

GREEN BURIEN PARTNERSHIP

URBAN FOREST STEWARDSHIP PLAN



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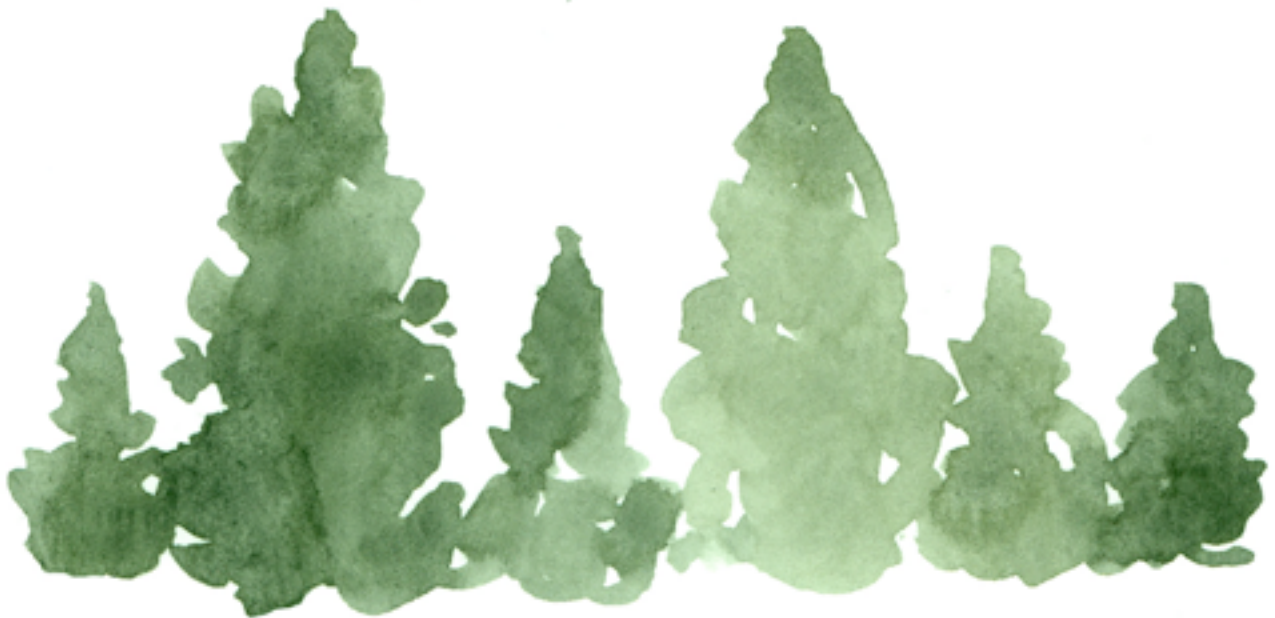




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The Airport Community Ecology (ACE) Fund, authorized by the Port of Seattle Commission in November 2016, recognizes that neighboring communities that experience more impacts from airport operations should also experience more benefits. The Port of Seattle provided seed funding to launch the Green Burien Partnership, a partnership between the Port, the City of Burien, and Forterra to evaluate the health of Burien's urban forests and take action. Burien now joins Seattle, Tacoma, Snoqualmie, Kent, Redmond, Snohomish County, Kirkland, Everett, Puyallup, Tukwila, Issaquah, Shoreline, Des Moines, and SeaTac as members of the Green Cities Network. These 15 Green Cities in the Puget Sound region represent three counties (King, Pierce, and Snohomish), collectively serve over 3 million people, and aim to restore and steward more than 13,000 acres of land. As part of this robust network of resources and expertise, the Green Burien Partnership will help ensure a livable and healthy community.

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EXECUTIVE SUMMARY

Burien is a city known for its charming neighborhoods, marine views, beautiful parks, and community pride. Its wealth of trees — both in neighborhoods and in parks — defines the city, gives it character, and makes community spaces active and vibrant. Urban forests play a vital role in the environmental, economic, and public health of all our cities. According to the US Census Bureau, as of 2010, 80% of the United States population lives in urban areas, and those residents rely heavily on the natural resources found in the urbanized centers.

The City of Burien worked closely with Forterra in the creation of this Urban Forest Stewardship Plan to provide a strategy for enhancing Burien's urban forest through active restoration and management of the city's trees, natural areas, and parks. "The urban forest is defined to comprise all trees in the urban area, inclusive of individual street trees and clusters of park trees" (Endreny 2018). Urban forests provide services to the people and the surrounding ecosystem. They are increasingly recommended by national and state environmental protection agencies to mitigate the harmful impacts of air and water pollutants, harmful emissions, and the negative effects of urban heat and noise (Wolf and Robbins 2015). Protecting, enhancing, and maintaining the trees and parks that comprise Burien's urban forest is critical to the health and welfare of the citizens of Burien and will have a positive impact on the entire region.

Although this plan sets ambitious goals and is only possible with the help of an engaged community and volunteer leaders, it is important for the health of the city's environment and its people. Burien's trees face the same kinds of pressures and problems as many urban forests: canopy-cover decline and removal, fragmentation, an influx of invasive species, declining tree health due to age, and resource limitations for management and maintenance. These pressures diminish the benefits provided by the urban forest, thereby diminishing quality of life for Burien's residents.

The Green Burien Partnership's vision is **to have a healthy urban forest supporting — and supported by — an aware and engaged community**. The Green Burien Partnership's mission is **to engage the community in enhancing and maintaining a healthy, sustainable urban forest in order to increase quality of life, mitigate climate change at the local level, and protect Burien's valuable natural resources for current and future generations to enjoy**. The envisioned Urban

Forest Stewardship Plan, initiated by the Partnership, will restore and maintain forested parklands and increase tree-canopy cover throughout the city, all while centering equity and fostering appreciation and understanding of the long-term benefits that urban forests provide to the City of Burien.

Forterra and American Forest Management conducted a complete assessment of all 326 acres of land to be included in the Green Burien Partnership, as well as a land-cover analysis of the entire city (both private and public land). In-depth information about these findings is included in the appendices. More data (including park-specific data) was provided to the City and is available on our website, www.greenburien.org.

For this plan, we took two measures of urban forest health: a forested-lands health assessment, primarily in parks, and an urban-canopy-cover analysis. As of 2017, Burien had a canopy cover of 30%, but in the Pacific Northwest, where cities now cover land that was once dense forest, there is an ecological capacity for 40% or more canopy cover. In order to achieve this additional canopy, Burien would have to add approximately 39,000 trees—which would also add 7.3 million dollars in ecological benefits (Appendix K). Even more vital in a quest to increase canopy cover is the halting of current canopy-cover decline, through education and City policies, as well as intentional planting and the equitable distribution of trees. The Partnership aims to increase Burien's canopy cover by 10% over the next 20 to 30 years. The results of the forested-lands health assessment indicate that much of the work of caring for Burien's dense forest will be removing invasive species, helping forests regenerate, and establishing long-term monitoring.

To determine the total cost of work over the Green Burien Partnership Urban Forest Stewardship Plan's 20-year time frame, Forterra conducted a cost analysis. This analysis determined the total cost to be \$7 million (in 2019 dollars). This is a significant investment, but the cost of effectively managing these lands without volunteer involvement and solely using skilled field crews is estimated to be more expensive — and does not guarantee long-term success or community ownership. However, working side by side with city staff, volunteers are forecasted to leverage up to an additional \$2.3 million in value for the Partnership during the course of the plan.

Based on the condition-assessment results, this plan establishes a long-term, whole-forest management approach for Burien's urban forest. It also outlines potential target areas for tree planting within the city and provides several tools during the implementation



phase that will assist the city in increasing canopy cover. **Successful completion of this plan will result in a healthy, functioning urban forest and improved ecosystem benefits, such as cleaner air and increased climate-change mitigation, and will provide wellness and mental health benefits to Burien’s residents.**

The intent of this document is to provide a thorough health assessment of Burien’s urban forest, as well as set Partnership goals and objectives that will enhance the current conditions of the urban forest in order to provide outcomes that benefit Burien’s people and ecosystem.

The Green Burien Partnership’s projected results are:

1. All 326 acres of forested parkland and natural areas within the Green Burien Partnership will be enrolled in active restoration and maintenance.
2. Burien’s tree cover will be increased to the recommended 40% by planting and caring for trees, and centering equitable distribution of trees across the entire city.
3. Burien’s urban forest will be actively and adaptively managed, with a vision of continuing this practice beyond 2038 to ensure that lands in active restoration remain ecologically healthy and the city’s forest continues to provide numerous benefits.
4. Long-term volunteers will be engaged and provided with a high level of training and expertise in order to enhance the urban forest.
5. An inclusive and successful volunteer program will be maintained that encourages participation from a diverse network of individuals, families, schools, businesses, and nonprofits. Equity will be centered so that the volunteer program encourages residents to participate in their own neighborhood and in ways that are accessible to all.
6. Stable, sustainable funding will be secured so that the Partnership can balance staff resources and utilize contracted crews when necessary to accomplish its long-term forest health, community-development, and program-administration goals.

I. INTRODUCTION

Imagine a city devoid of trees and vegetation. Consider what the air and water might be like without the natural filtration that plants provide. What would it sound like on a windy day? What would spring look like? Would the summer sun be overwhelming without the shade that trees provide?

Burien is a city known for its iconic parks and shorelines, marine views, family-friendly community, and innovative leadership. Its wealth of trees, in both parks and neighborhoods, defines the city, gives it character, and makes its neighborhoods active and vibrant. This urban forest plays a vital role in the city's environmental, economic, and public health. Despite its value, Burien's urban forest is declining in health and needs active management in order to survive. By enhancing this urban forest, we can preserve Burien's iconic beauty and increase the forest's benefits for the people who live, work, and play here.

Burien's urban forest — including its areas of dense forest, natural shoreline, open spaces, and wetlands — provides numerous services that benefit all areas of the city. These services include absorbing stormwater runoff, returning oxygen back to the air, sequestering carbon, stabilizing shorelines and steep slopes, reducing flooding and erosion, filtering fine and ultrafine particulates from the air, reducing noise pollution, and more (USDA Forest Service 2018). Areas with increased vegetation, leaves specifically, capture more particulates in the tree canopy and clean the air. These same areas have healthier soils, which clean the water by filtering polluted runoff. As well, the urban forest enhances the livability of neighborhoods, makes Burien more beautiful, offers shade on the hottest days, and provides habitat for local wildlife.

In its work, the Port of Seattle has recognized both the importance of these natural areas and the impact Port operations have on neighboring communities and urban forests. Because of this, the Port developed its Airport Community Ecology (ACE) Fund, which supports the work of community-based projects and nonprofits in the three cities — Burien, Des Moines, and SeaTac — that are closest to the airport. The Port selected the Green Cities Partnership, managed by Forterra, as the recipient of a portion of its ACE funding to help engage community members in order to restore, maintain, and increase urban forests in those cities.

Historically, development has been the largest threat to both natural areas and urban tree density in the Puget

Sound region's urban and suburban centers. Our cities were once predominantly forested lands. As the region became urbanized, public agencies and land trusts have worked together to purchase and conserve pockets of dense forest, vital wetlands, sensitive areas, farmland, and other important lands. Conserving these green spaces is an important first step in preserving the region's natural resources in the face of urbanization.

Unfortunately, in the past these areas were left unmanaged because there was a belief that it was better to keep human impact as minimal as possible. Yesterday's scientists didn't see every tree — even those on private land or planted next to a sidewalk — as part of a larger whole. However, by studying this urban system, we have learned that urban forests encompass the whole and that environments face unique pressures, needing more care than we once believed. Invasive species, litter, pollution, the redirection of creeks, the diversion of stormwater, and the isolation of dense pockets of plants (such as in parks) reduce the forest's natural ability to thrive within cities and suburban areas. We now know that we must actively manage urban forests: remove invasive species, help regenerate young trees, monitor for and respond to pests, water young trees during times of drought, prune trees and perform maintenance, and more. The urban forest needs our help and continued support. The Green City Partnerships work with City staff to engage a robust volunteer effort in order to fulfill this important role.

Scientists and municipalities have also begun to recognize the many benefits of having more trees within the urban landscape: in neighborhoods, on school grounds, at libraries, and on travel corridors. Trees are of huge benefit to the people who live among them: they provide services such as cleaner, cooler air; improved water quality; community connections; and even mental health benefits. The measurement of a city's urban forest — called canopy cover or tree density — includes street trees, school and community-space trees, as well as trees on private land, such as single- and multi-family zones. Because of our past misunderstanding and lack of care, our urban forests are disappearing — not just to development, but because they are unhealthy. When we lose urban forests, we lose the services they provide. Many studies have proven that educating and engaging residents and securing a strong commitment of care can quickly change the health of a city's forest (USDA Forest Service 2018). The City of Burien is committed to increasing the health of its urban forest and increasing its canopy cover from 30% to 40% over the next 20 years in order to create a more sustainable, healthier city.

