-being of community members through increased access to green open space.

Natural water sources

Natural water features, such as rivers, lakes, ponds, and streams, can help mitigate the UHI effect and be used by people to cool down during an extreme heat event. Water features can act as a thermal buffer because water has a large capacity to absorb heat and can therefore

cool the surrounding area. In addition to cooling, the preservation and restoration of these bodies of water can prevent flooding and improve habitat for wildlife.

Public agencies can support the preservation and restoration of major water bodies through policy changes and projects. Agencies can fund or incentivize green infrastructure projects or mandate green infrastructure in development projects. Agencies can also fund restoration and water quality projects, including riparian planting and stream daylighting. Daylighting is the process of uncovering and restoring buried or culverted streams, which can augment cooling by removing gray infrastructure, especially if vegetation is added around the uncovered stream. Some public agencies may create programs to manage land use, water quality, and conservation efforts across jurisdictions to protect entire watersheds.

Local and regional examples

The Portland metropolitan region has access to the Willamette, Sandy, and Columbia rivers, and multiple lakes, streams, and ponds. These large bodies of water can be used for swimming, wading, kayaking, canoeing, paddleboarding, boating, and other activities.

The City of Portland has a watershed restoration program led by Environmental Services, which includes stream, wetland, floodplain restoration, and stream daylighting.

The Johnson Creek Watershed Council, Columbia Slough Watershed Council, Tryon Creek Watershed Council, and other watershed organizations work with volunteers to enhance, restore, and conserve the ecological health and function of their respective watersheds.

Benefits	Challenges
+ Absorb heat, which cools the surrounding area + Provide heat relief during extreme heat events + Enhance physical health and mental well-being + Can be used for recreational activities + Enhance biodiversity and attract birds, insects, and other small animals	– Less effective at cooling in areas of high humidity

Artificial water features

Like natural water sources, artificial features, such as pools, fountains, splashpads, and mechanical misting, can help mitigate UHI effects and be used by people to cool down during

heat events. These types of features can be located on streetscapes or in public parks and plazas to increase accessibility to community members and create spaces for people to gather.

Public agencies can build these types of features in existing public spaces, like plazas and parks, or incentivize these types of features in privatized spaces that can be accessed by the public, such as shopping centers, apartment complexes with open space, or commercial development with courtyards.

Local and regional examples

Across the Portland metro region, there are public cooling spaces, such as pools and fountains. Multnomah County offers an interactive online map that features indoor and outdoor cool spaces. The outdoor spaces are all related to water and include swimming pools, interactive fountains, splash pads, misting, and hydration stations.

Several jurisdictions across the region have interactive fountains, splash pads, and "spraygrounds" that can be used to keep cool when the weather gets hot. These features are opened seasonally based on certain dates rather than temperature.

In Hillsboro, "hometown taps" are sustainable water filling stations designed and built by Hillsboro Water Department operators. Each station includes a spigot to refill water bottles with Hillsboro tap water. The city currently has three locations, and additional locations are sometimes added and available during heatwaves. Some of the stations feature artwork from local artists as seen in **Figure 15**.

Figure 15. Hometown tap location in Hillsboro.

Benefits	Challenges
+ Provide heat relief during extreme heat events	– Require regular maintenance and cleaning to maintain functionality
+ Serve as gathering places for the community, fostering human connection	– Use of water resources for heat mitigation and adaptation must be weighed against water conservation goals

Figure 16. A map showcasing all of the free drinking water locations in Paris (Eau de Paris).

A program in **Paris, France** operated by Eau de Paris (or Paris Water), the publicly owned company responsible for the public water supply and wastewater collection for the city, supplies and maintains a network of over 1,000 public fountains in the city. In 2021, Eau de Paris reimagined some of the public fountains as a 2-in-1 system that provides drinking water and misting for cooling. The company equipped five of the public fountains in its network with an invisible misting system that emits mist automatically every four minutes in case of extreme heat. By 2026, around 50 of the public fountains will be equipped with the misting system. As shown in **Figure 16**, there is an online map showing all of the public fountains. Filters can be used to show fountains that are available 24/7, fountains that have water misting, and fountains with sparkling water, or to show fountains by type.

Parks and Open Space

On hot days, many people may visit parks and open green spaces to escape the heat. In addition, these areas provide some of the greatest heat reduction capabilities due to their high concentration of trees and vegetation and low concentration of impermeable pavements and buildings. Large green spaces over 25 acres are considered to produce the most intense temperature reduction and contribute to cooling surrounding areas within a 350-meter radius.[10] Smaller parks and green spaces also result in lower temperatures. A collection of these smaller green spaces is more feasible in high density urban areas.

[10] Aram, F., Higueras García, E., Solgi, E., & Mansournia, S. (2019, March 6). *Urban green space cooling effect in cities*. Heliyon. https://doi.org/10.1016/j.heliyon.2019.e01339

Park conservation and land acquisition

Park conservation efforts focus on preserving, enhancing, and expanding green spaces to reduce UHI effects and improve climate resilience. Parks provide natural cooling through shade from tree canopies and evapotranspiration from vegetation, which helps to lower surrounding temperatures. Conservation strategies include protecting existing park and undeveloped lands from development, restoring degraded ecosystems within urban parks, and enhancing tree cover and vegetation to maximize cooling benefits. Maintaining infrastructure in parks, such as water features, shaded seating areas, and walking paths, also increases public use and creates comfortable microclimates. By improving access to well-maintained green spaces, park conservation efforts contribute to cooler urban environments, improved air quality, and better mental and physical health for residents.

Public agencies can maintain existing public parks, ensuring that the trees and other vegetation are cared for, the physical infrastructure is maintained, and the public areas are kept clean and clear of trash and debris. Agencies can also create funding programs designed to acquire private land and turn it into natural areas that are open to the public.

Local and regional examples

Metro's 2023 Regional Transportation Plan calls for the protection of natural areas to slow growth in carbon emissions and reduce UHI effects.

Metro's 2016 Parks & Nature System Plan highlights three strategies focused primarily on protecting and conserving nature. The first strategy is to protect and connect significant landscapes through land acquisition and restoration. The second strategy is to lead regional efforts to protect and manage significant landscapes beyond Metro's portfolio. The third strategy is to incorporate climate resilience and adaptation into Metro's work.

Metro's Protect and Restore Land program and Nature in Neighborhoods program are two of six program areas funded by a Metro Parks and Nature bond measure from 2019.The *Protect and Restore Land* program aims to purchase land from willing sellers in the Portland metro region to restore and preserve regional watersheds, natural habitats, and culturally important plants as well as provide opportunities to create future potential access to nature. The *Nature in Neighborhoods* program funds community-led restoration, land acquisition, and urban transformation projects that can transform privately-owned property into natural neighborhood areas and preserve special places in communities across the greater Portland area. The Nature in Neighborhoods capital grants have protected local assets that are not covered by Metro's regional efforts to buy natural areas.

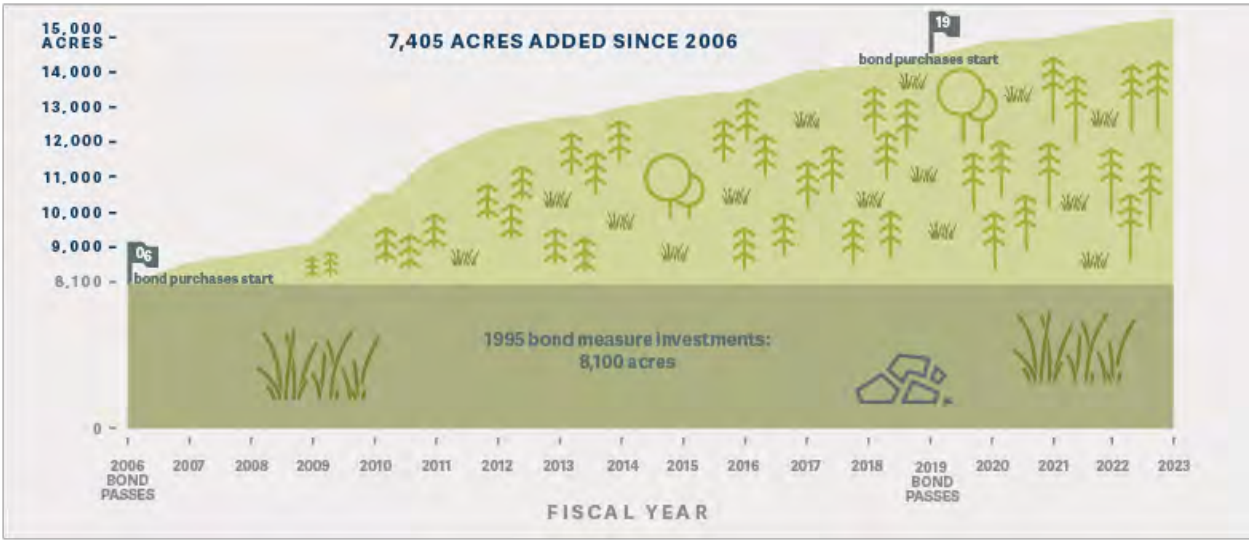


Figure 17. Cumulative land acquisitions with 2006 and 2019 bond measures (Metro).

The City of Portland's Land Acquisition Program acquires property for park purposes using a variety of funding sources, including grants, special one-time allocations from City Council, bond measures, and the Parks System Development Charges (SDC) fund. The SDC fund can be used for acquisitions that add capacity to the park system to address the need created by new development.

Benefits	Challenges
+ Generates natural cooling and promotes heat reduction	– Land acquisitions require significant financial investment
+ Improves public health and community well-being	– Requires high maintenance and water needs
+ Supports biodiversity and wildlife habitat	– May create uneven access and equity issues
	– Vulnerable to climate stress and development

Habitat restoration

Habitat restoration is the process of returning a degraded or destroyed ecosystem to a healthy, functional state. Restored environments, such as forests and wetlands, help cool surrounding areas by providing shade, enhancing soil moisture, and promoting evapotranspiration. Restoration efforts may involve planting native vegetation, improving soil stability, and restoring natural water systems to improve ecosystem health.

These actions not only create cooler and more comfortable environments but also generate a range of co-benefits that extend beyond temperature reduction. Habitat restoration improves air and water quality, reduces flood risk, supports carbon sequestration, and provides critical wildlife habitat that strengthens biodiversity. Restored landscapes can enhance recreational opportunities, promote mental health and well-being, and build community stewardship of natural areas.

By investing in habitat restoration, communities can build healthier, more resilient landscapes that mitigate the impacts of climate change, advance equity by bringing green spaces to historically underserved neighborhoods, and deliver lasting ecological, social, and economic benefits.

Public agencies can purchase land or conservation easements near critical habitats or introduce zoning laws to protect ecologically important areas from development. Agencies can also administer grant programs that fund restoration projects or provide financial incentives to landowners who engage in restoration or conservation activities. When restoring natural areas, agencies and landowners can remove invasive plants and animals and reintroduce native species. Lastly, agencies can work with nonprofits, schools, and local volunteers on restoration projects, or support community-led restoration events and education.

Local and regional examples

Willamette Riverkeeper's Habitat Restoration Program works to improve floodplain and riparian habitats within the Willamette Basin, in collaboration with multiple partners including private and public landowners as well as other conservation organizations.

Figure 18. Nettle Creek before and after the removal of a fish passage barrier (Tryon Creek Watershed Council).

As mentioned, the Johnson Creek Watershed Council, Columbia Slough Watershed Council, and Tryon Creek Watershed Council work with volunteers to enhance, restore, and conserve

the ecological health and function of their respective watersheds through efforts like upland restoration, riparian restoration, and fish passage restoration.

Figure 19. A metal yard sign from the Backyard Habitat Certification Program certifying that the yard is fully restored (Backyard Habitat Certification Program).

The Columbia Land Trust and Bird Alliance of Oregon offer the Backyard Habitat Certification Program to support the creation and expansion of urban natural habitats in peoples' yards and gardens. Once someone's space has been certified, they receive a sign (seen in **Figure 19**) that show neighbors their yard is fully restored natural habitat.

As mentioned, Metro's *Protect and Restore Land* program aims to purchase land from willing sellers in the Portland metro region to restore and preserve regional watersheds, natural habitats, and culturally important plants as well as provide opportunities to create future potential access to nature. The 2019 bond measure also allocated $92 million towards supporting local projects by providing funds to cities, counties, and other park providers across greater Portland to protect land, restore habitat, and build and care for parks that connect people to nature in local communities.

Clean Water Services, urban Washington County's water resources management utility, is working on a variety of projects, including aquatic habitat enhancement, riparian planting, and wetland restoration across urban and rural areas of the Tualatin River Watershed.

Benefits	Challenges
+ Provides natural cooling	– May compete with development or agricultural needs

Benefits	Challenges
+ Increases animal habitat and supports biodiversity + Improves air quality and groundwater recharge	– Time- and cost-intensive

Design standards open space preservation

Design standards that prioritize open spaces are essential for mitigating urban heat and promoting community well-being. By preserving and enhancing parks, ecologically friendly plazas, and other open areas, cities can reduce heat, improve air circulation, and provide shaded refuges in hot neighborhoods or during extreme heat events. Thoughtful design interventions, such as integrating tree canopies, permeable surfaces, and native landscaping, help maximize these cooling benefits. Open spaces also serve as gathering points for social connection and recreation, contributing to public health and quality of life. Establishing clear design standards that prioritize open space preservation ensures these benefits are maintained as communities grow and develop.

Public agencies can support open space–oriented design standards by embedding them into zoning codes, development guidelines, and capital improvement plans. They can lead by example through public projects that integrate tree canopies, permeable materials, and native landscaping, while also offering incentives or requirements for private developments to preserve and enhance open areas. Agencies can partner with community organizations to identify priority locations, especially in heat-vulnerable neighborhoods, and ensure equitable distribution of shaded, accessible spaces. By setting clear, enforceable standards and providing technical and financial support, public agencies help safeguard the cooling, health, and social benefits of open spaces as cities evolve.

Benefits	Challenges
+ Reduce UHI effects and provide shade + Improve air circulation + Promote social connections and improve public health and quality of life	– May compete with development or agricultural needs

The **City of Asheville, North Carolina** provides development standards requiring the preservation and protection of urban open spaces. These standards apply in both residential and commercial developments, with a few exceptions. The standards allow for two different open space typologies – recreational and natural. Some examples of recreational open spaces include playgrounds, community gardens, parks, pavilions, rooftop decks, or rooftop gardens. Potential natural resources are streams, riparian areas, wetlands, forested areas, and tree canopy preservation areas – all of which must be accessible via a public pedestrian path.

Source: Smart Surfaces Coalition Policy Tracker (https://smartsurfacespolicy.org/policies/)

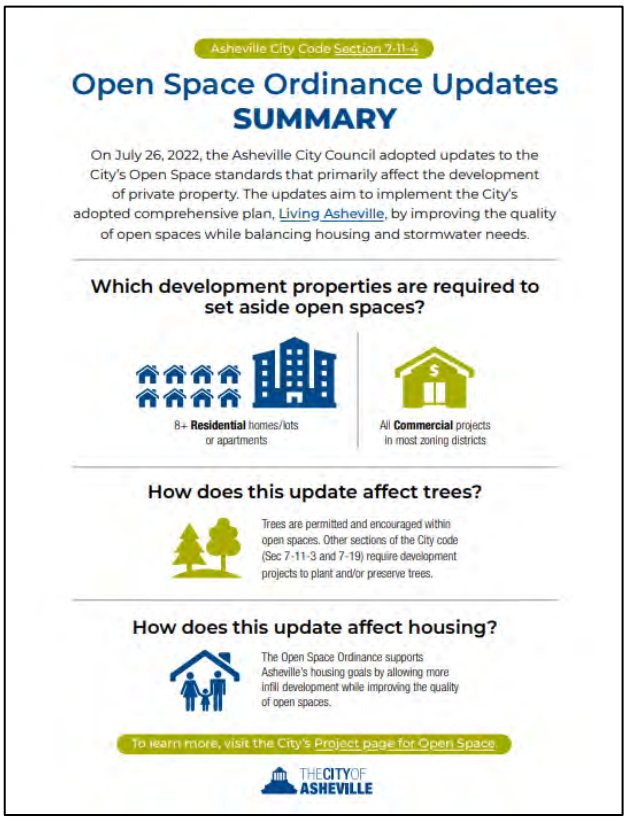


Figure 20. A one-pager detailing the City of Asheville, North Carolina's open space ordinance.

Pavement

Pavement is a common feature in urban landscapes, covering roads, parking lots, and sidewalks to provide durable and accessible surfaces for cars, trucks, buses, trains, pedestrians, and cyclists. However, conventional pavement materials, like asphalt and concrete, are largely impermeable, absorbing and radiating heat and thus contributing to UHI effects. They also prevent water from naturally soaking into the ground, increasing surface runoff and straining stormwater systems. Though surface runoff is an essential step in the water cycle, it can be detrimental to the environment if it carries pollutants like fertilizers, pesticides, oil, sediment, and bacteria from parking lots or other hard surfaces directly into waterways without being filtered. Using permeable pavement alternatives helps mitigate these issues by allowing water to filter through, reducing runoff and cooling urban areas more effectively. Adopting permeable pavements and other alternatives, such as cool pavement or de-paving, are crucial for building heat-resilient cities.

Permeable pavement

Permeable, or porous, pavement is a type of pavement that allows water to seep through its surface and into the ground. Examples include porous asphalt, pervious concrete, interlocking pavers, or Permeable Articulating Concrete Blocks (P-ACBs). The water that seeps through permeable pavement can cool the surrounding surface temperature through evaporative cooling. Permeable pavement is most often implemented to help manage stormwater and surface runoff, but cooling is an important co-benefit.

P-ACBs are open joint permeable concrete pavers that have very high infiltration rates (1,000-1,600 inches per hour) and high load capacity. The unique interlocking design of P-ACBs allows for easy removal and replacement to access utilities. Unlike interlocking pavers, P-ACBs do not require filled joints between each block, allowing for greater water penetration.

Figure 21. Examples of porous asphalt (left), pervious concrete (middle left), interlocking pavers (middle right), and P-ACBs (right).

Public agencies can include permeable pavement requirements in city code, encouraging or requiring that developers use permeable pavement for some or all their development. Design standards can establish how much of a certain type of development should be reserved for permeable pavement. Providing financial incentives or streamlining permitting processes can further encourage developers to use permeable pavement instead of conventional pavement.

Local and regional examples

The 2015 Climate Action Plan for the City of Portland and Multnomah County identifies de-paving and porous pavement as part of a priority action focused on decreasing UHI effect. The City of Portland Stormwater Management Manual establishes requirements related to the design and implementation of stormwater management facilities in Portland. Site design requirements include guidelines around the reduction of impervious areas, including the minimization of impervious areas using permeable pavement, removal of abandoned pavement, and avoiding the use of compacting soil in undeveloped areas.

There are several examples of the use of permeable pavement in Portland and across the rest of the region.

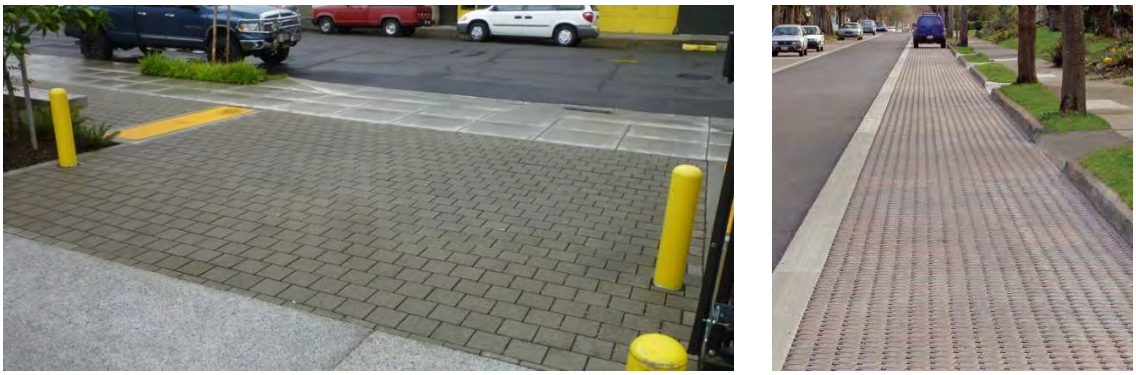


Figure 22. Example of permeable pavements in Portland (City of Portland and MutualMaterials).

In West Linn, the city code requires habitat friendly development practices to be incorporated into the design of any improvements and projects, including the use of pervious paving materials for driveways, parking lots, sidewalks, patios, and walkways.

In Oregon City, the city code encourages the use of pervious asphalt or concrete and alternative designs that reduce stormwater runoff when building off-street parking spaces and access aisles. The City's Thimble Creek Concept Plan requires that any new development must incorporate at least six sustainability features. One of the six possible features is permeable paving. Permeable paving totaling twenty to forty percent of all paved surfaces shall count as one feature, and permeable paving of forty percent or more of all paved surfaces shall count as two features.

In Wood Village, a rule establishes design requirements for all developments located within the neighborhood commercial zone. One of the standards is that at least 50 percent of all new vehicle and pedestrian areas must be surfaced with pervious pavement approved by the City Manager.

Washington County has established that minimum landscape areas may be reduced by up to 20 percent if required driveways or off-street parking areas are designed and constructed to reduce stormwater runoff using pervious materials.

Clean Water Services developed the Low Impact Development Approaches (LIDA) Handbook to promote sustainable development practices for the Tualatin River Watershed in 2009. LIDAs, including porous pavement, can help maximize a site's potential to treat stormwater.

Benefits	Challenges
+ Reduces temperatures in urban areas	– Requires specialized materials and installation techniques

Benefits	Challenges
+ Reduces stormwater runoff and improves water quality + Improves safety by reducing water spray from moving vehicles and increasing traction through better water drainage + Less prone to cracking or buckling from freezing and thawing + Can last for more than 20 years	– More expensive than conventional pavement options – Possible accessibility issues for those needing mobility devices – Some options need regular cleaning and maintenance to maintain effectiveness – Some options are not ideal for high traffic or high-speed areas due to lower load-bearing capacity than conventional pavement

In the **City of Tucson's** complete street policy, permeable pavements are encouraged or permitted. The policy considers that where the planting or amenity zone is paved, permeable materials should be considered, such as porous unit pavers with interlocking designs or permeable concrete. Permeable pavement may be used for sidewalks or shared-use paths as long as it is firm, stable, and slip resistant without excessive vibration causing features.

In places like **Greenville, South Carolina** and **Dallas, Texas**, the city codes are used to encourage or require permeable surfaces in development. In Greenville, developers are encouraged to maximize the use of permeable pavements on all sites, and in Dallas, within specific urban corridor districts, a "minimum of 10 percent of the lot area must be open space in the form of permeable surfaces such as perimeter landscape buffer strip, recreation area, or conservation area."

Some places utilize financial incentives to encourage the use of permeable pavement. In **Fort Mill, South Carolina**, property owners can receive credit against up to 70 percent of their stormwater utility fee for implementing green infrastructure measures including installing pervious pavement or reducing impervious cover.

Source: Smart Surfaces Coalition Policy Tracker (https://smartsurfacespolicy.org/policies/)

Reflective pavement

Conventional pavements, such as asphalt and concrete, for parking lots and roadways are one of the main contributors to the UHI effect. These materials have low albedo (i.e., reflective capabilities) and high heat absorption capacities, absorbing up to 80-95 percent of

solar radiation and transforming it into heat.[11] Reflective pavements (sometimes referred to as *cool pavements*) have a higher solar reflectance than conventional pavements and absorb less solar energy, resulting in lower surface temperatures during the day and less heat released during the night. Furthermore, reflective pavements can help lower the temperature of surface runoff, resulting in less thermal shock to aquatic life in waterways.[12]

Reflective pavements can be made from traditional paving materials, such as cement concrete, as new cement concrete has a solar reflectance of 30–50 percent. There are also cool-colored coatings for asphalt concrete pavements that reflect about 50 percent of sunlight. Another approach is to use a clear binder that reveals highly reflective (light-colored) aggregate. It is important to note that the reflectivity of these pavements may diminish due to wear from dirt, tire marks, stains, oxidation, or abrasion, which may contribute to a reduction in cooling effects over time.[13]

Public agencies can include reflective pavement in city code, encouraging or requiring that developers use reflective pavement for some or all their development. Design standards can establish how much of a certain type of development should be reserved for reflective pavement. Providing financial incentives or streamlining permitting processes can further encourage developers to use reflective pavement instead of conventional pavement.

Benefits	Challenges
+ Promotes cooling	– Potentially reduce human thermal comfort for those walking
+ Can reduce street lighting costs	– Can create significant eye strain or contrast to surroundings
+ Reduces emissions	– Might impair the visibility of pedestrians or drivers
+ Increases visibility and driver safety at night	
+ Some technologies can improve air quality by remediating air pollutants	

[11] Heat Island Group - Berkeley Lab. (n.d.). *Cool Science*. Cool Pavements. https://heatisland.lbl.gov/coolscience/cool-pavements

[12] Using Cool Pavements to Reduce Heat Islands. (n.d.). EPA. *https://www.epa.gov/heatislands/using-cool-*pavements-reduce-heat-islands

[13] Durability evaluation of heat-reflective coatings for road surfaces: A systematic review. (October 1, 2024). Sustainable Cities and Society. https://www.sciencedirect.com/science/article/abs/pii/S2210670724004505

Figure 23. City of Phoenix crews applying a reflective coating to a street as part of the Cool Pavement Program.

In **South Carolina**, Charleston County's FY 2025 – FY 2027 Strategic Plan lists, among other resilience strategies, the goal of increasing the city's use of titanium dioxide-based reflective pavement coatings by 5 percent annually on eligible roadways.

In **Miami Beach, Florida**, the city waives specified permit review fees for any projects involving cool pavement as well as other alternative and sustainable solutions like porous pavement, a solar carport, or a sustainable roofing system.

Phoenix, Arizona's Climate Action Plan (2021) called for increasing the use of high albedo, or reflective, materials in infrastructure projects and completing a cool pavement pilot program. Since the City completed a pilot, cool pavement is now a permanent part of the City's street maintenance program as part of a program called the Cool Pavement Program. In **Maricopa County, Arizona**, a sustainable development incentive program was created to promote sustainable development practices, like the use of hardscape materials with an initial solar reflectance value not less than 0.30.

Source: Smart Surfaces Coalition Policy Tracker (https://smartsurfacespolicy.org/policies/)

De-paving

De-paving is the process of removing impermeable surfaces, such as parking lots, driveways, sidewalks, or patios, and replacing them with a permeable surface, especially green space. The impermeable areas that undergo this process are often underutilized – contributing to UHI effects, increased levels of surface runoff and water pollution, and often uncomfortable pedestrian environments without providing any benefits. Examples of permeable surfaces include grass, bare soil, plant beds, mulch, gravel, and urban meadows.

Public agencies can offer grants or subsidies to de-paving projects and partner with community groups already doing that work. Agencies can help identify priority areas that should be targeted for de-paving projects and make it easier to remove unused pavement in those areas by loosening permitting rules or encouraging de-pavement in development guidelines. After de-paving, agencies can also support replanting native vegetation.

Local and regional examples

Figure 24. Before and after a retrofit project (Depave).

In Portland, the organization Depave empowers disenfranchised communities to address social and environmental injustices and adapt to climate change through urban re-greening. Depave transforms over-paved places, creates resilient community greenspaces, promotes workforce development and education, and advocates for policy change to undo manifestations of systemic racism. Depave has two types of projects. Transformation projects are typically larger and more complex and alter original site use (e.g., nature playgrounds, healing gardens). *Retrofit projects* are typically smaller and require less planning and heavy construction (e.g., a tree well in a schoolyard, a bioswale in a parking lot). Depave also shares helpful resources like a how-to-depave guide, links to project permitting information, and contact information for equipment rental and asphalt hauling and recycling.

Benefits	Challenges
+ Promotes cooling and mitigates UHI effects + Reduces stormwater runoff and improves water quality + Provides more habitat for wildlife + Improves quality of life for community members	– High costs due to labor, specialized equipment needs, material disposal, and the cost of replacing the surface with new materials or plants – Involves administrative or technical requirements

Roofs and Buildings

Roofs and buildings play a significant role in urban heat mitigation through strategies that reduce heat absorption and improve indoor comfort. Cool roofs are designed with reflective materials that minimize heat retention, lowering surface temperatures and reducing cooling demands. Green roofs add vegetation layers that provide insulation, absorb heat, and improve stormwater management. Similarly, installing energy-efficient siding materials can further reduce heat absorption. Inside buildings, cooling mechanisms, such as improved ventilation systems, heat-reflective window treatments, and passive cooling designs help maintain comfortable indoor temperatures. One of the most effective indoor cooling mechanisms is air conditioning, (AC) which can be energy intensive but lifesaving on extremely hot days. Implementing these strategies in both new and existing buildings can significantly reduce heat exposure, especially in densely built areas that do not have much access to natural areas.

Cool roofs

Cool roofs are made with highly reflective materials or coatings that keep surfaces significantly cooler than traditional roofs—often by 50 to 60 degrees Fahrenheit during peak summer heat. Typically, cool roofs are designed to have lighter colored surfaces to aid in their reflectivity and overall heat reduction. This means that these surfaces absorb and transfer less solar heat into buildings than traditional roofs, helping to maintain cooler indoor temperatures. Cool roofs can cool temperatures inside buildings and provide energy cost savings. With roughly 60 percent of urban surfaces nationally covered by traditional roofs or pavements, there is significant opportunity to retrofit these surfaces with reflective materials to help reduce urban heat.[14]

Examples of cool roofing materials include reflective coatings which are UV protectant, cool-pigmented (i.e., light-colored) asphalt shingles, coated metal, cool-pigmented clay or concrete tiles for steep-sloped roofs, white elastomeric coatings (i.e., an acrylic-based roof coating), and white single-ply membranes for low-sloped roofs.

[14] Center For Climate And Energy Solutions. (2017, November). Resilience Strategies For Extreme Heat. https://www.c2es.org/wp-content/uploads/2017/11/resilience-strategies-for-extreme-heat.pdf

Figure 25. Example of light-colored and reflective roofing (Smart Surfaces Coalition).

Public agencies can lead by example and install cool roofs on public buildings. Agencies can update building codes and include requirements or recommendations for cool roofs in new construction and major renovations, and provide grants, rebates, or tax credits to developers or property owners who install cool roofs.

Benefits	Challenges
+ Potentially decrease maximum indoor air temperatures by 1.3 degrees Fahrenheit and maximum ceiling temperatures by 3.3 degrees Fahrenheit + Can lead to significant energy-cost savings	– Concerns over algae and mold in places with cold and wet winter climates, like Oregon – Lighter-colored roofing may show dirt more easily – May result in higher energy costs during colder winter weather due to reflective properties resulting in an increased need for heating systems

In 2017, the **Center for Climate and Energy Solutions** produced a cost-benefit analysis of cool roofs showing that although installation costs $0.05–$0.10 (2017 dollars) more per square foot than conventional roofing, cool roofs have the possibility to reduce peak electricity demand by up to 10-40 percent. Despite the national estimated energy

savings for white roofs being low at $0.03 cents per square foot, various cities around the country have calculated energy savings as high as $1.34 per square foot.

