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Growing Deeper Roots: Toward Resilient Urban Forests

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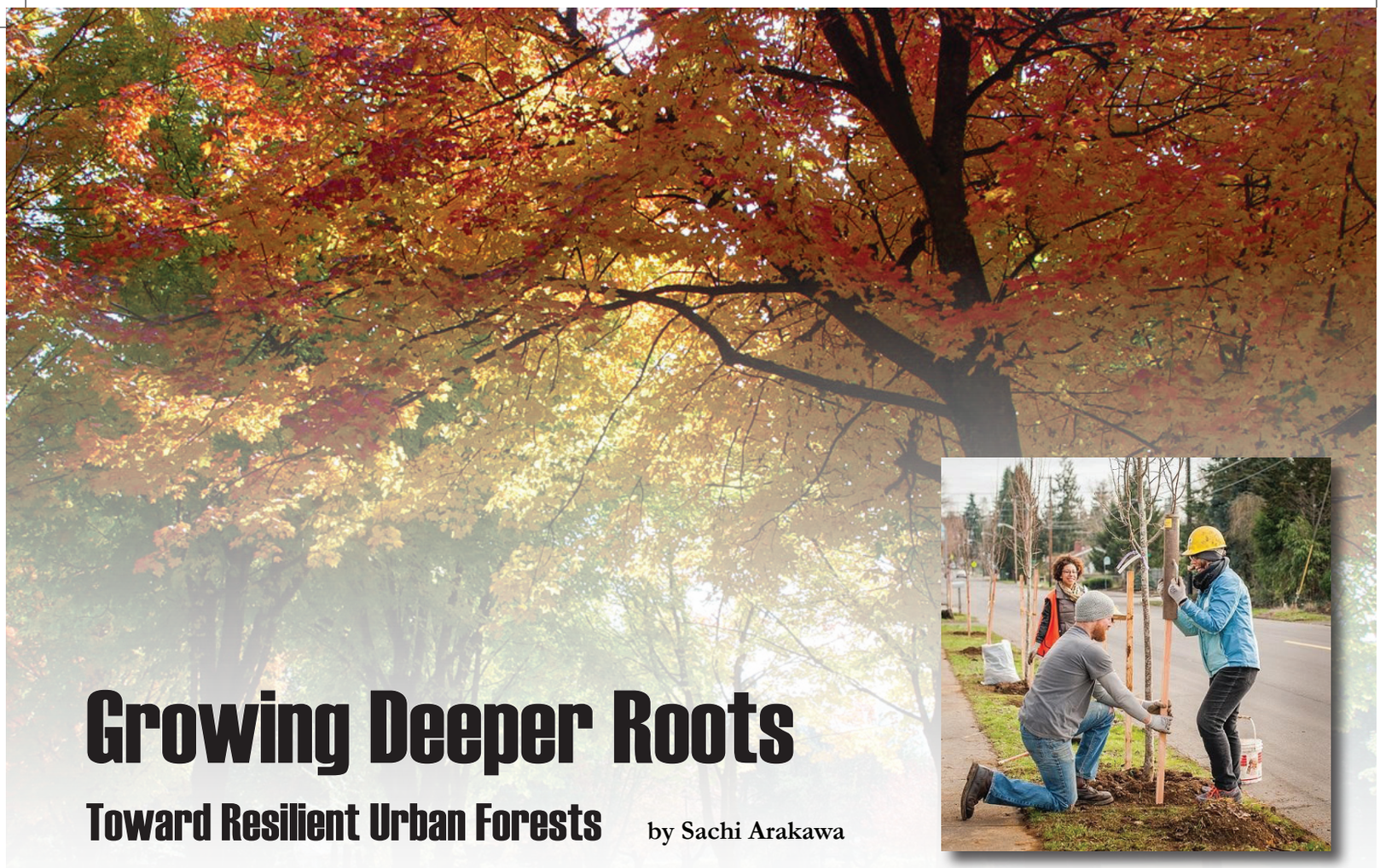

Growing Deeper Roots

Toward Resilient Urban Forests

by Sachi Arakawa

Above: Bella Vista Park (Photo: City of Gresham)

Above-right: Friends of Trees volunteers planting street trees in Vancouver, WA. (Photo: Friends of Trees)

Photos by author unless otherwise noted.