This plan also addresses the need to care for, maintain, and many times restore the tree cover already present in Burien due to a prior lack of active management. In assessing

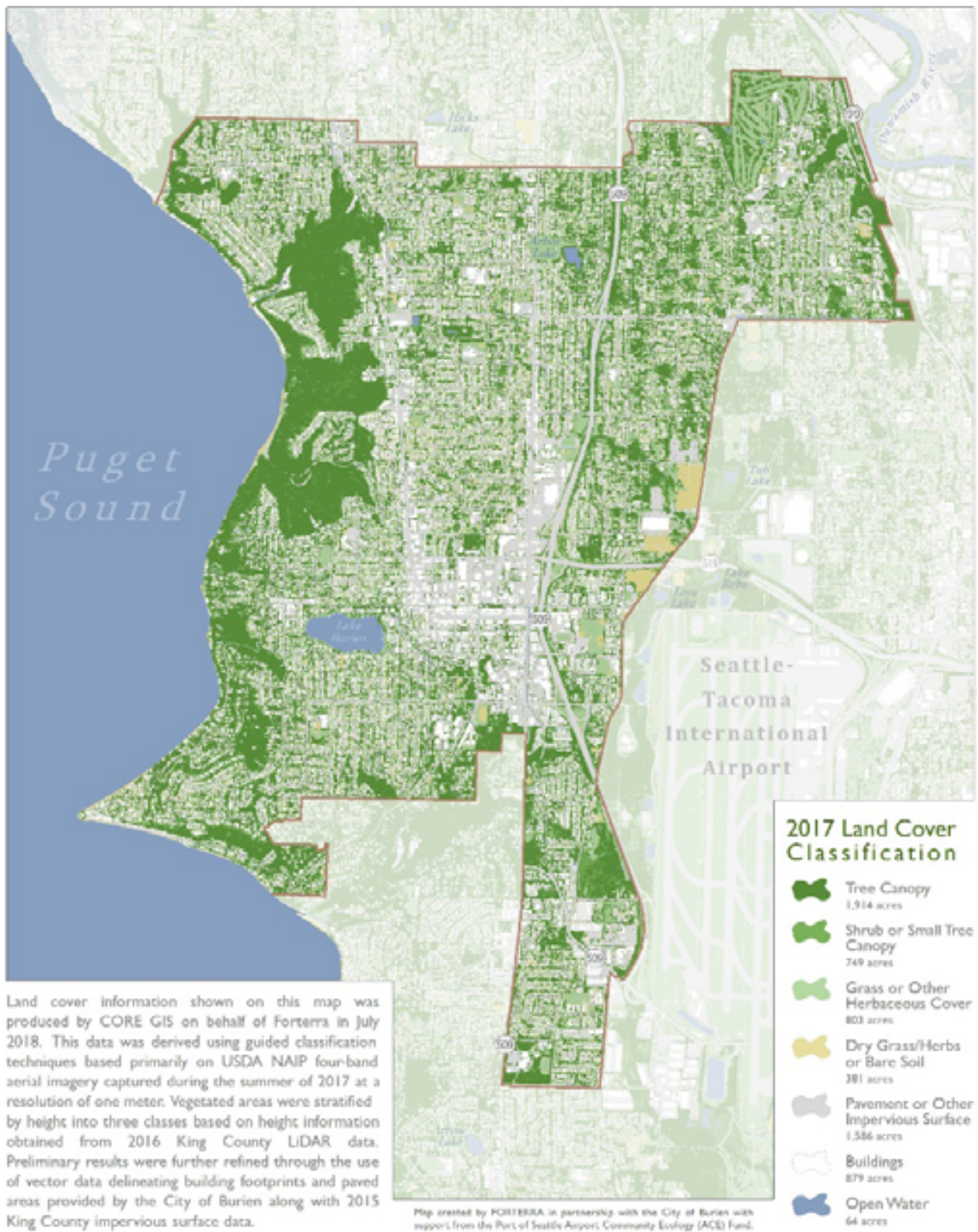


Figure 1: Map of Land-Cover Classifications in the City of Burien

the forested lands within Burien’s park system, the Partnership identified a potential for an overall loss of canopy without intervention. The dominance of nonnative plant species is a major cause of the loss of biodiversity and the degradation of urban forests (Pimentel et al. 2000; Soulé 1991). These invasive weeds lack natural population control (e.g., predators, diseases) and are capable of rapid reproduction; they can quickly blanket the ground and prevent native plants from reseeding (Boersma et al. 2006). At the same time, invasive vines such as English ivy climb into treetops, where they can block light from reaching a tree’s leaves, thus preventing the trees from making food until, eventually, the trees die. This problem is exacerbated by the fact that a significant portion of the Puget Sound region’s forest canopy is now composed of relatively short-lived, mature deciduous trees, such as maples, that are coming to the end of their life spans. As these trees die, new seedlings are not present to replace them, resulting in a loss of forests over time. Burien is committed to enhancing the health of its urban forest with the help of the Partnership.

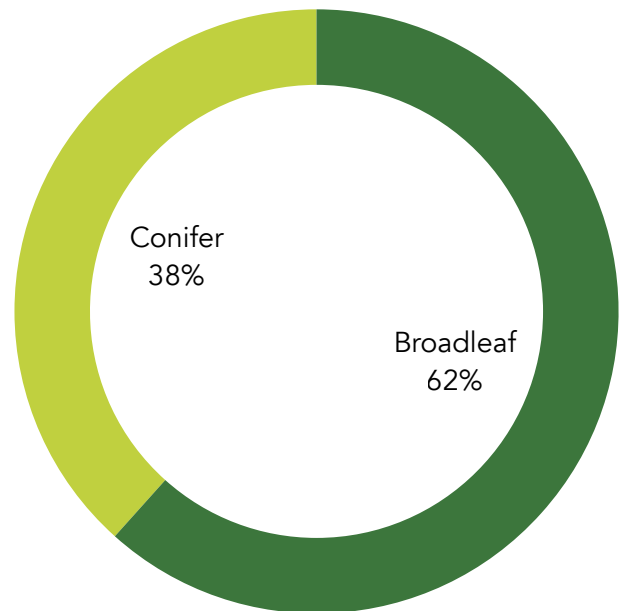


Figure 2: Primary overstory composition of Burien’s forested parkland

What Is an Urban Forest?

An urban forest encompasses all the trees in a defined urban area, such as a city. Urban forests broadly include the trees in urban parks; on city streets; in residential areas, including private yards and shared residential spaces; trees in community spaces (such as libraries and public gardens) and in greenways, river corridors, wetlands, nature preserves, and natural areas; shelter belts of trees; and working trees at industrial brownfield sites, among others (USDA Forest Service 2018).

What Is Canopy Cover?

Imagine you are a bird flying over a city (or a human in an airplane) in the summer months. As you look down on your city, what percentage of the ground is covered (obscured from view) by trees? That amount is called the “canopy cover” of an area. In 2017, Burien had a canopy cover of 30%.

The Need for a Green Burien Partnership

Burien’s degrading urban forests can significantly benefit from intervention to help reverse their decline and prevent major loss of ecological services such as cleaner air. Thanks to the Port of Seattle’s ACE Fund, the City of Burien and Forterra together created the Green Burien Partnership, a coordinated urban-forest-enhancement program. The Partnership developed this long-term plan to enhance the benefits that Burien’s urban forest provides by giving funding and direction, and creating a road map that helps the City meet its goals. This plan determines agency capacity, promotes community participation, and establishes the long-term planning needed to support the Partnership’s vision and goals. It also sets out a framework for implementing urban forest stewardship projects throughout the city with input from the community. The Partnership primarily achieves these goals through community engagement and the volunteerism of residents. The plan doesn’t just define the problems, but offers solutions for the recovery and enhancement of Burien’s urban forest.

With continued population growth anticipated throughout the Puget Sound region, Burien’s residential and business density will be higher in the future. One of the challenges facing the city is how to balance this growth while maintaining a strong economy

and exceptional quality of life. For example, increasing high-density housing, including condominiums and multifamily developments, often results in residents having less access to open space and natural settings. Studies have proven that this is detrimental to health and wellness (USDA Forest Service 2018). Thus, it is important to protect and enhance Burien's canopy cover, when possible, in order to preserve and enhance the City's urban forest and the services it provides.

Urban developments such as condominiums, townhouses, and office parks are considered by residents to be more desirable when they are located near parks and natural areas that are accessible by bike or on foot (Tyrväinen and Miettinen 2000). **Because green space is an important element of livable, attractive communities, it provides benefits beyond environmental services.** Parks, trails, and natural areas give people who live in cities recreational opportunities and a connection to nature and their community that can help sustain an active life. Trees and green space are associated with a variety of measurable public health benefits by providing people with access to nature and low- or no-cost exercise, both of which have links to stress reduction, improved mental health, and increased physical wellness (see Chapter 2).

In 2005, Forterra launched the Cascade Agenda, a 100-year vision for conservation and economic growth in the Pacific Northwest, with a focus on building livable urban communities. The City of Burien also recognizes the need

to invest in the care and attention of its urban forest. The Port of Seattle recognizes that airport operations impact neighboring communities and therefore, those communities should see increased benefits. **The Green Burien Partnership can play a key role in helping meet these shared goals.** The cost of doing nothing is very high: some areas of Burien have a current trajectory of a complete loss of urban forest. Taking steps to reverse this trend is crucial for the health of the city's urban forests — and the city itself. This will only be possible with the help of an engaged and dedicated community that has an ownership stake in the Green Burien Partnership's success.

In 2019, the Green Cities Network is 14 cities strong and is making ecosystem-wide, regional change. During the writing of this plan, Snohomish County became the first county to make the commitment as a Green County. Similar Green City Partnerships have already seen success in Seattle, Tacoma, Kirkland, Redmond, Kent, Everett, Tukwila, Puyallup, and more. **Together, these partnerships are establishing one of the largest urban-forest-restoration networks in the nation.** This network of municipalities holds annual summits and quarterly meetings where ideas are exchanged and solutions offered. Thanks to the Port of Seattle's ACE funding, the City of Burien will join this impressive, innovative network and contribute to the health and livability of the entire Puget Sound region.



Photo: City of Burien

2. MORE THAN JUST GREEN:

URBAN FORESTS HAVE MANY BENEFITS

The benefits of caring for Burien’s urban forest are myriad, and they affect all aspects of the community. Research indicates that urban forests give people a higher quality of life (Dwyer et al. 1992), provide ecosystem services such as flood prevention, create opportunities

to improve physical and mental health, reduce crime, and provide opportunities to enjoy nature close at hand. They help keep the air and water cleaner, provide habitat for native wildlife, and make communities more livable and beautiful.

TABLE 1 | Benefits of Urban Forests

Reduce Stormwater Runoff	Urban forests can reduce annual stormwater runoff by 2%–7%, and a mature tree can store 50–100 gallons of water during large storms (Fazio 2010). Green streets, rain barrels, and tree planting are estimated to be three to six times more effective in managing stormwater per \$1,000 invested than conventional methods (Foster et al. 2011).
Improve Water Quality	Plant roots absorb water, much of which is full of pollutants in an urban environment. Some pollutants are filtered and transformed by bacteria and other microorganisms in the soil (Prince George’s County 2007); others are transformed by plants through metabolism or trapped in woody tissues and released when a tree decomposes.
Reduce Erosion	As the tree canopy slows the speed of rain falling on the earth, rainwater has less energy to displace soil particles. Soils under a canopy and the thick layer of leaf litter are protected from the erosive energy of rainwater (Xiao et al. 1998).
Improve Air Quality	Plant leaves absorb carbon dioxide and produce oxygen through photosynthesis. The surfaces of leaves trap airborne dust and soot (McPherson et al. 1994), removing millions of pounds of air pollutants annually from the air in a city (American Forests 2001).
Provide Wildlife Habitat	Native wildlife has unique requirements for food and shelter. Healthy urban forests under restoration have been demonstrated to increase species diversity (Ruiz-Jaén and Aide 2006).
Reduce Energy Use and Combat Climate Change	A 25-foot tree reduces annual heating and cooling costs of a typical residence by an average of 8%–12% (Wolf 1998). Urban forests can also lower ambient temperatures of nearby urban areas (Nowak and Heisler 2010), which lowers energy consumption. Trees absorb carbon dioxide and store the carbon in woody tissues, reducing the amount of carbon dioxide in the atmosphere. Each year, an acre of trees absorbs the amount of carbon produced by driving a car for 26,000 miles (Nowak 2011).
Buffer Noise	Tree canopies dampen sound by intercepting sound waves (Herrington 1974). Noise buffers composed of trees and shrubs can reduce 50% of noise detectable by the human ear (USDA Forest Service 1998), including high-frequency noise, which is the most distressing to people (McPherson et al. 2001).

Table #1 | Benefits of Urban Forests (cont.)

<p>Boost Local and Regional Economies</p>	<p>Urban forestry supports job creation and retention, resulting in added individual income and increased local, state, and federal taxes (California Department of Forestry and Fire Protection 2011). Homes that border urban forests are often valued at up to 5% more than comparable homes farther from parks (Tyrväinen and Miettinen 2000), and street trees add value to homes as well (Donovan and Butry 2010).</p>
<p>Build Community</p>	<p>Physical features, particularly natural ones, play an important role in creating vital neighborhood spaces (Sullivan et al. 2004). Urban green spaces and parks provide gathering places for people of different backgrounds to integrate and connect with each other. Greener neighborhoods can encourage social bonding between neighbors and improve social connections. Residents who are more attached to their community have higher levels of social cohesion and social control, and less fear of crime, and their neighborhoods display more signs of physical revitalization (Brown et al. 2003).</p>
<p>Make Communities More Attractive</p>	<p>Trees are the most important factor in influencing the perception of a community’s aesthetic value (Schroeder 1989). Trees and natural landscapes are associated with reduced aggression and violence (Kuo and Sullivan 2001b), and less graffiti, vandalism, and littering (Brunson 1999).</p>
<p>Foster Physical Wellness and Fitness</p>	<p>People in communities with high levels of greenery or green space are more likely to be physically active (Maas et al. 2006; Ellaway et al. 2005). In fact, people who use parks and open spaces are three times more likely to achieve recommended levels of physical activity than nonusers (Giles-Corti et al. 2005).</p>
<p>Improve Mental Health and Function</p>	<p>The experience of being in nature helps restore the mind after the mental fatigue of work or studies, improving productivity and creativity (Kaplan 1995; Hartig et al. 1991). A recent study found that just 20 minutes of walking in nature significantly lowers stress hormones (Hunter et al. 2019).</p>
<p>Help Children Develop</p>	<p>Experience with nature helps children develop cognitively, emotionally, and behaviorally by connecting them to environments that encourage intellectual development, imagination, and social relationships (Isenberg and Quisenberry 2002; Heerwagen and Orians 2002). Green settings and green play areas also decrease the severity of attention deficit disorder in children (Taylor et al. 2001).</p>
<p>Stewardship Activities Benefit Health and Wellness</p>	<p>Volunteer stewards of all ages who regularly remove invasive species, plant trees, and perform other stewardship activities are likely to gain health benefits from physical exertion. In one hour, a 150-pound person can burn 440 calories from digging, gardening, and mulching, and 330 calories from light gardening such as planting trees (www.choosemyplate.gov). Strong community relationships are built from sharing personal stories, exchanging information, and working together to achieve common goals (e.g., community forest improvements).</p>

Economic Benefits

The Puget Sound region's forests provide measurable, valuable services that affect us every day. In 1998, American Forests, a nonprofit citizens' conservation organization, analyzed Washington State's urban forests. Its study revealed that these trees removed 38,990 tons of air pollution — a service that is valued at \$261.6 million in 2019. The study also showed that the trees created a 2.9 billion-cubic-foot reduction in runoff, a service valued at \$9.2 billion, adjusted for inflation (American Forests 1998). Were these forests to be lost, these dollar values become the costs associated with building new infrastructure to carry out equivalent functions.

Air Quality Improvement

A city with abundant and healthy vegetation enjoys significantly higher air quality. Conifers, specifically, can remove 50 pounds of particulate pollutants from the air per year (Dwyer et al. 1992), which is correlated in studies with a reduced incidence of asthma in children and other related respiratory health issues in people of all ages (Lovasi et al. 2008). Trees remove soot and other pollutants through their leaves and branches, and evergreen trees do this work year-round. More recent studies have found that conifers, in particular, are natural filters of ultra-fine particle pollutants, and they actually remediate or decontaminate both air and water in a process called phytoremediation. One study likened trees as the “green liver and lungs” of urban areas (Abd ElAziz et al. 2015). In 2006, the total amount of air pollution removed by urban trees annually within the United States was estimated to be 711,000 metric tons (Nowak et al. 2006).