Nationally, there are various cities that have policies regarding the implementation of cool roofs. **New York City** has a program, NYC Cool Roofs, that provides no-cost cool roof installations to nonprofit organizations and low-income housing buildings. **Philadelphia** amended their building code to require white or highly reflective roofs for all newly developed buildings and building additions. **Chicago** also requires new roofs to be at least 72 percent reflective, and old roofs to be at least 50 percent reflective.

Source: Center For Climate & Energy Solutions – Resilience Strategies for Extreme Heat (https://www.c2es.org/wp-content/uploads/2017/11/resilience-strategies-for-extreme-heat.pdf)

Green roofs and sidings

Green roofs replace conventional roofing materials with plants and soil, creating a living landscape on top of buildings. Typically, green roofs are categorized as being either intensive or extensive. Intensive green roofs are designed to appear like a natural landscape by hosting various combinations of trees, plants, and vegetation. Oftentimes, they resemble parks and gardens. As the name implies, these types of green roofs require intensive maintenance, structural support, and irrigation systems. Extensive green roofs are lower maintenance and allow for climate resilient shallow-rooted plants and vegetation (e.g., succulents) to be planted. These types of green roofs are lighter in weight, requiring less structural support and irrigation systems. Both types of green roofs are shown to reduce building temperatures, increase urban greenery, and provide energy savings.

Figure 26. Example of a green wall (Bend Magazine).

Vines, vegetation, and plants may also be added to the sidings of buildings to form *green walls* also known as *vertical gardens*. They can be as simple as placing cables in front of exterior walls and allowing vines to grow along them, or they can be more complex like designing planters to be incorporated into a building's outer walls. Vertical gardens can be effective in covering windows that cannot be shaded by trees due to the height or design features of a building. They also provide similar effects to green roofs in reducing building temperatures, providing energy costs savings, and increasing urban greenery, all while adding to the urban aesthetic.[15]

[15] Bass, B., Liu, K., & Baskaran, B. (2003, January). Evaluating Rooftop and Vertical Gardens as an Adaptation Strategy for Urban Areas. Research Gate. https://www.researchgate.net/publication/44055696_Evaluating_Rooftop_and_Vertical_Gardens_as_an_Adaptation_Strategy_for_Urban_Areas

Public agencies can lead by example by installing green roofs on public buildings. Agencies can update building codes and include requirements or recommendations for green roofs in new construction and major renovations, and provide grants, rebates, or tax credits to developers or property owners who install green roofs.

Local and regional examples

Figure 27. Green roof on Portland's city hall (Mayer/Reed).

The City of Portland has led the charge in including policies and ordinances addressing green roofs (referred to as eco-roofs). Specifically, within the Central City Plan District, new buildings with a net area of 20,000 square feet or more must be 100 percent covered with an eco-roof (with exceptions). Up to 40 percent of the eco-roof may be covered with a combination of other eco-roofing features, such as solar panels, skylights, and rainwater harvesting systems. Ultimately, eco-roofs must also meet the city's Bureau of Environmental Services design criteria in accordance with the Stormwater Management Manual. Also, the City of Portland is addressing green infrastructure in their land use policies. The City plans to update their green building policy. Currently, the policy requires green building principles to be incorporated into all newly constructed city facilities and city-funded projects, and all new city-owned buildings must have their rooftop space covered by eco-roofs with certain exceptions.

Figure 28. The green roof on the Metro Regional Center (Metro).

Similar to the City of Portland, Metro adopted a Sustainable Buildings and Sites Policy in 2023 to update the agency's 2011 Green Building Policy. The policy establishes standards for the site design, construction, and operation of Metro-owned buildings, parks, and developed properties that are aligned with regional climate and equity goals. The policy requires the agency to site and design buildings and landscapes to minimize urban heat island effects, including evaluating and implementing heat mitigation strategies in landscaping design, cool roofs and green roofs, and cool pavement and wall strategies where appropriate. For roofing, the policy establishes a prioritization hierarchy for consideration where the generation of clean energy is first, green roofs are second, and cool roofs are third.

Benefits	Challenges
+ Reduce building temperatures	– High initial investment costs and maintenance costs
+ Aesthetically pleasing	– Buildings must be able to bear the weight of needed infrastructure, like irrigation systems
+ Increase access to greenery, especially for highly dense urban areas where greenery is sparce	– Competes with opportunities to generate solar energy
+ Improve community well-being	– Vegetation must work well in the area's weather, whether icy winters or dry summers
+ Improve stormwater management and reduce surface runoff	

Austin, Texas has implemented an ordinance to their site development standards requiring 50 percent of above-ground open space to be dedicated to vegetated green roofs. Additionally, they have created a Downtown Density Bonus program that allows development projects to receive density bonuses for providing green roofs. If developers or building owners access this bonus, the green roof must adhere to the Vegetated ("Green") Roof Performance Standards. If the space fails to meet those requirements for more than 180 days in any 365-day period, the owner must pay the allotted bonus amount back into the Downtown Open Space Fund.

Source: Smart Surfaces Coalition Policy Tracker (https://smartsurfacespolicy.org/policies/)

Figure 29. Green roofing on the City of Austin's city hall.

Internal building cooling mechanisms

Most people who die from heat-related causes die while inside their home. Of the 72 Multnomah County residents who passed away during the 2021 heat dome, 68 of them died at home (94 percent) and only 10 of those who died had air conditioning (15 percent).[16]

Immediate adaptation measures, like air conditioning, proper thermal insulation, and window treatments such as blackout shades, are urgently needed. Air conditioning is the most impactful way to cool and control internal temperatures. However, thermal insulation and window adaptations can assist in maintaining those temperatures.

While expanding access to air conditioning can be lifesaving during extreme heat, it also increases energy demand and greenhouse gas emissions. A more sustainable approach is to prioritize the installation of high-efficiency heat pumps, which not only provide reliable cooling but also significantly reduce emissions compared to traditional air conditioning units. By investing in heat pumps, the region can protect public health during heatwaves while advancing climate goals.

Public agencies can update development codes and design standards to require or encourage internal cooling systems, including heat pumps and thermal insulation, in new construction and major renovations, especially affordable housing. For old buildings, agencies can offer free or low-cost air conditioning units or heat pumps, particularly to vulnerable households (e.g., seniors, low-income renters) and those without cooling options. Air conditioning can be energy intensive and cost prohibitive, so agencies can also consider providing utility bill assistance or connecting vulnerable households with community programs that can help.

Local and regional examples

The State of Oregon passed Senate Bill 1536 in 2022, which legalized an air conditioning deployment program with increased tenant protections regarding the right to install units within their residences. This program provides qualifying community members with free air conditioning units, prioritizing those most vulnerable in heat events.

The City of Portland has a very similar program, Cooling Portland, where free air conditioning units are also provided and installed for qualifying community members.

Verde's Home Heating and Cooling program helps connect income-qualified community members with energy-efficient cooling solutions. Similarly, Community Energy Project provides two affordable cooling programs: a program funded by the Portland Clean Energy

[16] Frank, T. (2024, September 3). *They Died With The AC Off. Why The Government Pays For Heating But Not Cooling.* E&E News by POLITICO. https://www.eenews.net/articles/why-the-government-lets-extreme-heat-get-away-with-murder/

Fund (PCEF) that provides a complete home energy retrofit and a free home repair program that provides more minor weatherization projects.

Benefits	Challenges
+ Provide immediate relief from extreme heat + Prevent heat-related illnesses or deaths	– Air conditioning units use large amounts of energy and release waste heat, adding to rising outdoor temperatures – High costs and low availability pose barriers to low-income residents

According to the city code for **Phoenix, Arizona,** landlords are legally required to provide adequate cooling to all rental units. All cooling systems must be permanently installed and sufficient to maintain a temperature of 86 degrees Fahrenheit for evaporative cooling systems and 82 degrees Fahrenheit for air conditioning units.

Source: Smart Surfaces Coalition Policy Tracker (https://smartsurfacespolicy.org/policies/)

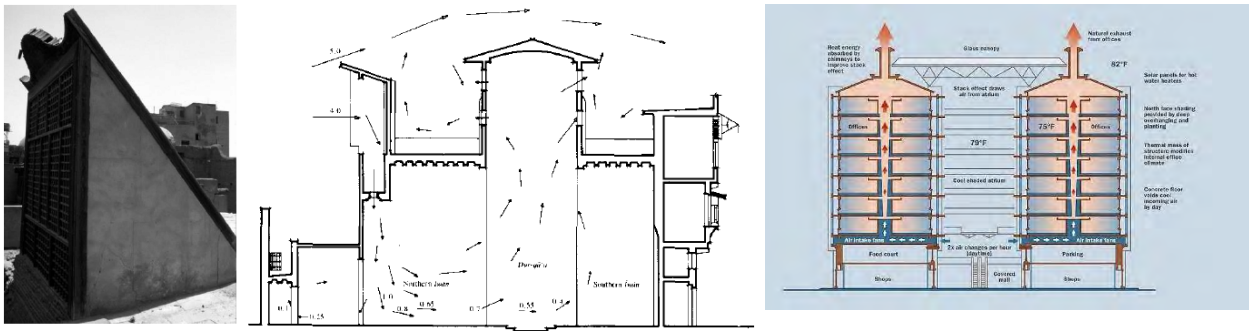


Figure 30. A traditional Malqaf wind catcher (left) allows airflow through a building (middle) (ResearchGate). The Eastgate Building (right) uses a different approach from most buildings to maintain internal temperature.

Globally, other passive or low-intensity cooling technologies have been used, some dating back to ancient societies, such as the Malqaf (i.e., windcatcher) in **Egypt** (1300 BC). In **Harare, Zimbabwe**, the Eastgate Building is designed to be ventilated and cooled by entirely natural means, inspired by the ventilation of termite mounds. The building uses traditional stone architecture of Great Zimbabwe to increase the external surface area of the building, lowering both day and nighttime internal temperatures. The building uses 35 percent less total energy than other similar buildings with heating, ventilation, and air conditioning (HVAC). The capital cost savings were about 10 percent of total building costs with the absence of an HVAC system.

Source: Eastgate Building (https://www.mickpearce.com/Eastgate.html)

Streetscape Design

Streetscape design encompasses the planning and arrangement of roadways, buildings, and other physical features that collectively shape the appearance and experience of a street. Effective streetscape design prioritizes enhancing the experiences of pedestrians, cyclists, and residents. To address UHI effects, key considerations include incorporating bioswales, optimizing building orientation, shading pathways with building awnings and arcades, providing covered transit stops, planting street trees, and ensuring safe, accessible pedestrian and bike pathways. These elements play a crucial role in shaping the infrastructure of future cooling corridors. By increasing shade and comfort, they enhance the community's ability to escape heat, whether near their homes or during commutes to cooler spaces.

Metro published the Designing Livable Streets & Trails Guide to make pathways more environmentally friendly and safer for pedestrians. The guide lists green street and stormwater management design elements that should be considered when designing livable streets and trails, such as planters, curb extensions with landscaping, basins, bioswales, ponds, stormwater medians, hybrid stormwater facility types, street trees, stormwater trees, and pervious surfaces. Some of these elements are described in more detail in this chapter.

Engineered shade structures

Engineered shade structures, like shade sails, canopies, pavilions, and umbrellas, are designed and built to provide protection from direct sunlight and prolonged heat exposure for those using outdoor spaces, such as plazas, promenades, or sidewalks. One way to incorporate shade is to cover transit stops. Covered transit stops may encourage public transit use by making waiting areas more comfortable, which can help reduce reliance on single-occupancy vehicles and thus decrease emissions from vehicle traffic that contribute to the changing climate. Shade structures provide the opportunity to pilot other physical interventions at a smaller scale, such as reflective materials, ventilation gaps, and vines or green roofs. With additional investment, shade structures can include water misting systems or solar-powered fans to further enhance cooling.

Public agencies can install shade structures in high-use public areas and work with housing developers, transit agencies, and schools to integrate shade structures into public-facing spaces. These types of structures can be in design standards for spaces, such as plazas and parks. Agencies can support community organizations, schools, and small businesses in adding shade structures to outdoor areas through grants or incentives.

Local and regional examples

Metro's Designing Livable Streets and Trails Guide suggests that transit stop amenities, including shelters, should be included whenever possible.

Figure 31. An example of a shaded TriMet transit stop.

TriMet, which operates over 6,600 bus stops across the region, installs covered shelters, benches, lighting, and pedestrian access improvements at high-use stops, typically those with over 35 to 50 weekday boardings. Some transit-priority corridors, developed under the City of Portland's Rose Lanes program or served by TriMet's FX service, include enhanced bus stop designs that integrate shade elements and street trees to improve comfort and safety for riders. It is important to note that not all transit stops and stations are shaded.

Benefits	Challenges
+ Provides direct shade and cooling	– High installation and maintenance costs
+ Enhances comfort of pedestrians and transit users	– Potential for vandalism and wear from weather and personal safety and visibility concerns
+ Provides opportunity to pilot sustainable designs	– May have an uneven geographic distribution

Figure 32. Awnings and umbrellas on Santee Alley.

Santee Alley (known colloquially as Los Callejones) in **Los Angeles, California** is an example of a community using informal shading technologies to beat the heat. This commercial district has some access to extended building awnings; however, vendors utilize tents, umbrellas, and tarps to provide extra shade to customers and community members walking or rolling throughout the area. These types of shading techniques are common in community spaces across the nation and exemplify low-cost and flexible solutions for the immediate need to escape heat.

Street tree planting

Street trees play a vital role in mitigating urban heat and improving the pedestrian experience. By providing shade, they reduce surface temperatures on streets and sidewalks, creating cooler microclimates that can help protect residents during extreme heat events. In addition to their cooling benefits, street trees improve air quality, absorb stormwater runoff, and enhance the overall aesthetic and walkability of neighborhoods. Strategically preserving, planting, and maintaining street trees in areas most vulnerable to extreme heat can be a cost-effective and sustainable intervention that supports both public health and environmental goals.

Utility companies may have concerns about tree canopy interfering with power lines. To address these issues, several cities and counties across the United States have approved street tree lists for planting spaces near power lines.

Public agencies can encourage street trees in streetscape design, require street trees in roadway projects, launch neighborhood tree planting events, partner with community organizations that run tree planting programs, and most importantly, help fund or support long-term tree maintenance or dead tree removal to ease the burden on those living near street trees.

Local and regional examples

The following agencies in the greater Portland region have approved street tree lists for planting spaces near power lines: City of Portland, City of Beaverton, City of Fairview, City of Forest Grove, City of Gresham, City of Happy Valley, City of Milwaukie, City of Oregon City, City of Tualatin, Clackamas County, and Washington County.

PCEF's Community Responsive Grants provide non-profit organizations, businesses, and local governmental jurisdictions with funds to invest in carbon-sequestering green infrastructure, including street trees, bioswales, de-paving initiatives, and more.

The City of Portland's Trees in the Curb Zone Pilot Project aims to expand Portland's street tree canopy through planting street trees along corridors that do not have them or space for them. The project creates space for new street trees by repurposing on-street parking and

curb zones along corridors to hold planters suitable for street trees. In addition, the City offered free yard trees to all properties along qualified corridors. This pilot project is taking place in the Lents neighborhood after considering the amount of available on-street parking, lack of street trees, locations of underground or overhead utility lines, and the urban heat index. As of now, approximately fifteen trees have been planted in the right-of-way. All trees planted as part of this project will be owned and maintained by Portland Parks & Recreation's Urban Forestry team, which is notably different than the traditional maintenance responsibility falling on the adjacent property owner.

Figure 33. Examples of trees planted as part of the City of Portland's Trees in the Curb Zone pilot project.

In 2025, the City of Portland updated its approved street trees planting list. This resource is maintained by the Portland Parks & Recreation's Urban Forestry team and used by a wide range of stakeholders—including property owners, tree care providers, landscape professionals, developers, non-profits, and regional agencies—to determine what tree species are approved for planting in the City of Portland managed right-of-way. This process is informed by stakeholder input, tree inventory and monitoring data, nursery availability,

literature reviews from scientific research, tree books, and regional tree lists. The updated list adds trees that will be better suited to the region's changing climate and no longer includes trees that were found to have poor performance.

Benefits	Challenges
+ Provides shade and creates a comfortable pedestrian environment + Reduces UHI effects and temperatures + Reduces stormwater runoff and improves water quality + Helps calm traffic and reduces vehicle speeds and traffic-related deaths and injuries + Improves air quality by capturing carbon and filtering pollutants + Provides habitat for wildlife and supports urban biodiversity + Enhances community health and fosters physical and mental well-being	– Branches and roots may interfere with above ground and underground utility lines if the appropriate tree is not selected for the space – Roots may damage sidewalks or pavement, requiring costly repairs – Requires regular maintenance (e.g., pruning) and debris removal (e.g., fallen leaves, branches, or fruit)

Rain gardens, bioswales, and groundcover

Rain gardens, bioswales, and groundcover are effective strategies for managing heat on streetscapes by reducing heat absorption and enhancing evaporative cooling. Rain gardens (depressed landscaped areas), bioswales (vegetated channels or trenches), and groundcovers (such as grass, flowers, and shrubs) are each designed to capture and infiltrate stormwater runoff and rainwater. Bioswales are commonly applied along roadways and parking lots to treat stormwater runoff that may contain pollutants from vehicles. Beyond their cooling effects, these features improve stormwater quality and support native plant habitats.

Figure 34. Example of a bioswale (The Business Journals).

Public agencies can integrate these features into stormwater management plans, update building codes and zoning regulations to include these features and provide grants or tax credits for property owners and developers who integrate bioswales into their properties for stormwater management. To increase sustainability, agencies can promote the use of low maintenance native plants and work with local environmental groups to manage vegetation and filter systems.

Local and regional examples

As mentioned, Clean Water Services developed the Low Impact Development Approaches (LIDA) Handbook to promote sustainable development practices for the Tualatin River Watershed. LIDAs, including rain gardens and bioswales, can help maximize a site's potential to treat stormwater.

Benefits	Challenges
+ Reduce UHI effects and temperatures + Reduce stormwater runoff and improves water quality + Help calm traffic and reduce vehicle speeds and traffic-related deaths and injuries	– Require routine inspection and maintenance for performance and aesthetics – May require more right-of-way compared to traditional storm drain systems, which can reduce parking availability

Benefits	Challenges
+ Support native plant habitats	

Figure 35. Examples of landscaping along roadways in Tucson, Arizona (Sustainable Tucson).

The **City of Tucson, Arizona** established active practices guidelines in 2013 to require the incorporation of green infrastructure features into Tucson roadways wherever possible. The guidelines apply to new construction and street reconstruction of publicly funded roadways. These projects include the following criteria for landscape planting: trees are located to provide shade on sidewalks, mature tree canopy covers a minimum of 25 percent of the canopy area, and the bottom of basins have 25 percent cover of grass or shrubs.

Optimized building orientation

Optimized building orientation helps reduce UHI effects by minimizing heat reflection and absorption in the surrounding environment. Strategically positioning buildings to cast shade on sidewalks, streets, and adjacent structures can lower surface and ambient temperatures. Orienting buildings to create wind corridors enhances natural ventilation, promoting airflow and cooling in dense urban areas. Proper alignment also reduces the need for extensive paved surfaces like parking lots, which absorb and radiate heat. Additionally, clustering buildings to create shaded courtyards or open spaces can provide cooler microclimates and more comfortable public areas, benefiting pedestrians and outdoor activity.

Public agencies can promote strategic building orientation by updating zoning codes and development standards to encourage designs that cast shade on sidewalks, streets, and adjacent structures, and allow for airflow between buildings. To support implementation, agencies can offer incentives such as grants, density bonuses, or expedited permitting for developments that contribute to cooling the public realm. Partnering with developers, architects, and urban design experts, agencies can also provide guidance on passive cooling

strategies and identify priority areas, such as heat-vulnerable neighborhoods, where these strategies can have the greatest impact.

Local and regional examples

The City of Portland's 2035 Comprehensive Plan encourages the design and development of buildings, landscaping, and infrastructure that reduce UHI effects (Policy 4.83).

Benefits	Challenges
+ Reduces UHI effects + Improves airflow and ventilation + Cools public spaces + Improves walkability	– Has design and construction constraints – Higher initial planning and design costs – Reduces flexibility for site use

Conclusion

This chapter highlights a wide range of cooling strategies that can help reduce urban heat island effects and protect the health and well-being of communities most at risk from extreme heat. Organized across eight key topic areas, the list of strategies identifies existing local and regional efforts and offers practical tools for public agencies, community organizations, and other partners to consider and adapt. From tree planting and reflective pavement to cooling centers and public outreach campaigns, each strategy brings unique approaches, benefits, and trade-offs.

Chapter 3:
Engagement

Grounding in Community

From October 2024 to July 2025, Metro engaged over 135 people through 40 engagement touchpoints.

For engagement, the project team focused on three core objectives:

1. **Depth over breadth.** Rather than trying to hear from as many people as possible, engagement efforts were focused on high-quality engagement to learn from both technical experts and those with lived experience.
2. **Centering the most impacted.** The project team prioritized hearing from the voices of those most vulnerable to and impacted by extreme heat to better understand challenges they face and to collaboratively imagine community-rooted solutions.
3. **Cross-sector collaboration.** The project team created space for local agencies and community-based organizations (CBO) to share their knowledge and give feedback to ensure that efforts are aligned across the region and learn how Metro can best support this work.

The feedback from the different engagement activities was used to inform and prioritize the recommendations included in this report. Strategies that were considered community priorities, based on feedback from the Cooling Corridors Study's engagement events and prior feedback from community engagement at public agencies across the region, were scored more highly than other strategies.

Engagement by the Numbers

2 Disaster Preparedness and Community Resilience workshops

3 Community conversations

1 82nd Avenue cooling workshop

1 Expert panel with chief heat and climate officers

6 Regional Work Group meetings

10 Metro Advisory Group meetings

8 Regional Policy and Technical Advisory Committee meetings

11 Small group conversations with Metro staff

Voices at the Table

Community-based organizations

Adelante Mujeres, African Youth & Community Organization, APANO, Centro Cultural, Columbia Slough Watershed Council, Community Energy Project, Community Pulse Association, Connecting Canopies Coalition/ The Nature Conservancy, Depave, Ethiopian and Eritrean Cultural and Resource Center, Familias en Acción, Northwest Family Services, Northwest Pilot Project, Oregon Food Bank, Street Roots, Todos Juntos, Trash for Peace, Unite Oregon, Upstream Access, Verde

Subject matter experts

Jane Gilbert, Chief Heat Officer, Miami-Dade County, Florida

Eleni (Lenio) Myrivili, UN Global Chief Heat Officer and Senior Advisor at the Atlantic Council's Climate Resilience Center, Athens, Greece

Brian Swett, Chief Climate Officer, City of Boston

Regional Work Group partners

City of Portland, Clackamas County, Multnomah County, Washington County, State of Oregon, Portland State University, CAPA Strategies, Clean Water Services, Mayer/Reed, Inc.

Metro Policy and Technical Committees

Metro Policy Advisory Committee (MPAC), Joint Policy Advisory Committee on Transportation (JPACT), Metro Technical Advisory Committee (MTAC), Transportation Policy Alternatives Committee (TPAC)

Metro Project Advisory Group members

Cindy Pederson (research analytics manager), **Jessica Zdeb** (principal regional planner), **Lake McTighe** (principal transportation planner), **Melissa Ashbaugh** (senior transportation planner), **Eliot Rose** (senior transportation planner), **Matthew Hampton** (senior transportation planner), **Rod Wojtanik** (parks and nature planning manager), **Jonathan Soll** (science manager), **Olena Turula** (principal regional planner), **Lori Hennings** (senior scientist), **Alice Williamson** (senior real estate specialist), **Tommy Albo** (senior GIS specialist)

Summaries of Engagement Activities

Throughout the project, the project team met with vulnerable community members, community-based organizations, subject matter experts, representatives from public agencies, private and academic partners, advisory group members, regional policy and technical committees, and Metro leadership through a variety of avenues. Feedback from each engagement activity is described below. This chapter of the report does not summarize feedback from past relevant engagement activities conducted by Metro's local and regional partners.

Disaster Preparedness and Community Resilience Workshops

The Disaster Preparedness and Community Resilience workshops were done in partnership with the Regional Emergency Transportation Route (RETR) project, led by Metro and the Regional Disaster Preparedness Organization (RDPO). The workshops were designed to inform the RETR project, Metro's disaster-specific social vulnerability tools project, disaster debris planning and solid waste system resilience, and the Cooling Corridors Study. The Cooling Corridors Study participated in two workshops that informed this report. A third workshop is planned for October 2025 at which the project team will report back study recommendations and next steps.

The first workshop was held on April 3, 2025, over Zoom. Over 50 staff at organizations who serve vulnerable communities in the region were invited to participate in the first workshop, and nine organizations participated. Stipends of $300 were offered to each organization that participated in the workshop.

Participants were asked to share how Metro's projects can be responsive to the needs of vulnerable communities, informing targeted approaches towards addressing these needs and strengthening social networks that contribute to a more resilient region. **Appendix B** describes the workshop in more detail.

Key takeaways from Workshop #1

At the workshop, participants shared the following:

- **Vulnerable communities often find themselves in survival mode to meet their basic needs.** They often don't qualify for subsidized air conditioning or Portland's clean energy funding, and even when they do qualify, resources do not arrive in a timely manner.

- **Certain members of the community are afraid to seek services even in the event of disasters and emergencies like heatwaves due to immigration enforcement fears.** Similarly, these communities also experience a stigma around seeking help at community shelters.
- **There is a lot of information available to help vulnerable communities, but it is challenging to discern which information is correct.** Too much information can be overwhelming for community members.
- **Community members experience limited English proficiency.** Disaster and climate adaptation planning should continue to bridge the language barrier gap with these communities.
- **Community members do not know where to get "official" resources.** There is a need for clearer information on where they can go, physically and virtually, to receive the best resources and emergency information in a timely manner.
- **Communities rely more on Facebook and wireless emergency alerts**, but truthfulness and transparency remain concerns. They have relied less on television for emergency information.
- **CBOs are forming partnerships to address disaster preparedness training for Spanish speaking communities**, but resources are limited. CBOs are leading discussions on the needs of people living with disabilities and disaster preparedness.
- **Connections to church congregations, rural social groups, and neighbors, and the use of mutual aid played important roles in past recovery processes.** These groups can continue to be trusted during disasters and emergencies.
- **Local government agencies were visibly providing updates during extreme events.** Additionally, CBOs were essential for efforts taken before, during, and after disasters.
- **There is a need for neighborhood-level community resilience hubs that have resources**, like emergency kits, education, workshops, and connections to local resources, including fire departments and shelters.
- **It is important to foster trust between government agencies and CBOs.** This ensures that programs and policies reflect the real needs and priorities of the communities they aim to serve. When trust is established, CBOs are more likely to engage meaningfully, share local knowledge, and support implementation efforts, leading to more equitable, effective, and lasting outcomes.

The second workshop was held on June 23, 2025, over Zoom. Over 50 staff at organizations who serve vulnerable communities in the region were invited to participate in the second workshop, and eleven organizations participated. Stipends of $300 were offered to each organization that participated in the workshop.

Workshop facilitators shared the outcomes of the map-based analyses for the Cooling Corridors Study and asked representatives to provide feedback on the demographic communities and geographic areas that were identified as having the highest heat risk. The facilitators also shared some of the policy considerations, giving representatives an opportunity to assess which policies seem most helpful and which policies are missing. **Appendix B** describes the workshop in more detail.

Key takeaways from Workshop #2

At the workshop, participants shared the following:

- **Rural communities lack centralized cooling spaces**, such as shopping malls and public libraries, while **others living in the city also experience limited access to cooling centers** and adequate air conditioning and home weatherization.
- **Public libraries are viewed as informal cooling centers**, but participants want **more access to public pools, splash pads, cooling kits**, and cooling centers.
- **Supportive housing and schools often lack adequate air conditioning** and upfront costs to air conditioning units can be a barrier.
- **Culturally relevant resources in multiple languages are needed** to help non-English speaking community members feel better prepared to endure extreme heat events, and **training and resources should be provided by culturally competent facilitators** to build trust.

Community Conversations

From May to July 2025, the project team hosted three community conversations. These conversations were guided small group discussions with representatives of community-based organizations, people who have experienced or are experiencing housing insecurity, and older adults. The community conversations were designed to create space for storytelling to learn about the lived experience of vulnerable communities with extreme heat, and to deepen understanding of community-led heat and climate resilience work in the region.

Conversation with community-based organizations

For this conversation, the project team invited CBOs working to improve the environment and strengthen communities who may be disproportionately impacted by extreme heat. Eleven CBOs were invited, and five attended: Columbia Slough Watershed Council, Community Energy Project, Connecting Canopies Coalition, Depave, and Verde. Participants were served lunch, and stipends of $300 were offered to each organization that participated in the conversation.

This conversation had the following objectives:

- Learn about potential or current community efforts to protect the environment, improve climate resilience, or mitigate/adapt to extreme heat.
- Learn what resources community organizations need to continue this work and how Metro and other government agencies can best support these efforts.
- Understand community priorities when it comes to addressing climate change, particularly extreme heat.
- Strengthen relationships with community organizations and form partnerships between community organizations doing or hoping to do climate-related work.

The conversation was held in person on May 13, 2025, from 11 AM to 1 PM at the Metro Regional Center. **Appendix B** describes the conversation in more detail.

Key takeaways

Based on the conversations with CBO representatives, Metro learned the following:

- **Community members are concerned about heatwaves**, access to water and cool spaces, wildfire safety, and disaster preparedness.
- **Community-based organizations are doing great work** to build climate resilience in the community, especially with vulnerable communities, but need support.
- **Education, advocacy, and capacity building**, including building green infrastructure or weatherizing homes, are key focuses.
- **Limited staff capacity and access to limited and restrictive funding** are significant challenges.
- **Organizations want more opportunities to share knowledge and resources to build organizational capacity.** Metro can support coordination efforts by developing a "hub" or database.

Conversation with unhoused community members

For this conversation, the project team focused on learning about the lived experiences of one of the most vulnerable groups to heat, unhoused people. During past heatwaves, local deaths included unhoused individuals. They face extremely high risks during extreme heat, as they often lack steady access to shelter, cooling, and clean water to escape the dangerous conditions.

This conversation had the following objectives:

- Engage with members of the unhoused community or those who were formerly unhoused, groups who are the most vulnerable to extreme heat.

- Learn how unhoused people currently prepare for and experience extreme heat events, focusing on where they go and how they get there, what resources and services they rely on, how they learn about resources and services, what barriers they face in reaching resources and services, who provides leadership, and who they go to for help in their community.
- Support these vulnerable groups with helpful resources.

Metro partnered with Street Roots, a Portland-based nonprofit that empowers people experiencing homelessness through newspaper vending and advocacy, to invite eight unhoused individuals to the conversation. Six people participated. Participants were served lunch, and stipends of $300 were offered to each person that participated in the conversation. The conversation was held on May 19, 2025, from 10 AM to 12 PM at the Street Roots office in downtown Portland. **Appendix B** describes the conversation with unhoused community members in more detail.