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Almost everyone has a favorite tree. Whether it is the largest, the most beautiful, or just a tree that holds a special memory for you, these arboreal embodiments of history and geography make up a large part of our environment. For many who grew up as city dwellers, a street tree might be their first experience of nature. Neighborhoods and even cities can be defined by their urban forest (or lack of one). The urban forest includes trees along the street, in parks and natural areas, in commercial and industrial areas, and in our own backyards. The urban forest is more than just trees though. It is a complex system that affects and is affected by other plants, wildlife, soils, and the air around our city.[1] In the Portland Metro area, the way we manage our trees varies widely depending on the size, capacity, and needs of the city. Growing a healthy urban forest takes a village, and as our population grows, local urban forestry programs are looking to the community to help them protect and preserve the trees in our cities. Understanding how our urban tree can-

1. Portland Parks and Recreation, "Portland Urban Forestry Management Plan 2014," March 2014, i, https://www.portlandoregon.gov/parks/38306?a=184641

opy is managed and the challenges that it faces helps us to ensure the region's urban forest infrastructure for current and future generations.

Why Do Trees Matter?

The value of trees to a city can hardly be overstated. They provide shade and mitigate urban heat island effect. They promote carbon dioxide exchange, reduce energy use, reduce air pollution, improve water quality, and mitigate stormwater runoff.[2] We also know that interactions of humans with trees in urban settings have positive psycho-social benefits.[3] The presence of nature and greenspace in cities has been shown to help reduce stress and anxiety, improve medical recovery, contribute to greater productivity and satisfaction with work, and generally enhance quality of life.[4] As Jill Jonnes, author of *Urban Forests* puts it, walking down a tree-lined street can make one feel as though they are walking below "the most perfect roof in nature, [it is] enough to make one feel civil, even neighbourly."[5]

In the Portland Metro region, urban forestry programs vary from city to city. Major cities like Portland and Vancouver have comprehensive programs. Both cities have a designated city forester, an urban forestry plan, and outreach and education programs that host events and trainings for the community. The City of Portland additionally has a staff of arborists dedicated to maintenance, and staff who handle permitting. Cities like Gresham and Lake Oswego do not have the capacity to run a dedicated urban forestry program, but instead they depend on a variety of partners to help manage their trees. These partners can range from volunteer-driven groups like forestry councils and nonprofit organizations, to state or county run programs designed to support conservation efforts. Gresham's small-capacity forestry program is led

2. University of Washington, Human Dimensions of Urban Forestry and Urban Greening, "What is Urban and Community Forestry," http://www.naturewithin.info/UF/UFdefined.html
3. Andrea Faber Taylor, Angela Wiley, Frances E. Kuo, and William C. Sullivan, "Growing up in the Inner City: Green Spaces as Places to Grow," Environment and Behavior 30, no. 1 (1998): 3–27.
4. University of Washington, Human Dimensions of Urban Forestry and Urban Greening, "What is Urban and Community Forestry," http://www.naturewithin.info/UF/UFdefined.html
5. Jonnes, Jill. Urban Forests: A Natural History of Trees and People in the American Cityscape. New York. Penguin Random House, 2017.

What is Urban Forestry?

Urban forestry is the cultivation and management of trees in urban areas, and is sometimes referred to as city forestry or community forestry. The United States is a leader in the field of urban forestry. Trees and greenspace have been valued in urban environments in America since the mid-nineteenth century, when urban designers like Frederick Law Olmsted, Ebenezer Howard, and Patrick Geddes began exploring the value of green space and trees as an integral (and valuable) part of the metropolitan landscape.[1]

The concept of urban forestry emerged here during the 1960s as the introduction of new devastating pests and pathogens created a need for the management systems to cope with them.[2] *The development of tree ordinances emerged as Dutch elm disease ravaged cities in the eastern United States from the 1930s to 1960s. The movement continued to grow in response to urban development and loss of urban tree canopy.*