Water Quality Improvement

Neighborhoods with fewer trees have the potential for increased stormwater, pollutants, and chemicals flowing into their water supply and systems, resulting in flood damage, health risks, and increased taxpayer dollars to treat the water (Seitz and Escobedo 2008). Trees absorb and filter water through their roots, and the loss of trees means the loss of these vital services. Trees also help soils that have been compacted by human intervention and no longer absorb water; they do this by sending down roots, which make paths that stormwater can follow in a process called infiltration (Bartens et al. 2008). The Partnership understands the important role trees play in improving water quality and will work interdepartmentally with city staff to be innovative and creative with tree-planting

efforts in order to improve water quality.

Mental Health Benefits

Higher percentages of neighborhood green space are associated with significantly lower levels of depression, anxiety, and stress, and one article found that “greening could be a mental health improvement strategy in the United States” (Beyer et al. 2014). Many of the health benefits of trees and green spaces come from their ability to improve the mood and mental health of the people who live around them. Immersion in natural settings is impactful, but even viewing trees through a window can reduce stress and improve outcomes for everyone from students in a classroom to patients in hospitals (USDA Forest Service 2018). In the community survey the Partnership conducted (see Chapter 4), 41% of respondents said they are already using parks to relax and increase their mental wellness (see Appendix J). Increasing this benefit is as simple as ensuring an equitable distribution of trees and green spaces that are accessible to residents and encouraging people to look or go outside. The Partnership's goal of increasing canopy cover, especially near where people live and work and children go to school, has the added benefit of increasing access to these mental health benefits.

Climate-Change Mitigation: Carbon and Heat

Urban forests also help combat climate change and the effects of air pollution through carbon capture. Trees, as they grow, capture carbon dioxide through the process of photosynthesis. They store the carbon from absorbed carbon dioxide in the woody mass of their branches and trunks, and release oxygen into the air. It is estimated that Washington State's urban trees are responsible for the sequestration of more than 500,000 tons of carbon per year (Nowak and Crane 2002). Each acre of healthy, mature, dense Western Washington forest could be responsible for the storage of more than 300 tons of carbon, which translates to the removal of more than 1,100 tons of carbon dioxide from the atmosphere (Smithwick et al. 2002). For example, the average passenger vehicle emits about 4.6 metric tons, 11,000 pounds, of carbon dioxide per year (EPA 2018). According to the EPA, each acre of healthy forest can remove carbon dioxide emissions for approximately 2.4 vehicles per year. Burién has 326 acres of dense forest that the Green Cities Partnership will help restore to a healthy condition. This acreage has the potential to mitigate the emissions of more than 750 cars per year once it is restored.

Trees in an urban setting combat the “urban-heat-island effect” caused by paved surfaces absorbing and radiating heat from the sun. Trees produce shade, reflect sunlight well above the pavement, and convert sunlight through photosynthesis. Urban forests also create microclimates that move air and further cool their surroundings. They have been shown to significantly lower ambient temperatures, making hot days more comfortable and reducing energy consumption needed for artificial cooling (Kurn et al. 1994). A single 25-foot tree reduces a typical residence’s annual heating and cooling costs by an average of 8%–12% (Wolf 1998).

While invasive plants such as ivy and blackberry also carry out photosynthesis to sequester carbon and create oxygen, they are shorter lived and contain less biomass than mature conifers. This makes them less effective at removing carbon dioxide from the atmosphere and storing it. Additionally, they often do not supply adequate habitat for local native wildlife and are much less effective at providing other ecosystem functions than healthy native Northwest forest communities. Invasive plants typically exclude other plants, so they do not foster the diversity that keeps natural areas healthy and stable.

Each 10% increase in overall urban tree canopy generates a 2 degree F reduction in ambient heat (Wolf 2008). Urban trees are particularly vital for reducing heat stress and decreasing the size and effect of the urban heat island



(Zupancic et al. 2015). Trees have the unique ability to use evapotranspiration to provide micro-cooling. Zupancic also found that green spaces that are connected and closely spaced can improve the flow of cool air throughout an entire city. The Green Burien Partnership’s goal of increasing canopy cover is informed by these studies on the many benefits of trees, including their ability to mitigate the effects of climate change.

Decreased Crime

Studies have shown that urban forest and healthy green spaces decrease crime (Kuo and Sullivan 2001a). Recently, the Chicago Region Trees Initiative (CRTI) has been mapping and studying this correlation between trees and reductions in crime. According to CRTI Director Lydia Scott, “Communities that have higher tree population have lower crime. [In] areas where trees are prevalent, people tend to be outside, mingling, enjoying their community” (Nolan 2017). The CRTI team used new technology to check that the correlation wasn’t due to socioeconomic or other factors. Another study found that Philadelphia experienced an 18%–27% reduction in reports of narcotics possession in areas with enhanced vegetation (Kondo et al. 2015). Restoration projects led by the community help reclaim such areas as positive public spaces that are welcoming for everyone, and they regularly bring more watchful attention to areas, increasing a sense of public ownership and responsibility.

In a separate paper, Kuo and Sullivan studied 98 apartment buildings in an inner-city neighborhood of Chicago and found that regardless of the socioeconomics of the residents of an apartment building, “the greener a building’s surroundings are, the fewer total crimes” (Kuo and Sullivan 2001b). Troy et al. (2012) found that a 10% increase in tree canopy was associated with a roughly 12% decrease in crime. Expanding public awareness and building a robust volunteer program that has high ownership and valuation of urban forest, parks, neighborhoods, and public spaces are the main tenets of the Green Burien Partnership.

More research is still needed to quantify the economic and ecosystem benefits of Burien’s urban forest. That said, drawing from the wide body of knowledge and related studies outlined here, we know that the cost of doing nothing to maintain the health of the city’s urban forest will be high and have negative effects on Burien’s environmental, economic, and public health. As development throughout the region continues at a rapid pace, preserving and enhancing our remaining urban forest is now more important than ever.

3. THE CHALLENGE

THREATS TO THE URBAN FOREST

Burien’s Urban Forest

Most people, when asked to picture a forest, imagine a scene dappled with sunlight, where trees tower overhead, birds chirp, and the air smells like conifers. Urban forests — forests that survive and thrive within the built environment — are not what most people typically picture when thinking of forest. That said, Burien is home to 326 acres of dense forest, primarily located in parks, as well as thousands of single trees and small groves throughout the city. Of Burien’s 30% canopy cover, more than half is on residential land, and about 14% is on parks and other public land (see Figure 3). This urban forest adds character to Burien and provides the numerous benefits detailed previously, and this forest is currently under threat.

Challenges and Threats to Sustainability

Urban forests face unique challenges and pressures that require specific attention. The following section outlines six primary issues that prevent urban forests from sustaining themselves or pose risks to current and future ecological sustainability:

- Fragmentation and development
- Climate change
- Declining habitat quality
- Invasive species: plants and insects
- Harmful use: intentional and unintentional
- Lack of homeowner education and resource allocation

Fragmentation and Development

Habitat fragmentation is a forest threat that is inevitable in urban environments. Fragmentation occurs when contiguous forested areas are divided by development. This fragmentation decreases the valuable internal habitat of the forest and increases edge effects because these areas receive more human interference, are more disturbed, and receive more sunlight than contiguous forest. As well, pollination can be challenging when fragmentation isolates populations of plants – plants that are farther from each other have less likelihood of sharing pollen by wind or insects. This can lead to seeds going unfertilized and a lack of tree regeneration. Fragmentation also disrupts the connecting corridors used as habitats for birds, amphibians, and mammals.

Urban forests exist in human-use areas; if the benefits of healthy forest are desired, planning and development must consider how and where to keep dense forest as uninterrupted as possible. Carefully considered urban planning of green belts and parks, tree-related municipal

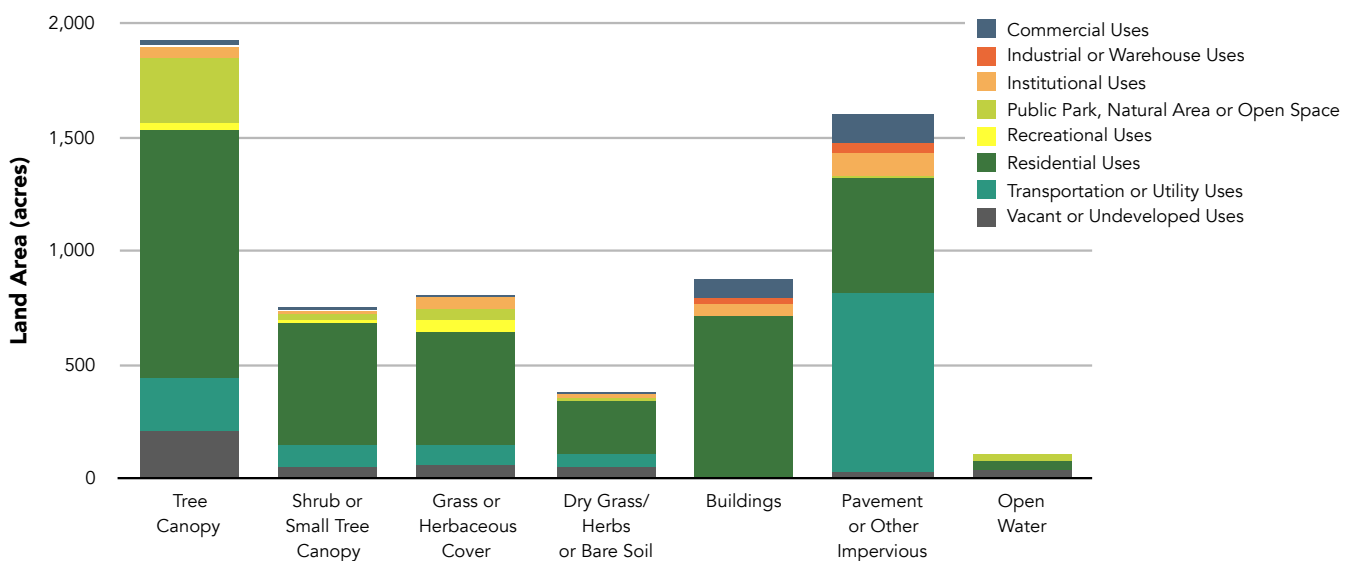


Figure 3: Distributions of land-use categories by land-cover type

policies, and neighborhood-specific regulations and association agreements can reduce fragmentation and contribute to the health of the urban forest. These intact green corridors can serve as the “skeleton” of a city’s green infrastructure, supported by individual trees or small groves of trees.

Climate Change

The Pacific Northwest region faces climate-change impacts that include warmer winters; hotter, drier summers; and changes in precipitation (Littell et al. 2009). Climate change is expected to negatively impact the health and resilience of forests and natural areas by shifting the habitat conditions of native tree species that are common in Puget Sound lowland forests (Kim et al. 2012). Shifts in growing conditions, such as changes to summer and winter temperatures and soil moisture, can directly affect tree health and vigor, and make trees more susceptible to mechanical or physical failure, insect infestations, and disease (Littell et al. 2010).

Restoration and conservation of urban forests and natural areas therefore become increasingly important. The Green Burien Partnership’s restoration efforts are essential to preserve forest and natural-area health, and ensure the critical ecosystem functions these resources provide, such as reducing urban-heat-island effects, sequestering carbon, and mitigating stormwater impacts from increased precipitation. To improve the ability of forests and natural areas to mitigate as well as adapt to climate-change stressors, Green Burien Partnership managers will need to integrate adaptation and resilience strategies into their general management practices and park-specific stewardship plans.

Declining Habitat Quality

Several factors contribute to the loss of habitat quality in Burien’s urban forest. Compared with the region’s native forest composition, deciduous trees make up much more of Burien’s forest canopy than is typical in a healthy Northwest forest. Deciduous trees are early-colonizing species and help establish a forest in disturbed areas, such as after the logging activity that occurred throughout the Puget Sound in both the 1800s and 1900s. Deciduous bigleaf maples, cottonwoods, and alders now dominate the majority of Burien’s forested overstory, especially in parks. Under natural conditions, as deciduous trees begin to die off, they are typically replaced by longer-lived conifers; however, Burien’s urban forest no longer grows under natural conditions.

The high proportion of deciduous trees in Burien’s forest indicates that there will be a pronounced decline in tree canopy in the near future. Many of the deciduous trees — both native and nonnative — are nearing the end of their natural life spans. As they die, more sunlight can reach the ground, resulting in perfect growing conditions for aggressive, invasive plants to flourish. The loss of tree canopy allows invasive plants to become the dominant species in many parts of the city, inhibiting the growth of new trees and plants. Without intervention, such as planting young native trees to create the next generation of canopy, this plan’s technical analysis projects that the natural death of these deciduous trees could lead to a loss of much of Burien’s forest overstory.

Additionally, past removal of vegetation, urban development, and channelization along our region’s many streams and wetlands resulted in a loss of native species cover. Large areas of the watershed, such as smaller creeks, wetlands, and other sensitive areas, are now buried under a blanket of invasive species such as Himalayan blackberry, English ivy, and knotweed. The loss of native vegetation along waterways results in significant impacts on stream temperatures and water quality, and negatively affects aquatic species, including threatened salmon. The City of Burien has prioritized the restoration of riparian areas in Burien and the Partnership should continue to protect and prioritize these riparian areas for their ecological benefit.

Invasive Species: Plants and Insects

Invasive plants now outcompete native understory plants in many of Burien’s private, park, and undeveloped urban areas. Aggressive, nonnative plants cover the ground, preventing tree seedlings and other native plants from receiving sunlight and nutrients. Robust Himalayan and evergreen blackberry bushes spread along the ground in large thickets, and birds disperse the seeds to new locations. Invasive blackberry grows densely, choking out native plants and destroying native habitat for wildlife species. Blackberry thickets are especially aggressive when establishing along creeks and gulches, which, in the long term, can be detrimental to salmon. This impacts the ecosystem and can lead to a decline in the health of the Puget Sound.