Key takeaways

Based on the conversation, Metro learned the following:

- **Extreme heat poses daily risks for the unhoused** and current emergency response efforts are not enough.
- **Public resources like libraries and community groups are lifelines**, but these places are overstretched and under resourced.
- **Misting stations and better access to drinking water** are seen as most helpful on hot days.
- **Better outreach before events and education** are necessary to help people feel more prepared. Participants would appreciate advanced warnings about imminent heatwaves and considering many people facing housing insecurity are transit dependent, they shared that alerts and other helpful information at transit stops or on transit vehicles would be accessible and extremely helpful.
- **Unhoused community members are already demonstrating leadership and care for each other,** but they need structural support from outside of the community to survive and thrive.
- **Climate resilience strategies must be designed with and for people experiencing homelessness**, ensuring solutions are practical, accessible, and responsive to on-the-ground realities.

Conversation with older adults

For this conversation, the project team focused on learning about the lived experiences of one of the most vulnerable groups to heat, older adults (i.e., people aged 65 years or older).

According to the Centers for Disease Control and Prevention (CDC) and Oregon Health Authority, older adults are one of the highest risk groups and consistently have the highest rates of heat-related deaths, especially during major heat events.

This conversation had the following objectives:

- Engage with community members who are 65 years or older.
- Learn how older adults currently prepare for and experience extreme heat events, focusing on where they go and how they get there, what resources and services they rely on, how they learn about resources and services, what barriers they face in reaching resources and services, who provides leadership, and who they go to for help in their community.
- Support these vulnerable groups with helpful resources.

Metro partnered with Northwest Pilot Project (NWPP), a nonprofit that connects low-income seniors (55 and over) in Multnomah County with rental housing that is safe, permanent, and affordable, to invite eight older adults to the conversation. Five people participated. Participants were served lunch, and stipends of $300 were offered to each person that participated in the conversation. The conversation was July 28, 2025, from 10 AM to 12 PM at the Metro Regional Center. **Appendix B** describes the conversation in more detail.

Key takeaways

Based on the conversation, Metro learned the following:

- The **health impacts of extreme heat are a top concern for many older adults**, especially those living alone or on lower incomes.
- **Access to cooling resources and knowledge of best safety practices are limited** or unknown to many residents.
- **Preparedness education, proactive outreach, and protective infrastructure** like misting stations and shade structures are deeply needed.
- **Utility costs on fixed incomes impact people's decision to provide themselves with the proper cooling** in their homes.
- **Social isolation during extreme heat is a serious concern** for older adults living alone or who know others living alone. Participants shared stories about neighbors, friends, and family who had passed away without anyone knowing and expressed worry that the same may happen to them during heatwaves if no one knows to check on them.
- **Strengthening social connections must be a central strategy** in any emergency response plan.

82nd Avenue Cooling Workshop

The 82nd Avenue Cooling Workshop was a two-day community workshop that invited public agencies, community-based organizations, and community members to explore and share ideas on how to make the corridor cooler and more resilient during extreme heat events and representative of the community through placemaking and public art. The event was in partnership with the 82nd Avenue Coalition, Metro, the City of Portland, and TriMet with assistance provided by the U.S. Environmental Protection Agency's (EPA) Building Blocks for Sustainable Communities program.

The workshop was held from July 22-23, 2025, at the Dharma Rain Zen Center located near 82nd Avenue. During the first day of the workshop, participants were asked to develop a vision for the corridor, including goals to guide implementation. During the second day of the workshop, staff from Metro, local public agencies, state agencies, transit agencies, and other community partners discussed actionable steps to implementation of the vision that was developed the first day.

Key takeaways

At the workshop, Metro learned the following:

- **Greening and cooling 82nd Avenue emerged as a shared and urgent goal for all participants.** Other goals included incorporating placemaking and public art along the corridor, using 82nd Avenue to pilot strategies that can later be expanded to support broader initiatives, and engaging closely with youth and supporting a workforce development program for them.
- To cool the neighborhood, **participants expressed the most support for**: establishing **a green corridor approach**, establishing **a coordinated approach for greening that includes public and private greening**, and incorporating **shade at bus stops** that lack shade.
- Participants also shared that it is important to **use a variety of greening techniques** where possible and to **shift the burden of maintenance for street trees and other green infrastructure to public agencies** whenever possible.

Expert Panel

Metro invited chief heat and climate officers from different levels of government to attend a panel focused on addressing urban heat. When searching for panelists, the project team focused on high-level leaders who are actively working to build heat or climate resilience in their communities and understand not just what needs to change, but how to make those changes happen within agencies and systems.

Jane Gilbert (Chief Heat Officer, Miami-Dade County, Florida), Eleni Myrivili (UN Global Chief Heat Officer and Senior Advisor at the Atlantic Council's Climate Resilience Center, Athens, Greece), and Brian Swett (Chief Climate Officer, City of Boston) agreed to serve as panelists given their current roles and expertise.

The expert panel was held on May 5, 2025, from 8 to 10 AM (PST) on Zoom. The expert panel was open to Metro Councilors, Metro leadership, and Metro staff. **Appendix B** describes the conversation in more detail. A video recording of the expert panel is available here: https://vimeo.com/1081932445.

Key takeaways

Based on the conversation with the panelists, Metro learned the following lessons:

- **Extreme heat needs equal prioritization as other climate threats** in both emergency response and policy planning.
- **Engagement with trusted partners**, like healthcare workers and neighborhood groups, is critical for successful outreach, credibility, and adoption of new initiatives.
- **Localized pilot projects can build political and community support** before policies are scaled citywide or regionwide.
- **Co-designing projects with community builds ownership and trust** and ensures culturally appropriate and effective strategies.

Regional Work Group

After public agencies showed strong interest in staying connected to the Cooling Corridors Study and discussing heat adaptation in the region, the project team formed the Regional Work Group to create a space to exchange ideas and get technical and policy feedback from local partners. The group met monthly from March 2025 until September 2025.

The Regional Work Group is made up of 16 representatives from 10 public, private, and academic partners in greater Portland. The group charter, including a list of participants, can be found in **Appendix B**.

The group charter recognizes the following objectives:

- Provide points of connection for partners who may be interested in learning about and providing feedback on the study.
- Learn from Metro's project team about recent work on the study.
- Provide policy and technical feedback to Metro's project team.
- Ensure the interests of partner agencies, local jurisdictions, and other stakeholders are heard and help inform the study.

During meetings, the project team presented updates on the research, engagement, analysis, and prioritization of recommendations, providing opportunities for group members to give direct feedback on the team's approach, work, and outcomes, and ask both technical and practical questions that sometimes prompted additions or revisions to the project work. Members of the Regional Work Group shared important considerations for the project team to keep in mind, including suggestions on how to refine the prioritization of recommendations, potential implementation challenges, and how to anticipate public concerns.

Regional Work Group survey

Towards the end of the project, the Regional Work Group was invited to respond to a survey created to learn more about existing and upcoming efforts related to heat mitigation and adaptation at local agencies and organizations and ways Metro can help support or complement those efforts. The responses to this survey informed recommendations for the Cooling Corridors Study. For more information on the survey, please see **Appendix B**.

Key takeaways

Based on feedback from the survey, Metro learned the following:

- **Local agencies are already responding to extreme heat in the region**, but funding constraints limit implementation of existing or planned plans, policies, and programs.
- **Tree planting and elevating extreme heat as a critical issue are high priority** for local partners.
- **Financial support is the most helpful way for Metro to support local efforts**, followed by regional coordination, coalition building, model policies and codes, publicly available data and maps, guidance, and technical assistance.

Metro Policy and Technical Advisory Committees

Throughout the study, the project team presented to Metro regional policy and technical advisory committees to share project information and seek feedback on past research to build on, strategies to research, and stakeholders and community groups to engage in the study.

Metro Project Advisory Group

The Metro Project Advisory Group was comprised of Metro staff from the Planning, Development and Research department and Parks and Nature department. The project team met with the advisory group monthly from October 2024 to July 2025 to present project updates and seek technical and policy guidance and feedback, including suggestions for

strategies to research, prioritization criteria to use, and stakeholders and community groups to engage in the study.

Conversations with Metro staff

In June 2025, the project team facilitated multiple conversations with Metro staff across different departments, which included members of the Metro Project Advisory Group, to discuss draft recommendations and actions for the Cooling Corridors Study. These conversations aimed to help ensure that final recommendations are feasible and reasonable for Metro staff and public agencies to implement, and to address any potential challenges to implementation. The conversations were focused on different topics relevant to the work, expertise, and interests of Metro staff across the agency.

The conversations were designed to introduce staff unfamiliar with the Cooling Corridors Study to the project and to familiarize the project team with existing efforts at different Metro departments related to draft recommendations that the project team developed based on the study's background research and engagement efforts. During the conversations, Metro staff shared insights into the role Metro can play in the region to build heat resilience and suggested recommendations or revisions to draft recommendations for the project team to consider. For more information on the conversations, please see **Appendix B**.

Key takeaways

The conversations with Metro staff revealed the following:

- The conversations revealed that **there is already great work being done at Metro related to building heat and climate resilience** at the agency and across the region.
- **Further collaboration is needed across Metro departments to ensure that efforts are not siloed**, resources and knowledge can be shared, and staff can support staff on other teams working on similar projects.
- **Metro plays a significant role in facilitating collaboration across the region** and by setting examples for other public agencies.

Key Themes from Engagement Activities

Extreme heat must be urgently addressed and prioritized alongside other climate threats in emergency response and long-term planning efforts.

There are many existing efforts to build regional heat resilience led by public agencies and community groups that can be built on. **Community organizations and public agencies seek deeper and more frequent collaboration with Metro and peer groups** to amplify the impact of these efforts.

Engagement through trusted community organizations, healthcare workers, and other reliable partners leads to stronger relationships, more effective outreach, and more meaningful participation with hard-to-reach or historically underserved groups.

Timely, clear, and accessible outreach efforts and widespread education are needed to ensure community members understand heat risks, are informed about available resources, and feel better prepared for extreme heat events.

Reducing social isolation, particularly for older adults and unhoused community members, **fostering community, and building neighborhood-level resilience are extremely important** components of this work.

Public agencies, community groups, and community members all support expanded efforts to plant trees throughout the region, however, **maintenance responsibilities should shift to public agencies to avoid burdening community members** and to ensure sustainability.

For the most vulnerable living in the community, **access to life-saving solutions like free drinking water, air-conditioning, and misting can have the highest impact**.

Public agencies require less regional support for emergency response activities and other efforts, suggesting **Metro should focus efforts on heat mitigation and adaptation** rather than duplicate existing emergency response work.

Metro plays a significant role in facilitating collaboration and building coalitions across the region and can be most helpful to public agencies by offering financial support through incentive or grant programs, model code or

policy, maps and technical data, guidance documents, and technical assistance.

Pilot projects offer a pathway to build community support, test ideas, and demonstrate success on a small scale.

Conclusion

Throughout the engagement process, it was clear that extreme heat is a growing and urgent concern for people living in greater Portland, especially for communities that are most vulnerable due to systemic inequities, limited access to resources, or existing health and housing challenges. From technical experts to those with lived experience, participants emphasized that extreme heat must be treated with the same seriousness and coordination as other threats and regional issues.

Through centering both technical experts and impacted voices and fostering cross-sector collaboration, engagement efforts helped identify critical insights, challenges, and community-led solutions. Participants consistently called for clear, accessible information, stronger partnerships and more opportunities for collaboration, further support for existing community-led efforts, investments in pilot projects and neighborhood-level solutions.

The feedback gathered through these engagement efforts directly shaped the recommendations and supporting actions in **Chapter 6** of this report, building on the technical cooling strategies outlined in **Chapter 2**. By grounding this work in existing local and regional efforts, community priorities, and lived experience, Metro is better positioned to support meaningful, equitable, and lasting solutions to extreme heat across the region.

Chapter 4:
Analysis

Analyzing Regionwide Heat and Identifying Priority Corridors for Cooling

Purpose

To better understand the effects of heat across greater Portland, the project team conducted a regionwide map-based analysis. To reduce these effects, it is important to understand and address how heat affects people and places at different scales – from individual street blocks to neighborhoods and the entire region. Therefore, the analysis was conducted at three different scales: the pedestrian scale, the neighborhood scale, and the regional scale. By breaking it down this way, the project team could better identify where small-scale efforts, such as building a splash pad at a neighborhood park, would be most helpful in the short term, and where larger, longer-term investments, like a region-wide tree planting program or initiative to implement a network of cool corridors, would have the biggest regional impact. This layered approach helps inform urban planning decisions that are responsive to both immediate needs and long-term climate resilience.

Objectives

The map-based analysis had the following objectives:

- Identify the hottest and most heat-vulnerable areas in the region.
- Identify areas that would benefit most from pedestrian-scale investments in the shorter-term and would help to expand the network of existing cooling corridors in the region in the longer term.

Methodology

The project team used geographic information systems (GIS) data to conduct the assessment. GIS is a tool that allows users to store, analyze, and display demographic and geographic data on maps in order to see and understand patterns and relationships between different factors. For this analysis, GIS was applied to evaluate the distribution of natural resources, like trees and water, and surface and air temperature. The environmental patterns were layered with demographic data, including total population and jobs, as well as a heat vulnerability index comprised of data related to age, income, education, race and ethnicity, language, household type and composition, and health and disability status.

Analysis and Key Takeaways

Pedestrian Scale

The pedestrian scale analysis took a street-level look at how heat might affect people walking, rolling, or biking along corridors. Considering it is well documented that trees have

significant potential for mitigating heat and enhancing the pedestrian experience, this analysis focuses on assessing the number of trees that occur in or near public right of ways, allowing the option to use governmental policy levers that exist in the public sphere and aligning with one of Metro's focuses on transportation and land use investments.

Pedestrian Scale Methodology

Data on population and employment, tree canopy coverage, air and surface temperature, heat vulnerable communities, and pavement temperatures were analyzed to identify the streets that feel the hottest for pedestrians in greater Portland. For a more detailed description of the data and analysis, see **Appendix C**.

Pedestrian Scale Results

Which streets are near the most residences and jobs?

After evaluating population and employment estimates across the region, **Figure 36** shows the amount of people that live and work within 500 feet of streets (to estimate the people most likely to frequent those streets on a daily basis). As shown in red, relative to the rest of the region, there is a greater density of people and jobs in Portland, but there are also dense clusters throughout East Multnomah County, Clackamas County, and Washington County.

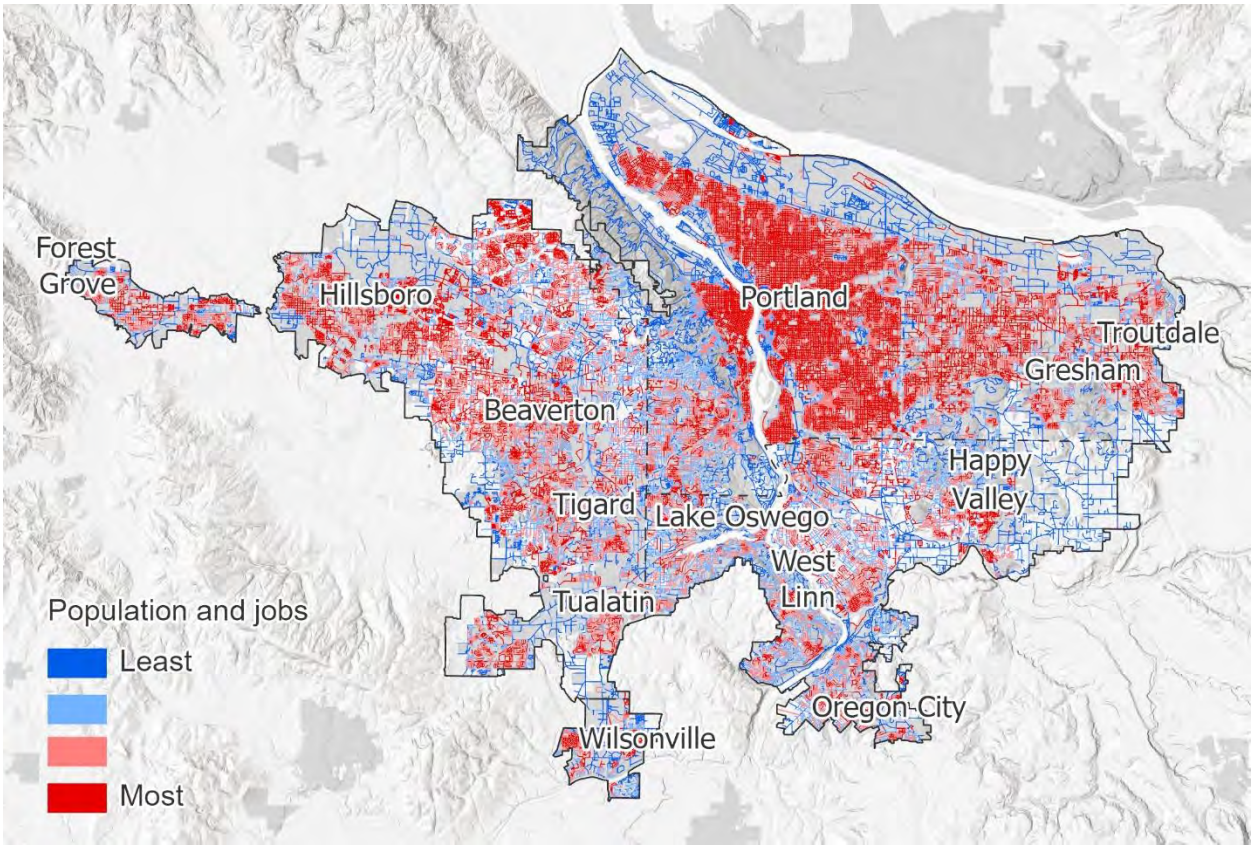


Figure 36. Streets ranked by population and employment density.

Which streets have the least shade and highest temperatures?

After assessing streets based on their environmental characteristics – including tree cover, surface temperature, and air temperature (within 50 feet to estimate the pedestrian experience) (**Error! Reference source not found.** highlights geographic corridors with less trees and more built environments and impervious surfaces, which often correlate with higher commercial, mixed use residential, and industrial land uses.

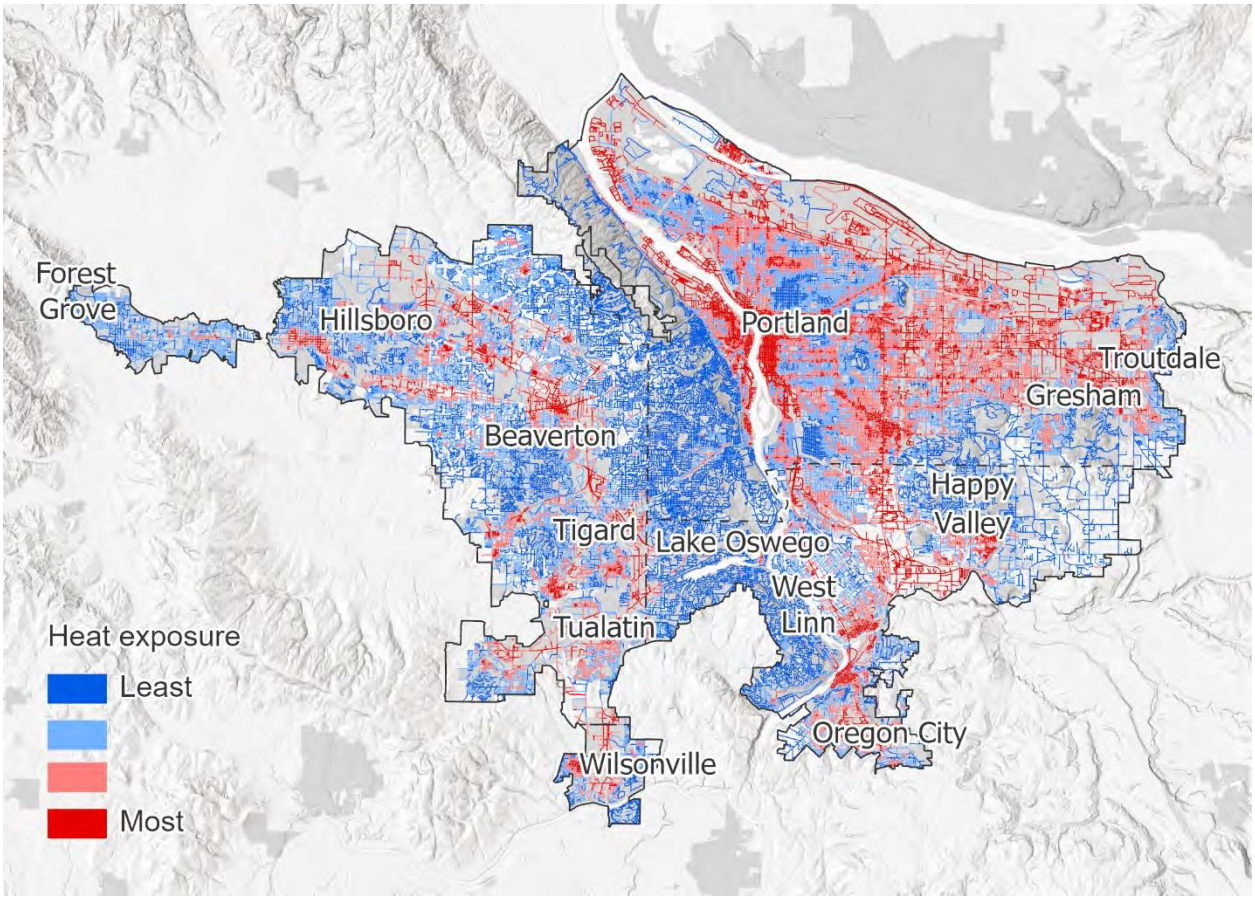


Figure 37. Streets ranked by least tree canopy coverage and highest temperatures (surface and air).

Which streets serve communities with the greatest heat vulnerability?

As shown in **Figure 38**, the most vulnerable areas are areas with higher environmental exposure and lack of adaptive capacity to extreme heat, like areas in East Multnomah County, downtown and north Portland, and scattered throughout Washington and Clackamas County. This analysis incorporated information from Metro's heat vulnerability index (based on Census

tracts) and combines numerous demographic indicators – beyond population and jobs – with environmental indicators to identify the neighborhoods with greater heat vulnerability.

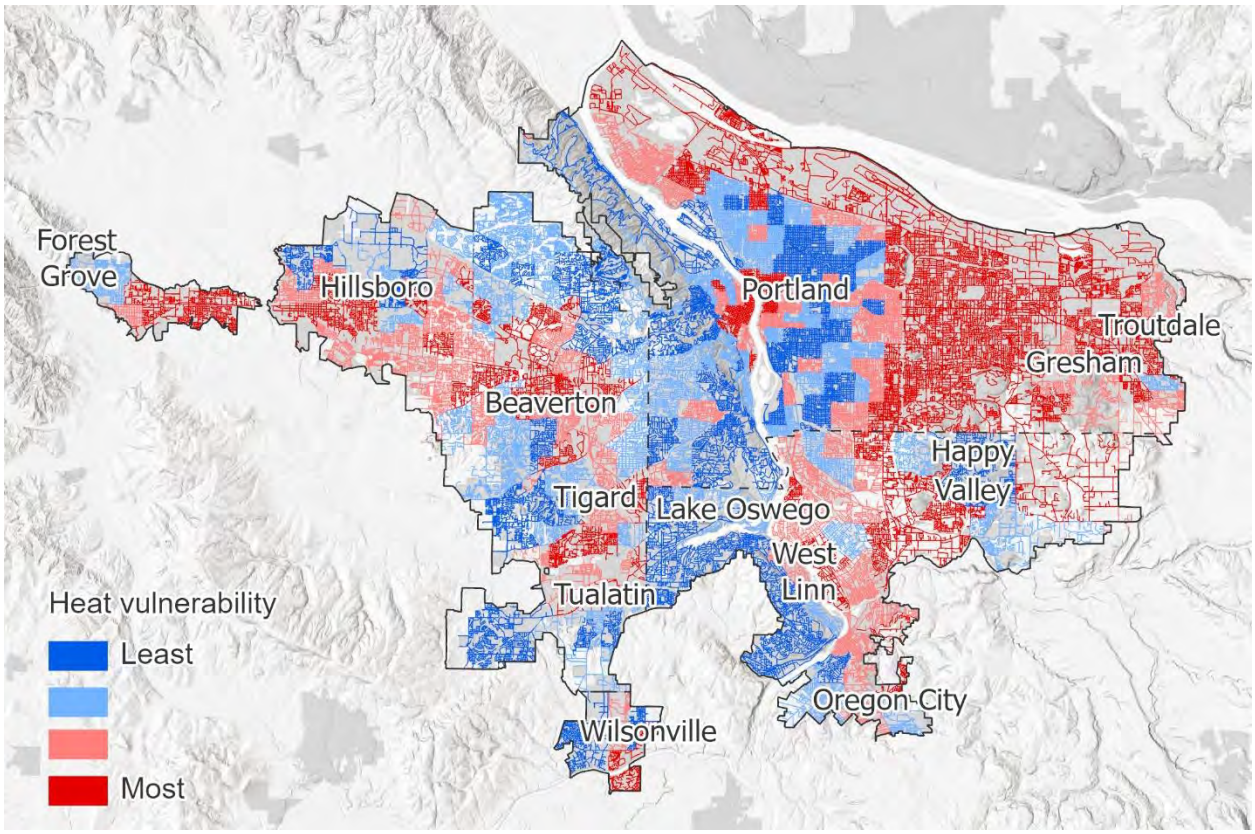


Figure 38. Streets ranked by neighborhood heat vulnerability.

Which streets have the most people, highest temperatures, and vulnerable communities?

After averaging the demographic, environmental, and vulnerability factors, the analysis revealed that streets with the greatest need for cooling investments in Clackamas County are in Milwaukie, Gladstone, Oregon City, and unincorporated Clackamas County north of Johnson City and west of Happy Valley. In Multnomah County, the most heat-vulnerable streets are in the eastern part of Multnomah County (including east Portland, Gresham and Troutdale), downtown Portland, and industrial and residential areas in north Portland. Lastly, in Washington County, streets with the highest heat-vulnerability are in areas located in Forest Grove, Cornelius, Hillsboro, Beaverton, and Tigard.

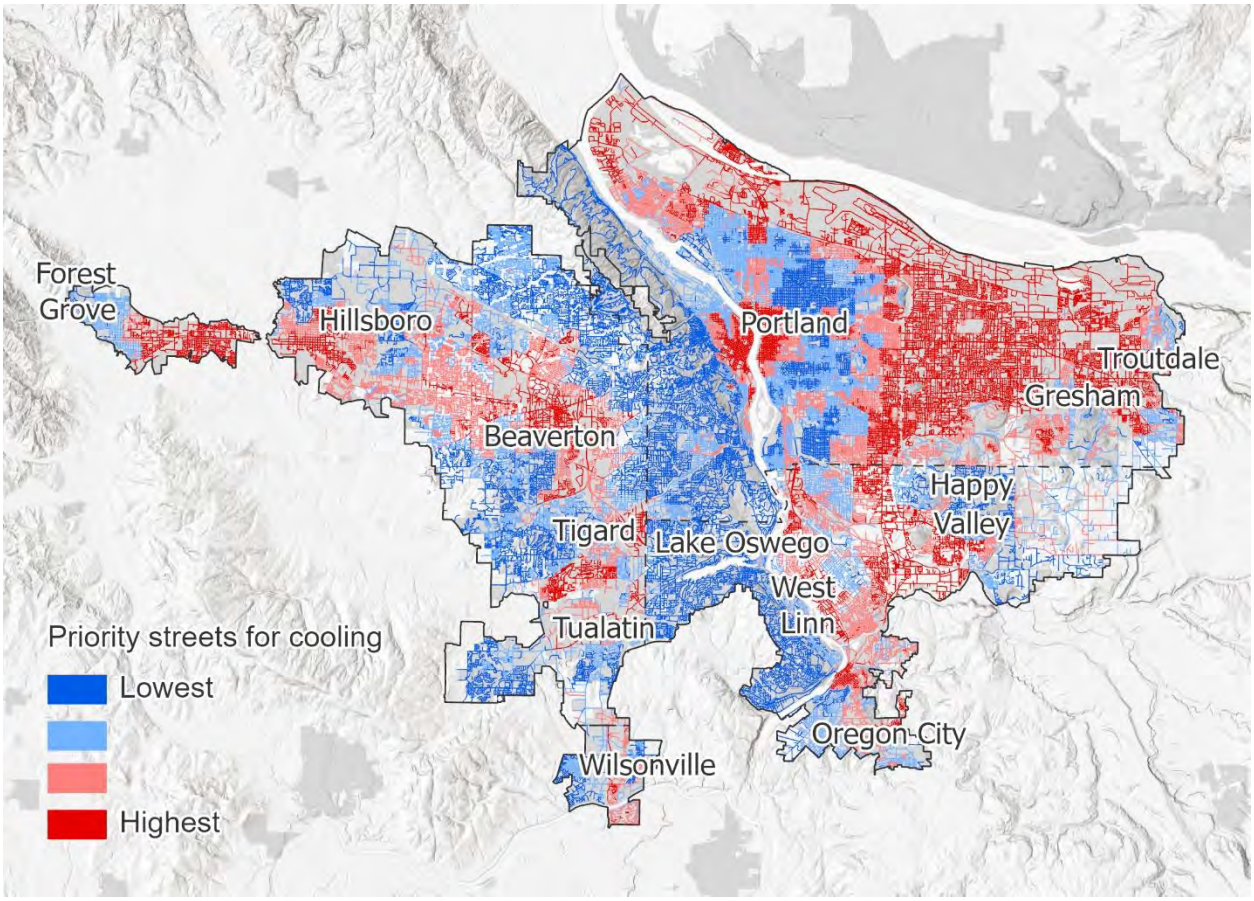


Figure 39. Combined street index based on population and employment, tree canopy, surface and air temperature, and heat vulnerability.

Neighborhood Scale

The neighborhood scale analysis assessed large collections of natural green spaces like parks, greenways, and urban forests. For neighborhood-level cooling, contiguous natural areas are particularly significant. Cooling effects can be felt within these spaces, but when extensive and well connected, these spaces can also cool the surrounding streets, homes, and neighborhoods.

While the cooling benefits of green infrastructure are well-recognized, an important question to consider is whether there is an optimal size threshold for contiguous natural areas to maximize their cooling impact at the neighborhood level. Despite a large body of research dedicated to determining the optimal size, there is no universal answer. However, in terms of balancing the costs of public investment and resulting cooling benefits, several studies have suggested that small-to-medium sized areas of contiguous green infrastructure are optimal in urban areas.

Neighborhood Scale Methodology

Aerial imagery showing vegetation and data on streams, rivers, and other waterbodies were analyzed to identify large contiguous natural areas, or *cooling corridors*. The analysis focused on evaluating where cooling corridors already exist, how large those corridors need to be to make a meaningful difference on surrounding areas, and where there are "gaps" in the network – places that don't have access to cooling benefits and therefore could benefit from new investments in green infrastructure.

Neighborhood Scale Results

Cooling corridor gaps across the region

Across the Portland metropolitan area, approximately **17 percent** of land within the urban growth boundary is in a cooling corridor gap. Narrowing down to the county-level, **8 percent of Clackamas County**, **25 percent of Multnomah County**, and **10 percent of Washington County** are in gaps.