The 1980s brought a second generation of city tree ordinances, due to a growing desire in communities to preserve nature as new development happened. These new ordinances often included specific provisions such as the diameter of trees and percentage of trees to be protected during development.[3] *This era also saw the creation of nonprofit organizations functioning as community tree advocates.*

Today contemporary urban forestry programs often rely heavily on nonprofit tree advocacy groups for tree plantings, outreach, and stewardship efforts.[4] *Groups like the Arbor Day Foundation, working at the national level, also provide support for local urban forestry efforts.*

1. Robert Young, "Interdisciplinary Foundations of Urban Ecology," Urban Ecosystems 12 (2009): 311–331.
2. Mark Johnston, "A Brief History of Urban Forestry in the United States," Arboricultural Journal: The International Journal of Urban Forestry 20, no. 3 (1996): 257–278.
3. Haileng Xiao, "Local Ordinances to Protect Private Trees: A Field Investigation and an Analysis," ProQuest Dissertations and Theses, 1995.
4. Wolf, "Introduction to Urban and Community Forestry Programs," 19–28.

The Dollar Value of Trees

In the last decade, researchers have found a way to put a dollar amount on some of the benefits trees give us, through a program called i-Tree.

i-Tree is a state-of-the-art, peer-reviewed software suite from the US Forest Service that helps urban foresters assess and quantify various components of their tree population. i-Tree takes details from existing inventories and quickly produces a cost-benefit analysis of the trees to the community.[1] *In 2006, the City of Portland used iTree to perform a comprehensive analysis of the structure and function of the city's trees, and to assign an economic value to the benefits they provide.*

The iTree analysis demonstrated that for every dollar invested in the public tree asset, Portland enjoys three dollars and eighty cents in benefits.[2] *According to the City of Portland's tree inventory, the city's street trees produce an estimated $28.6 million annually in environmental and aesthetic benefits.*[3]

1. iTree: Tools for Assessing and Managing Forests & Community Trees, https://www.itreetools.org/
2. Angie DiSalvo, Julie Fukuda, and Jeff Ramsey, "Street Tree Inventory Report: City of Portland" (April 2017).
3. DiSalvo, "Street Tree Inventory."

by a natural resources planner in the Urban Design and Planning Department. The program has a lean budget and limited resources, so it relies on coordination with other city departments to keep the urban forest healthy and abundant. The city's Transportation and Park Operation Divisions handle some basic tree removal and replacement in streets and parks, and the Environmental Services Department handles tree installation, riparian restoration, and pest management. Until recently, the City of Gresham had little budget to plant new trees or provide the community with tree education. However, in 2017, Multnomah County, the City of Gresham, and Friends of Trees jointly received a $143,000 three-year Partners in Conservation grant from the East Multnomah Soil and Water Conservation District (funded by Oregon's Department of Natural Resources) for tree planting and forestry education. The grant will help Gresham grow their community forestry program to include education, outreach, and tree plantings. The city and its grant partners plan to hold a Trees and Health Symposium next year, a culmination of the work done with the grant money, showing the planting numbers and demonstrating how trees benefit air quality, public health, and walkability.

Challenges to Building a Healthy Urban Forest

Caring for urban trees comes with its own set of challenges, from combating destructive pathogens and pests to addressing concerns about environmental equity. A healthy urban forest should be diverse in both age and species, abundant, and resilient, but urban trees take a lot of abuse. Many are not planted in an ideal location, while others suffer damage from cars or vandalism. Keeping our city trees healthy is a big job.

Pests

One of the greatest threats to an urban forest is pests and pathogens. Portland has felt the effects of Dutch elm disease for many years, and the city is taking steps to manage and mitigate tree loss. In Europe, the American Midwest, and East Coast, Dutch elm disease and emerald ash borer have decimated urban forests, causing tree loss often in the millions and leaving formerly tree-lined roads without greenery or shade.[6] Not only do these pests cause huge tree casualties, but as a result they cost cities millions of dollars to clean up the diseased and dying trees. Cities like Detroit, Cincinnati, and Indianapolis are still paying for the damage these destructive pests have caused. Research by the US Forest service predicts that the cumulative effects

6. City of Portland Parks and Recreation, "Elm Protection Program and Dutch Elm Disease (DED)," https://www.portlandoregon.gov/parks/article/424029

of emerald ash borer will cost an estimated $10.7 billion nationally by 2019. This includes the cost of ash tree treatment, removal, and replacement (re-planting of new trees) for an estimated loss of 17 million ash trees.[7]

We are lucky that the Portland region has not yet seen the large-scale devastation that other US cities have because many of these pests have not yet reached us, but one case of contamination can quickly spread across an entire city with devastating and costly results.