English ivy reaches into the treetops and can kill a healthy deciduous tree within 20 years by spreading up from the understory into the tree canopy. Ivy coats the branches of the tree and absorbs sunlight the tree needs to survive. Once ivy becomes established, an intense investment of time and resources is required to remove it. Where

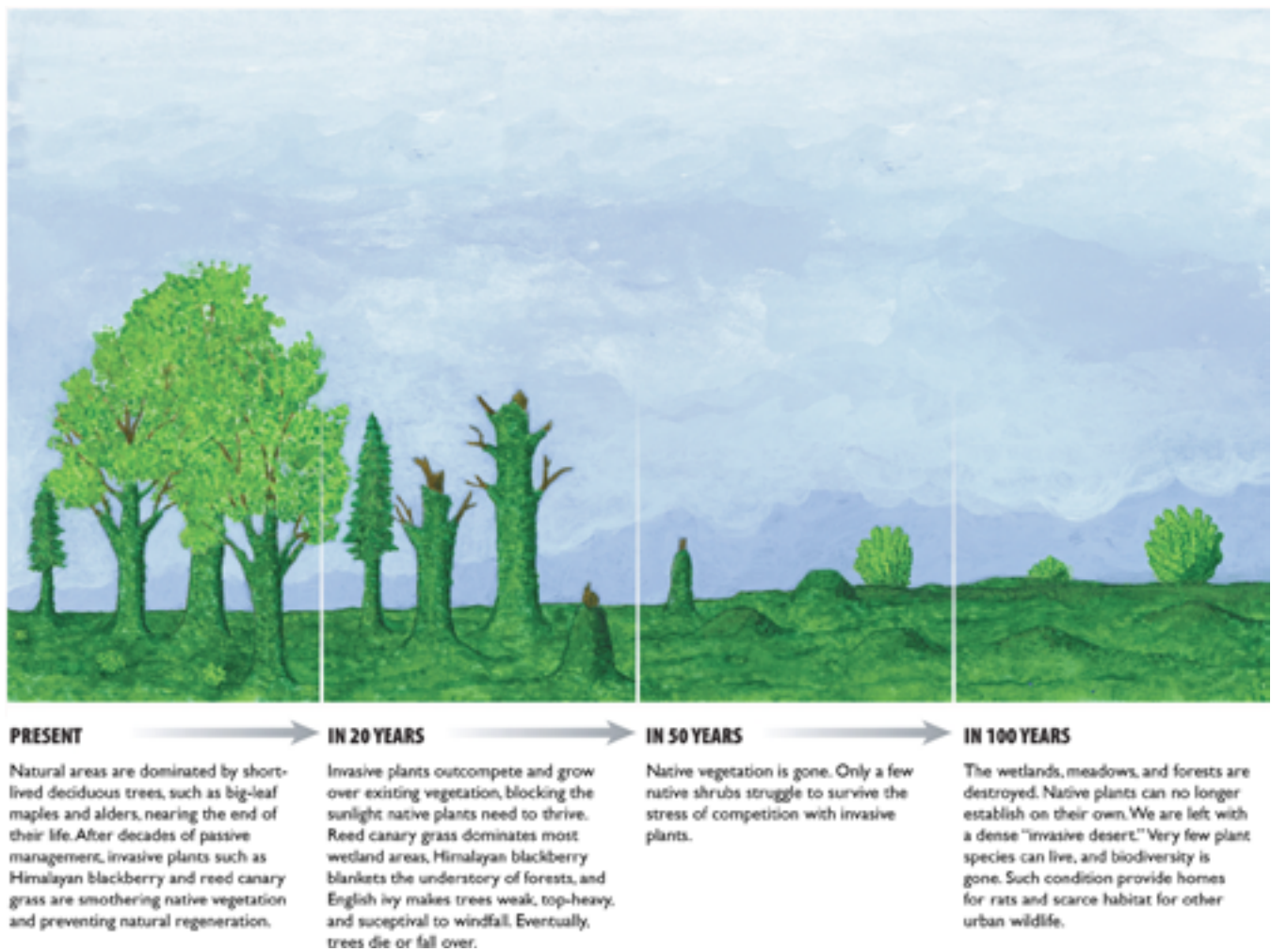


Figure 4: Illustration of the forest's potential if it is not restored

English ivy is in the early stages of blanketing forest floors and trees in Burien, the opportunity exists to remove the existing growth and prevent further spread and a much bigger future cost of management. English ivy is the dominant invasive plant in Burien's forested parks (see detailed information about the forested parks health assessment in Chapter 6).

As invasive species begin to dominate the urban forest, the diversity of food and habitat available throughout the seasons is diminished. While some animals, such as rats, can live and even thrive in the dense monocultures of blackberry or ivy, quality habitat for most native wildlife is degraded by invasive species. In addition, environmental benefits such as stormwater retention, erosion control, and carbon sequestration are greatly decreased when invasive species displace complex communities of native vegetation that have grown together throughout this region's history. If the spread of invasive species is not

prevented, the result is degraded forests and natural areas overrun with sprawling thickets of blackberry and engulfed in ivy (see Figure 4).

Non-native, invasive insects can also have catastrophic effects on a region's natural resources and do not contribute to the natural ecological processes found in healthy natural open spaces. Wood-boring beetles have been documented in the northeastern US and California since 1996. The Asian long-horned beetle (*Anoplophora glabripennis*) and the citrus long-horned beetle, which arrive on wood pallets from Asia, are known to attack and kill maple trees and other deciduous hardwoods (Haack et al. 2010); they arrived in our region in 2001, but have since been eradicated. Outbreaks of Asian and European gypsy moths have been documented here, though successful control efforts have prevented populations from establishing. In areas where full populations have established, such as in the Northeastern and Midwestern

United States, gypsy moths — which forage by defoliating trees — have weakened trees and degraded wildlife habitat on millions of forested acres. Weakened trees then succumb to other pests or disease. In the Pacific Northwest, gypsy moths have been known to attack red alder, Douglas-fir, and western hemlock (Boersma et al. 2006).

To protect Burien’s forested natural areas, the Green Burien Partnership will need to stay abreast of potential invasive insect outbreaks in the region. Information is available to staff and volunteers through the Washington Invasive Species Council and US Department of Agriculture (USDA) Animal and Plant Health Inspection Service. The Green Cities Network is working with the Washington Invasive Species Council to develop protocols and monitoring procedures for Forest Stewards to help cities with invasive species outbreak detection, and this could be offered as training for Green Burien Stewards.

As the Green Burien Partnership implements its 20-year plan, insect pests and other forest-health threats should be monitored at each project site as part of a detailed stewardship plan. To protect urban forests from devastating future pest and disease outbreaks, it is absolutely vital to plant a diversity of trees and shrubs throughout the city. A landscape dominated by just one or a few species is more vulnerable, as most pests and tree diseases attack only certain species. A diverse landscape of different plant species will be more resilient to all kinds of future uncertainties.

Harmful Use: Intentional and Unintentional

In addition to the indirect effects of human development, harmful and often illegal activity, especially in parks, has had a direct impact on Burien’s urban forest. People misuse parks, harm community trees, and destroy spaces that are meant to benefit them, though this is often unintentional and a byproduct of inequity or miseducation. Trees are damaged and cut for views, park trees are taken for firewood, and other vegetation is injured in acts of vandalism. Dumped garbage and yard waste is a common problem in parks and natural areas throughout the city. Illegally dumped garbage can leach chemicals into the ground, attract rodents or other pests, and smother understory vegetation. Encroachments onto public land from adjoining private-property owners bring with them a number of problems for natural areas: primarily, the removal of native vegetation for the establishment of ornamental landscaping, lawns, or personal views. Almost all community forests also feel the

impact of neighbors’ access paths, built structures, and domestic animals.

While addressing all types of illegal activity will require sensitivity, the issue of homeless encampments is undoubtedly among the most complex. The Partnership will approach encampments on project-area sites with sensitivity toward all involved, and work with social services organizations whenever possible to come up with action plans in the combined best interest of people experiencing homelessness, neighbors, volunteers, and the urban forest itself. Drawing on the Green Cities’ Network diversity of experiences and knowledge, the Partnership will employ best practices for the health and safety of volunteers and the just and equitable treatment of the individuals experiencing homelessness and their belongings. The City of Burien employs a Human Services Manager who can serve in an advisory role when needed. The Partnership may also find solutions in connecting with the Green Cities Network and suggest policy additions or changes for Burien to address this issue with sensitivity and respect, as well as care for our shared public land.

When forested urban areas are unmanaged, they can quickly be perceived as a refuge for unintended and illegal activity, such as drug use and violent crime, because they are seen as abandoned or forgotten land. This is an unfortunate perception, as it is often untrue: well-managed green space doesn’t encourage crime, but rather, **it reduces it** (USDA Forest Service 2018). The issue is that management is costly and challenges many communities, especially in an urban setting and with limited staff capacity. When illegal activity takes place, forested areas can become known more for the harmful pursuits they harbor than for the valuable benefits they provide. Reversing this perception takes a concerted effort, but simply bringing more attention and activity to these areas helps enormously. The Green Cities Partnership uses the entire community to assist in this management through community work parties, educational walks, and events.

Lack of Homeowner Education and Resource Allocation

A final threat to Burien’s urban forest is that private-property owners lack resources relating to urban forest care, management, and maintenance. With just over half of Burien’s canopy cover existing on residential and private land, this education and resource allocation is imperative. Homeowners often inherit trees from previous owners, and in the past there were fewer resources for private tree management. Without these

resources, many homeowners and landowners choose to remove healthy trees due to the potential expenses associated with aging, large trees. The Green Burien Partnership has identified ways to provide this education and training both within the Partnership and through connecting residents with other programs and resources such as the King Conservation District.

Resource Limitations on Urban Forest Management and Maintenance on Public Lands

Historically, resources for tree and forest management and maintenance, such as in parks, have been limited in cities. In the past, it was widely believed that forests and natural areas, even in urban environments, could take care of themselves, which tended to discourage managers from allocating sufficient funds for the care of urban forests. Many Northwest parks and natural areas were left to benign neglect under the assumption that they were self-sustaining and without the understanding that they were susceptible to changing conditions and outside influence. This passive management directly led to declining health in unsupported urban forests and other natural areas. Unfortunately, but unsurprisingly, the longer active management is postponed, the more expensive it becomes, as existing tree canopy declines or is removed, invasive species spread prolifically, and threats compound.

Fortunately, scientists studying these trends began to realize that urban forests needed a more active approach. Instead of placing blame on past managers, it is important to remember that this is new information that has resulted in an increasing commitment to protect and restore healthy, urban forests in many of the world's cities. To uphold this new science, this plan recommends investing in, and is committed to, the active management of Burien's urban forest. Trees are now recognized as city and community assets — also known as “green infrastructure” — and need to be maintained as such with attendant planning, policy, and budgeting.

Unfortunately, the level of need to care for and actively manage Burien's urban forest exceeds current City staffing and funding. The diversity of forest-cover types, land uses, population densities, and land ownerships across urban areas calls for complex, long-term urban-forest-management plans (Dwyer et al. 2000). This Urban Forest Stewardship Plan is one step toward whole-forest management for Burien. The Partnership can work together to prioritize this management and be creative

in securing resources to assist with management and maintenance. By continuing to engage the community in a more structured effort to manage the urban forest, the Partnership seeks to leverage additional partner investment and volunteer engagement to meet this need. By working together, we can help Burien's urban forest thrive.

What Is Active Management?

Urban forests work differently than other natural areas. Because of development, more light enters the forest in certain areas. People bring in seeds on their clothes and shoes. And because an urban forest exists in small islands, it may have issues with pollination and regeneration. Meeting these needs and keeping these special forests healthy requires more human intervention than in other natural areas. Some examples include removing invasive plants, planting native plants, watering, mulching, stabilizing stream banks, removing garbage or yard waste, maintaining trails, or visiting to check for new problems that arise. We refer to these activities as “active management,” thus acknowledging that caring for urban natural areas requires a dynamic, hands-on effort to counteract the unique pressures they face.



4. UNDERSTANDING THE CHALLENGE IN CONTEXT

In order to fully understand the challenges and needs of Burien’s urban forests, the Partnership prioritized creating community connections and obtaining feedback from residents on how and where they would like the Partnership to work. Burien is a diverse city in an incredibly diverse part of King County. The EPA has identified areas and neighborhoods in Burien with high levels of negative environmental impacts. These impacts disproportionately occur in neighborhoods with elderly, low-income, and minority populations. The Partnership felt it was imperative to include a diversity of voices in creating this plan and did so by engaging the community in three ways: an online and paper survey, a community open house, and two small community meetings. For the purposes of this community engagement, the Partnerships in Burien, SeaTac, and Des Moines, all funded through the Port of Seattle’s ACE Fund, worked together to generate community feedback. Many residents use parks in all three cities, and many work in one city while living in another. Forterra contracted Global to Local, an organization with roots in the communities, to ensure that the feedback received was representative of the entire population of these three cities.

What Is Environmental Justice?

Some environmental factors, such as canopy cover and pollution, are disproportionately distributed across populations of people. The EPA recognizes that negative environmental factors are concentrated in areas where there are low-income earners, a majority of people of color, immigrant communities, and the elderly. Environmental justice, as defined by the EPA, is “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.”

The EPA gives a metric for achieving environmental justice: “When everyone enjoys the same degree of protection from environmental and health hazards, and equal access to the decision-making process to have a healthy environment in which to live, learn, and work.”

Community Engagement Process

One of the main goals of the process was to ensure that community perspectives — particularly those of residents from historically marginalized groups — informed the priorities and activities of the new Partnerships from the outset. Forterra conducted outreach in two main ways: tailored engagement via the Community Connectors model with Global to Local, which targeted individuals from difficult-to-reach communities through in-person surveys and small community meetings, and traditional engagement in the form of open houses and digital surveys, which was meant to gather feedback from a broad audience.

Community Survey

Forterra developed an eight-question survey designed to gather quantifiable data on community members’ priorities related to urban forestry and green space. The community survey was available online and also often administered in person by a Community Connector, who was a paid representative of Global to Local. Forterra commissioned a translation agency to translate the survey into three non-English languages that are commonly spoken among the communities represented by the Connectors: Spanish, Somali, and Filipino.

In total, we collected survey responses from 162 individuals. Of these surveys, 58 came through Connectors, 26 were completed at one of the open house events, and 14 were completed at small community meetings. The remaining 64 surveys were completed online. Of the 162 respondents, 25% live in the City of Burien, and 59% indicated that they often visit parks there. The respondents’ demographic breakdown very roughly reflects the overall population of all three cities (see Appendix J).

The most popular activity that respondents participate in when they visit parks is “view[ing] nature, trees, flowers, birds, wildlife, etc.,” which was closely followed by “relax[ing].” When asked to select the three health- or environment-related issues that were most important to them, 70% of respondents chose air pollution and 55% chose water quality — the two most common responses. While clean air and water were the top environmental priorities for community members, a significant proportion of respondents also indicated that they valued access to nature/natural beauty; quality of life/mental

health; and safe spaces for relaxing and having fun — each of these issues were chosen by 41% of respondents.

When they were asked to identify areas in their city where they would like to see more trees, it was clear that parks were a priority for many participants, as well as community/public spaces such as churches, libraries, schools, and bus stops. Many people also mentioned roadways, indicating that street trees are also in demand among survey respondents. The idea of planting more trees to serve as a visual/sound buffer between residents and industry (e.g., airport activities, construction, warehouses) was also commonly mentioned. Finally, some respondents were interested in developing ways to incentivize homeowners to plant trees on their property.

Open Houses

The Partnerships hosted three open house events in fall 2018: in SeaTac on Saturday, October 20; in Des Moines on Monday, October 29; and in Burien on Wednesday, November 7. The open houses served a dual purpose: to provide information about the project to community members and to gather input from residents about

stewardship priorities in their neighborhoods. There were several “stations” set up around the room that gave participants the opportunity to learn more about Green Cities Partnerships, engage with research that has been conducted thus far, and provide both site-specific and general feedback on areas where they would like to see more trees and/or restoration efforts. The Port of Seattle also hosted a table with information on ACE Fund priorities and activities.