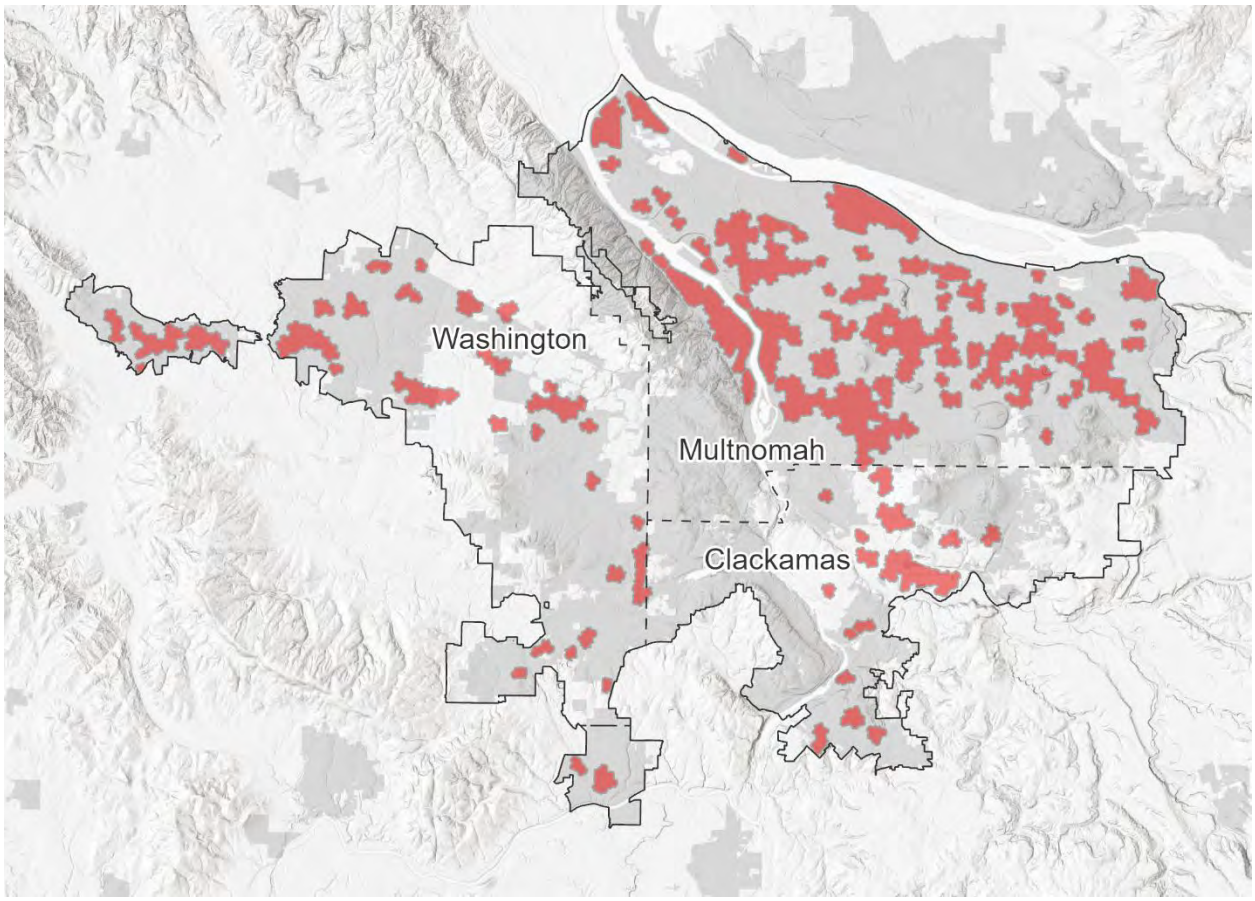


Figure 40. Regional distribution of cooling corridor gaps.

Cooling corridor gaps in Clackamas County

In Clackamas County, the following cities have higher percentages of gaps between cool corridors: **Gladstone** (16 percent), **Johnson City** (13 percent), and **Oregon City** (10 percent). Eleven percent of unincorporated parts of Clackamas County within the urban growth boundary are located in cooling corridor gaps.

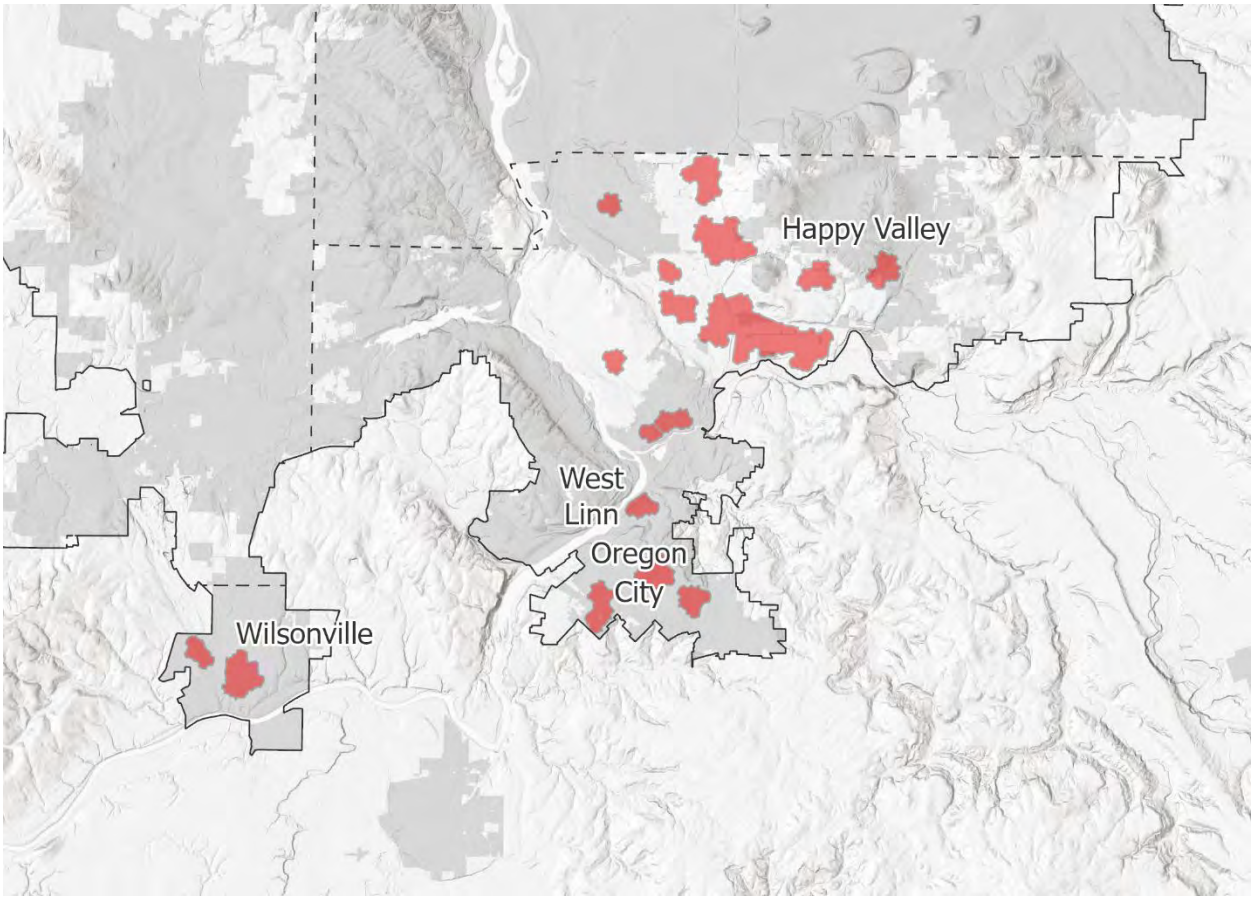


Figure 41. Distribution of cooling corridor gaps in Clackamas County.

Cooling corridor gaps in Multnomah County

In Multnomah County, the following cities have higher percentages of gaps between cool corridors: **Gresham** (32 percent), **Portland** (26 percent), **Troutdale** (24 percent), and **Fairview** (13 percent).

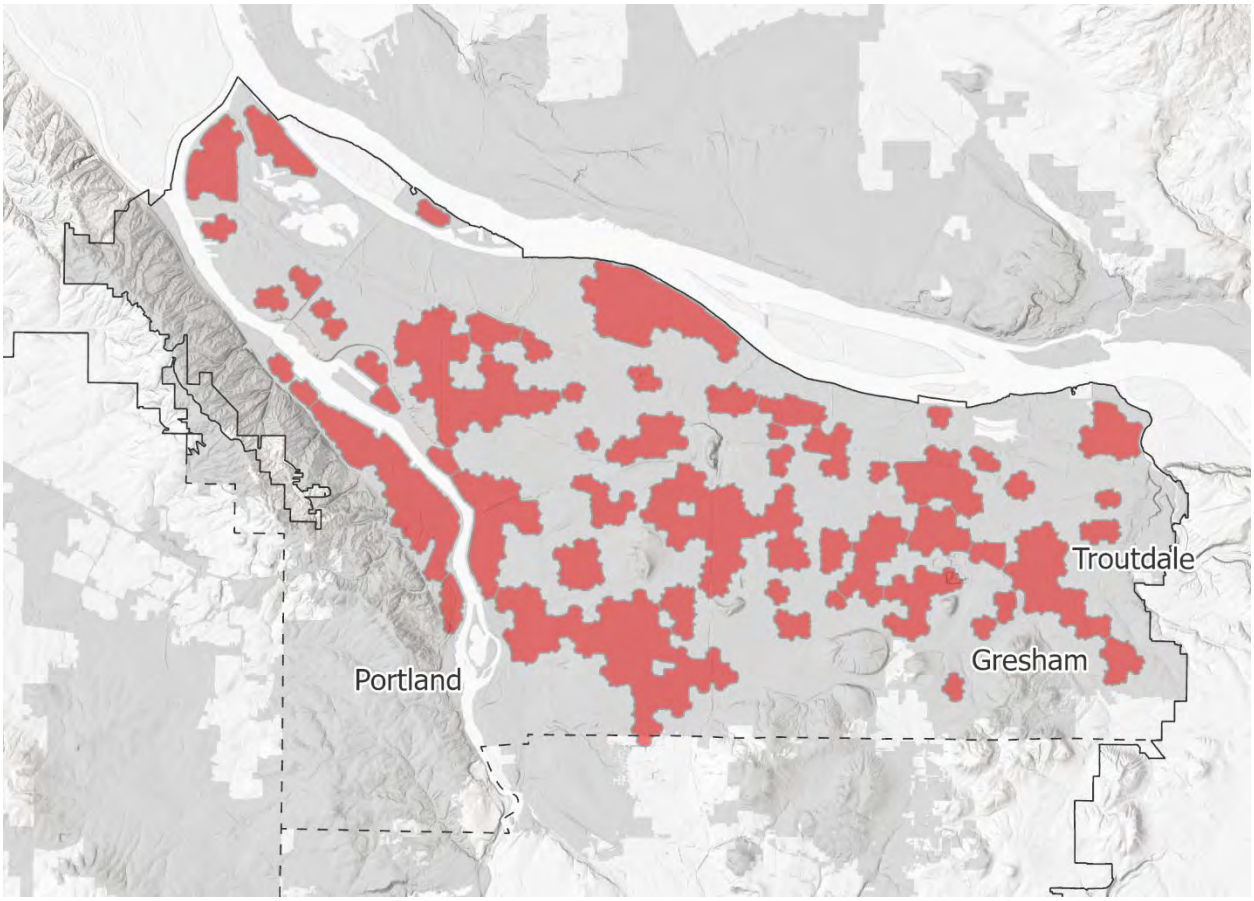


Figure 42. Distribution of cooling corridor gaps in Multnomah County.

Cooling corridor gaps in Washington County

In Washington County, the following cities have higher percentages of gaps between cool corridors: **Cornelius** (41 percent), **Forest Grove** (30 percent), **Hillsboro** (18 percent), and **Beaverton** (11 percent).

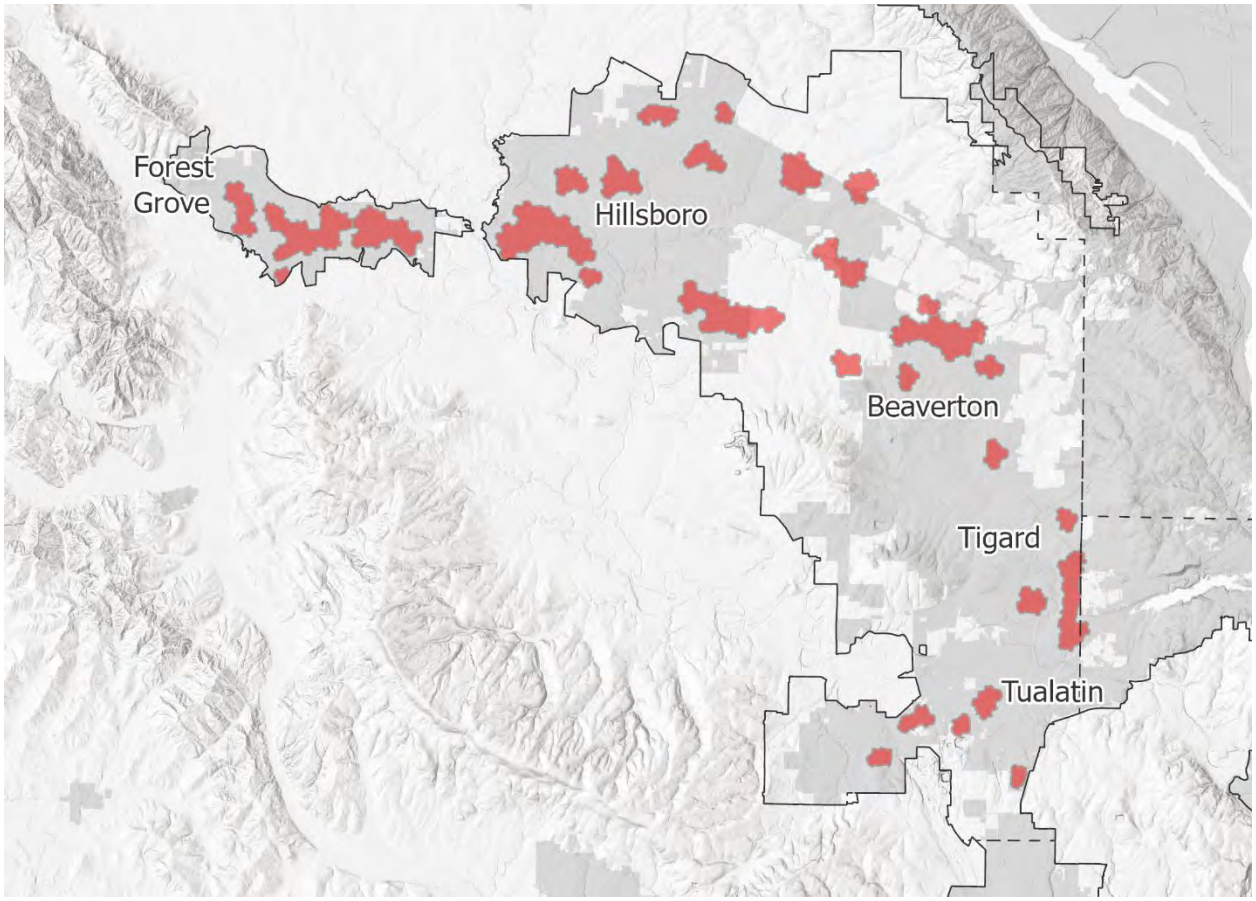


Figure 43. Distribution of cooling corridor gaps in Washington County.

Prioritizing Gaps in Cooling Corridors

To prioritize gaps between cooling corridors to inform investment priorities within the region, the results from the pedestrian-level analysis were intersected with the results of the neighborhood-level analysis of gaps.

Although the cooling corridor gaps generally intersect hotter areas in the region, the street index also includes proximity to population and employment, as well as potentially vulnerable demographics. Accordingly, some of the gaps are aligning with areas that have lower scores in the combined street index and others are aligning with higher index scores (shown in **Error! Reference source not found.** in blue and red respectively).

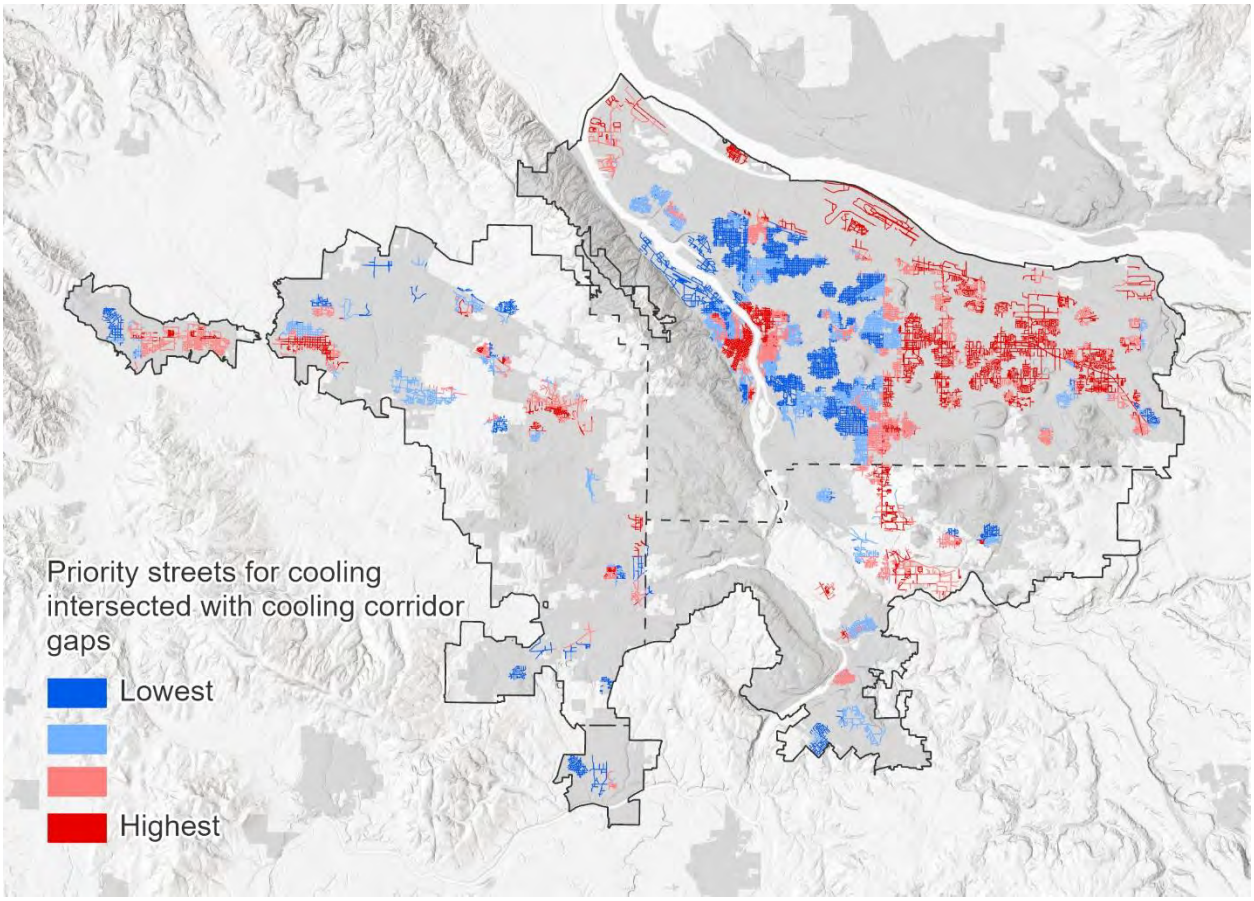


Figure 44. Distribution of streets – ranked by population and employment, tree canopy, temperature, and neighborhood heat vulnerability – intersecting with cooling corridor gaps.

The intersecting street segments and associated index values are aggregated to each cooling corridor gap to provide rank scores for gaps in the region and respective counties.

The majority of cooling corridor gaps in the region that score highest in the streets index – thus showing a combination of more people and jobs, less canopy and higher temperatures, and neighborhoods with greater heat vulnerability – are in Multnomah County, but a several high scoring gaps also appear in each of Clackamas and Washington counties (shown in **Figure** 46 in dark orange).

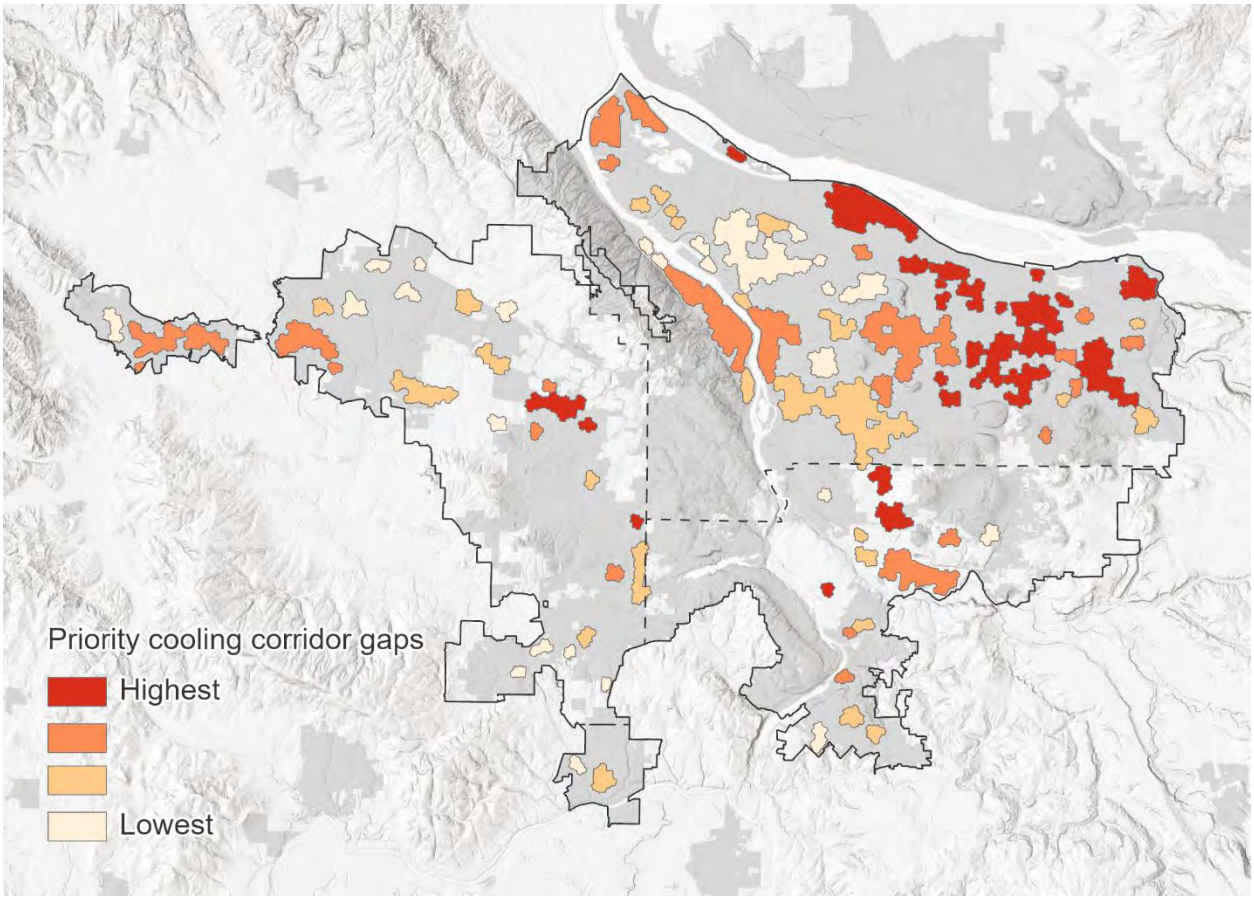


Figure 45. Cooling corridor gaps ranked by combined street index.

Categorizing cooling corridor gaps by land use

For the purpose of helping to understand the functional urban characteristics of cooling corridor gaps, categories are applied from the intersecting land uses in the street index.

If greater than 50% of streets in a gap are associated with a specific land use type (e.g., industrial), then the gap is assigned that category. Gaps that don't have a majority land use type are assigned to a "Mix" category.

The distribution of land use types within cooling corridor gaps may help to shape which types of strategies will be better suited for different areas. For example, areas with predominant single family residences may lend themselves toward policies or investments focused on increasing urban canopy. Areas with mixed use / multi family residences and businesses may be better suited to the targeted inclusion of natural space in denser urban environments accompanied by broader investments in cooler built surfaces (e.g. roofs, pavement). Largely industrial areas may have the capacity for both natural greening or built cooling.

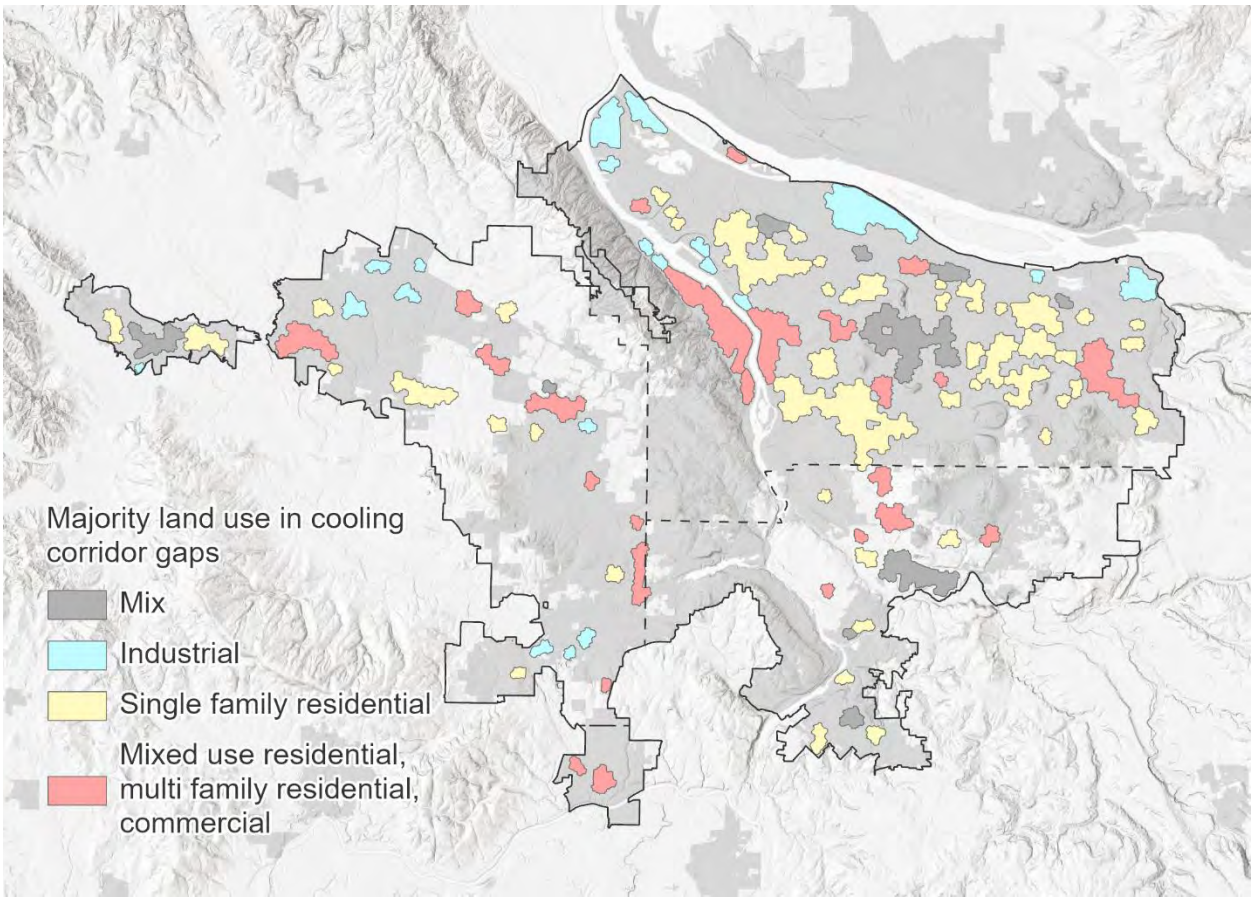


Figure 47. Cooling corridor gaps categorized by majority land use type.

Cooling corridor gaps ranked with land use in Clackamas County

The two top ranked gaps in Clackamas County (labeled 1 and 2 in the figure to the right) are both a combination of mixed use and multi family residential and commercial, and occur around the 82nd Avenue area including Clackamas Town Center. The third highest ranked gap is also a mixture of residential and commercial along McGloughlin Boulevard.

These areas likely have increased urban density with higher areas of impervious surfaces. The cooling strategies here will have to be shaped accordingly, perhaps focusing on a mix of cooler built surfaces and tree canopy investments where space allows.

The fourth highest rank gap in Clackamas County, however, does not have a majority land use type, and includes single family residential and industrial intermixed with multi family and commercial. This mix of land use types might allow for greater flexibility in the types of cooling strategies that are applied here, but there might not be any single predominant strategy.

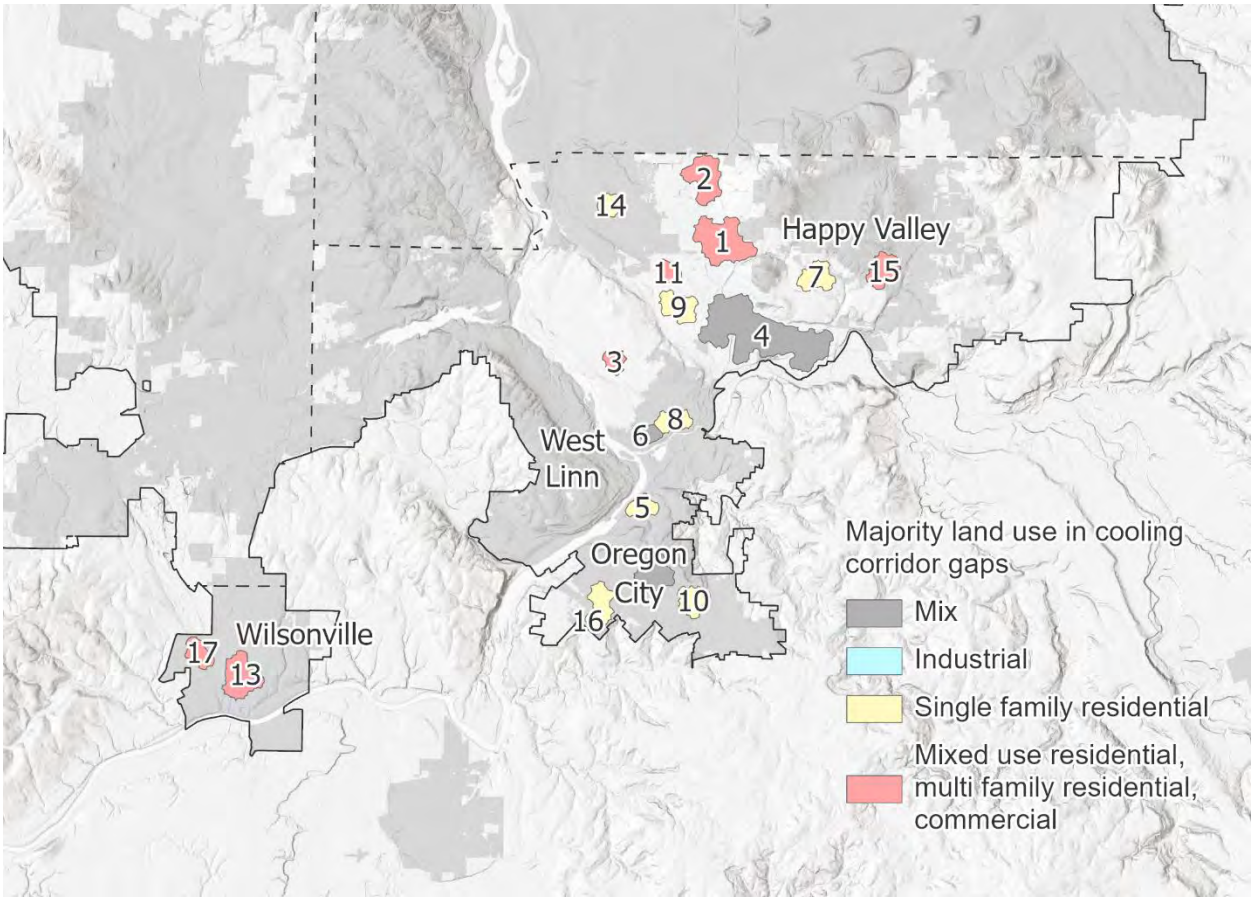


Figure 48. Cooling corridor gaps in Clackamas County categorized by majority land use type.