Maintenance

Maintenance is another important component of most urban forestry programs, though it is often overlooked and underfunded. Angie DiSalvo, Outreach and Science Supervisor for Portland's Urban Forestry Department says, "Tree planting is a very visible, feel-good activity that captures the public's attention, but it's just one small part of the big picture. Maintenance doesn't have that same appeal. Not only will trees that are not maintained have shorter lifespans, but they will cost more in the long run. Like with anything else, a little preventative maintenance goes a long way." While trees have huge monetary benefits for cities, they can also be costly to maintain and remove if they are not cared for correctly early in their lives. Currently, most cities in the Portland Metro area have a similar approach to street tree maintenance, where the city regulates the trees in public rights-of-way, but the person who owns the property adjacent to a tree is responsible for maintaining the tree.

Required maintenance includes pruning, planting, tree removal, leaf disposal, and sidewalk repair from tree root damage. This means people may find themselves having to pay to prune or remove a tree from the planting strip in front of their house, even though it is in the right-of-way that is owned by the city. In addition, property owners can be held liable for damages caused by the trees.[8] These

7. US Forest Service, "Emerald Ash Borer," https://www.nrs.fs.fed.us/disturbance/invasive_species/eab/effects_impacts/cost_of_infestation/
8. Davey Resource Group, "City of Portland, Oregon, Initial Assessment of the Costs of Managing Street Trees as a Public Asset," June 2009, 3, https://www.

Dutch Elm Disease

Dutch elm disease (DED) is a deadly fungus that affects elm trees. It first appeared in the United States in 1930 via shipping crates made of infected elm wood.

The first case of DED in the United States was recorded in Ohio, and soon after it began spreading across the East Coast with disastrous results. The first case of DED hit Portland in 1977 in Overlook Park. The elm was quickly removed, leaving no further outbreaks of DED in western Oregon until 1986, when a second case of DED in Portland was discovered at NE Thirty-Ninth Avenue and E. Burnside Street.[1]

Inoculating for DED in Portland. Photo: City of Portland.

On June 10, 1987, Portland City Council passed an ordinance declaring Dutch elm disease-infected trees a nuisance and enacting an emergency. The ordinance specifies that it is unlawful for elm trees infected with DED to remain on any lot or parcel of land in the city.[2]

The city's monitoring program has thus far been effective at keeping the spread of DED under control throughout the city.

1. Portland Parks and Recreation, "Urban Forestry Elm Report: Background, Findings and Recommendations," (October 2015).
2. City of Portland Parks and Recreation, "Elm Protection Program and Dutch Elm Disease (DED)," https://www.portlandoregon.gov/parks/article/424029

Tree Inventories

A tree inventory is kind of like a census for trees. It is a way to count and catalogue our trees and attributes about the trees like their health, species diversity, age, and size. A city might conduct a tree inventory for a number of reasons, such as determining tree maintenance needs, accessing citywide vulnerability to pests and pathogens, or to make a long range plan for the future of the community's trees.

Tree inventories are often used by cities when they write comprehensive plans or devise new policy like tree codes, and, like many community forestry efforts, tree inventories are often volunteer driven. In 2016, the City of Portland wrapped up their citywide inventory of street trees. The Portland Tree Inventory Project started as a pilot neighborhood street tree inventory in 2010, and grew to a citywide effort, partnering with Urban Forestry to inventory 218,000 street trees.

Trained Volunteers measure and assess trees for the City of Portland's Tree Inventory Project.

requirements have caused some confusion and frustration for residents, and can put a burden on low-income residents.