Overall, the Partnerships engaged 74 guests at the open houses, including 29 guests in Burien. These numbers reflect individuals who signed in at the events, and therefore may underrepresent the actual number of people who participated.

From the open-house-feedback activities, we gained input related to site-specific stewardship priorities, types of landscapes where residents want to see more trees, and general community feedback. There were also several comments about planting trees near areas undergoing development in order to provide a buffer between residents and development activities. For a full summary of feedback collected at the open houses, see Appendix J.



Photo: City of Burien

Small Community Meetings

The Partnership conducted two small community meetings in Burien and six, in total, in all three cities. These meetings were focused around groups not already represented in the surveys or community open houses. In Burien, Partnership representatives attended meetings of the South King County Native Coalition and met with high school students from Highline Public Schools' Waskowitz Environmental Leadership and Service Program. From these meetings, the Partnership gained perspectives about accessibility and inclusivity that will inform its future projects and programs.

The high school students expressed concern about their personal safety and how they are perceived by adults when they are using green spaces. They spoke about how the smaller parks in their neighborhoods were not made up of much forest, and that access to larger parks is very limited. Several students had only been to Seahurst Park, Burien's largest, on a class field trip, despite living nearby. The students said that the parks closer to their homes are dirty, in disrepair, and full of litter. Many mentioned that they might be profiled if they were seen "hanging out" in parks and feel like they don't know how best to use parks now that they have outgrown the playground equipment. A few students remarked that they perceive parks as places where illegal activities take place, and, potentially because of their age and color of their skin, they might be perceived by others as being associated with these criminal acts.

Finally, several students mentioned how much planting and maintaining trees would mean to their school grounds. They wanted to be the recipient of potential tree giveaways — even going so far as to suggest planting a tree in the middle of their classroom. The students expressed concern about the current lack of access to trees, especially after learning about trees' mental health benefits during a recent school project. Finally, the students were excited about the potential for the Partnership to supplement their school curriculum with hands-on skill building in career paths such as urban forest management, tree care, and community outreach.

At the Coalition meeting, the discussion was centered on encouraging community participation in events for indigenous youth and adults. The Coalition stressed the importance of recognizing urban native peoples (those not residing on tribal lands) and finding ways to best reach those persons. The Green City Partnership expressed interest in engaging all urban people, including indigenous people, in the projects and programs of the Green Burien Partnership. The Coalition suggested that the Partnership

work closely with Highline Public Schools, as well as the Native American Youth Leadership Academy, in order to ensure that Native American representation exists within the plan and programs.

Centering Equity and Diversity

A number of studies have concluded that the distribution of urban green space is related to measures of socioeconomic status, such as income, race/ethnicity, education, and occupation. These studies regularly report that neighborhoods with higher socioeconomic status enjoy greater access to nearby green space (Gordon-Larsen et al. 2006; Jennings and Johnson Gaither 2015; Wen et al. 2015). We also know that people living near parks and green space have less mental distress, are more physically active, and have extended life spans (USDA Forest Service 2018). When we reviewed community feedback, obvious patterns emerged, especially the community's concerns surrounding environmental health and wellness — namely air pollution and mental health.

Studies show that poorer communities are at higher risk of exposure to air pollution and the effects of extreme heat (Huang et al. 2011). Trees and vegetation in parks can help reduce air pollution directly by removing pollutants and reducing air temperature, both of which contribute to smog (Nowak and Heiseler 2010). In 2010, in the United States alone, trees removed 17.4 million tons of air pollution, which prevented 850 human deaths and 670,000 cases of acute respiratory symptoms (Nowak et al. 2018).

Higher tree density in urban areas is also associated with decreased risk of depression (Astell-Burt et al. 2014). When people live more than 1 kilometer (0.6 miles) away from green space (or blue space, such as beaches), they report a 42 percent increase in stress levels (Stigsdotter et al. 2010). Every 1% increase in a city's useable or total green space results in a 4% lower rate of anxiety/mood disorder treatment (Nutsford et al. 2013). The data paints a clear picture: if communities are concerned with mental health and wellness, air pollution, and other environmental health concerns, they should enhance and preserve green spaces across cities and plant more trees — especially in areas where people live and work. The Green Burien Partnership has responded with a two-pronged approach: enhance preexisting urban forest and work to increase canopy cover throughout the city, especially in areas with low cover and/or lower socioeconomic status.



Figure 5: Illustration of canopy cover in a city neighborhood

How Does Burien's 30% Canopy Cover Measure Up?

Across the United States, the suitability of land for trees varies widely. Imagine Phoenix, once a large and beautiful desert, being densely planted like a forest — it just doesn't make sense. Thus, in the US, an average of 33.6% urban canopy cover is a number we probably could improve on, but it covers diverse landscapes. Here in Western Washington, our potential for tree cover varies as well, but according to most research, the potential for trees in cities that were once forested is about 40%–60%. Currently, a few cities, such as Redmond, are leading the pack with high canopy goals.

- National urban-canopy-cover average: 33.6%
- Redmond, WA: 38%

Because not all areas can support tree planting, the Partnership recommends targeting areas with lower canopy cover, greater potential for planting sites, and little current access to green spaces. The Partnership worked with King Conservation District to produce a tool called Canopy Planner that can help managers prioritize such sites. For the purposes of this plan, there are **11 census districts in Burien with canopy cover lower than 25% that have a potential for 25%–40% canopy cover** (see Figure 6). Interestingly, using the EPA's environmental-justice mapping tool, EJ Screen, the Partnership determined that, of these 11 identified districts, six are potential sites for environmental-justice initiatives because of factors such as increased cancer risk, as well as demographic factors such as high economic and racial diversity, and percentage of elderly residents.

Canopy-Cover Analysis: Canopy Cover in Relation to Schools

A Michigan study found that, after controlling for student socioeconomic status and racial/ethnic makeup, building age, and size of school enrollment, views from school windows (namely, cafeteria and classroom windows) with greater quantities of shrub and tree cover were positively associated with higher standardized test scores, elevated graduation rates, and a higher percentage of students planning to attend a four-year college. These schools also had fewer incidences of criminal behavior (Matsuoka 2010). A 2016 study found that classrooms with views of green landscapes had significantly better performance on tests of attention (Li and Sullivan 2016). Because of studies like this, the Partnership agreed that it was important to consider how Burien's schools compare to each other and to the city average in their access to trees (see Figure 7). Remembering that Burien's overall canopy cover is at 30%, we analyzed the percentage of canopy cover within a quarter mile of each school (the distance of a short walk or possible viewshed); see Appendix C for a map that illustrates the results.

Schools with 10%–20% canopy cover within a quarter mile:

- Highline High School
- Puget Sound Skills Center
- Big Picture Schools
- Choice Academy
- John F. Kennedy Catholic High School

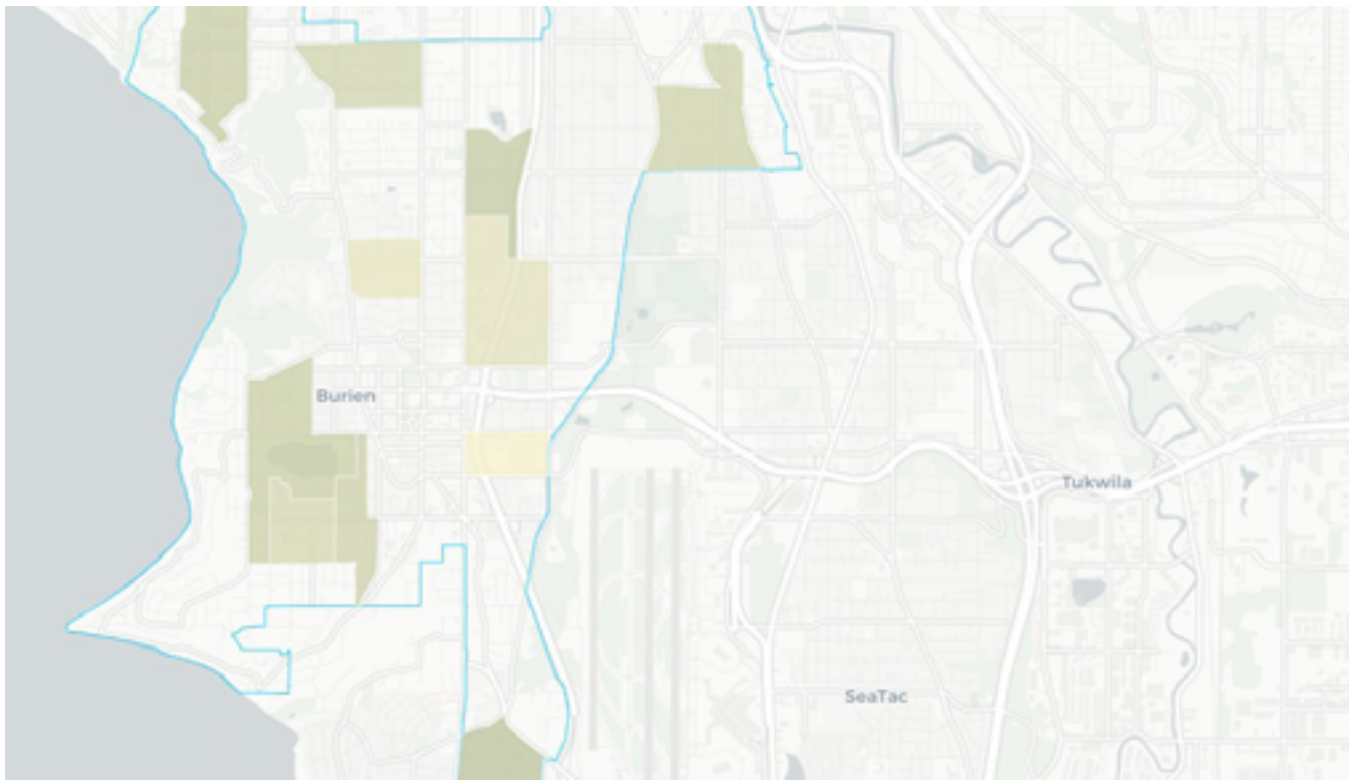


Figure 6: Canopy-planning-software map with 11 target census districts identified

Schools with 20%–30% canopy cover within a quarter mile:

- Gregory Heights Elementary School
- Three Tree Montessori School
- St. Francis of Assisi School
- Seahurst Elementary School
- Hazel Valley Elementary School
- Cedarhurst Elementary School
- St. Bernadette Parish School
- New Start High School
- Hilltop Elementary School
- Shorewood Elementary School

With support from the Partnership, Burien can be intentional about increasing canopy cover close to its schools. And because schools are also located in neighborhoods, the benefits of increasing canopy cover in these areas can have a double impact. Because schools connect to almost all of the city’s community groups, they should be prioritized for forest-canopy enhancement.

Canopy-Cover Analysis: Canopy Cover in Relation to Public Housing

In 2001, researchers studied 169 children who lived in identical public-housing buildings in a city with varying levels of nature nearby. They found that the more natural the view from the child’s home, the higher the child scored on tests of concentration, impulse control, and delayed gratification. These researchers suggested that, “when housing managers and city officials cut budgets for landscaping [in cities], they deprive children of more than just an attractive view” (Faber Taylor et al. 2002). Of course, that means the opposite is also true: managers and city officials who prioritize green space and planting around public-housing sites improve people’s lives.

In 2017, a tree-canopy analysis at Burien’s public-housing sites found that all sites could improve canopy cover, especially in comparison to citywide averages. At 10%–20%, Sunnysdale, Burien Park, and Munro Manor have the least amount of canopy cover within a quarter mile of the site. Boulevard Manor and Yardley Arms had 20%–30% canopy cover, which is less than the city’s average. With all the evidence we have about how enhancing canopy cover greatly affects the lives of residents, it is important that the City of Burien and the Green Burien Partnership prioritize increasing canopy cover in these areas.

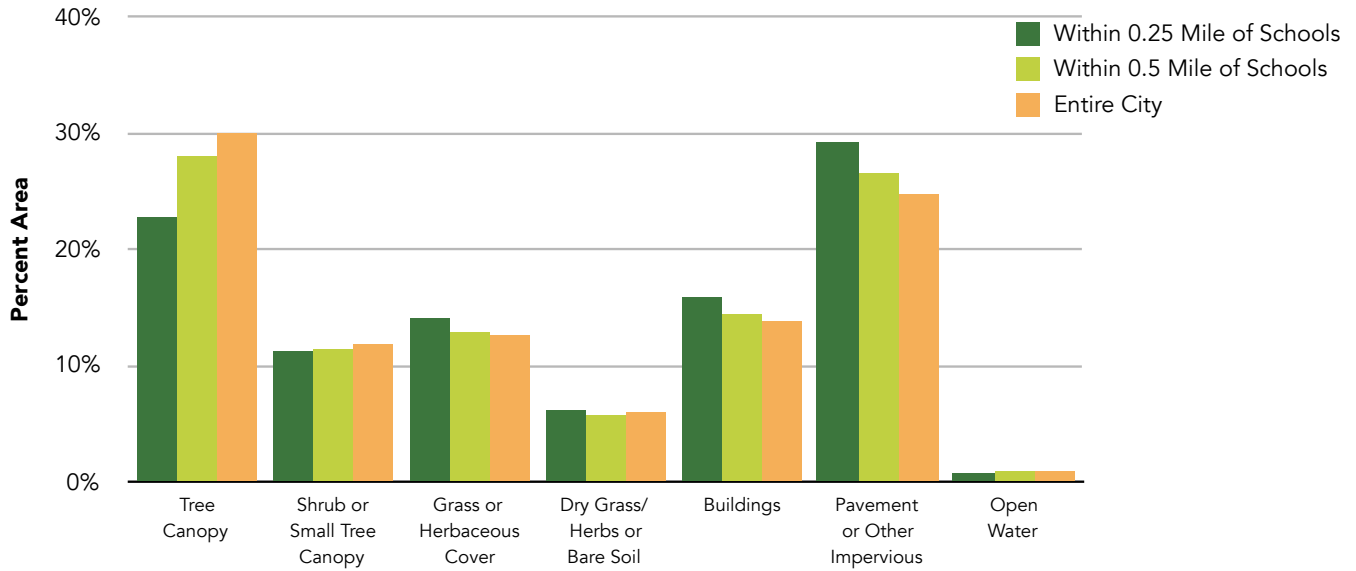


Figure 7: Land cover in proximity to schools compared with citywide totals

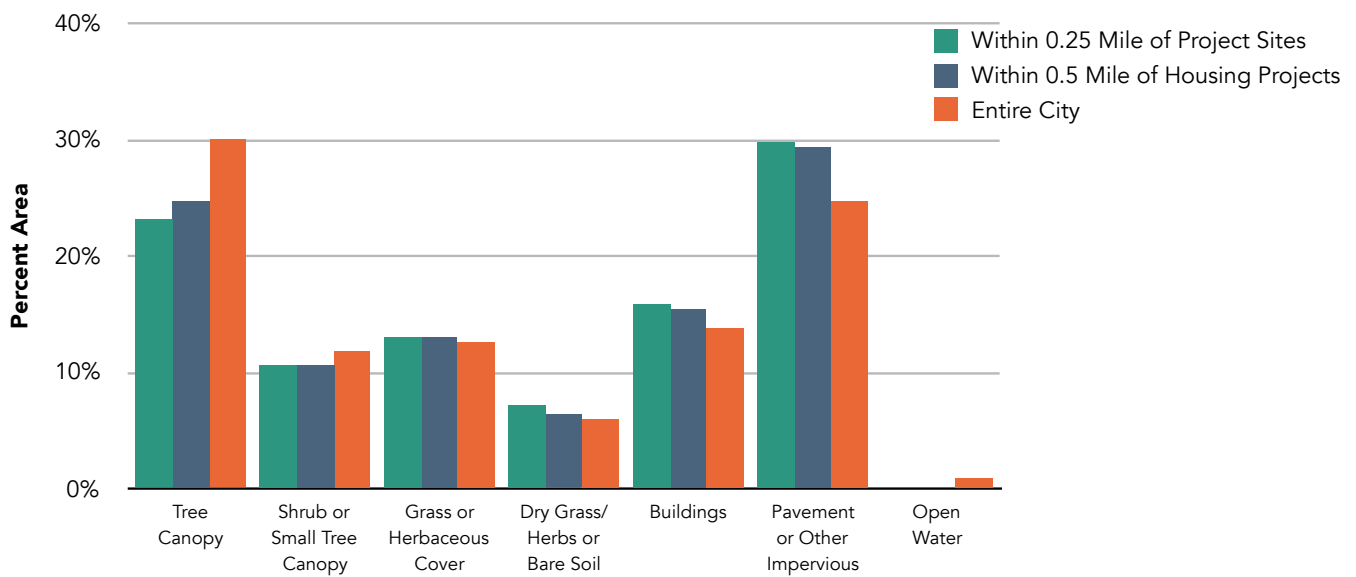


Figure 8: Land cover in proximity to public housing projects compared with citywide totals