Cooling corridor gaps ranked with land use in Multnomah County

Several of the top ranked gaps in Multnomah County occur in east Portland and Gresham, in areas with a majority of single family residential land use. Knowing this, investments in tree canopy may help these neighborhoods in the medium and long term.

Additionally, five industrial areas show up with higher rankings, including the port terminal areas in north Portland, as well as the airports in Portland and Troutdale.

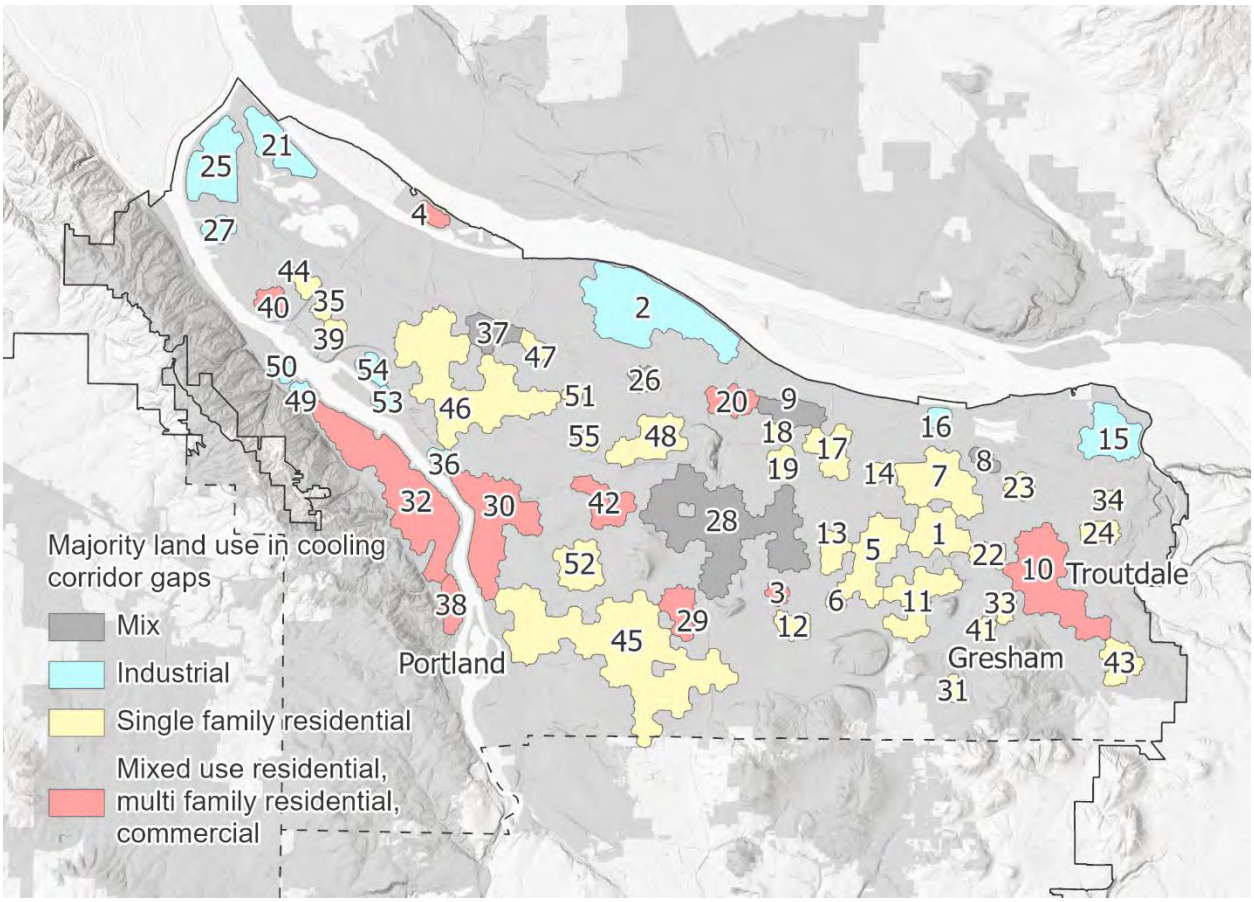


Figure 49. Cooling corridor gaps in Multnomah County categorized by majority land use type.

Cooling corridor gaps ranked with land use in Washington County

In Washington County, there is a greater variety of land use types in the top ranked gaps, including mixed use / multi family residential and commerical areas in Tigard, Beaverton, and Hillsboro, as well as an industrial area in Beaverton and a single family residential area in Cornelius.

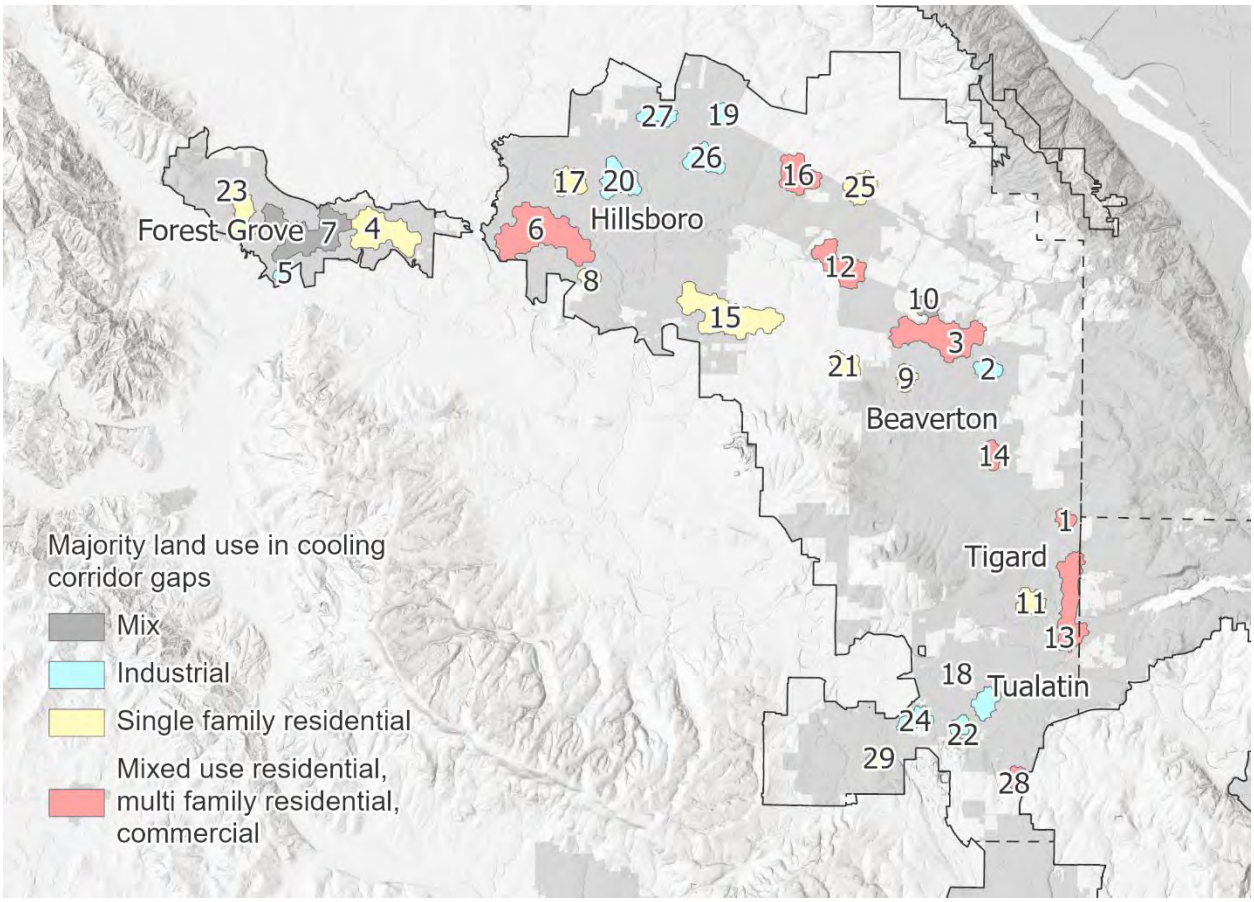


Figure 50. Cooling corridor gaps in Washington County categorized by majority land use type.

This combination of pedestrian-scale ranking and land use information, as applied to the neighborhood-scale cooling corridor gaps, can help planners prioritize areas of interest and customize the types of cooling strategies that may be more effective in those areas.

Regional Scale

The regional scale looks at the entire greater Portland region together (Multnomah, Washington, and Clackamas Counties). At this level, the project team investigated how the natural environment contributes to inherently differing temperatures across the region. For example, the City of Portland is relatively flat in comparison to the West Hills – these geographic differences influence how extreme heat is experienced differently in these areas. Taking a zoomed-out approach also allows us to recommend cooling strategies that take existing environmental conditions into consideration, especially when thinking about how wind, elevation, and other natural factors can positively contribute to cooling our region.

Regional Scale Methodology

The regional analysis takes four inputs, including elevation, aspect, solar irradiance, and wind speed. The assumptions are that – all other inputs being held constant – higher elevations will tend to be cooler than lower elevations, certain aspects will tend to have more solar exposure throughout the day than others (e.g., south facing slopes more than north, west more than east), areas with increased solar irradiance will tend to be hotter, and higher wind speeds will tend to provide more cooling.

The inputs are standardized to the same scale and averaged into an overall cooling capacity index, which can serve as a decision support tool for helping to evaluate which investments in cooling corridors may provide an easier path to realized neighborhood cooling or conversely help mitigate a natural tendency for urban heating, given their inherent environmental strengths and weaknesses respectively.

Regional Scale Results

The rescaled ranked aspect model shows areas in the region with less potential solar exposure (e.g., east side of West Hills) and other areas with more potential solar exposure (e.g., western Washington County, southeast Portland, Gresham, and unincorporated Clackamas County west of Happy Valley).

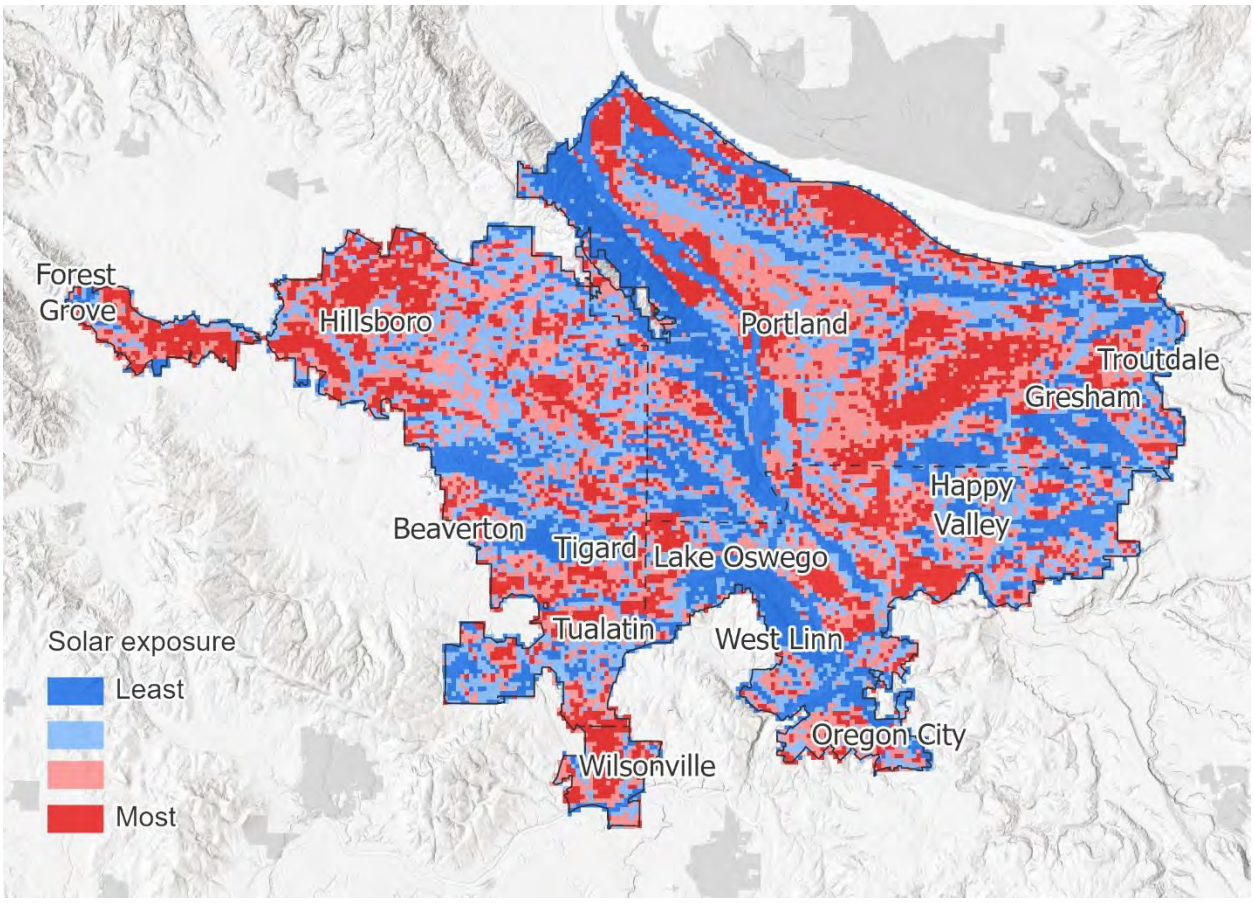


Figure 50. Aspect model showing solar exposure based on direction of earth surface.

The rescaled digital elevation model shows the highest and lowest area in the region. The relationship between elevation and urban heat islands is complex, but all other inputs held constant, higher elevations may experience slightly lower overall temperatures.

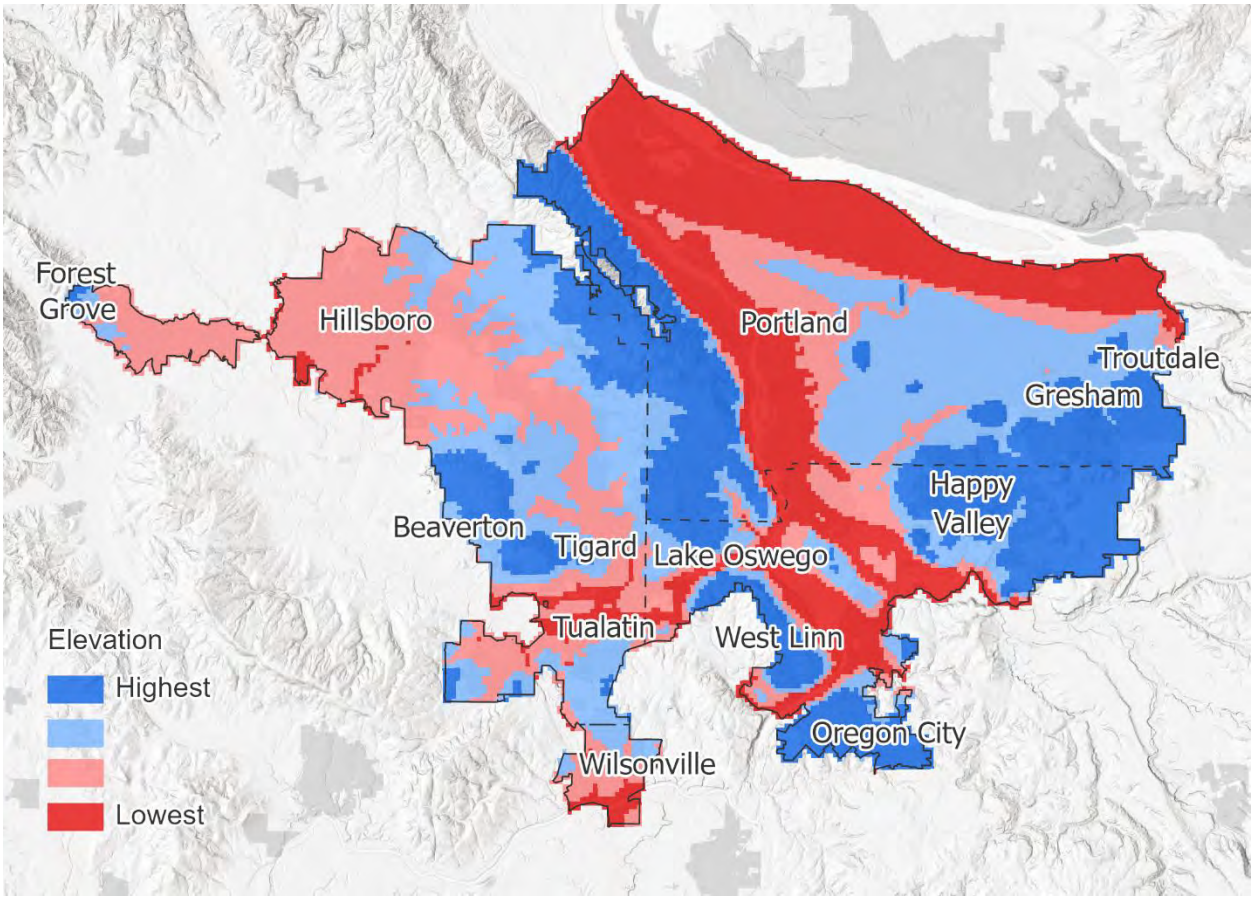


Figure 51. Elevation model showing potential cooling effect of higher and lower areas.

Solar irradiance refers to the power of the emitted energy from the sun (radiation) that a unit of area on the earth is receiving.

The rescaled solar irradiance model shows the large-scale affect of topography on our region, whereby the flatter areas in the west and south receive greater solar irradiance than the more topographically complex areas in the north and east of the region.

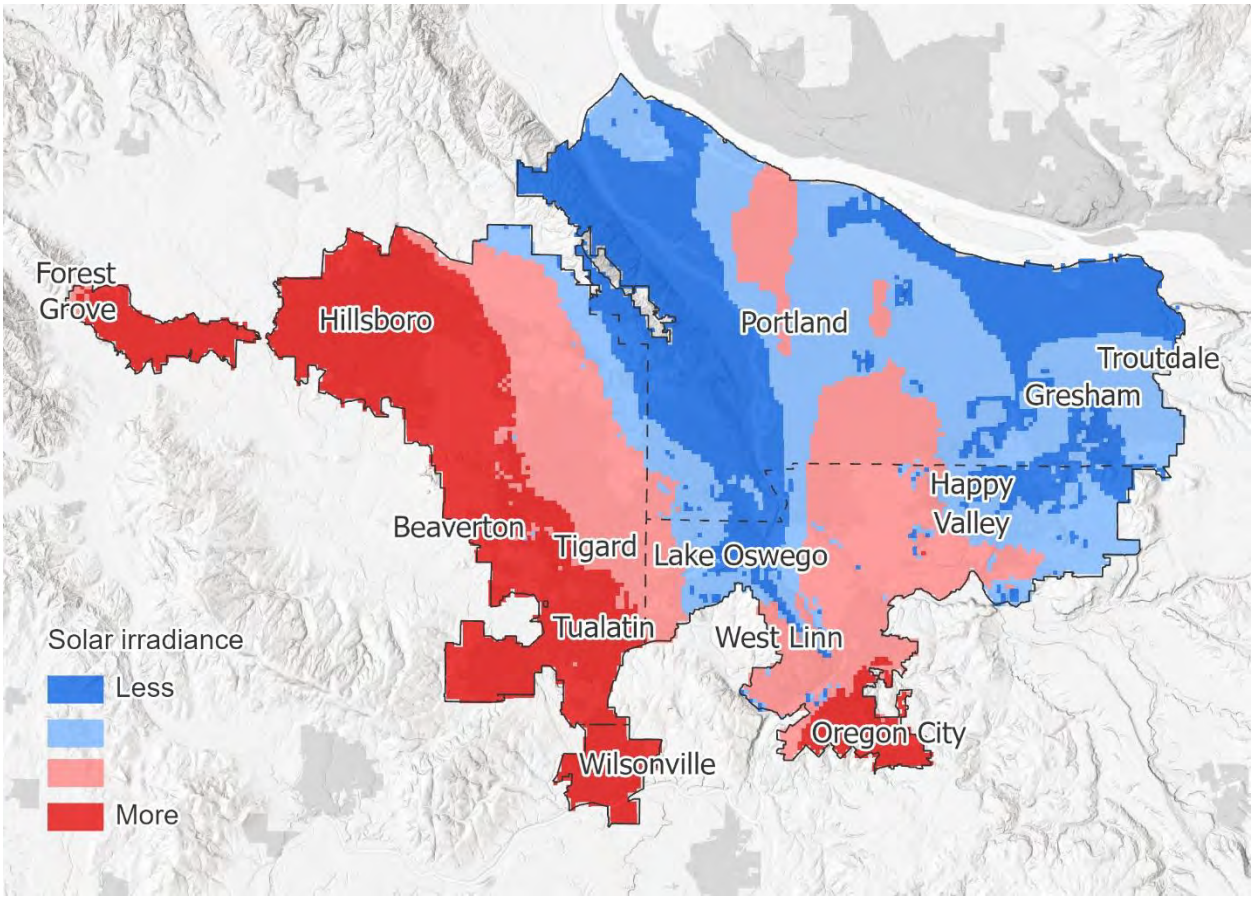


Figure 52. Solar irradiance model showing the amount of solar energy that areas in the region receive.

The wind speed model estimates wind speed at 10 meters above the earth's surface. The rescaled wind speed model shows a genrally similar pattern to the solar irradiance model, whereby flatter areas in the region tend to have lower wind speeds and more tographically complex areas (e.g., hills, rivers) have higher wind speeds.

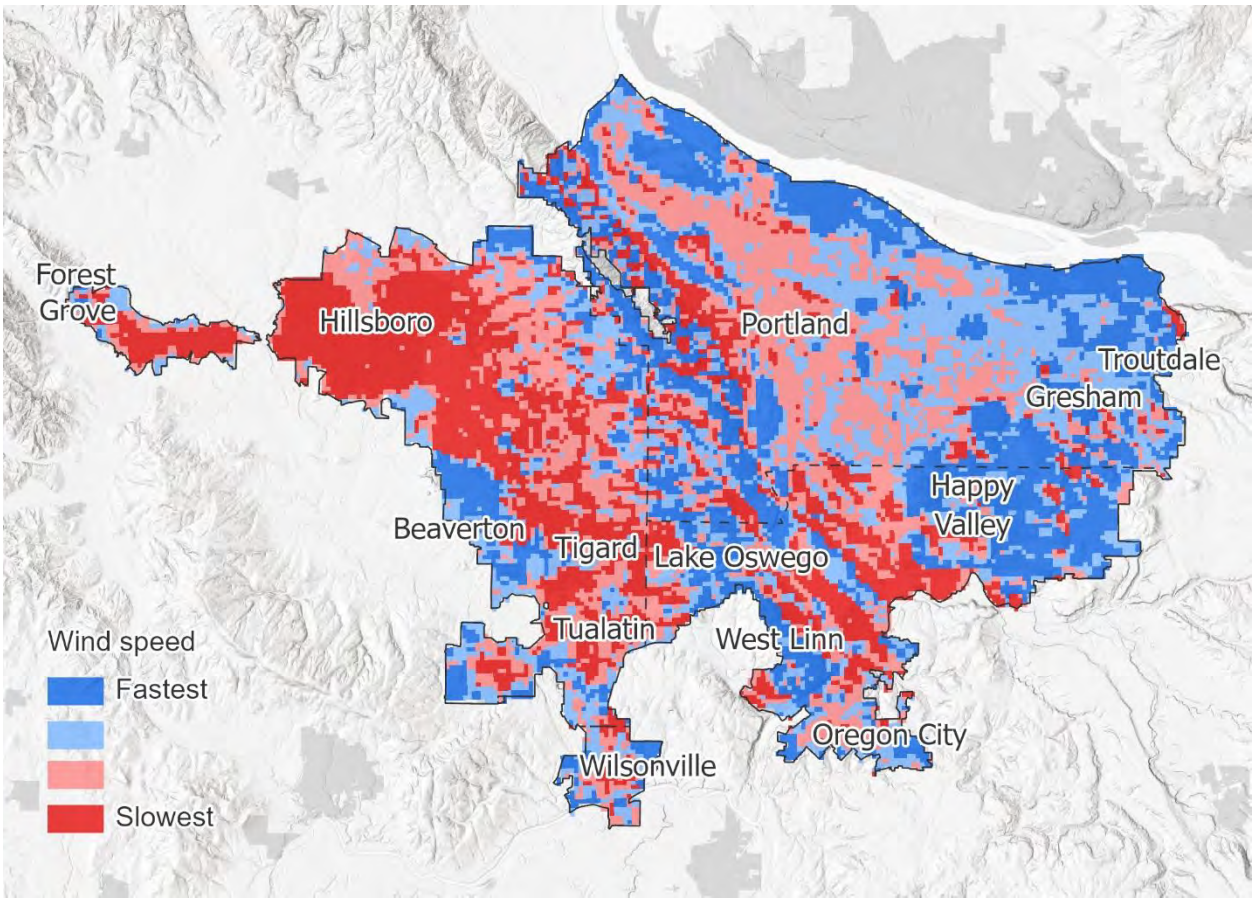


Figure 53. Wind speed model showing areas that may have greater cooling effect based on faster wind speeds.

The overall regional-scale index serves as a proxy for potential cooling capacity given the baseline environmental metrics, including elevation, aspect, and solar and wind capacity. The cooling capacity index mirrors some of the trends shown in the solar and wind models, including flatter and lower elevation areas having more inherent cooling challenges, whereby areas with topographic complexity having greater cooling capacity.

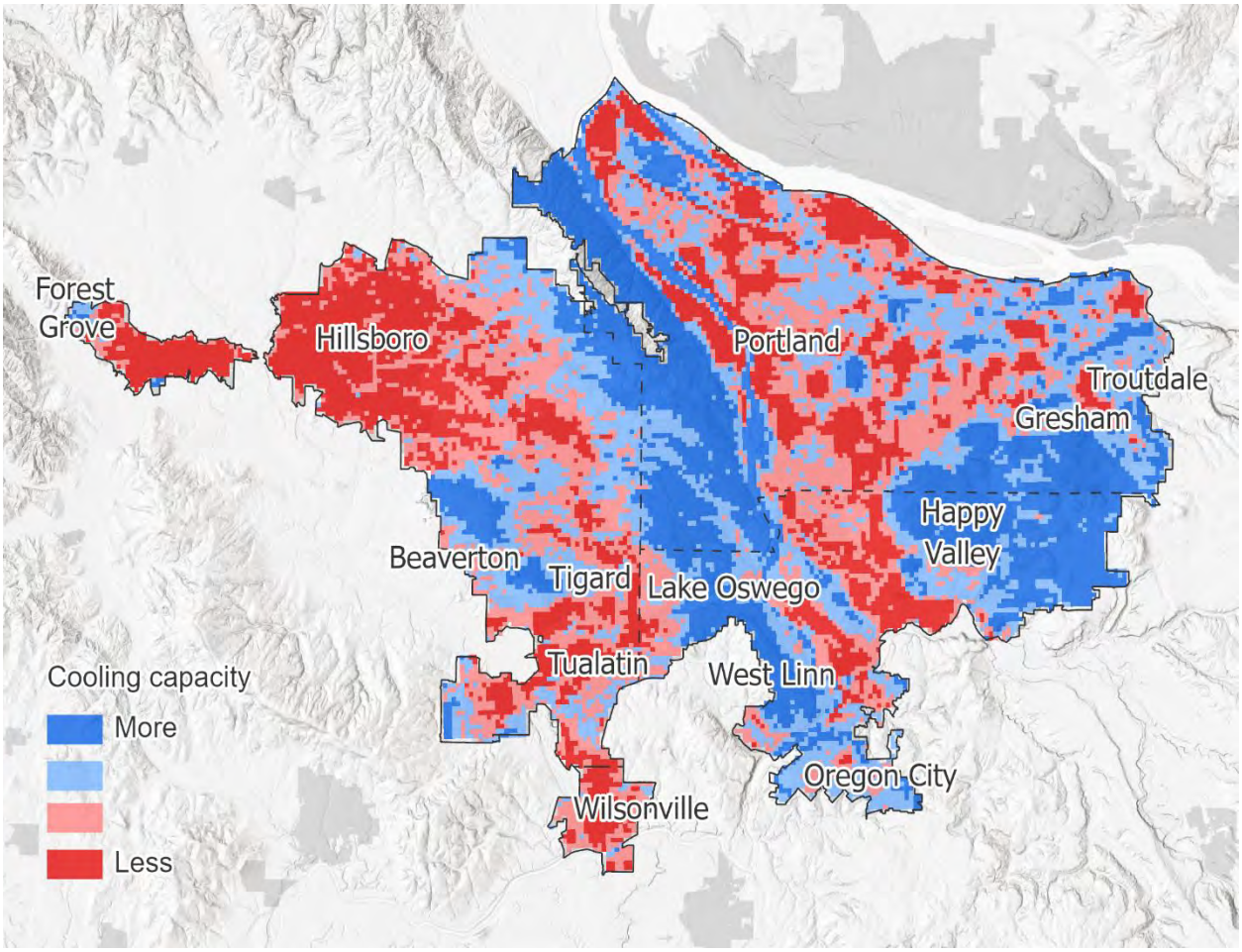


Figure 54. Combined cooling capacity model based on aspect, elevation, solar irradiation, and wind speed.

The cooling capacity index can be used in conjunction with the cooling corridor gaps results as a decision support tool. Some areas for potential investment may have inherent geographic strengths (as indicated by the cooling capacity index), which may indicate an easier path from cooling investments to realized neighborhood cooling. Conversely, other areas may have inherent geographic weaknesses, which may indicate a greater need to mitigate potential urban heat issues in those areas.

Conclusion

The pedestrian, neighborhood, and regional analyses are interdependent, in that the neighborhood scale results are informed by the pedestrian and regional scale results. Efforts to increase connectivity in regional cooling corridors, and thereby mitigate urban heat in neighborhoods, can be prioritized using the pedestrian scale analyses, and the regional scale analyses can be used to help understand which cooling corridor gaps may benefit from inherent environmental strengths or conversely be hindered by environmental weaknesses.