Since they rely on residents to plant and maintain the trees in the rights-of-way adjacent to their property, it is important to urban forestry programs to educate citizens on what types of trees to plant and how to care for them. In cities like Portland, Vancouver, and Gresham, urban forestry programs emphasize the idea of "right tree, right place." They want to ensure that residents know how to select a tree that is going to fit well in its planting space, will provide them with the maximum environmental benefits, and won't become a hazard. Many cities have a recommended list of trees to plant, and require that the species chosen is approved by the city through a permitting process. Cities also often have a list of trees that cannot be planted because they are overabundant or considered invasive. In the Portland Metro area, these lists often include trees like black locust, Norway maple, and tree of heaven (Ailanthus altissima).

Though there are restrictions, if a resident wants to plant a tree that the city doesn't necessarily want or that isn't on the approved planting list, foresters are often willing to work with residents. Most importantly, urban foresters want people to be happy with their tree so they will continue to care for it as it matures.

Equity

It has been well established that trees bring many benefits to urban neighborhoods. Besides the environmental, health, and aesthetic benefits, they also have been shown to raise overall property values.[9] However, the way trees and their benefits are distributed across neighborhoods is not always equitable. Recent research has found significant disparity in urban canopy cover, with primarily low income and minority neighborhoods commonly being underserved.[10] This begs the question central to environmental justice: who gets what, when, and why? This question becomes even more important as cities like Portland seek to increase urban canopy cover as part of urban forestry management plans or larger climate change mitigation strategies.

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portlandoregon.gov/parks/article/514095

9. Kaid Benfied, "The Case for More Urban Trees," CityLab (blog), July 31,2012, https://www.citylab.com/environment/2012/07/case-more-urban-trees/2768/

10. Rachel S. Danford, Chingwen Cheng, Michael W. Strohbach, Robert Ryan, Craig Nicolson, and Paige S. Warren, "What Does It Take to Achieve Equitable Urban Tree Canopy Distribution? A Boston Case Study.," Cities and the Environment (CATE) 7, issue 1, article 2 (2014).

Portland's Bureau of Environmental Services and their Urban Forestry Department both have projects focusing on equity and increasing tree canopy in underserved neighborhoods.[11] According to Angie DiSalvo, "one of Portland's biggest challenges is that our canopy is not equitably distributed. Simply put, higher income areas have more trees and greater capacity to pay for street tree maintenance. This isn't unique to Portland and there are a lot of reasons why. Portland Parks and Recreation is currently partnering with Portland State University's Sustaining Urban Places Research Lab to develop a citywide tree planting strategy so that we can improve access to tree canopy for all Portlanders." DiSalvo says that equitable access to trees has become a big focus recently, especially given that trees provide so many benefits for communities beyond clean air and water. Jessica George of the City of Vancouver's Urban Forestry Program echoed this sentiment, saying that Vancouver is also seeing a correlation between income level and tree canopy.

The city has been trying to focus more tree planting efforts in low-income neighborhoods. In these neighborhoods, they work with residents who can't afford trees, by partnering with local nonprofit Friends of Trees to provide trees for low or no cost to residents, and, if possible, to help residents with watering when the trees are still young. The City of Gresham suspects inequities in their urban forest as well, and is now mobilizing to address this issue. Tina Osterink, who leads urban forestry planning efforts in Gresham, says that the city is in the early stages of planning a tree inventory in the Rockwood/West Gresham region, a neighborhood that has a high rate of childhood asthma and experiences higher summer temperatures than the rest of the city due to urban heat island effect. Heat Island research raises concerns about public health, especially in this area where many residents commute on foot or by public transit. The city plans to inventory the region's public trees in an effort to identify areas of limited canopy and high potential for planting. Increasing the tree canopy in this vulnerable area will provide residents with more shade, cleaner air, and a more walkable neighborhood.

The Role of Nonprofits in Urban Tree Management

Urban and community forestry has, from the outset, been driven by people who love trees. Having an engaged citizen base of tree stewards builds the capacity of city forestry programs that are often strapped for

11. City of Portland Environmental Services, "Portland's Tree Planting: Actions for Equity," May 25, 2016, https://www.portlandoregon.gov/bes/article/577852

Tree Diversity

A street lined with trees of the same species and age is more vulnerable to pests and pathogens. Image courtesy of Portland Urban Forestry

Overabundance of any one species of tree can lead to increased vulnerability in urban forest. This became increasingly evident as Dutch elm disease dramatically impacted canopy cover in cities across the American Midwest and East Coast.