5. MEETING THE CHALLENGE

Mission and Vision

Green Burien Partnership’s mission is to engage the community in enhancing and maintaining a healthy and sustainable urban forest in order to increase quality of life, mitigate climate change at the local level, and protect Burien’s valuable natural resources for current and future generations to enjoy.

Mission Moment

- *Engage the community.*
- *Enhance and maintain a healthy urban forest.*
- *Increase quality of life.*
- *Mitigate climate change.*
- *Protect resources for all to enjoy.*

The Partnership will be a collaborative effort that brings together the City of Burien, Port of Seattle, and other government agencies; Highline Public Schools and other educational institutions; nonprofit organizations such as Forterra; and private landowners, local businesses, and the Burien community at large. The Partnership’s vision is a city with a healthy, sustainable urban forest and an engaged community invested in our shared environment. A healthy urban forest contains multiaged canopies of trees throughout the city, where invasive plants pose a low threat and, where appropriate, a diverse assemblage of plants provides a multitude of benefits to the ecosystem. Sustainable urban forests are distributed equitably throughout the city, are not concentrated solely in areas of prosperity, and are supported by both city staff and the community (Endreny 2018).

Outcomes

Achieving the Green Burien Partnership’s long-term vision will benefit the city in a variety of ways. Specifically, the Partnership anticipates that success will include the following outcomes:

1. Improved health of Burien’s urban forest, with all 326 acres of park-based urban forest enrolled in restoration and active management.
2. An increase in canopy cover, due to ending the

decline of Burien’s urban trees and canopy cover and increasing equitable tree distribution throughout the city.

3. Quality-of-life enhancement through the public’s increased use and enjoyment of a healthy, safe, accessible urban environment.
4. Positive economic and public-health effects and enhancement of ecosystem services that a healthy urban environment provides (e.g., cleaner air, cleaner water, stormwater retention, safe access to recreation, increased wildlife habitat, community building, civic pride, and more).
5. A high ownership stake in, and a personal connection to, the city’s urban forest (including parks and open spaces) for Burien residents.

Goals

For the Green Burien Partnership’s mission to succeed and for its vision and desired outcomes to become a reality, certain goals must be achieved during the next 20 years. The following goals, along with measurable benchmarks (Appendix I), were developed based on current habitat conditions, current capacity to support restoration efforts, and the experience of other partnerships in the Green Cities Network. Chapter 8, “Adaptive Management,” describes the process of monitoring and tracking the program’s success in more detail.

1. Identify priority sites for restoration and active management of already existing community forest, and work to replace aging canopy cover in those areas by developing stewardship plans for priority sites.
2. To support this restoration, identify areas most appropriate for canopy-cover enhancement and begin working on city and volunteer initiatives to enhance urban canopy.
3. Host community events that foster the use, enjoyment of, and connection with, Burien’s urban forest in ways that are relevant to its diverse community and encourage stewardship, connection, and education.
4. Recruit, retain, and support volunteers in meaningful restoration and enhancement projects in local parks and throughout the city.
5. Develop a stewardship program that empowers a growing number of dedicated participants to take a

leadership role in restoration of the city's parks and community forest.

6. Develop a stewardship program that empowers a growing number of dedicated participants in canopy-cover enhancement, tree maintenance, and neighborhood greening efforts.
7. Identify areas where skilled field crews are necessary and work collaboratively as a Partnership to fund, support, and complete this work.
8. Build collaborative working relationships among government agencies, nonprofits, schools, and other partners.
9. Establish resources to sustain the program for the long term.
10. Celebrate the Partnership's success.

Partnership Roles and Responsibilities

Based on the experience of the other Green Cities, this section describes a management-structure model that has been modified for the Green Burien Partnership. The structure is intended to support several thousand community volunteers, City and nonprofit staff, and skilled field crews, who will implement the Partnership by performing the work needed to achieve plan goals. In the Partnership's first two years of implementation, a primary task will be planning and prioritizing projects. The Partnership's leadership, or Management Team, will guide the program's planning and implementation, ensure quality programming and fieldwork, seek and allocate resources, and help achieve plan goals. Working collaboratively as a Management Team, both Forterra and the City can strategically grow the leadership to include representatives from other stakeholder agencies, such as Highline Public Schools, EarthCorps, or other environmental nonprofits. All three program areas (community, field, and resources) should be part of this team's scope, including tracking and reporting each area's progress. In the first five years, the focus is on building and supporting a volunteer base, spreading program awareness, and demonstrating restoration and planting results on the ground. As community support becomes established, staff time can be reallocated to the fieldwork component, especially for volunteer management and coordination of the work done by Stewards and skilled field crews.

Support staff will help facilitate implementation work by coordinating resources and communication across the

Partnership. There will also be a need to seek the necessary near-term funding and resources to help meet program goals. The funding from the Port of Seattle's ACE Fund is intended to support the Partnership during the first full year of implementation in 2020. Beyond that time, the City may need to consider other ways to fund the work of the partnership. It is important that the Partnership consider creative ways of funding the work and rely on the Green Cities Network for ideas and tested strategies; other Green Cities can help provide information on what has worked for them in securing resources. Partnering organizations such as Forterra, other organizations, and businesses can help provide ideas and be an advocate for the City to get the funds to continue this work.

During these initial years, the Green Burien Management Team will provide guidance and oversight. If there is enough support from interested Burien residents, the Partnership may benefit from establishing a Community Advisory Committee. This committee should include community members and representatives from diverse backgrounds and interests. Potential organizations represented could include advocacy groups, the school district, neighborhood groups, and local corporate sponsors, along with the City and Forterra. The key roles of the Community Advisory Committee could be to advance the Partnership's larger goals, provide guidance regarding budgets and funding, and garner community support.

All of this is designed to provide resources to support and track on-the-ground fieldwork undertaken by volunteers and skilled field crews (city staff, nonprofits, and other professional contractors). Without advance planning and structure for the Green Burien Partnership, the fieldwork will not be as successful, efficient, and organized as it should to achieve the plan's goals during the next 20 years.

City of Burien

City of Burien staff members provided expert information, guidance, and advice in the planning of the community outreach described in Chapter 4 and potential implementation projects, as well as the creation of this plan. These staff — primarily the City planning staff, who will serve as the primary point of contact — will continue to provide oversight for the Green Burien Partnership. They are a vital part of the Partnership, as they guide the investment of the ACE Fund from the Port of Seattle and ensure that the Green Burien Partnership reflects the values and the mission of the City itself. Other departments working collaboratively with the Partnership include Public Works, Communications, and PARCS.

PARCS

The City of Burien's Parks, Recreation, and Cultural Services Department currently manages almost all of the sites within the Green Burien project area. However, the department is currently at capacity addressing its community programs, facility maintenance, ornamental plantings, and lawn areas. The PARCS Department has dedicated staff time to helping draft this plan and is committed to implementing Green Burien Partnership projects. Its staff currently conduct outreach and volunteer recruitment for a variety of projects, including an Adopt-a-Park program. This program will be enhanced by the Partnership's volunteer Forest Stewards, who will be trained to restore and care for forested parks that are currently under-resourced.

PARCS is currently collaborating with EarthCorps, an environmental nonprofit, to restore some areas of Seahurst and Eagle Landing Parks, among others, through King Conservation District funding. PARCS has connected Forterra to these projects and has found ways to incorporate Green Burien Forest Stewards. The Green Burien Partnership will promote and support these and other projects with community events and long-term maintenance and monitoring through volunteer engagement.

Port of Seattle

As the funder of this work, the Port of Seattle selected the Green City model to invest in long-term forest stewardship for near-airport communities. Additionally, through the ACE Fund, the Port has invested \$240,000 since 2017 in 28 small matching grants for community environmental projects in Burien, SeaTac, and Des Moines.

The Port has also completed its own forest health assessment of urban forests located on airport property. The assessment will be used to develop a long-term land stewardship plan for Sea-Tac Airport and identify forest restoration activities in alignment with the Green Burien Partnership.

Forterra

Forterra is dedicated to regional sustainability in all its dimensions — environmental, social, and economic — Forterra secures places across Washington's full landscape that are keystones of our shared future. This includes the work of the Green City Partnerships Department which supports all Green City Partnerships

and works to keep all Partnerships connected through the Green Cities Network. The Green Cities Network facilitates quarterly focus groups that are open to all Partnership staff; distributes training, grant, and other announcements via the Network listserv; and offers technical and general assistance to participating Green City partner agencies.

Forterra will continue to work alongside partner agencies and the public to articulate and advance the goals of the Green Burien Partnership, initiate Partnership programs by creating a Forest Steward Program in Burien, and begin restoring priority sites through volunteer events, including Green Burien Day. It will also initiate education and engagement around increasing the city's canopy cover through tree distribution to private homeowners and landowners, community-based tree plantings, educational tree walks, and tree-care trainings. It will encourage community tree volunteerism throughout the program and conduct the initial community outreach and volunteer recruitment for all aspects of the Partnership. Forterra may also provide additional skilled field crews, program management, outreach, marketing, development, and greater coordination and connection to the regional Green Cities Network, if needed, through possible future grants or contract funding.

Highline Public Schools

Highline Public Schools is committed to the Partnership and is interested in finding ways to collaborate for the benefit of the urban forest and the students and staff at its schools. The District property has several locations that would be perfect for urban canopy enhancement. Also, much of the urban forest acreage needing restoration is near schools, and this presents an excellent opportunity to involve students and classes in stewardship. The District's communications staff will help find opportunities for the Partnership to reach students and families. The District, along with the Partnership, also has the potential to apply for grants and other funding to create new greening efforts on school property.

Nonprofit Organizations

ACE Small Grant Recipients

Since 2017, 28 projects have been funded for a total of just under \$240,000 to support environmental projects in the cities of Burien, SeaTac and Des Moines. Many of these recipients are ideal candidates for partnership. There are a multitude of opportunities possible for these organizations to participate, including co-hosting

events and stewarding Green Burien sites. For a full list of recipients, please visit <https://www.portseattle.org/page/airport-community-ecology-ace-fund>.

ECOSS

ECOSS, formerly known as the Environmental Coalition of South Seattle, currently runs a program for Burien's newly arrived residents, particularly from immigrant and refugee communities. The program helps them get to know their new home and its surrounding environment by offering information on issues such as accessing and using public natural areas, and the permits, rules, and regulations regarding harvesting and recreation. The Green Burien Partnership will look for ways to partner with ECOSS to create programming and events that are culturally appropriate, appealing, and accessible to Burien's large immigrant and refugee communities, and that celebrate their use of public parks and natural areas.

EarthCorps

EarthCorps has a long history of working with Burien's PARCs staff as professional contract crews for restoration of parks through invasive species removal. This work will eventually lead to canopy-cover replacement and enhancement of Burien's urban forest with assistance from the Partnership and volunteer planting projects. The Partnership will work collaboratively with EarthCorps not only as a contractor, but also as a nonprofit member of the team. Additional roles EarthCorps may fill are listed below in "Other Organizations."

Other Organizations

It is the Partnership's intent to look for opportunities to collaborate with organizations that share common goals. Reaching out to various nonprofit organizations and community groups that serve the Burien area and finding arenas for mutually beneficial work will strengthen and leverage community support for the plan. Additional groups may supplement work performed by Green Burien partner agencies in the following capacities:

- Recruit, organize, support, lead, and/or train community volunteers.
- Facilitate involvement of Burien residents or civic, business, and community organizations.
- Perform restoration work in areas that cannot be served by volunteers or in areas where the Partnership directs such work.

Volunteers and the Community at Large

Volunteers donate their time to the Partnership by helping restore and enhance Burien's urban forest, leveraging the financial resources of Green Burien partner agencies, and allowing more areas to be actively cared for. They bolster community interest and support for local parks and natural areas through their advocacy, and build critical local ownership of, and investment in, public spaces. A key responsibility of the Partnership will be to work with community members to provide training, site-planning assistance, support, and encouragement.

Forest Stewards

An active and educated group of Forest Stewards is essential to expanding the Partnership's capacity to work in many parks simultaneously and will help shape the work to fit the needs of particular communities. Individual volunteers and groups will be recruited to help Stewards with their forest-restoration projects, with a goal of assigning one Forest Steward to each of Burien's forested parks. These stewards will host three or four work parties annually in their park. These events will be open to the public and will assist in the restoration of Burien's 326 acres of forested parkland.

Community Stewards

There is a potential for other volunteer stewards to be trained and valued members of the Green Burien Partnership. One goal of the Partnership is to hold a tree-care and maintenance training where participants can gain a better understanding of how best to care for individual community trees or trees in their own yard. An active program of Community Stewards could help plant, care for, and monitor community trees in Burien and help relieve the Public Works Department's workload in caring for street trees.