The pedestrian scale analysis can help planners and policy makers compare and prioritize cooling corridor gaps, as well as prioritize which streets within individual gaps have the greatest need for cooling investments.

The regional scale analysis can help identify cooling corridor gaps which may more efficiently benefit from underlying environmental strengths or be in greater need of investment due to underlying environmental weaknesses (e.g., lower elevation, flatter slopes, higher solar energy, less wind).

The data is ultimately most useful in the hands of practicioners that are helping to do the local work to help shape policy. **Appendix C** provides more details on the analysis.

Chapter 5: Evaluation and Prioritization

Purpose

The purpose of this chapter is to highlight the methodology developed to better understand which types of strategies would be most effective and feasible within a regional context. The scoring system was designed to be used in conjunction with the maps developed and described in **Chapter 4** as an additional tool to begin to prioritize actions, allowing comparison across different action types and supporting transparent decision-making.

The overarching goal of this methodology was to provide a starting point for the comparison of actions that might seem difficult to compare at face value. The project team recognizes that this method has inherent limitations but believes its development was a useful addition to begin setting the stage for future discussions about how to implement the supporting actions highlighted in this report.

Desired Outcomes

To help assess priorities when creating scoring criteria for our matrix, the project team developed these four outcomes:

1. Reduce the number of annual heat-related deaths to zero in the Portland metro area
2. Reduce the number of heat-related illnesses in the Portland metro area
3. Reduce the outdoor temperature in public right-of-way, focusing on areas that are disproportionately hot
4. Increase the amount of cooling resources available and enhance accessibility to communities during extreme heat events

Principles and Framework

The scoring methodology is organized into five overarching topics that together provide a comprehensive framework for evaluating potential strategies:

1. Urgency
2. Regional priorities
3. Community priority
4. Benefits
5. Financial feasibility

Each topic captures a different dimension of what makes an action effective, feasible, and equitable. Taken together, they ensure that the scoring process balances immediate life-saving needs with long-term resilience, aligns with regional commitments, centers community priorities, recognizes the value of co-benefits, and realistically accounts for costs and funding.

Evaluation Topics

Urgency reflects the extent to which an action can provide immediate relief and prevent loss of life during extreme heat events. This category emphasizes timeliness and how easily the action can be deployed. Actions that can be implemented quickly, within days or weeks, and that deliver rapid benefits are scored more highly, while those requiring longer lead times are still valued for their role in building enduring resilience.

Regional priority evaluates how well an action aligns with existing regional commitments, policies, and climate resilience goals. It considers whether strategies are already endorsed by local or state governments, incorporated into adopted plans, or supported through political commitments such as resolutions and budget allocations. Actions that reinforce and accelerate current regional priorities, or that strengthen coordination across agencies and partners, are prioritized in the scoring process.

Community priority measures the degree to which an action responds to needs identified through public engagement, community-driven planning, or input from frontline populations. It also captures opportunities for communities to lead, co-own, or directly participate in implementation. Particular weight is placed on strategies that address the disproportionate burdens of heat experienced by low-income, BIPOC, immigrant, senior, and houseless populations. Actions that are rooted in community priorities and amplify community leadership are scored most favorably.

Benefits considers the breadth and depth of positive outcomes associated with an action. Beyond reducing heat risk, actions are evaluated for their ability to contribute to multiple climate goals, such as greenhouse gas reduction, habitat restoration, and broader adaptation efforts. Co-benefits—such as improving air and water quality, supporting physical and mental health, increasing preparedness and strengthening the local economy through workforce development and job creation—are also key factors. Strategies that generate wide-ranging, long-term benefits across systems are given higher scores.

Financial feasibility assesses the affordability, sustainability, and funding prospects of an action. This includes upfront capital costs, long-term maintenance and operational expenses, and the availability of funding sources such as local budgets, grants, or private investment. Strategies that can be supported with existing or readily accessible funds, that minimize ongoing costs, or that demonstrate potential for cost savings over time are prioritized. Actions requiring significant and uncertain long-term funding commitments are scored lower, unless their benefits clearly outweigh the costs.

While this scoring methodology is not perfect, it provides a structured way to evaluate and compare strategies that are otherwise difficult to weigh against one another. Heat mitigation and adaptation actions vary widely in scale, scope, and type—from tactical strategies to long-term policy changes—and each comes with different benefits, costs, and timelines. The framework does not capture every nuance, but it creates a transparent basis for comparison, allowing decision-makers to see trade-offs clearly and prioritize actions in a more consistent and equitable way. By doing so, it turns a complex and multifaceted problem into a set of structured choices that can guide community and regional action and investment.

Replicability

A central goal in designing the scoring methodology was to ensure that the process could be understood, repeated, and adapted by others for future efforts. The use of clearly defined topics, measurable scoring statements, and a binary (true/false) system was intended to make the framework as transparent as possible. By breaking down broad concepts into specific and verifiable questions, the methodology allows decision-makers and community partners to see how scores were derived and to trace results back to the criteria used.

Replicability was also a key consideration. The framework is designed so that future planning efforts whether at the regional, county, or city level can apply the same set of criteria to evaluate new or evolving strategies. Because the criteria are structured and consistent, different users can apply them to a wide range of actions, from infrastructure investments to policy changes, while still producing comparable results.

At the same time, the methodology is flexible. As new data, research, and community priorities emerge, the scoring statements can be refined or expanded to reflect updated knowledge. This adaptability ensures that the framework can continue to serve as a decision-support tool well beyond the scope of this project.

Data Sources and Evidence Base

The scoring relied on a combination of data sources, regional policy documents, and community engagement. Where available, peer-reviewed research and regional technical studies were used to determine whether an action was supported by evidence of effectiveness. Existing local and regional plans including climate, health, and transportation strategies also provided a foundation for assessing alignment with established priorities.

Community engagement findings, including input from frontline populations and advisory groups, informed the scoring of community priority criteria. In areas where quantitative data were limited, professional expertise and qualitative insights were applied to ensure that scoring decisions were still grounded in a transparent process.

This blended evidence base reflects both the strengths and constraints of current knowledge. While not all actions could be evaluated with equal levels of empirical support, combining research, policy guidance, and community perspectives created a more balanced and assessment. The methodology is designed to evolve as new data and research become available, ensuring that future applications are informed by the best evidence possible.

Integration with Other Decision-Making Tools

The scoring methodology was designed to complement, not replace, other planning and decision-making tools. In particular, it was designed to be paired with the spatial analysis and mapping described in **Chapter 4**, allowing actions to be considered not only on their relative strengths but also on where they would have the greatest geographic impact.

Beyond mapping, the framework can be used alongside emerging tools like climate risk assessments, and health impact studies to provide a fuller picture of trade-offs and synergies when considering future investment. While the scoring highlights comparative feasibility and effectiveness, other tools can deepen the understanding of scale, cost efficiency, and long-term outcomes.

As mentioned earlier, this methodology was intentionally structured to be flexible and modular. This means it can be incorporated into a range of future regional planning efforts, transportation or land use planning processes, or grant prioritization frameworks as needed.

Scoring

Scoring Design

Within each topic area, three scoring statements were developed to break down broad concepts into measurable, concrete questions. See **Appendix D** to view all of the scoring statements. This structure ensured that scoring was not based on general impressions, but on specific, verifiable conditions. Each statement was scored as true (1) if the condition was met, or false (0) if it was not, producing a possible score of 0–3 within each topic area.

The use of three statements per topic served several purposes. First, it created a balance between simplicity and depth: too few statements would risk overlooking important dimensions, while too many would introduce unmanageable complexity. Second, the three-statement format allowed for coverage of different aspects of each topic while still keeping the scoring transparent and easy to apply. For example:

- *Urgency* was evaluated not just on whether an action could reduce deaths and illnesses, but also on whether it could have immediate effects and how quickly it could be deployed.

- *Regional priority* considered political commitment, partner support, and consistency with broader resilience strategies and plans, capturing both institutional and policy relevance.
- *Community priority* measured whether strategies were identified through past engagement, created opportunities for community leadership, and directly addressed the needs of vulnerable populations.
- *Benefits* accounted for climate contributions (mitigation and adaptation), public health and environmental benefits, preparedness benefits, and economic co-benefits such as job creation.
- *Financial feasibility* was evaluated through implementation costs, the availability of local, regional or state funding, and the level of ongoing maintenance or operational resources required.

By applying three targeted statements per topic, the scoring system translated complex, multidimensional concepts into practical evaluation questions. This design also made it possible to compare very different strategies—such as tree planting, cooling centers, or reflective pavement—on an equivalent basis, since each was assessed against the same structured set of statements.

Scoring Application

The scoring process was initially carried out by our project team, who applied the methodology to each action based on available data, regional policies, and community input. This ensured consistency in interpretation across the full range of actions. The preliminary results were then shared with the broader project team and various project advisory groups for review and discussion.

This two-step process allowed for both technical consistency and collaborative validation. The initial scoring provided a clear and structured baseline, while feedback from advisory groups introduced additional perspectives and ensured that results reflected regional expertise and community priorities. Although the scores were not recalculated during this review, the discussions informed refinements to the methodology and helped build consensus around the comparative strengths and weaknesses of different strategies.

By pairing technical application with group review, the approach provided a credible set of results that balanced background research, professional assessment and community-informed oversight.

Scoring Results

The scoring process produced a clear picture of how different strategies compare in terms of urgency, alignment with regional and community priorities, breadth of benefits, and financial feasibility.

Several near-term, life-saving measures received the highest overall scores. For example, actions such as implementing home wellness checks for high-risk populations, expanding access to free drinking water, and providing emergency kits scored between 13 and 14 points out of a possible 15. These strategies were recognized for their ability to be deployed quickly, deliver immediate health and safety benefits, and respond directly to the needs of vulnerable populations.

Structural and long-term resilience strategies also scored highly. Tree planting and canopy expansion, cooling investments at transit stops and public spaces, and expanding safe access to rivers and parks consistently scored between 11 and 13. These actions demonstrated strong alignment with community and regional priorities and offered significant co-benefits, including improved public health, climate resilience, and workforce development opportunities.

Some policy and governance actions such as creating regional work groups, strengthening coordination across agencies, and developing inventories of resources—also performed well, particularly in terms of benefits and alignment with regional priorities. However, these tended to score lower on urgency because they cannot deliver immediate life-saving outcomes within a 90-day period.

On the other end of the spectrum, a handful of actions received total scores below 8. These were typically strategies that lacked immediate life-saving potential, had limited demonstrated community demand, or presented uncertain funding and feasibility challenges. While still valuable, these results suggest that such actions may be more appropriate as longer-term efforts rather than near-term priorities.

Taken together, the scoring results emphasize a balanced portfolio: rapid-response interventions that can prevent illness and death in the short term, paired with systemic investments that build lasting resilience. The completed scoring matrix which details results for all recommend action, can be viewed in **Appendix D**.

Limitations and Next Steps

The scoring methodology presented in this chapter is not intended to be a final or exhaustive decision-making tool, but rather a structured starting point. Its greatest value lies in helping regional leaders, community partners, and technical staff make informed comparisons

across a wide range of potential actions. By clarifying trade-offs, highlighting co-benefits, and aligning strategies with community and regional priorities, the framework supports more transparent and equitable choices.

Much of the value of this methodology lies not only in the scores themselves, but additionally in the very process of quickly establishing a clear and effective scoring matrix. By defining a limited set of consistent topics and three targeted statements for each, the framework provides a straightforward template that can be applied with minimal resources while still producing meaningful, transparent results. This simplicity makes the methodology especially useful for agencies or community groups that may not have the time or capacity for extensive technical analysis but still need a structured way to compare options, guide discussions, and identify priorities.

In the near term, the results of this scoring exercise can inform discussions about which strategies to advance first, where to target pilot projects, and how to align regional investments with community needs. Over time, the methodology can also be adapted for specific funding programs, incorporated into broader resilience planning efforts, and refined with new data and community feedback.

As climate conditions evolve and new research becomes available, the framework should be revisited and updated to ensure its continued relevance. Future applications may include weighting of criteria, expanded community engagement in scoring, or integration with health impact and cost-benefit analyses. By iterating and expanding on this initial framework, regional partners will be able to strengthen their collective ability to prioritize, fund, and implement the actions needed to reduce heat-related deaths and illnesses in the greater Portland area.

Chapter 6:
Recommendations and Potential Supporting Actions

Building Regionwide Resilience to Heat

This chapter offers nine overarching recommendations and 48 potential supporting actions that could provide a multifaceted framework for addressing extreme heat risk in the greater Portland region and help build regionwide resilience to heat. These recommendations are broad priority areas that identify **what needs to be done**, while the potential supporting actions within each describe **how they could be accomplished**. The recommendations and actions are not directive to Metro, public agencies, community groups or local partners; they are intended to be a resource to inform future action and collaboration at the local and regional levels.

The recommendations and potential supporting actions were informed by findings from research on cooling strategies, regionwide map-based analyses of factors like tree canopy coverage and temperature, and engagement with national and international heat experts, local and regional partners, and communities most vulnerable to extreme heat. The recommendations and potential supporting actions are designed to strengthen and build on existing local and regional efforts, identify opportunities to collaborate and coordinate, address gaps in action, and protect those most at risk for heat-related illnesses and death.

Once developed, the recommendations were divided into three overarching categories:

1. **Raise awareness and increase preparedness:** Recommendations focus on educating the public about extreme heat risks and connecting them with resources to help them prepare for and respond to heat events.
2. **Strengthen coordinated action and response:** Recommendations emphasize collaboration among local and regional partners, including public agencies and community groups, to improve readiness, align resources, and expand emergency response capabilities.
3. **Expand cooling strategies:** Recommendations highlight long-term investments in the built and natural environment, such as trees, green infrastructure, and park conservation, to reduce urban heat and protect vulnerable populations.

The tables below show all the recommendations and supporting actions divided by category.

In the pages proceeding the tables, there is a guide to reading the rest of the chapter followed by detailed descriptions of each of the potential supporting actions.

The potential supporting actions for each recommendation were evaluated using a scoring matrix that was described in **Chapter 5**. See **Appendix D** to see the scoring matrix and results. Based on the scoring results, the supporting actions within each recommendation

were sorted into two categories: *near term actions* and *future actions*. Near term actions are actions that could be reasonably started or completed within one year after this report is published, however, remaining actions could be started or completed within one year. Future actions are actions that are deemed important but may require additional time, effort, partnerships and funding to be successfully implemented.

Metro recognizes that many of the recommendations and potential supporting actions included in this report require increased financial resources that may not have yet been identified by Metro or other local and regional partners and may require more staff capacity than current capacity.

Regional Context

Implementing the Cooling Corridors Study will require collaboration across a wide range of partners who influence the design, funding, and stewardship of the public realm.

- Local governments will play a central role in adopting policies, updating codes, and implementing tree planting, green infrastructure, and cooling interventions within their jurisdictions.
- Regional agencies, such as Metro and TriMet, can provide data, coordinate planning efforts, and align regional investments to support equitable outcomes.
- State and federal agencies can contribute funding, technical assistance, and regulatory support.
- Utilities are critical partners for infrastructure coordination, including undergrounding wires, expanding tree-friendly planting areas, and supporting energy resilience at public facilities.
- Community-based organizations and advocacy groups are essential for shaping strategies that reflect local priorities, engaging residents in project design, and helping with maintenance and stewardship.
- Academic institutions and researchers can help evaluate effectiveness, develop case studies, and refine best practices over time.

This work is most effective when these partners collaborate, aligning priorities, sharing resources, and learning from each other's successes and challenges. A coordinated approach ensures that cooling investments are equitable, scalable, and create a greater collective impact than any single organization could achieve alone.

Category	Recommendation	Potential Supporting Actions	Cost	Effort
Raise awareness and increase preparedness	1. Elevate extreme heat as an issue of regional concern and strengthen regionwide climate and disaster resilience.	**Near-Term Actions**		
		1.A. Declare extreme heat as an issue of regional concern and designate a regionwide heat season.	$	
		1.B. Support the hiring of a regional resilience resource coordinator to track the availability of federal, state, and private funding programs that can be allocated to cooling strategies and to coordinate with partners to pursue funding opportunities.	$	
		1.C. Establish a chief climate and resilience officer at Metro to represent the agency and facilitate internal coordination.	$ $	
		Future Actions		
		1.D. Identify opportunities and funding to support the implementation of cooling strategies.	$	
		1.E. Expand the scope of future studies to address multiple climate hazards beyond extreme heat.	$ $	
		1.F. Track and report on progress implementing recommendations from the Cooling Corridors Study.	$	
	2. Apply a heat-resilience lens to planning, policy, and project decisions using	**Near-Term Actions**		
		2.A. Establish a centralized hub for heat and climate data.	$	
		Future Actions		

Category	Recommendation	Potential Supporting Actions	Cost	Effort
	research and best practices.	2.B. Integrate heat resiliency in relevant plans, policies, project designs, and investment decisions.	$	
		2.C. Continue research into heat-related issues, solutions, and benefits.	$ $	
		2.D. Identify opportunities to use public facilities as demonstration projects for heat-resilient design and practices.	$ $	
	3. Raise public awareness of extreme heat events and associated health risks, and connect public agencies, community groups, and community members with practical resources to help prepare for and survive these events.	**Near-Term Actions**		
		3.A. Collaborate with other agencies and organizations to create and maintain a comprehensive, regionwide inventory and map of cooling resources in the region that provide relief from extreme heat.	$ $	
		3.B. Identify ways to share heat-related resources developed by Metro and partners widely and equitably.	$ $	
		Future Actions		
		3.C. Explore opportunities to leverage transit stops and transit vehicles to share extreme heat information and connect riders with resources.	$	
		3.D. Host regional webinars and information sessions on extreme heat for different stakeholders.	$	
		3.E. Expand Metro education programs to include curriculum on extreme heat.	$ $	

Category	Recommendation	Potential Supporting Actions	Cost	Effort
Strengthen coordinated action and response	4. Support and coordinate community-led efforts and government actions to build heat and climate resilience across the region.	**Near-Term Actions**		
		4.A. Develop a regional relief network focused on tracking and updating existing cooling resources across the region.	$	
		4.B. Convene a regional work group on heat and climate resilience to keep fostering collaboration among public, private, and academic partners and support ongoing local and regional efforts.	$	
		4.C. Create a regional community-based work group on heat and climate resilience to foster collaboration among community-based organizations across the region and support ongoing local efforts.	$	
		4.D. Collaborate with other agencies and organizations to create and host a regionwide inventory of heat-related educational activities and materials, environmental and climate resilience programs, and related efforts.	$ $	
		Future Actions		
		4.E. Offer technical assistance and guidance to support community-led heat resilience and climate adaptation projects.	$ $	
		4.F. Connect public agencies and community groups to guidance for anti-displacement and equitable development.	$	
		Near-Term Actions		

Category	Recommendation	Potential Supporting Actions	Cost	Effort
	5. Support and expand emergency response actions by public agencies, special districts, utilities, and other workplaces.	5.A. Identify potential locations for resilience hubs.	$	
		5.B. Implement ways to increase public access to free drinking water.	$ $	
		5.C. Increase access to emergency kits for residents living in the region.	$ $	
		5.D. Support the implementation of home wellness checks for high-risk populations when temperatures reach a certain threshold.	$ $ $	
		Future Actions		
		5.E. Assess whether additional publicly-owned and operated facilities can be used as cooling centers during extreme heat events.	$	
		5.F. Develop programming for publicly-owned and operated cooling centers.	$ $	
		5.G. Host tabletop exercises with emergency response staff, first responders, and healthcare workers to discuss extreme heat protocols and support needs.	$	
		5.H. Identify partnerships and funding to support implementation of free transit service regionwide during heat emergencies for trips to all locations, not just cooling centers.	$ $ $	

Category	Recommendation	Potential Supporting Actions	Cost	Effort
		5.I. Revise policies to activate splash pads and similar features based on temperature thresholds rather than fixed seasonal schedules.	$ $ $	
Expand cooling strategies	6. Improve access to home weatherization and air conditioning, especially for vulnerable populations.	**Near-Term Actions**		
		6.A. Seek additional funding to expand cooling programs.	$ $	
		Future Actions		
		6.B. Equip all schools without air conditioning with effective cooling systems.	$ $ $	
		6.C. Improve access to home weatherization, cooling installation, and utility bill assistance programs for low-income households.	$ $ $	
	7. Promote investment in green infrastructure, energy-efficient cooling, and climate-resilient streetscapes and public and private spaces.	**Near-Term Actions**		
		7.A. Remove regulatory barriers to support the installation of green infrastructure, energy-efficient cooling equipment, and other cooling amenities in new and existing buildings and renovations, development, and public, commercial, and other private spaces.	$	
		Future Actions		
		7.B. Incentivize the installation of green infrastructure and energy-efficient cooling features in new and existing buildings and renovations, development, and public commercial, and other private spaces.	$ $	

Category	Recommendation	Potential Supporting Actions	Cost	Effort
		7.C. Educate developers on the costs and benefits of installing cooling or energy efficient design features.	$	
		7.D. Compile and document information on available grant funding sources and incentive programs that can be shared with other jurisdictions, developers, and homeowners.	$ $	
		7.E. Identify opportunities and funding to make transit stops and other public spaces cooler and more comfortable during hot weather.	$ $	
	8. Support coordinated regional efforts to plant, protect, and maintain trees long-term.	**Near-Term Actions**		
		8.A. Establish and coordinate ambitious, equity-focused tree canopy coverage goals across the region.	$	
		Future Actions		
		8.B. Implement or expand street tree planting pilot projects in the neighborhoods most vulnerable to heat.	$ $ $	
		8.C. Partner with community-based organizations offering tree care or habitat restoration workforce development programs to expand training and certification and offer career pathways in urban forestry teams.	$ $ $	
		8.D. Partner with utilities and nonprofits to plan and implement regionwide tree planting and greening initiatives.	$ $ $	
		8.E. Explore opportunities to underground utility wires throughout the region.	$ $ $	

Category	Recommendation	Potential Supporting Actions	Cost	Effort
	9. Preserve and enhance access to parks and open spaces as cooling refuges.	**Near-Term Actions**		
		9.A. Continue and expand programs that preserve existing parks, acquire land for conservation, and support habitat restoration.	$ $ $	
		Future Actions		
		9.B. Explore opportunities to extend hours of access to local and regional parks during extreme heat events.	$ $ $	
		9.C. Sustain and expand restoration and water quality projects that support climate resilience.	$ $	
		9.D. Expand safe, pedestrian-friendly public access to rivers, especially in underserved and heat-vulnerable areas.	$ $	
		9.E. Develop standards that require adequate access to open and green spaces in all new development or redevelopment projects.	$ $	

How to Read the Following Pages

On the following pages, the recommendations are organized into the three overarching categories described above. The nine recommendations are shown in **light blue**. Within each recommendation, the potential supporting actions are shown in **dark blue** and organized into two tiers shown in **green**: *near term actions* and *future actions*. The tiering is based on the scoring described in **Chapter 5**.

Each action includes the following information to support implementation.

Overview: This summarizes what the action seeks to accomplish. It provides all necessary background information to help implementation partners understand the action's purpose and intended outcomes.

Implementation partners: This identifies which public, private, and/or community partners can serve a key role in implementation or support of the action. Partners may include Metro, city governments, county governments, special districts (e.g., TriMet, SMART, C-Tran, Port of Portland, etc.), utilities (e.g., Portland General Electric, Northwest Natural, Pacific Power, etc.), nonprofit organizations, community groups, private developers, businesses, and faith-based groups.

Action typology: The action typologies organize the actions into clear, high-level categories that communicate *what kind of solution* each action represents. They are separated into the following categories: (1) Policy and Governance, (2) Infrastructure and Design, (3) Programs and Operations, and (4) Funding and Resources.

Community priority: This identifies actions that are directly responsive to priorities identified by community members during engagement efforts for the Cooling Corridors Study. The absence of a check mark does not necessarily indicate that the action is not a priority. Instead, it indicates that the action was not explicitly mentioned in one of the study's engagement activities.

Benefits: Benefits may include heat reduction, improved public health or reduced deaths or illnesses, enhanced environmental health, increased public awareness, improved economy, and enhanced coordination.

Cost estimate: Icons are used to indicate the estimated implementation cost of each action relative to other actions. The scale ranges from lower cost ($) to higher cost ($$$).

Level of effort: Icons are used to indicate the relative level of effort required for implementation. The gauge symbol provides a visual scale: low effort (gauge pointing left), medium effort (gauge pointing center), and high effort (gauge pointing right).

Category 1: Raise awareness and increase preparedness

Recommendation 1: Elevate extreme heat as an issue of regional concern and strengthen regionwide climate and disaster resilience.

This recommendation underscores the urgent need to recognize extreme heat as a critical and growing threat in greater Portland with wide-ranging impacts on public health, infrastructure, natural ecosystems, and quality of life. By elevating extreme heat as a critical regional issue, Metro and local and regional partners can work together to advance urgent, coordinated, and collaborative action.

During the expert panel for the Cooling Corridors Study described in **Chapter 3**, the former chief heat officer for Miami-Dade County shared that the County took steps to raise public awareness of the risks of extreme heat events to the same level of awareness for sea level rise and hurricanes (other more widely-recognized climate-related threats for that region). These steps included designating a regionwide heat season that aligned with a coordinated and widespread outreach campaign highlighting the risks of extreme heat.

Notably, many of the heat-related mitigation and adaptation actions identified in this report, such as tree canopy expansion, coalition building, and the creation of resilience hubs, can also strengthen resilience to other climate hazards, including wildfire smoke, drought, and snow and ice. Looking to the future, positioning extreme heat within a broader, holistic approach to climate resilience ensures that investments serve multiple purposes and support long-term and widespread community well-being.

Near term actions

Action 1.A. Declare extreme heat as an issue of regional concern and designate a regionwide heat season.

Overview

This action proposes the Metro Council formally declare extreme heat and climate change as issues of regional concern and designate May 1 through September 30[17] as the Portland metropolitan area's official heat season. This symbolic declaration and designation would raise public awareness of extreme heat as a critical and recurring threat in the region, while also building political and community support for heat-specific mitigation, preparedness, and response efforts.

[17] Washington, Clackamas, and Multnomah Counties have used the period of May 1 through Sept 30 as their heat season since 2019, consistent with guidance from the Council of State and Territorial Epidemiologists.

By declaring extreme heat and climate as topics of metropolitan concern, the Metro Council can also direct the Metro Policy Advisory Committee (MPAC) to advise Metro Council on extreme heat and climate action. MPAC was created by the Metro Charter to advise the Metro Council on issues of metropolitan concern. Importantly, this action is not intended to interfere with existing extreme heat notifications and emergency response protocols, but rather to highlight and build on the important work already underway to increase awareness and strengthen regional and community resilience to heat.

Implementation partners

Metro Council is proposed to be responsible for implementation.

Action typology	Policy and Governance		
Community priority		Level of effort	
Benefits	Increased public awareness	Cost estimate	$

Heat, the silent killer: Historically, greater Portland has experienced mild summers, and until recent years, air conditioning was not considered to be needed as a standard feature of residential buildings. During engagement for the Cooling Corridors Study, a chief climate officer described heat as a "silent killer" due to its often-overlooked health impacts. Additionally, many vulnerable community members shared that they feel less prepared for extreme heat compared to winter weather, highlighting the urgent need for increased awareness and action on this emerging and critical issue.

Action 1.B. Support the hiring of a regional resilience resource coordinator to track the availability of federal, state, and private funding programs that can be allocated to cooling strategies and to coordinate with partners to pursue funding opportunities.

Overview

This effort would track federal, state, and private grant programs and other funding sources dedicated to climate mitigation, green infrastructure, green buildings, resilience hubs, cooling centers, and related cooling strategies. The outcome could include a user-friendly guide that public agencies and community organizations can use to identify, access, and connect with available funding opportunities and look for opportunities to collaborate and leverage other resources. One example of this is the Climate Action Resource Navigator initiative launched by Metro's Social Innovation Program in 2024. Championed by the Social Innovation Council convened by Metro, the initiative aims to strengthen the ability of community organizations to access local, state, and federal climate funding, craft

competitive proposals, and build strategic partnerships that drive collaborative, community-led solutions. This initiative also includes providing the technical expertise and collaborative networks needed for community organizations to secure and manage awarded resources effectively.

Implementation partners

Metro could be the primary agency responsible for implementation in coordination with community organizations and other partners.

Action typology	Funding and Resources		
Community priority	☑	Level of effort	
Benefits	Enhanced coordination, Improved economy	Cost estimate	$

Action 1.C. Establish a chief climate and resilience officer at Metro to represent the agency and facilitate internal coordination.

Overview

This action proposes to establish a chief climate and resilience officer at Metro to facilitate internal coordination of Metro's climate efforts. While oversight of climate and resilience work is recommended to remain in individual Metro departments and programs, the proposed chief climate and resilience officer could facilitate information sharing and coordination of agency-wide efforts and communications related to greenhouse gas emissions reduction, heat mitigation and adaptation, and preparation for and responses to climate hazards, such as extreme heat, wildfires, snow and ice, and extreme weather.

The chief climate and resilience officer could track and report on department-level implementation of climate-related components of Metro's plans, policies, projects, and supporting actions from the Cooling Corridors Study. The chief climate and resilience officer could be charged with convening and staffing an internal work group that meets quarterly to coordinate department-level implementation efforts. The internal work group is proposed to take the place of the current internal Climate Justice Task Force. The chief climate and resilience officer could also provide annual updates to Council and regional policy committees.

While climate-related work currently exists within multiple departments, more can done to coordinate this work. A dedicated position signals the importance of this work, ensures that climate resilience is represented in executive decision-making, and provides authority to coordinate cross-departmental efforts and increase accountability. This role would also position Metro to strategically pursue external funding, respond quickly to emerging funding opportunities, and serve as a clear point of contact for partners and stakeholders.

Implementation partners

Metro is proposed to be responsible for implementation.

Action typology	Policy and Governance		
Community priority		Level of effort	
Benefits	Increased public awareness, Enhanced, coordination	Cost estimate	$ $

Future actions

Action 1.D. Identify opportunities and funding to support the implementation of cooling strategies.

Overview

Several of the proposed supporting actions in the Cooling Corridors Study report require additional funding for successful and equitable implementation. During engagement, the following needs were identified: funding for the long-term maintenance of street trees (particularly to shift the burden from individual residents to public agencies), increased staff capacity for Metro Parks and Nature or local parks and recreation teams (to support park maintenance and extended hours at local and regional parks during heatwaves), new or expanded incentive programs to support the installation of green infrastructure and energy-efficient building features, a grant program to fund the development of resilience hubs, and a grant program to support community-led, neighborhood-based adaptation pilots.

This action calls for Metro and local and regional partners to identify opportunities and funding to meet these identified needs, support implementation of other potential supporting actions, and help sustain long-term regional heat and climate resilience.

Implementation partners

Metro and public agencies can support implementation.

Action typology	Policy and Governance		
Community priority	☑	Level of effort	
Benefits	Enhanced coordination	Cost estimate	$

Action 1.E. Expand the scope of future studies to address multiple climate hazards beyond extreme heat.