Many diseases and pests tend to choose trees by family or genus. For example, the European elm bark beetle, which carries Dutch elm disease, has the potential to attack several species from the elm genus (ulmus). This means if elms make up 25 percent of a city's urban forest, the city stands to lose up to one quarter of their tree canopy to the disease.

Increasing diversity of tree type at the genus and family levels can help increase resilience.[1] *Urban foresters generally use the 10-20-30 rule of thumb which says that a forest population should not consist of more than 10 percent of one species, 20 percent of one genus, or 30 percent of one family. However, more progressive forestry programs are now limiting this to 5-10-20.*

1. City of Portland. Citywide Tree Inventory Report, 2017. https://www.portlandoregon.gov/parks/article/638773

resources. Partnerships with nonprofit organizations (NPOs) and citizen groups are central to community forestry efforts around the country and in the Portland metro area. These groups can be anything from a formal tree group to a neighborhood association with a team of tree lovers who want to take care of trees in their neighborhood. A nonprofit organization may take on short-term projects that reflect emerging community needs (e.g., youth environmental education, or watershed restoration), or act as a liaison between government agencies that may have similar goals but do not have the administrative structure in place for community programs. Some contract with local government to provide specific services, such as green infrastructure maintenance or neighborhood tree planting, making use of their volunteer recruitment and training capability. These NPOs often are funded by grants from private firms, federal, state, or regional government.[12] An example of an NPO start-up in the Portland area that has grown to be a regional partner in urban forestry is Friends of Trees. Friends of Trees was founded in 1989 by a resident tree lover who started doing tree plantings in Portland neighborhoods. They have grown into a large organization that has planted more than 600,000 trees and native plants in more than 120 neighborhoods in six counties across Oregon and Washington.[13]

Urban forestry committees are also important community leaders in tree management. A committee is generally made up of a small group of residents who advise the mayor and city council on local and regional tree-related issues. These volunteer committee members help guide the city in tree policy to develop good management practices to conserve the city's trees and forests. Members are often experts or practitioners, but can also be amateur tree lovers. Gresham's Urban Forestry Subcommittee is made up of citizen tree advocates who provide recommendations for city staff on things like tree preservation and tree plans, as well as helping to coordinate Tree City USA activities like Arbor Day. Several of these dedicated volunteer members have served on the subcommittee since the mid-1990s. Portland's Urban Forestry Commission is composed of eleven volunteers, appointed by the mayor, who "have demonstrated an interest in the preservation of trees and the beautification of Portland."[14] The Forestry Commission reviews development plans for their potential impacts on trees, acts as an appeals board for tree permits, and sponsors Portland's Heritage Tree Program.

The Future Forest

Urban forest managers are constantly seeking to improve our trees' resilience to threats from climate change, exotic pests and pathogens, and pressures from development and increasing density. They are also increasingly looking to improve equitable access to trees and their many benefits for all metro residents. Growing a healthy urban forest can't be accomplished by a single city bureau. In the Portland region, there are many organizations and city bureaus who work together to plant, maintain, regulate, and promote trees. Partnerships with nonprofits, schools, and state and county organizations help to build the capacity of our region's community forestry efforts. Portland Metro residents play an incredibly important role in these efforts, as they care for the trees not just in their yards, but also in the public right-of-way. Whether a city has a large- or small-scale urban forestry program, it relies on residents to help grow and care for a diverse and bountiful urban forest. Everyday people can become champions for trees in their own neighborhoods, spreading the word to friends and neighbors. Our future forest depends on the commitment of the entire community in order to thrive.

12. K. L. Wolf, "Introduction to Urban and Community Forestry Programs in the United States," Landscape Planning and Horticulture 4, no. 3, (Japan 2003) 19–28.
13. Friends of Trees, "What We Do," http://www.friendsoftrees.org/learn/about-our-work
14. City of Portland Parks and Recreation, "Urban Forestry Commission," https://www-portlandoregon.gov/parks/41487