Commercial and Nonprofit Field Crews

Professional field crews and contractors will complement the work of volunteers in achieving forest-stewardship goals. Professional crews typically focus on steep slopes and other sensitive areas not appropriate for volunteers, or projects that require technical expertise beyond the scope of volunteers, such as mature tree care and training. Several local training crews, including EarthCorps, the Student Conservation Association, Washington Conservation Corps, Duwamish Valley Youth Corps, and Duwamish Infrastructure Restoration Training (DIRT)

Corps, provide excellent opportunities to get restoration work done on Green Burien sites, along with employment and job-skills development for local residents, especially youth. It is the hope of the Partnership to secure funding for hiring professional crews in areas where it is appropriate or necessary.

Potential Sponsors

Corporate sponsors will have opportunities to support the Partnership with financial donations and beyond. Many businesses offer their employees opportunities to volunteer for various community projects. Corporations and local businesses will be invited to participate in volunteer restoration events, providing a substantial volunteer labor resource. Sponsors may also be asked to make other contributions as appropriate. For example, it is not uncommon for businesses to help defray expenses by donating event supplies, coffee and snacks, or services such as graphic design, advertising, or event planning as an in-kind donation to the Partnership. In return, these organizations receive the opportunity to engage with the community and contribute to a healthier, more livable urban environment.

Private Landowners

Private and public lands create a patchwork of natural areas across the City of Burien. Private lands serve as vital connectors between fragmented public green spaces. Many of the pressures on Burien's forested parks and

natural areas are related to actions on adjacent private land, which can either enhance surrounding public spaces or lead to their degradation. Private landowners can also have a powerful impact on stopping canopy decline and increasing canopy cover.

In Burien, 56% of land use is residential, and 30% of residential land is covered with trees. Through a tree-distribution event, the Partnership will encourage private landowners to increase their canopy cover by providing trees to the community to plant at their homes.

Landscaping choices and lack of maintenance on private property are major sources of invasive plants that spread to public parks. Illegal dumping of yard waste on park property also leads to the spread of invasive plants and smothers healthy plant communities. Burien landowners who live adjacent to forested parks will be encouraged to be more active in the stewardship of their land. Efforts to educate landowners about the benefits of native shrubs and trees, and the problems of invasive species such as English ivy, can play a key role in preventing the continued spread of invasive species throughout the city. Working with landowners through education programs, landowner-incentive stewardship programs, and other complementary programs for private property will help the Partnership generate a community that cares about the well-being of the urban forest, both on their own lands and in public spaces. Engaging these landowners as invested stakeholders will mobilize an important corps of advocates and volunteers to reverse the trend and improve the health of their property and the parks.



Photo: Laura Marchbanks

6. ASSESSING THE URBAN FOREST

Effective and efficient natural-resource management can only be accomplished if planners, field staff, and decision makers have up-to-date environmental information on which to base actions. Empowered with clear, systematically collected data, the Partnership will be able to understand on-the-ground conditions, identify the strategies and resources needed to accomplish the work, and identify priorities. With this in mind, the Partnership employed two methods for assessing Burien’s urban forest: its density and its health.

Part I: Land-Cover Classification and Canopy-Cover Analysis

For the first time in the Green Cities Network, Forterra’s GIS team partnered with Core GIS, a small, local, and woman-owned geospatial firm, in order to survey the forest-canopy cover through a land-cover classification of the City of Burien. This provided us with a clear picture of land use in the entire city (See Figure 9). Forterra’s GIS experts then developed maps and tools that can help encourage equity when increasing forest canopy. As mentioned in Chapter 4, we also used community feedback and data from the land-cover classification to help inform our recommendations for future implementation projects.

Methods

The first step in performing our neighborhood canopy assessment was to map the extent of tree canopy and other land-cover types throughout Burien. The Partnership subcontracted this work to CORE GIS, which has considerable experience producing this sort of land-cover-classification data. The CORE GIS team used the same methodology and conducted these analyses in all three ACE Green Cities.

CORE GIS derived the data using guided classification techniques based primarily on four-band aerial imagery captured during the summer of 2017 by the USDA National Agricultural Imagery Program (NAIP) at a resolution of 1 meter. They stratified vegetated areas by height into three classes (tree, shrub, grass/herb), based on height information obtained from 2016 King County LiDAR data. The team further refined preliminary results through the use of vector data delineating building footprints and paved areas provided by the city or

digitized by hand as needed, along with 2015 King County impervious-surface data created using remote-sensing techniques.

The resulting spatial data set includes the following seven land-cover classes, visually portrayed below:

- Tree canopy
- Shrub or small-tree canopy
- Grass or herbaceous cover
- Dry grass/herbs or bare ground
- Buildings
- Pavement and other impervious surfaces
- Open-water areas



This 2017 land-cover-classification data set was rated at a 97% accuracy averaged across all seven classes, which lies well above the 85% level of accuracy that is widely held to be acceptable for land-cover data produced using this approach. The first application for this data was to calculate the distributions of all seven cover classes within Burien.

“Land use” refers to how land is used or managed by humans. Classification systems commonly adopted in the context of municipal planning and management tend to differentiate, at the most basic level, commercial, industrial, residential, governmental/institutional, and undeveloped/vacant uses. For the purposes of this plan, we measured the following land-use classifications using the use-category codes defined by the Washington Department of Revenue:

- Commercial
- Industrial or warehouse

- Institutional
- Public park, natural area, or open space
- Recreational (private or commercial)
- Residential
- Transportation or utility
- Vacant or undeveloped

The Department of Revenue model as used by King County employs more than 125 different classes. This provides more detail than is practical for this plan’s purposes, so we simplified by combining similar county present-use categories into this final list of eight, more general categories.

Results

As a primary objective of this project, Forterra mapped and measured the distribution of tree canopy and other land-cover types across Burien to provide a general indication of urban-forest cover in each of these communities. In addition to citywide statistics on total and percent area, we calculated the distribution of land-cover types coincident with the following locations or landscape characteristics:

- Existing land use
- Proximity to public housing projects (Appendix B)
- Proximity to schools (Appendix C)
- Social vulnerability (Appendix D)

These statistics are intended to serve as indicators of a community’s current access to the social and health benefits associated with tree canopy, as well as to identify potential stewardship activities and guide equitable and sustainable development.

Part II: Parks and Natural Areas Health Assessment

In addition to the previous analysis, the Green Burien Partnership conducted a forest health assessment to characterize habitat conditions across Burien’s forested parks and natural areas, and develop its citywide restoration plan. Although this work will not meaningfully increase canopy cover, it will ensure that the present canopy cover in these areas is not lost. For the purposes of this plan, when looking at forest health, we assessed parks with large portions of forested area, as well as dense-forest

and natural areas owned by the City. Combined together, this land makes up 326 acres, roughly 5% of Burien’s total land area.

How Big Is 326 Acres?

At 326 acres, Burien’s forested and natural area parkland, combined together, represent an area that is equivalent to 247 regulation American football fields, a little under the size of two Seahurst Parks, or roughly 1/8th the size of Sea-Tac Airport.

Methods

The habitat assessment focused on the 326 acres of forested and natural area parkland owned and managed by the City of Burien. The parcels included in the Partnership’s scope were those that currently support, or have the potential to support, (1) native lowland-forest communities with tree-canopy cover greater than 25% and (2) forested and shrub-dominated wetlands or emergent wetlands that do not support a full tree canopy. While landscaped parks and street trees provide important ecological benefits and should be targeted for maintenance and tree planting where desired, they were not included in this assessment, but were included in the Partnership’s canopy assessment. Open water was also not included in the health assessment.

Tree-iage and the Forest Landscape Assessment Tool

Baseline ecological data during the fall of 2017 using a rapid-assessment data-collection protocol called the Forest Landscape Assessment Tool (FLAT), developed by the Green Cities Research Alliance (<https://www.fs.usda.gov/pnw/tools/forest-landscape-assessment-tool-flat-rapid-assessment-land-management>). FLAT is based on the “tree-iage” model, originally developed by the Green Seattle Partnership. Tree-iage is a prioritization tool, based on the concept of medical triage, that uses habitat composition (e.g., canopy cover or native plant cover) and invasive plant cover as the two parameters to prioritize restoration (Ciecko et al. 2016).

The FLAT adaptation builds on the existing framework of the tree-iage model to characterize additional habitat attributes beyond tree canopy and invasive plant cover.

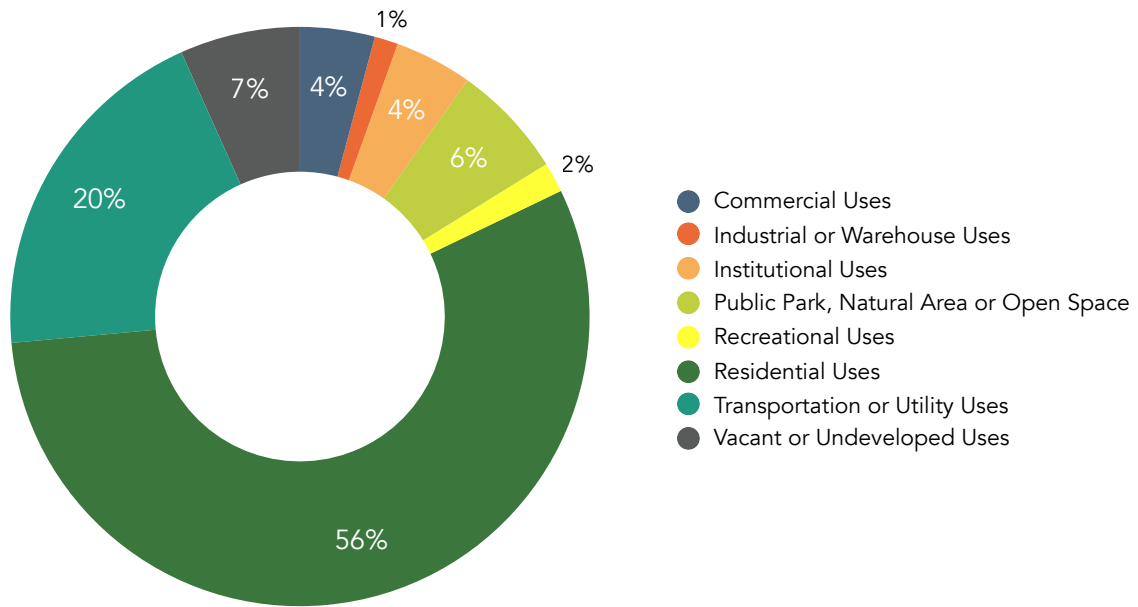


Figure 9: Land use in the City of Burien in 2018

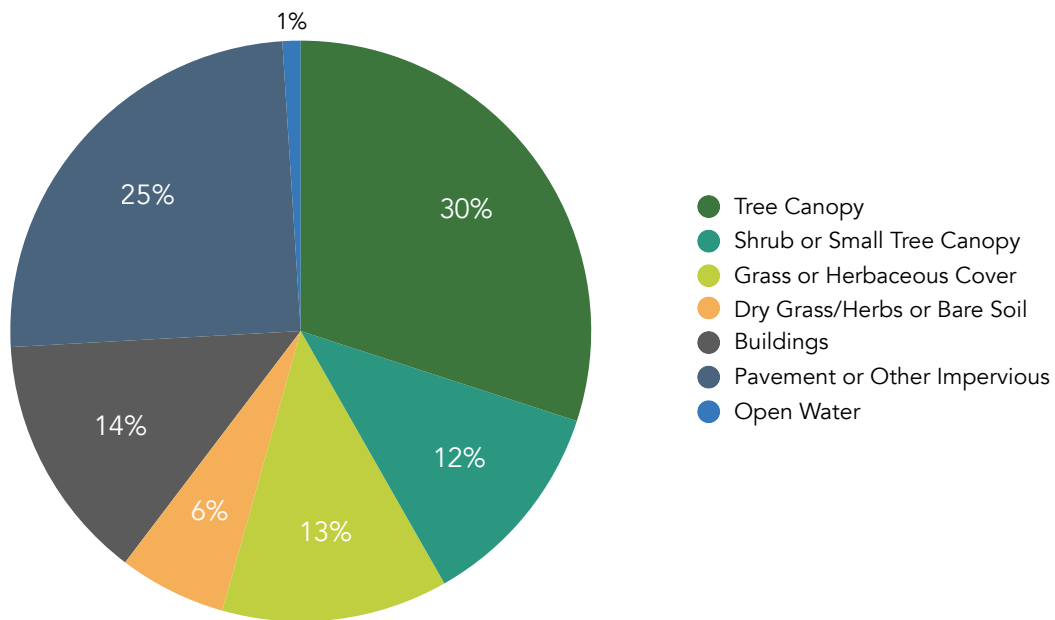


Figure 10: Land use in the City of Burien in 2018

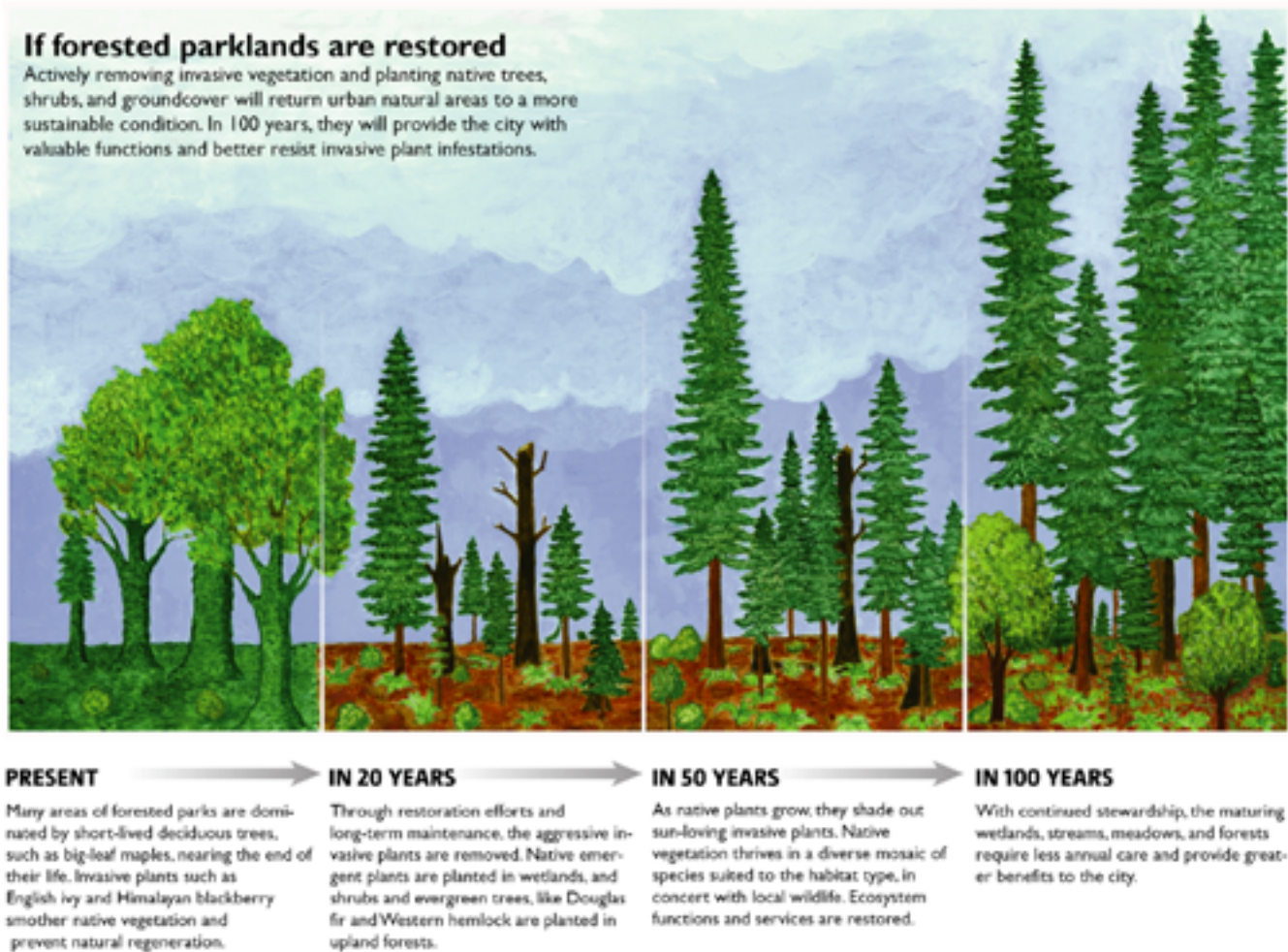


Figure 11: Illustration of the forest if it is restored

These include tree age and size class, native understory species present, and indicators of threats to forest health, including low tree-canopy vigor, root rot, mistletoe, and bare soils due to erosion. We also documented the presence of regenerating trees (canopy species less than 5 inches in diameter at breast height), which play an important role in the forest’s long-term sustainability. In addition, we deemed each stand “plantable” or “not plantable” based on whether site conditions were appropriate for tree-seedling establishment.