Overview

While the focus on extreme heat in the Cooling Corridors Study is both timely and critical, it is important to recognize that climate change presents a broader set of challenges and climate hazards beyond rising temperatures. Impacts such as increased wildfires, severe storms, flooding, drought, and changing disease patterns are also growing in frequency and intensity.

This action suggests expanding future studies to consider a more comprehensive set of climate risks. Limiting the scope of adaptation planning to heat alone may miss opportunities to develop integrated strategies that build resilience to multiple climate hazards. Considering additional climate risks can lead to more effective, equitable, and durable solutions and ensure that investments made today support communities in the face of a wider range of future threats.

At Metro, some projects are already laying the groundwork for this broader climate resilience approach. The Social Vulnerability Tools project, funded by the Regional Disaster Preparedness Organization (RDPO) and managed by Metro, developed the Social Vulnerability Explorer to provide tools and analysis to better understand which communities in greater Portland experience barriers to emergency services and programs before, during, and after disasters. This resource is being refined to address specific climate hazards like extreme heat. Additionally, the Regional Emergency Transportation Route project, collaboratively led by RDPO and Metro, updated the regional network of emergency transportation routes (ETRs), routes targeted during an emergency for rapid damage assessment and debris-clearance, and is in the process of prioritizing and tiering the routes.

To build on these foundational efforts, when applicable, future studies and recurring plans like the Regional Transportation Plan and Climate Smart Strategy, should provide updates on relevant climate-related activities, including efforts to reduce GHG emissions and to adapt to the impacts of climate change. This broader approach will help identify gaps, improve

coordination, and promote integrated adaptation planning that addresses the full spectrum of climate hazards facing the region.

Implementation partners

Similar to the Cooling Corridors Study, Metro could be the primary agency responsible for implementation with support from city and county governments, special districts, utilities, community groups, and other partners.

Action typology	Policy and Governance		
Community priority	☑	Level of effort	
Benefits	Increased public awareness, Enhanced coordination	Cost estimate	$ $

Action 1.F. Track and report on progress implementing recommendations from the Cooling Corridors Study.

Overview

This action involves regularly tracking and reporting on the progress of implementing recommendations and supporting actions from the Cooling Corridors Study. Ongoing monitoring would provide transparency, promote accountability among stakeholders, and help identify successes and challenges. This process supports continuous improvement and ensures that efforts to mitigate and adapt to urban heat are effectively advancing toward regional goals.

As a near-term step, Metro could develop case studies or an annual report highlighting recent development projects that successfully achieve multiple goals, including heat resilience, across the region. These case studies could showcase which parts of the region are achieving desired levels of urbanism while reducing heat risk, providing examples that local governments and developers can learn from. Conversely, the annual report could examine where recent developments or transportation projects are exacerbating urban heat, documenting lessons learned and opportunities for improved practice. This dual focus would turn tracking into an active learning process, helping refine Metro's own guidance and strengthen future policy and investment decisions.

Implementation partners

Metro could be the primary agency responsible for implementation. However, city and county governments, special districts, utilities, community groups, and other partners can support implementation of this action by sharing updates on local initiatives.

Action typology	Policy and Governance		
Community priority		Level of effort	
Benefits	Enhanced coordination	Cost estimate	

Recommendation 2: Apply a heat-resilience lens to planning, policy, and project decisions using research and best practices.

This recommendation encourages Metro and partners to integrate heat considerations into plans, policies, projects, and investment decisions, and to apply best practices for the implementation of cooling strategies. Doing so will help Metro and partners more effectively anticipate and address the effects of heat, support community-informed and data-driven decisions, and enhance the effectiveness of heat mitigation and adaptation efforts.

Near-term actions

Action 2.A. Establish a centralized hub for heat and climate data.

Overview

Public partners have expressed significant interest in having access to the maps and data developed for the Cooling Corridors Study, as well as frequently updated maps of tree canopy coverage across the region to assess the impacts of tree-related policies and programs. A centralized hub would meet this need by giving jurisdictions and community partners a central source to inform decision-making. By showing where heat risk is highest, where investments are occurring, and where gaps remain, the hub would help partners target cooling projects, track progress toward regional goals, and adjust strategies as conditions change. This turns data into a practical tool for planning, funding, and coordinating implementation efforts across the region. This action calls for Metro to make the heat data from this study available within Metro's Regional Land Information System (RLIS) Discovery Data Hub and maintain the following datasets:

- Urban heat index (from Landsat surface temperature) updated annually
- Cooling corridor gaps (from Metro aerial imagery) updated annually
- Tree canopy (from Metro aerial imagery and lidar) updated every five years

- Social Vulnerability Indices (from various demographic/health data) updated annually

In addition, this action calls for identifying opportunities for future partnerships and collaboration to expand the data hub. Examples data sets could include Portland State University Transportation Research and Education Center's (TREC) upcoming resource hub and the Smart Surfaces Coalition Decision Support Tool.

Implementation partners

Metro could be the primary agency responsible for implementation. State agencies, city and county governments, special districts, academic institutions, utilities, and community groups can all support implementation of this action.

Action typology	Programs and Operations		
Community priority		Level of effort	
Benefits		Cost estimate	

Future actions

Action 2.B. Integrate heat resiliency in relevant plans, policies, project designs, and investment decisions.

Overview

This action calls for the integrating of community impacts, urban heat island effects, and extreme heat events in future updates of relevant plans and policies, such as Metro's Regional Framework Plan, Parks and Nature System Plan, Regional Transportation Plan, and local plans and street tree codes. Doing so would ensure that heat mitigation and adaptation efforts are reinforced and expanded through coordinated planning.

This action also calls for integrating heat-related criteria and evaluation metrics into applicable grant programs, specifically programs that support natural spaces and green infrastructure, such as Metro's Nature in Neighborhoods program. This would support the prioritization of projects that address urban heat reduction through shade, cooling, and related strategies.

Implementation partners

Metro, state agencies, city and county governments, special districts, utilities, and community groups can all support implementation of this action.

Action typology	Policy and Governance

Community priority		Level of effort	
Benefits	Enhanced Public Awareness, Enhanced Coordination	Cost estimate	$

Action 2.C. Continue research into heat-related issues, solutions, and benefits.

Overview

This action supports best practices research into a range of heat-related issues and potential solutions. Supporting this research would inform more effective, equitable, and sustainable regional cooling strategies.

During conversations with Metro staff, the following research topics were identified: selecting appropriate plant species for hotter climates, addressing accessibility concerns with non-traditional pavements, exploring how health insurance can improve access to air conditioning, overcoming implementation and funding challenges for energy-efficient initiatives and street tree maintenance, and reviewing available research on the relationship between green infrastructure investments and community displacement.

Beyond these topics, ongoing research may uncover new challenges and innovative solutions as heat conditions evolve and community needs shift. Continued engagement with diverse stakeholders will be essential to identify emerging issues and adapt strategies to ensure heat mitigation efforts remain effective, equitable, and responsive over time. This research can also be used to improve communication about potential benefits and provide information and data that can help demonstrate the need for a project or program and its potential benefits.

Implementation partners

Metro, state agencies, city and county governments, special districts, academic institutions, utilities, and community groups can all support implementation of this action and are encouraged to contribute research efforts and share relevant findings and insights.

Action typology	Programs and Operations		
Community priority		Level of effort	
Benefits	Increased Public Awareness,	Cost estimate	$ $ $

Enhanced Coordination

Action 2.D. Identify opportunities to use public facilities as demonstration projects for heat-resilient design and practices.

Overview

This action supports using public facilities as pilot and demonstration projects for implementing heat-resilient design and practices. Projects, such as planting heat-resilient trees and installing permeable pavement and shade structures in local and regional parks, can test and demonstrate effective cooling solutions in action. Additional strategies could include installing solar photovoltaic (solar PV) panels atop newly implemented shade structures, incorporating urban meadows and other native vegetation plantings in underutilized areas such as parking lot edges, and adding green stormwater infrastructure in curb bump outs and traffic circles. Demonstration projects could also test colorful cool pavement designs that enhance pedestrian safety while creating vibrant public spaces, or retrofit existing community centers, such as libraries and schools, with green walls to provide cooling and aesthetic benefits. Together, these projects enable Metro and other public agencies to evaluate effectiveness, identify implementation challenges, and learn from real-world applications. One idea that emerged during engagement was the suggestion to deploy heat sensors at all Metro-owned and operated facilities to collect site-specific data, enabling more targeted and effective cooling strategies. Another idea is to share Metro's Sustainable Buildings and Sites Policy with partner agencies to promote sustainable building and site practices across the region.

Implementation partners

Metro and public agencies can support implementation.

Action typology	Design and Infrastructure		
Community priority		Level of effort	
Benefits	Heat reduction, Improved public health, Enhanced environmental health, Increased public awareness	Cost estimate	$ $

Recommendation 3: Raise public awareness of extreme heat events and associated health risks, and connect public agencies, community groups, and community members with practical resources to help prepare for and survive these events.

This recommendation focuses on increasing public understanding of extreme heat risks and improving accessibility to resources to help people prepare and stay safe during hot days. By properly educating public agencies, community groups, and community members and connecting them with practical tools and information, the region can improve awareness and preparedness, reduce the number of heat-related illnesses and deaths, and strengthen community resilience during extreme heat events.

Near-term actions

Action 3.A. Collaborate with other agencies and organizations to create and maintain a comprehensive, regionwide inventory and map of cooling resources in the region that provide relief from extreme heat.

Overview

This action recommends compiling a regionwide inventory and subsequently creating a regional map of cooling resources, including cooling centers, resilience hubs, community centers, public libraries, swimming pools, drinking fountains, interactive fountains, splash pads, misting stations, and publicly accessible beaches or river access points. The map would display the resources that were identified in the regionwide assessment and could include helpful information, such as detailed information about accessibility and how to get there by foot, bike, transit, or car.

Many agencies and organizations in the region have already compiled some of this information, including Clackamas County, Multnomah County, and Washington County. Counties establish cooling centers and provide resources during heat events, and the website 211info.org provides information on cooling centers and transportation options to get there. This action would bring information together in a regional dataset in order to develop a comprehensive regional map of cooling resources that public agencies, community groups, and community members can use to locate nearby cooling options during extreme heat events.

The inventory should be updated annually to ensure that all information is current. After the initial inventory is developed, annual updates to the inventory can be supported by the proposed regional relief network.

Implementation partners

Metro could be the primary agency responsible for compiling and hosting the inventory. However, public agencies, community groups, and other partners can support implementation by informing Metro of any existing resources that should be included in the inventory.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Enhanced Public Awareness, Enhanced Coordination	Cost estimate	$ $

From engagement to action: Across conversations with agency staff, community groups, and vulnerable community members, participants expressed strong support for a more comprehensive and regionwide inventory and map, so that residents can find all options in one place. These conversations also revealed that efforts tend to feel focused on Portland and Multnomah County, even if resources and actions exist in other parts of the region, highlighting a need for increased awareness of actions in other places.

Action 3.B. Identify ways to share heat-related resources developed by Metro and partners widely and equitably.

Overview

The Cooling Corridors Study calls for the development of several heat-related resources (signage, one-pagers, videos and websites) intended to raise awareness of heat risks, educate the public on how to prepare for and survive extreme heat events, and connect community groups and community members with existing resources. These resources include the comprehensive, cross-jurisdictional inventory and map of cooling resources, the publicly accessible database of heat-related projects, programs, tools, and resources, and future model codes and policies, maps, and guidance documents that can support implementation of cooling strategies.

This action recommends exploring ways to share these resources widely across the region, targeting vulnerable populations. One way to do so is to partner with trusted groups in the community. By partnering and collaborating with culturally specific organizations, service providers (e.g., healthcare facilities, treatment centers, emergency shelters, etc.), and other trusted groups (e.g., workplaces, schools, etc.), Metro and other public agencies can ensure that community members receive timely, relevant, and accessible information and support

before, during, and after extreme heat events. These partnerships can help build trust, close communication gaps, and more effectively reach communities most impacted by heat-related health risks.

Resources should include accessible formats and multiple languages whenever possible, leverage digital and physical distribution channels (e.g., social media, email newsletters, mailings, in-person events, etc.), and prioritize areas and communities living in areas with the highest heat risk.

Metro could possibly develop and share clear guidance and tools with local governments, nonprofits, and community leaders to support consistent and effective outreach across the region.

Implementation partners

Metro could be the primary agency responsible for implementation. However, public agencies and community groups can support implementation by connecting with community members directly.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Improved public health, Increased public awareness, Enhanced coordination	Cost estimate	$ $

Information gap: Although many informational and practical resources are already available in the region, most of the community members that engaged with the Cooling Corridors Study expressed uncertainty about where to find "official" guidance or how to identify the most reliable information and, oftentimes, they did not know where to find any information at all. This confusion and lack of awareness left most feeling unprepared for extreme heat events.

Future actions

Action 3.C. Explore opportunities to leverage transit stops and transit vehicles to share extreme heat information and connect riders with resources.

Overview

Two of the most vulnerable groups to extreme heat, the unhoused and older adults, rely on public transit to travel or escape the heat. During conversations with both groups, community members shared how helpful it would be to have heat alerts, educational materials, and information on nearby cooling resources posted at transit stops or on buses or MAX trains.

This action recommends using transit stops, transit vehicles, and transit websites or apps to provide accessible information about extreme heat risks and available resources. Messaging can include extreme heat advisories, symptoms of heat-related illnesses, recommended safety precautions (such as staying hydrated and seeking shade), and steps to take if someone shows signs of heat stroke. This information can be delivered through signage, QR codes, or real-time arrival screens.

Implementation partners

Transit agencies, Metro and other public agencies and partners can support implementation.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Improved Public Health, Increased Public Awareness	Cost estimate	$

Keep this in mind: During a conversation with unhoused community members, the project team learned that notification of extreme heat events should happen days before the events to give people living outside as much time as possible to prepare. To aid preparation even further, heat advisory messages should include information on how to find or access cooling resources.

Action 3.D. Host regional webinars and information sessions on extreme heat for different stakeholders.

Overview

This action involves organizing virtual and/or in-person sessions to educate various stakeholders about extreme heat. These sessions can be tailored to different groups, namely those requiring more technical knowledge and those requiring more practical information and tips.

Webinars and information sessions tailored to planners, elected officials, and public health professionals can focus on sharing emerging data, best practices, case studies, and tools related to heat resilience. These webinars will build regional capacity by helping local leaders

and practitioners better understand extreme heat risks, equity considerations, and effective strategies for mitigation and adaptation.

Webinars and information sessions tailored to community groups and the public can be designed to raise awareness about extreme heat, share practical tips for staying safe, and connect people with local resources. Sessions can highlight community-led initiatives, showcase available programs, and provide space for participants to ask questions and share ideas for building resilience at the neighborhood level.

Implementation partners

Metro and public agencies can support implementation.

Action typology	Programs and Operations		
Community priority		Level of effort	
Benefits	Increased Public Awareness	Cost estimate	

Action 3.E. Expand Metro education programs to include curriculum on extreme heat.

Overview

Relevant educational efforts, including classroom presentations, community workshops, and workplace trainings, should consider including heat-related curriculum to help learners of all ages understand the causes, risks, and safety strategies related to extreme heat in our region. This action also provides the opportunity to introduce emerging and less familiar technologies like smart surfaces, smart shade solutions, and real-time heat dashboards to expand knowledge and adoption.

One example is Metro's education programs that offer free learning opportunities for young people and adults on topics such as recycling, natural resources, climate change, and alternatives to toxics. These programs are delivered through classroom presentations, community events, workshops, and learning gardens across Clackamas, Multnomah, and Washington counties. Metro's Waste Prevention and Environmental Services (WPES) secondary education program has recently introduced curriculum focused on extreme heat. This content could be expanded to other program areas and used as guidance for programs outside of Metro.

Implementation partners

Metro is proposed to be the primary agency responsible for implementation. However, other public agencies and community groups can support implementation.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Increased Public Awareness	Cost estimate	$ $

Category 2: Strengthen coordinated action and response

Recommendation 4: Support and coordinate community-led efforts and government actions to build heat and climate resilience across the region.

This recommendation encourages strong coordination between Metro, community groups, local governments, and other partners to strengthen local and regional heat and climate resilience efforts. Metro can bolster existing efforts that address the unique needs and priorities of diverse communities across the region by amplifying local knowledge, fostering collaboration, and providing financial support, model policies, relevant publicly available maps and databases, guidance documents, and technical assistance.

Near-term actions

Action 4.A. Develop a regional relief network focused on tracking and updating existing cooling resources across the region.

Overview

This action supports the creation of a formal regional relief network, a collaborative partnership among Metro, public agencies, nonprofit organizations, community groups, faith-based groups, and businesses. This group would be focused on maintaining up-to-date documentation of cooling resources, which can support related efforts, such as the regionwide assessment of existing cooling resources and development of a comprehensive, publicly accessible, regionwide map of the cooling resources identified in the assessment.

Metro could coordinate annual updates to the network map and directories as new partners join, aiming to prevent heat-related illnesses and deaths, particularly among vulnerable populations. During winter months, the network can adapt to focus on resources addressing cold-related health risks.

This regional relief network is intended to be distinct from the regional work group. However, there is potential for the regional work group to serve as the network itself or to establish a dedicated subcommittee to manage these functions. This approach could leverage existing partnerships and expertise while maintaining clear roles for coordination, resource mapping, and response efforts.

Implementation partners

Metro and RDPO could lead coordination of the relief network and manage regular updates to the proposed inventory and map of existing cooling resources. Local jurisdictions, community groups, faith-based groups, and businesses could provide data on facilities and services.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Enhanced coordination	Cost estimate	$

Action 4.B. Convene a regional work group on heat and climate resilience to keep fostering collaboration among public, private, and academic partners and support ongoing local and regional efforts.

Overview

A regional work group was formed as part of the Cooling Corridors Study to serve as a collaborative forum for public, private, and academic partners across greater Portland to exchange ideas and provide technical and policy feedback on the study. Members of the group expressed desire to continue the work group beyond the Cooling Corridors Study.

Moving forward the group could meet quarterly to coordinate and collaborate on heat mitigation and adaptation efforts with the potential to broaden its focus to address additional climate hazards and broader resilience strategies. The group could be expanded to include representatives from every city and county in the Portland metropolitan area as well as additional relevant private partners.

The work group could help maintain the proposed publicly accessible database that inventories local heat-related projects, programs, tools, and resources by collecting and sharing updated information annually to ensure the database remains current and comprehensive.

Implementation partners

While Metro facilitated the first iteration of the group, ongoing coordination and leadership responsibilities should transition to public agencies and other partners.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Enhanced Coordination	Cost estimate	$

Action 4.C. Create a regional community-based work group on heat and climate resilience to foster collaboration among community-based organizations across the region and support ongoing local efforts.

Overview

This action proposes the creation of a regional work group to serve as a collaborative forum for community-based organizations from across the region dedicated to discussing heat mitigation and adaptation efforts with the potential to broaden its focus to address additional climate hazards and wider resilience strategies. The group could bring together diverse community groups to share local knowledge and efforts, identify priorities, and co-develop equitable initiatives for addressing heat and broader climate challenges. This collaborative platform would ensure that community voices are central to local and regional resilience planning and implementation. The group could meet quarterly.

The work group could help maintain the proposed publicly accessible database that inventories local heat-related projects, programs, tools, and resources by collecting and sharing updated information annually to ensure the database remains current and comprehensive.

Implementation partners

Metro could support the initial convening, offer expertise and data as needed, and occasionally provide logistical support and physical meeting space. Community groups (or the Climate Action Resource Navigator) could be primarily responsible for ongoing coordination and leadership.

Action typology	Programs and Operations

Community priority	☑	Level of effort	
Benefits	Enhanced Coordination	Cost estimate	$

Connecting the dots: During a conversation with community-based organizations, representatives expressed support for a community hub where community groups can connect with other groups and share knowledge and resources. The proposed regional community-based work group (described above) and publicly accessible database (described below) showcasing local heat-related projects, programs, tools, and resources both address this need, providing avenues for community groups to deeply collaborate and gain valuable information on local initiatives.

Action 4.D. Collaborate with other agencies and organizations to create and host a regionwide inventory of heat-related educational activities and materials, environmental and climate resilience programs, and related efforts.

Overview

This action aims to inventory heat-related educational activities and materials, environmental and climate resilience programs, and related efforts led by state agencies, local governments, community groups, and other partners across the region. Examples include extreme heat safety workshops, educational walks, guides on tree care or depaving, tree planting initiatives, home weatherization programs, environmental restoration training, and public information campaigns.

The inventory would help identify existing resources, reveal gaps or overlaps, and support better coordination and communication among partners to increase capacity and support knowledge and resource sharing.

The inventory should be updated annually to ensure that all information is current. After the initial inventory is developed, annual updates to the inventory can be supported by the proposed regional work group and regional community-based work group to ensure the database remains current and comprehensive.

This action would inform the development of a publicly accessible database of the information and materials collected during this assessment that can serve as a centralized hub for heat-related projects, programs, tools, and resources, and support future targeted outreach campaigns to help community groups and community members easily find and connect with available resources. This database could be hosted on Metro's website and include links to heat-related educational activities and materials, environmental and climate

resilience programs, and related tools and resources, making it easier for public agencies, community groups, and community members to find and share information.

Implementation partners

Metro could be the primary agency responsible for compiling and hosting the inventory. However, public agencies, community groups, and other partners can support implementation by informing Metro of any existing resources that should be included in the inventory.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Increased Public Awareness, Enhanced Coordination	Cost estimate	$ $

Heat alert hub: RDPO conducted a comprehensive scan of emergency messaging for extreme heat (and other emergencies) across the region a few years ago, compiling over 1,200 urgent messages available in over 25 languages. The inventory also includes American Sign Language videos, copyright free illustrations, fliers, videos, and audio files on extreme heat. The library of heat-related messaging tools is available on publicalerts.com/messaging-tools.

Cooling collaboration: The regional relief network is inspired by the Maricopa Association of Governments' (MAG) Heat Relief Network. MAG has partnered with municipalities, nonprofits, faith-based groups, and businesses to coordinate the network during summer months in Arizona (May 1–September 30). Each year, the network maps and maintains a directory of partner cooling sites, including hydration stations, with updates made in real time as new partners join throughout the heat season. The purpose is to protect vulnerable populations by making heat relief resources easily accessible across the region. The map and directory are hosted online. Additionally, 211 live operators take calls, in English and Spanish, from 9 a.m. to 7 p.m. daily to help connect residents to the directory, map, and other helpful resources and information.

Future actions

Action 4.E. Offer technical assistance and guidance to support community-led heat resilience and climate adaptation projects.

Overview

Community groups and residents often lead the way in identifying and in some cases, implementing locally scaled adaptation solutions but may face barriers related to technical knowledge, permitting processes, or project planning. This action calls for providing hands-on support, such as guidance on project design, navigating regulatory requirements, accessing funding opportunities, and incorporating climate resilience best practices, especially for historically underserved or heat-vulnerable communities.

This support could also take the form of a clear, user-friendly guide, similar to Metro's Community Quick-Build and Demonstration Projects guide. The guide could help community groups plan and carry out adaptation projects by providing step-by-step instructions, permitting tips, funding information, and example projects. Making this information easy to access would help more communities take action, especially those with limited resources or experience.

Implementation partners

Metro could lead development of a user-friendly guide, if deemed necessary, and coordinate technical assistance efforts. Local jurisdictions could offer permitting support, share relevant policies, and connect community projects to local funding. Community-based organizations could identify priority projects, ensure materials reflect local needs, and lead outreach in underserved or heat-vulnerable areas. Private sector partners, such as engineering or design firms, could offer pro bono or low-cost technical support for community-led projects.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Enhanced Coordination	Cost estimate	$ $

Action 4.F. Connect public agencies and community groups to guidance for anti-displacement and equitable development.

Overview

During a conversation with local community groups taking on climate work, one participant mentioned needing guidance on how to prevent displacement when installing green

infrastructure and enhancing greenspace and other natural spaces near low-income households.

Metro, in partnership with community coalitions, has developed equitable development strategies for major projects, like the Southwest Corridor transit project, Tualatin Valley Highway Transit Project, and 82nd Avenue Transit Project, to help prevent displacement and address disparities. These strategies and other guidance documents offer concrete examples of policies and actions that public agencies and community groups can adopt to ensure that climate resilience and infrastructure investments do not displace existing residents or exacerbate inequities. Sharing and applying this guidance regionally can support more just and inclusive development.

Implementation partners

Metro could lead by sharing and adapting equitable development strategies, and public agencies and community-based organizations could ensure strategies reflect local priorities and lead outreach efforts. Local governments could also consider integrating the guidance into planning and investment decisions, and affordable housing providers could apply these practices in housing projects.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Increased Public Awareness	Cost estimate	$

Recommendation 5: Support and expand emergency response actions by public agencies, special districts, utilities, and other workplaces.

This recommendation encourages Metro to support emergency response efforts across Metro, public agencies, special districts, utilities, and workplaces and for all implementation partners to expand and broaden the reach of these efforts. By enhancing coordination, resources, and public awareness, these efforts can more effectively protect communities during extreme heat events and other emergencies.

Near-term actions

Action 5.A. Identify potential locations for resilience hubs across the region.

Overview

This action involves identifying potential locations for resilience hubs across the region. Resilience hubs are community-serving facilities that can provide support and resources before, during, and after extreme heat events and other emergencies.

Resilience hubs can include public libraries, community and cultural centers, nonprofit organizations, places of worship, health clinics and schools. However, these places are not inherently resilience hubs because simply being a community space does not guarantee they have the necessary resources, infrastructure, or coordination in place to effectively serve people during extreme heat or other emergencies. True resilience hubs require intentional planning, investment in cooling equipment, emergency supplies, trained staff, and connections to local support networks to provide safe refuge and services when needed.

The Getting There Together Coalition's Resilience Hub Locator map provides information about publicly-owned parcels of land in the Portland metropolitan area alongside spatial data such as zoning, transit, parks, schools, community organizations, and census tract demographics. The tool can be used to analyze the development feasibility of the publicly owned parcels for creating resilience hubs. The Getting There Together Coalition can build on this tool by clearly identifying the locations of existing resilience hubs and other resources such as cooling centers and green spaces.

Metro can develop guidance to prioritize equitable and effective placement of resilience hubs to support communities before, during, and after extreme heat and other climate-related events.

Implementation partners

Local governments and community groups can implement this supporting action by using the Resilience Hub Locator as a tool. Metro can support implementation by providing guidance on equitable and effective placement.

Action typology	Infrastructure and Design		
Community priority		Level of effort	
Benefits	Enhanced Coordination	Cost estimate	$

Action 5.B. Implement ways to increase public access to free drinking water during extreme heat events.

Overview

This action calls for public agencies to coordinate to develop a regional strategy for increasing public access to free drinking water, especially during extreme heat events. This could include deploying mobile hydration stations at outdoor events, in parks, and at transit hubs during hot weather. For example, the Hillsboro Tap program provides a mobile water trailer for community events, offering a strong model for regional replication. Long-term strategies could also include installing or upgrading permanent public drinking fountains and bottle refilling stations in high-traffic areas and the most heat-vulnerable neighborhoods.

Implementation partners

Public agencies would be responsible for coordination and implementation. Community groups can support this action through outreach to community members about the locations of available safe drinking water sources.

Action typology	Infrastrucutre and Design		
Community priority	☑	Level of effort	
Benefits	Improved Public Health	Cost estimate	$ $

Water is life: Conversations with unhoused community members underscored that access to free, clean drinking water can be difficult to come by yet essential for survival, especially during extreme heat. When asked what would help them feel more prepared for heatwaves, the first response was clear: *more water*. They envisioned a city with abundant drinking fountains and bottle-filling stations, and, if they could wave a magic wand, free drinking water at every street corner when temperatures are high. For now, cooling centers, including those operated by community groups like churches, remain one of the few reliable places to find free drinking water.

Action 5.C. Increase access to emergency kits for residents living in the region.

Overview

During engagement, vulnerable community members all agreed that none of them feel well prepared for extreme heat events. One man shared that he assembles his own makeshift emergency kits, stocked with extra bottles or jugs of water and a battery-powered fan, in case of high heat or power outages. But, for others, such resources are out of reach even if they understand the value of being more prepared. Increasing access to well-equipped emergency kits could be a critical step in helping those most at-risk stay safe when temperatures are high.

This action calls for public agencies to explore ways to increase access to heat-related emergency preparedness kits, particularly for residents who are low-income, older, living alone, or otherwise vulnerable during extreme heat events. This could include distributing kits through community-based organizations, integrating supplies into existing social service programs, or offering regionwide giveaways paired with educational outreach. Kits may include items such as bottled water, cooling towels, backup power sources, first aid supplies, and information on local resources and emergency contacts.

Implementation partners

Public agencies could be primarily responsible for implementation.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Improved Public Health	Cost estimate	$ $ $

Action 5.D. Support the implementation of home wellness checks for high-risk populations when temperatures reach a certain threshold.

Overview

Metro, public agencies, or community groups can partner with property managers, resident service coordinators, or other on-site staff at residential buildings that house at-risk populations, such as older adults with low incomes, to develop and implement wellness check programs during extreme heat events. These partnerships can establish clear protocols for checking in on residents when temperatures exceed certain thresholds, ensuring timely support for those who may be socially isolated, medically vulnerable, or unaware of available resources. Programs could include door-to-door visits, phone check-ins, and connections to cooling centers, transportation, or emergency services.

If home wellness checks exceed the capacity of property managers and staff, one idea shared during engagement was to create a resident volunteer network. Property managers could collect a list of tenants willing to check in on neighbors, or even conduct more formal wellness checks, during emergencies, including heatwaves.

Implementation partners

Metro, local governments, and community groups that represent or work directly with high-risk populations can support implementation through partnerships with private property managers and staff.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Improved Public Health	Cost estimate	$ $ $

The quiet danger of isolation: During a conversation with older adults living alone, several expressed deep concern for neighbors who might go unnoticed during heatwaves, especially those living alone, with health issues, or limited mobility. One of them shared heartbreaking stories of a friend and family member who both died alone, unnoticed for days or weeks, underscoring how isolation can dramatically increase vulnerability and the risk of severe heat-related harm.

Future actions

Action 5.E. Assess whether additional publicly-owned and operated facilities can be used as cooling centers during extreme heat events.

Overview

Across the region, Metro and local governments already operate a number of cooling centers during heatwaves, however, there may be opportunities to provide more cooling centers to improve access.

This action supports the assessment of additional publicly-owned and operated facilities that can be used as cooling centers during extreme heat events. Doing so can potentially fill gaps within the region where certain neighborhoods may not have easy access to cooling centers. The assessment could evaluate key factors such as location, accessibility by transit and walking, facility capacity, hours of operation, and the availability of critical infrastructure such as air conditioning, potable water, restrooms, and staff support.

Implementation partners

Metro and other public agencies could be primarily responsible for implementation.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	

Benefits	Enhanced Coordination	Cost estimate	$

Action 5.F. Develop programming for publicly-owned and operated cooling centers.

Overview

During the Cooling Corridors Study's community conversation with older adults who live alone in income-restricted housing, a participant shared that he utilized the Oregon Convention Center as a cooling center during the 2021 heat dome. He shared that the only activity he remembers being available at the cooling center was a television, leaving him and other community members without other options to keep them occupied or distracted.

To better support physical comfort, mental well-being, and social connection during extreme heat events, public agencies should develop programming for publicly-owned and operated cooling centers. This could include low-barrier activities such as games, reading materials, wellness resources, and community engagement opportunities.

The Oregon Convention Center can serve as a pilot site to test and refine programming before expanding to other regional cooling centers.

Implementation partners

Metro and other public agencies could be primarily responsible for implementation.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Improved Public Health, Increased Public Awareness	Cost estimate	$ $

Action 5.G. Host tabletop exercises with emergency response staff, first responders, and healthcare workers to discuss extreme heat protocols and support needs.

Overview

This action suggests hosting cross-sector tabletop exercises with emergency response staff, first responders, and healthcare workers to review and strengthen extreme heat response protocols. These exercises can help identify gaps in coordination, clarify roles and responsibilities, and uncover specific support needs, such as cooling resources, communication channels, or staffing, in advance of future heat events. Tabletop exercises

also offer a low-risk opportunity to build relationships across agencies and sectors, improving overall preparedness and resilience.

Implementation partners

Public agencies could be responsible for coordination and implementation.

Action typology	Programs and Operations		
Community priority		Level of effort	
Benefits	Increased Public Awareness	Cost estimate	

Bridging the awareness gap: Several public agencies across the region offer emergency response programs designed to support community members during extreme heat events. For example, the City of Portland's Bureau of Emergency Management operates a program to deploy tents and misting systems during heatwaves. However, engagement with community members made it clear that many are not aware of these available resources.

Action 5.H. Identify partnerships and funding to support implementation of free transit service regionwide during heat emergencies for trips to all locations, not just cooling centers.

Overview

During recent extreme heat events, TriMet, often aligned with Multnomah County emergency declarations, has offered fare-free rides to passengers heading to or from designated cooling centers, typically by asking riders to inform the operator of their destination.

This action suggests expanding the current policy of fare-free transit to cooling centers during declared heat emergencies by offering free transit service regionwide, regardless of destination. Providing unrestricted access would allow community members, especially those without personal vehicles, to reach libraries, malls, medical facilities, friends and family, or other safe, air-conditioned spaces. This approach supports broader mobility, equity, and safety goals during extreme heat events, particularly for those most vulnerable to heat-related illnesses.

Implementation partners

Transit agencies, Metro and other partners can support implementation by seeking or providing funding support, helping coordinate transit agencies and service providers, and promoting outreach.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Improved Public Health	Cost estimate	$ $

Action 5.I. Revise policies to activate splash pads and similar features based on temperature thresholds rather than fixed seasonal schedules.

Overview

In greater Portland, splash pads and interactive fountains are generally activated based on fixed seasonal schedules and not in response to temperature thresholds. For example, Portland Parks & Recreation operates splash pads daily from 10 a.m. to 8 p.m. starting June 14 through September 1 (Labor Day). In 2025, amid a heat wave Portland outdoor pools also extended their hours. In West Linn, spray pads follow a similar schedule for regular summer hours but are also operationalized from 10 a.m. to 6 p.m. starting May 28 for season opening.

This action suggests evaluating and updating operational policies so that public splash pads, fountains, and other cooling water features turn on at certain temperature thresholds, even if these temperatures are reached before existing schedules. By linking operations to temperature thresholds, cities can ensure timely access to outdoor cooling options for residents during unseasonal heatwaves, improving public health outcomes and promoting equitable access to relief.

Implementation partners

Local governments could be primarily responsible for implementation.

Action typology	Continue yet revise existing programs.		
Community priority	☑	Level of effort	
Benefits	Heat reduction, Improved public health	Cost estimate	$ $ $

Category 3: Expand cooling strategies

Recommendation 6: Improve access to home weatherization and air conditioning, especially for vulnerable populations.

Most people who die from heat-related causes die while inside their home. Here in greater Portland, 68 of the 72 Multnomah County residents who passed away during the 2021 heat dome died at home (94%) and only 10 of those who died had air conditioning (15%).

This recommendation calls public agencies to support increasing access to air conditioning (A/C) in residential buildings or spaces, such as schools, community centers, and workplaces.

While expanding access to air conditioning can be lifesaving during extreme heat, it also increases energy demand and greenhouse gas emissions. A more sustainable approach is to prioritize the installation of high-efficiency heat pumps, which not only provide reliable cooling but also significantly reduce emissions compared to traditional A/C units. By investing in heat pumps, the region can protect public health during heatwaves while advancing climate goals.

Near-term actions

Action 6.A. Improve access to home weatherization, cooling installation, and utility bill assistance programs for low-income households.

Overview

For many income-restricted households that lack air conditioning, expensive home retrofits may be hard to come by. Fortunately, programs exist in the region that help connect income-qualified community members with energy-efficient cooling solutions through home weatherization or free home-installations. Fort those who have access, many low-income residents, especially older adults living alone, are hesitant to use air conditioning during extreme heat due to concerns about high utility bills. During a conversation with older adults that live in income-restricted housing, the project team learned that oftentimes they will only use their air-conditioning for a few hours at the hottest time of day, even if high temperatures persist, because they are afraid that the costs of their monthly utility bill will go beyond the monthly stipend they receive for utilities.

Metro and partner agencies should work with utility providers and community-based organizations to increase awareness of existing assistance programs, ensure eligible households are enrolled, and provide targeted outreach ahead of and during heat season. In addition, utilities should explore expanding these programs to offer supplemental support

during declared heat emergencies, helping ensure that cost does not prevent vulnerable residents from staying safe and cool.

Implementation partners

Depending on the scale of distribution the implementation partners would change, however we see potential for delivery at multiple scales from community groups up to state agencies.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Improved Public Health, Increased Public Awareness, Enhanced Coordination	Cost estimate	$ $

Future actions

Action 6.B. Seek additional funding to expand existing cooling programs.

Overview

There are a number of existing programs across the state and Portland region that provide cooling equipment to people in need. Since the summer of 2022, the City of Portland's Cooling Portland program has worked to deliver and install efficient and portable heat pump cooling units to Portlanders most at risk for heat-related illnesses. Funded by the Portland Clean Energy Fund's (PCEF) climate resilience program, the program prioritizes households with older adults, especially those that are low-income and people of color. Initially, the program planned to distribute up to 15,000 units. However, in December of 2024, Portland City Council approved program expansion, and PCEF allocated $10.3 million to the program, allowing it to help 10,000 additional households through 2026.

In addition to the hyper-local efforts of PCEF, The Oregon Department of Energy also operates the Community Heat Pump Deployment Program ans well as the Oregon Rental Home Heat Pump Program to address this issue at a state level.

Some community-based organizations, including Verde and Community Energy Project, help connect income-qualified community members with energy-efficient cooling solutions. Verde's Home Heating and Cooling program provide affordable solutions across Portland. Community Energy Project provides two programs: a program funded by PCEF that provides a

complete home energy retrofit and a free home repair program that provides more minor weatherization projects.

Additional funding can support a range of programs that help residents stay safe during extreme heat. These include:

- Partnering with community-based organizations to expand weatherization or retrofit programs that provide heat pumps or A/C units to low-income households.
- Offering free or low-cost A/C units for residents in older buildings or without adequate cooling, especially older adults, people with disabilities, or others who are at higher heat-risk.
- Developing a regional subsidy program to assist with the purchase and installation of cooling equipment, including energy-efficient systems.
- Expanding distribution programs to provide portable or window A/C units to income-qualified households.
- Supporting cooling-as-resilience programs that offer education, installation support, and long-term maintenance.

These programs can help address disparities in access to cooling and reduce heat-related illness across the region.

Implementation partners

Public agencies and community organizations could be primarily responsible for implementation.

Action typology	Funding and Resoures		
Community priority	☑	Level of effort	
Benefits	Improved public health	Cost estimate	$ $ $

Keeping Portland cool – but more is needed elsewhere: Expanding funding and services to reach all jurisdictions across the region will ensure that residents, no matter where they live, have access to the tools and protections they need during extreme heat events.

Action 6.C. Equip all schools without air conditioning with effective cooling systems.

Overview

Only 15 of the 81 schools in the Portland Public Schools system, Oregon's largest school district, have access to air conditioning, and most schools across the region have instituted early release days or complete cancellations when temperatures reach at least 90 degrees Fahrenheit due to a lack of cool air in school buildings.

Trying to learn in overheated classrooms is uncomfortable and can diminish focus, retention, and overall well-being for students, teachers, and other staff. Releasing students early or canceling classes altogether disrupts instruction, widens learning gaps, and can place additional burdens on working families who must arrange last-minute childcare.

This action calls for the installation of heat pumps, air conditioning systems, or heating, ventilation, and cooling (HVAC) systems in all schools in the region that lack access.

Implementation Partners

School boards, district administration, and staff can partner to develop bond measures that propose funding for a school systemwide retrofit project.

Action typology

Community priority	☑	Level of effort	
Benefits	Improved public health	Cost estimate	$ $ $

Recommendation 7: Promote investment in green infrastructure, energy-efficient cooling, and climate-resilient streetscapes and public and private spaces.

This recommendation encourages increased investment in green infrastructure and energy-efficient cooling technologies to reduce urban heat, provide immediate relief from hot temperatures, and improve climate resilience. Enhancing streetscapes and public and private spaces with adaptive features, such as shade trees, permeable pavements, reflective surfaces, and heat pumps, can lower temperatures, improve air quality, provide cooling, and create healthier, more comfortable environments for all. Further, incorporating smart surfaces into traffic calming measures cost-effectively reduces traffic-related accidents, mitigates stormwater runoff and extreme heat, and improves air quality, making the built environment safer and more appealing to pedestrians and bikers. Developing curb extensions, roundabouts, and painted lanes that simultaneously incorporate urban greening,

reflective coatings, and permeable pavement technologies can address both pedestrian and biker safety as well as the urban heat island effect.

Near-term actions

Action 7.A. Remove regulatory barriers to support the installation of green infrastructure, energy-efficient cooling equipment, and other cooling amenities in new and existing buildings and renovations, development, and public, commercial, and other private spaces.

Overview

This action recommends that local governments remove regulatory barriers to support the installation of green infrastructure, energy-efficient cooling equipment, and other cooling amenities.

Local governments should review and revise development codes, zoning regulations, and permitting processes that may unintentionally limit the use of cool roofs, green roofs, solar panels, green siding, shade structures, air-conditioning units or systems, heat pumps, passive cooling strategies, bioswales and raingardens, permeable or reflective pavement, de-paving, or other cooling interventions. Removing these barriers can make it easier for both public and private projects to incorporate features that reduce indoor and outdoor temperatures, manage stormwater, and increase heat and climate resilience.

Metro can support this action by providing up-to-date data and mapping to identify priority areas and convening local partners to align strategies. These efforts can help local governments revise regulations and accelerate the adoption of cooling and green infrastructure across the region.

Implementation partners

Local governments are primarily responsible for implementation. However, Metro Could provide the role of gathering resources at the national level for dissemination to local partners.

Action typology	Policy and Governance		
Community priority		Level of effort	
Benefits	Heat reduction, Enhanced environmental health	Cost estimate	$

Future actions

Action 7.B. Incentivize the installation of green infrastructure and energy-efficient cooling features in new and existing buildings and renovations, development, and public, commercial, and other private spaces.

Overview

This action recommends that local governments incentivize developers, property owners or managers, and landlords to support the installation of green infrastructure, energy-efficient cooling equipment, and other cooling amenities.

Local governments can provide incentives, such as expedited permitting, or bonus density or floor area ratio, for projects that integrate features like cool roofs, green roofs, solar panels, green siding, shade structures, air-conditioning units or systems, heat pumps, passive cooling strategies, bioswales and raingardens, permeable or reflective pavement, de-paving, or other cooling strategies.

Metro can support these efforts by piloting these features on Metro-owned facilities, properties and buildings. These investments improve long-term resilience to extreme heat, reduce energy costs, and advance regional sustainability and equity goals.

Implementation partners

Local governments are primarily responsible for implementation. However, Metro can provide support as needed.

Action typology	Policy and Governance		
Community priority		Level of effort	
Benefits	Heat reduction, Enhanced environmental health	Cost estimate	$ $

Community-led visioning for 82nd Avenue: In July 2025, Metro co-hosted a community workshop funded by the U.S. Environmental Protection Agency focused on 82nd Avenue, which gathered local, regional, and state-level public agency staff, local community group representatives, and neighborhood residents to develop a vision and action plan for the corridor. Workshop participants expressed great interest in the use of green infrastructure to cool the disproportionately hot corridor and public and private partnerships to support implementation of the cooling features.

Action 7.C. Educate developers on the costs and benefits of installing cooling or energy efficient design features.

Overview

This action involves developing and delivering educational programs, such as a presentation, workshop, or technical assistance program, to help developers understand the lifecycle costs, long-term cost savings and broader benefits of installing cool roofs, green roofs, window shades, solar panels, and other energy-efficient or cooling design features.

Metro staff identified that the costs of these design features are not always fully incorporated early in project planning. The program should emphasize the importance of accounting for these costs early in the development process, ideally during project budgeting and conceptual design. Equipping developers with this knowledge can improve adoption and integration of climate-smart building practices across the region.

Implementation partners

Metro and local governments could support the development of educational materials and coordinate outreach. The planning and building departments for local governments could consider integrating the programs into permit processes to help developers connect to the information. There is also an opportunity to partner with established building and development organizations to hold formal educational events or workshops. Relevant community groups could support program delivery.

Action typology	Programs and Operations		
Community priority		Level of effort	
Benefits	Increased public awareness	Cost estimate	

Action 7.D. Compile and document information on available grant funding sources and incentive programs that can be shared with other jurisdictions, developers, and homeowners.

Overview

This action involves compiling a centralized resource that identifies available grant funding sources and incentive programs for the installation of cooling and energy-efficiency strategies, such as cool roofs, green roofs, solar panels, green siding, window shading devices, and air-conditioning units and systems. The document should be regularly updated and easily accessible to developers and homeowners interested in or encouraged to adopt

climate-resilient building strategies. Where possible, the document should highlight eligibility criteria, application processes, deadlines, and links to technical assistance to maximize impact and usability.

Implementation partners

Metro is primarily responsible for implementation.

Action typology	Funding and Resources		
Community priority		Level of effort	
Benefits	Increased public awareness	Cost estimate	$ $

Action 7.E. Identify opportunities and funding to make transit stops and other public spaces cooler and more comfortable during hot weather.

Overview

This action calls Metro and partner agencies, including transit agencies, to improve thermal comfort in public spaces, including transit stops, plazas, and parks, by incorporating features such as shade structures (paired with smart surfaces), misting systems, and other green infrastructure. Prioritization should be given to transit corridors and neighborhoods with limited tree canopy, high pedestrian activity, and communities vulnerable to extreme heat. Agencies can explore activating certain features, like misting stations, when temperatures exceed specific thresholds to maximize effectiveness and resource efficiency. Enhancing comfort in these spaces will improve health, safety, and equity for people who rely on public infrastructure during heat events.

Implementation partners

Metro and other public agencies, namely local governments and transit agencies could be responsible for implementation.

Action typology	Funding and Resources		
Community priority	☑	Level of effort	
Benefits	Heat reduction, Improved public health, Enhanced	Cost estimate	$ $

environmental health

Cool by design: An idea that emerged repeatedly during engagement events was the creative integration of public art installations with cooling strategies such as engineered shade structures. This approach provides not only relief from extreme heat but also enhances community identity by making public spaces more inviting and culturally meaningful. By combining art and design with cooling strategies, these installations can foster community pride while addressing heat vulnerability in public areas.

Recommendation 8: Support coordinated regional efforts to plant, protect, and maintain trees long-term.

This recommendation focuses on building a consistent, collaborative approach to growing and sustaining the region's tree canopy. Metro can work with local governments, community organizations, and state and federal partners to align tree-planting goals, share best practices, and coordinate funding. Efforts would include protecting existing mature trees, planting new trees in priority areas with low canopy and high heat risk, and ensuring long-term maintenance so trees thrive over time. Coordinated action will expand equitable access to shade, improve air quality, enhance habitat, and support regional climate resilience goals.

Near-term actions

Action 8.A. Establish and coordinate ambitious, equity-focused tree canopy coverage goals across the region.

Overview

Some cities in the Portland metropolitan area, such as Portland, Gresham, and Beaverton, have already adopted tree canopy coverage goals to improve air quality, reduce urban heat, and support community health. This action encourages all jurisdictions to set and regularly update tree canopy goals that reflect local conditions and equity priorities. Other city governments that have not adopted tree canopy coverage goals can consider learning from the approaches of the cities that have.

Goals could be informed by tree canopy coverage data, regionwide heat maps, and community input, especially in areas with low canopy coverage or higher vulnerability to extreme heat identified by the Cooling Corridors Study.

Metro can support this work by setting a regional tree canopy coverage goal, coordinating regional data collection and data sharing, providing technical assistance, and encouraging alignment with broader regional climate goals.

Implementation partners

City governments are primarily responsible for implementation. However, Metro can provide support through coordination, technical assistance, and data provision.

Action typology	Policy and Governance		
Community priority	☑	Level of effort	
Benefits	Heat reduction, Improved public health, Enhanced environmental health	Cost estimate	$

Small investment and big returns: Treebate in Portland is an annual program, running from September 1 to April 30, that provides a one-time credit on residents' water, sewer, and stormwater bill for planting a tree in their residential yard. Larger trees receive larger credits because they will capture a greater amount of rain when they are fully grown. This type of program can encourage homeowners to plant trees in their yards that can help reduce the amount of stormwater runoff in sewer systems and pollution to rivers.

Future actions

Action 8.B. Implement or expand street tree planting pilot projects in the neighborhoods most vulnerable to heat.

Overview

This action recommends planting more street trees in heat-vulnerable neighborhoods to reduce temperatures, improve air quality, and create shaded spaces that make those streets safer and more comfortable during extreme heat events. Pilot projects in areas with low tree cover and high levels of pavement allow agencies to test effective planting strategies, engage residents in stewardship, and identify the best tree species for long-term climate resilience while helping protect the communities that live there

One example pilot project is the City of Portland's Trees in the Curb Zone Pilot Project that aims to expand Portland's street tree canopy through planting street trees along corridors that do not have them or space for them. Creating space for new street trees will be done by

repurposing on-street parking and curb zones along corridors to now hold planters suitable for street trees. This pilot project is taking place in the Lents neighborhood, after considering the amount of available on-street parking, lack of street trees, locations of underground or overhead utility lines, and the urban heat index. All trees planted as part of this project will be owned and maintained by Portland Parks & Recreation's Urban Forestry team, which is notably different than the traditional maintenance responsibility falling on the adjacent property owner.

Implementation partners

Metro and local governments can implement or expand pilot projects. Transit agencies, utilities, and community groups can support implementation by helping plant trees and communicate with neighbors.

Action typology	Infrastructure and Design		
Community priority	☑	Level of effort	
Benefits	Heat reduction, Improved public health, Enhanced environmental health	Cost estimate	$ $ $

Shift the burden away from residents: Shifting the cost of tree maintenance from individual residents to public agencies can help ensure that street trees are planted and cared for equitably. In many parts of the region, the expense and responsibility of clearing fallen branches, pruning, and addressing roots pushing up surrounding sidewalk discourages residents, especially those in lower-income communities, from planting or keeping trees. By taking on these costs, public agencies can remove a major barrier, expand the urban canopy where it's needed most, and protect these important assets for a long time.

Lost in the weeds: The Climate Adaptive Plant Materials working group is researching how some of the most common species in the region will handle climate change impacts in the future as well as researching how to best bring in new plant stock that is more climate resilient. Outside of the working group, many are unaware of the valuable work already being done because there is currently no central online hub for their resources and findings. Metro can create a better online presence for the group where

resources and findings can easily be shared with other public agencies and community groups.

Action 8.C. Partner with community-based organizations offering tree care or habitat restoration workforce development programs to expand training and certification and offer career pathways in urban forestry teams.

Overview

There are several pathways available in greater Portland for people interested in pursuing a career in urban forestry, habitat and natural area restoration, or similar fields. Some examples include:

- Friends of Trees' Adult Urban Forestry & Restoration Training Program (AUF) is a 10-week paid training and internship program that offers classroom education, professional networking, and fieldwork to historically underrepresented communities in greater Portland. After training, AUF matches participants with internships at host sites across the region to gain on-site work experience in urban forestry and natural area restoration.
- Wisdom of the Elders, Inc. offers a workforce development program and paid internships that give environmental education, job skills, and career pathway support to people who want to work in the environmental sector. Both opportunities focus on environmental restoration and sharing Indigenous Traditional Ecological Knowledge (ITEK), which encompasses the environmental knowledge, practices, and worldviews of Indigenous peoples that have been gathered and passed down across generations.
- The Blueprint Foundation is leading the Green Workforce Academy, a five-week pre-apprentice program that provides career training and opportunities for 18 to 25 year-old Black, Indigenous, and other people of color in Portland. Developed in partnership with Native American Youth and Family Center (NAYA), Self Enhancement, Inc., Wisdom of the Elders, and Ecotrust, the curriculum includes caring for fruit trees, restoring natural habitats, and tending to urban gardens in underserved communities.
- Friends of Tryon Creek's Green Leaders Workforce Development Program is an opportunity for early-career youth to hone their environmental education, restoration, and professional skills. The program is paid and intended for individuals from marginalized communities.

Though these types of partnerships do exist in the region, Metro and local governments could continue to build on existing community-led initiatives through enhanced funding, policy

support, or partnership building doing so can continue to prepare people for careers in urban forestry, natural area restoration, or related fields to provide career opportunities after graduation from the programs.

Implementation partners

Metro, local governments, and community-based organizations can continue to partner and expand those partnerships.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Improved economy	Cost estimate	$ $ $

Action 8.D. Partner with utilities and nonprofits to plan and implement regionwide tree planting and greening initiatives.

Overview

This action suggests working collaboratively with utility providers, nonprofit organizations, and community groups to design and carry out coordinated tree planting and urban greening efforts across the greater Portland region. Partnerships can leverage funding, share expertise, and align priorities to maximize benefits such as reducing urban heat, improving air quality, and enhancing community well-being. Efforts should prioritize neighborhoods with the greatest vulnerability to extreme heat and limited existing tree canopy.

Implementation partners

Metro, local governments, utilities, nonprofit organizations, and community groups can all support implementation.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	
Benefits	Heat reduction, Improved public health, Enhanced environmental health	Cost estimate	$ $ $

Action 8.E. Explore opportunities to underground utility wires throughout the region.

Overview

This action suggests assessing the feasibility of moving overhead utility lines underground in targeted areas to reduce power outages during extreme weather, improve public safety, enhance neighborhood aesthetics, and allow for more uninhibited street tree canopy. Coordination with utility providers, local governments, and community stakeholders can help identify priority locations, potential funding sources, and strategies to minimize costs and disruption.

Implementation partners

Metro, local governments, and utilities can support implementation.

Action typology	Infrastructure and Design		
Community priority		Level of effort	
Benefits	Enhanced environmental health	Cost estimate	$ $ $

Space to grow: Overhead lines often limit the types and sizes of trees that can be planted along streets. Branches that grow into electricity lines can create safety hazards and service disruptions, requiring frequent pruning that weakens or distorts tree canopies. By placing wires underground, communities can reduce these conflicts, allowing for healthier, larger tree growth that provides more shade and long-term cooling benefits.

Recommendation 9: Preserve and enhance access to parks and open spaces as cooling refuges.

Large parks and open spaces play a vital role in reducing extreme heat. Research shows that green spaces over 25 acres can produce significant localized temperature reductions, cooling surrounding areas within roughly 350 meters. By preserving existing natural spaces, improving amenities, and expanding equitable access, these areas can serve as essential “cooling refuges” where residents can find relief from high temperatures. Enhancements, such as shade trees, water features, comfortable seating, and safe walking or transit access, can help ensure these areas are accessible and comfortable for everyone, especially those most at risk during extreme heat events.

Near-term actions

Action 9.A. Continue and expand programs that preserve existing parks, acquire land for conservation, and support habitat restoration.

Overview

Several programs in greater Portland currently support the preservation of parks, acquisition of land for conservation, and habitat restoration. These include:

- Metro's Nature in Neighborhoods program funds community-led restoration, land acquisition, and urban transformation projects that protect water quality, fish and wildlife habitat, and connect people with nature.
- Metro's Protect and Restore Land program aims to purchase land from willing sellers in the Portland metro region to restore and preserve regional watersheds, natural habitats, and culturally important plants as well as provide opportunities to create future potential access to nature.
- The City of Portland's Land Acquisition Program acquires property for park purposes using a variety of funding sources, including grants, special one-time allocations from City Council, bond measures,
- Parks System Development Charges (SDCs) are one-time fees assessed on new development or redevelopment projects to help fund the cost of expanding parks and recreation facilities needed to serve growing populations. These charges are typically collected by local governments when a building permit is issued and are based on the type and scale of development (e.g., residential vs. commercial, number of dwelling units)
- As the name suggests, tax increment financing (TIF) programs are funded by tax increments that result from the increase in property values after new development occurs in designated geographic areas known as TIF districts. TIF programs, such as Prosper Portland, allow local governments to invest in infrastructure and other improvements in those designated geographic areas, including parks and natural spaces.

As climate change continues and development pressures grow, it is vital to preserve these existing efforts and consider new ones that expand the reach and impact of current preservation and restoration programs. New initiatives could create incentives for habitat restoration or conservation on private land, connect parks through greenway corridors, and prioritize land acquisition in fast-growing suburbs.

Implementation partners

Metro and other public agencies could be primarily responsible for implementation.

Action typology	Programs and Operations		
Community priority		Level of effort	
Benefits	Heat reduction, Improved public health, Enhanced environmental health	Cost estimate	$ $ $

Future actions

Action 9.B. Explore opportunities to extend hours of access to local and regional parks during extreme heat events.

Overview

This recommendation emerged from a conversation with emergency managers in Metro's Parks and Nature department who noted that unhoused community members and others lacking access to indoor cooling frequently rely on parks for shade and relief from high temperatures during extreme heat events. However, most parks close in the evening, even though temperatures can remain dangerously high, leaving vulnerable populations without safe, accessible places to cool down.

To address this, this action encourages public agencies to explore extending park hours or designating certain parks to remain open later during heatwaves. Implementation could involve coordinating with park rangers, law enforcement, and social service providers to ensure safety and accessibility, as well as providing cooling resources such as water stations, misting tents, shaded rest areas, and clear public communication. Partnerships with community-based organizations can support outreach and services to those most at risk, ensuring that extended park access is effective and equitable.

Implementation partners

Metro, parks providers, and other public agencies could be primarily responsible for implementation.

Action typology	Programs and Operations		
Community priority	☑	Level of effort	

Benefits	Improved public health	Cost estimate	$ $ $

Action 9.C. Sustain and expand restoration and water quality projects that support climate resilience.

Overview

This action suggests sustaining and expanding restoration and water quality projects in greater Portland, such as local watershed health programs and habitat restoration initiatives. These efforts protect and enhance natural ecosystems, improve stormwater management, reduce flood risks, and increase shade and cooling along waterways. By supporting these projects, the region strengthens climate resilience for both communities and native wildlife, while promoting healthier, more livable neighborhoods.

Implementation partners

Local watershed councils, city and county environmental services departments, Metro, state agencies (e.g., Oregon Department of Environmental Quality, Oregon Department of Fish and Wildlife), tribal governments, environmental nonprofits, parks and recreation departments, and community-based organizations.

Action typology	Continue and expand programs.		
Community priority		Level of effort	
Benefits	Heat reduction, Improved public Health, Enhanced environmental health	Cost estimate	$ $

Action 9.D. Expand safe, pedestrian-friendly public access to rivers, especially in underserved and heat-vulnerable areas.

Overview

This action suggests expanding pedestrian-friendly public access points to rivers to improve community connectivity to natural cooling resources, support outdoor recreation, and enhance equitable opportunities for all residents to benefit from shade and water-based relief during extreme heat events. Prioritizing access in underserved neighborhoods can help reduce heat vulnerability and promote health and well-being.

Implementation partners

Local governments, parks and recreation districts, community-based organizations, environmental nonprofits, state natural resource agencies, tribal governments, and watershed councils.

Action typology	Infrastructure and Design		
Community priority		Level of effort	
Benefits	Improved public health	Cost estimate	$ $

Action 9.E. Develop standards that require adequate access to open and green spaces in all new development or redevelopment projects.

Overview

This action encourages local governments to evaluate and create standards that ensure new developments include meaningful open and green spaces. Integrating these spaces can improve neighborhood livability, support cooling, enhance biodiversity, and provide essential recreation opportunities for residents.

Local governments can update zoning codes and development regulations to require developers to preserve a minimum percentage of their sites as open space, green space, or landscaped areas. Other examples of implementation include requiring tree canopy preservation, on-site stormwater management features like bioswales, rain gardens, urban meadows, or the inclusion of ecologically friendly public plazas and courtyards that provide environmental and community benefits.

Metro can support these efforts by developing model zoning language or publishing regional design guidelines that promote consistent, equitable, and climate-resilient approaches to the integration of open and green space into new development or redevelopment across greater Portland. One existing example is Metro's Urban Growth Management Functional Plan (UGFMP), which sets minimum standards that cities and counties must follow to implement the Regional Framework Plan and manage growth within the urban growth boundary. The UGFMP can serve as a framework to ensure that green space standards are applied consistently and equitably across jurisdictions.

Implementation partners

Local governments could be primarily responsible for implementing. However, Metro could support implementation with research and resources.

Action typology	Policy and Governance

Community priority		Level of effort	
Benefits	Heat reduction, Improved public health, Enhanced environmental health	Cost estimate	$ $

Chapter 7: Charting a path forward

A foundation for future work

The Cooling Corridors Study was born out of the urgent need to address the growing risks of extreme heat in greater Portland, especially for communities most impacted and at risk. The study produced several important findings that highlight both the scale of the region's heat challenges and opportunities for local and regional action. The study recommendations were shaped by direct engagement with people who have experienced the impacts of high heat and professional experts paired with thorough background research. The recommended strategies respond to community priorities, while being grounded in scientific research and best practices from other places.

The comprehensive scan of existing cooling strategies identified over 30 strategies across eight topic areas. Over 40 engagement touchpoints uncovered existing regional and community needs and priorities and revealed existing local efforts and challenges that Metro and partners face when working to adapt to heat and worsening climate issues.

The result is a set of equity-centered and actionable findings, nine recommendations and over 30 potential supporting actions that provide a roadmap for coordination action that can inform updates to Metro's broader climate and land use policies, guide future investments in transportation and infrastructure, and shape partnerships with cities, counties, transit agencies, service providers, community based organizations, businesses and private developers.

Charting a path forward

At its core, this work is about more than cooling streets or planting trees. It is about building a healthier, more resilient and connected region where every resident has access to safe refuge today and 100 years into the future.

The study provides a comprehensive framework for local and regional action that combines recommendations for immediate protections, future planning, partnerships and investment to help prevent heat-related illnesses and deaths. The potential actions outlined here recognize that no single solution is sufficient, but together they chart a path forward. As climate impacts intensify, the findings here can inform other areas of climate resilience planning, from wildfire smoke preparedness to flood mitigation.

Realizing these opportunities will depend on strong and enduring partnerships between community organizations, public agencies and regional leaders. By working together, the region can ensure that investments in cooling corridors do more than respond to extreme heat. These investments can weave resilience, equity and care for place into the fabric of the region, leaving a legacy of innovation and community care for the generations that follow.