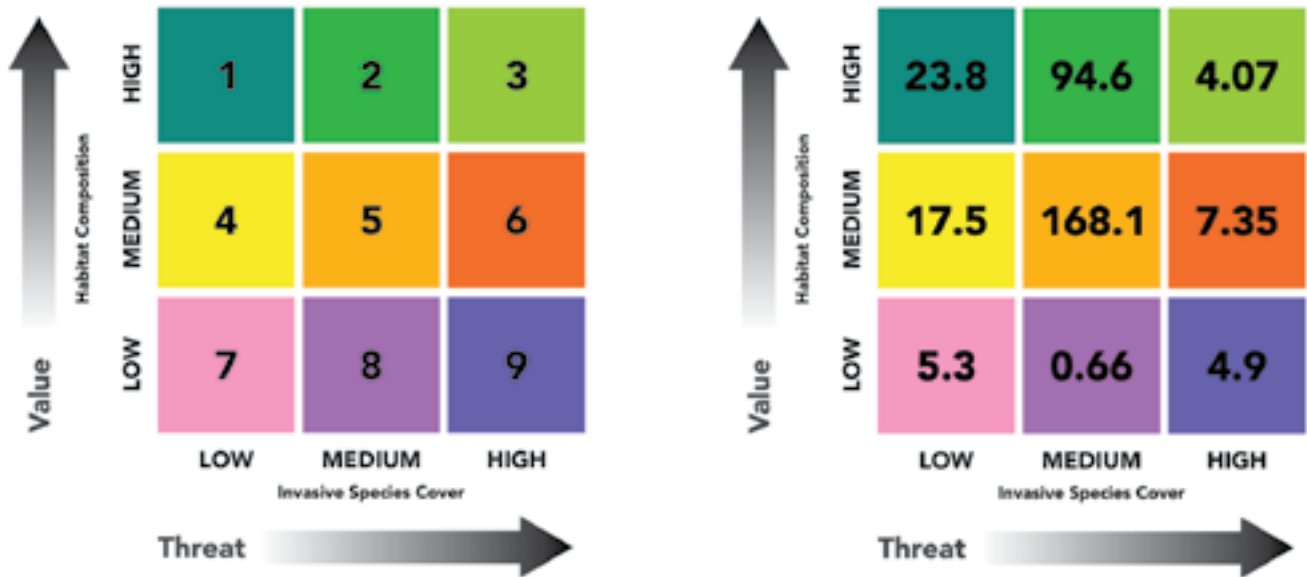
Rapid-assessment methodologies such as FLAT produce a snapshot of the overall condition at any one site and on a landscape or city scale. The data serves as a high-level baseline from which finer-scale, site-specific restoration planning can be conducted; site-by-site analysis will need to be done as work progresses to help ensure the most appropriate restoration practices and species composition are chosen for each site. Green Burien partners will continue to develop more-detailed site-level

stewardship plans to further assess planting conditions and outline management recommendations as more park sites are prioritized for restoration activities.

Prior to field-data collection, we classified natural areas within the Green Burien Partnership project area through digital orthophoto interpretation, dividing each stand into one of five categories: forested, natural, open water, hardscaped, or landscaped. These initial stand-type delineations were ground-verified in the field, and if necessary, the delineations were corrected, or the boundaries were adjusted in the GIS. The delineated stands are referred to as Management Units (MUs). All MUs were assigned unique numbers to be used for field verification and data tracking. Since hardscaped and landscaped areas are not suitable for active native-vegetation management, they were removed from the total acreage targeted by the Partnership.

In the field, we surveyed each MU to identify its specific habitat type (e.g., conifer forest, deciduous forest, riparian

Tables 2 and 3 | Tree-age Legend and Distribution of Acres in Each Tree-age Category



shrubland, etc.) and also to capture information on primary and secondary overstory species and size class, as well as primary and secondary understory species. (Primary refers to those species most abundant in the MU, and secondary refers to the second-most-abundant species.) From this data, each MU was assigned a value (high, medium, or low) for habitat composition, according to the following breakdown:

HIGH:

MUs with more than 25% native tree-canopy cover, in which evergreen species and/or madrones make up more than 50% of the total canopy.

OR, MUs with more than 25% native tree canopy in partially inundated wetlands that can support 1%–50% evergreen canopy.

OR, MUs in frequently inundated wetlands that cannot support evergreen/madrone canopy.

MEDIUM:

MUs with more than 25% native tree-canopy cover, in which evergreen species and/or madrones make up between 1% and 50% of the total canopy.

OR, MUs with less than 25% native tree canopy in partially inundated wetlands that can support 1%–50% evergreen/madrone canopy.

LOW:

MUs with less than 25% native tree-canopy cover.

OR forests with more than 25% native tree canopy, in which evergreen species and/or madrones make up 0% of the total canopy.

In addition, each MU was assigned one of the following invasive-cover threat values:

HIGH:

MUs with more than 50% invasive species cover.

MEDIUM:

MUs with between 5% and 50% invasive species cover.

LOW:

MUs with less than 5% invasive species cover.

Tree-age Categories

After we assigned habitat-composition and invasive-species-cover values, we used a matrix system to assign a tree-age category or priority rating to each MU (see Table 2). Categories range from 1 to 9. One represents high-quality habitat and low invasive-species threat, and 9 represents low-quality habitat and high invasive-species threat. An MU that appears in tree-age category 3 scored high for habitat value and high for invasive cover threat. MUs scoring low for habitat value and medium for

invasive cover threat were assigned to category 8 based on the tree-iage model.

It is important to reiterate that we collected this data to provide a broad view of the habitat conditions of Burien’s forested land and open space. Data collection occurred at the management-unit scale, but because MUs are different sizes (ranging from 0.02 acre to 9.14 acres), we present results here using average conditions associated with each MU. Small pockets within MUs may differ from the average across the stand. When the plan refers to specific data in a given area, the term “MU acre” will be used. Keeping in mind the purpose of the FLAT analysis, this assessment will help prioritize restoration efforts during the next 20 years. The data gathered will also serve as a baseline from which the effectiveness of restoration efforts and the long-term health of Burien’s forests and natural areas can be assessed in the future.

Results

Tree-iage Matrix

From the data gathered on all MUs during the FLAT assessment, a picture of Burien’s forests and natural areas begins to form. Table 3 shows the distribution of acres in each tree-iage category. By summing the acres in each row and column, one can see how much of the total project

area (326 acres) currently has low, medium, or high habitat value, and how much currently has low, medium, or high threat from invasive species.

This data informs the cost model discussed in Chapter 7 and is used to develop high-level cost estimates for the Partnership to consider when planning the next 20 years.

As seen in Table 3, 23.8 acres of the Green Burien Partnership project area is in exceptional condition (tree-iage category 1) with high-value habitat and low invasive-cover threat. All of these acres are in Salmon Creek Ravine Park and Seahurst Park. Looking only at the first axis of the tree-iage matrix, habitat composition, categories 1, 2, and 3 combined represent 37% of the acreage. Of acres surveyed, 60% have medium canopy composition (categories 4, 5, and 6). That leaves a little less than 3% of areas that are in the lowest condition: a 7, 8, or 9 on the tree-iage scale.

The second axis of the tree-iage matrix is the threat from invasive species, which is based on the percentage of the MU that is covered by invasive species (see Figure 13). Only 5% of Burien’s forested and natural area parklands have a high invasive species threat (categories 3, 6, and 9). In the project area, 81% falls in the medium category (categories 2, 5, and 8) for invasive species threat. And 14% of land surveyed has low invasive species threat (categories 1, 4, and 7).

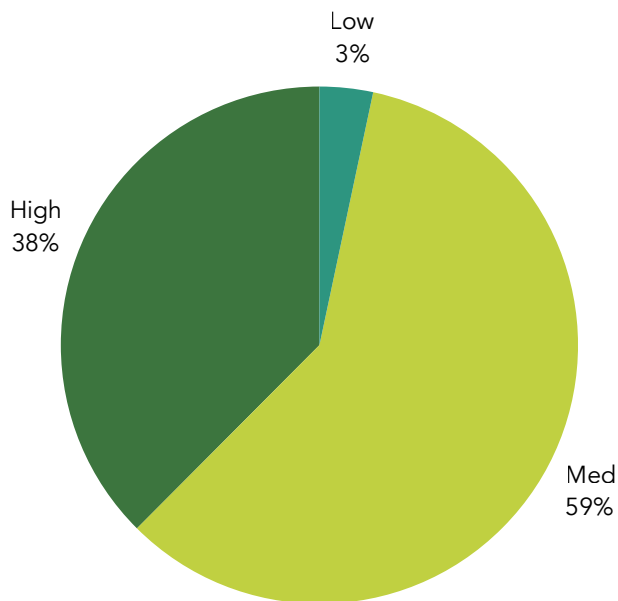


Figure 12: Canopy composition across management unit acres (MU acres)

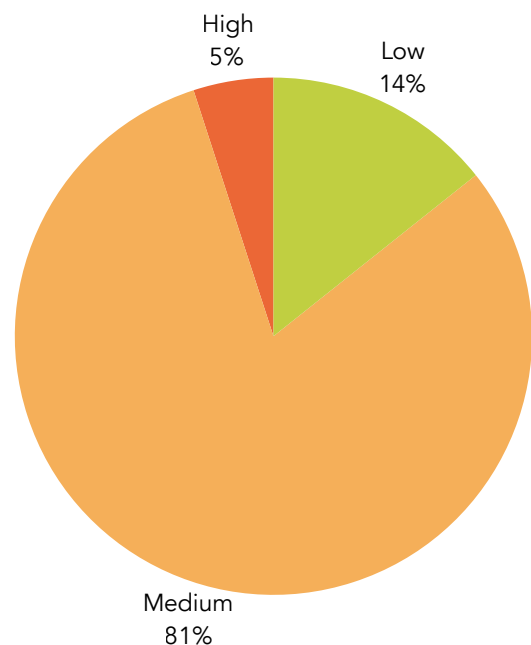


Figure 13: Distribution of the most common invasive species by MU acres

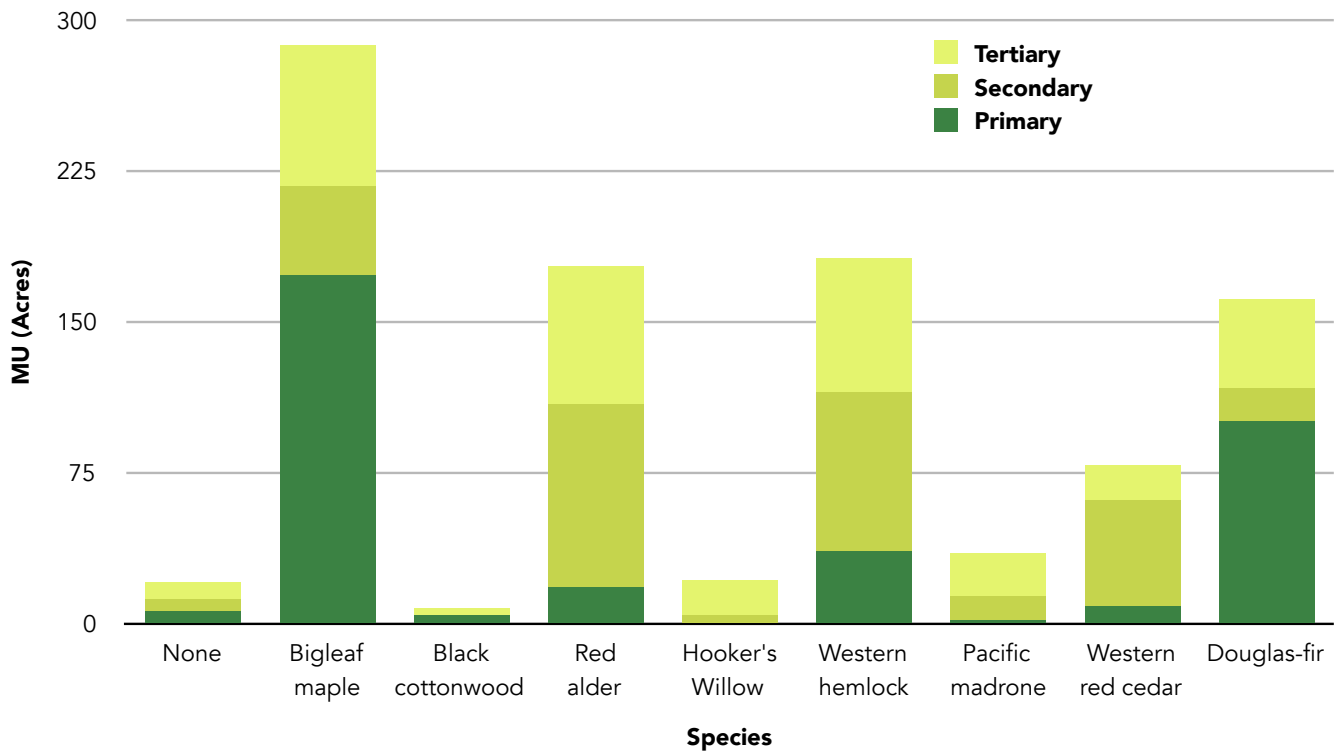


Figure 14: Distribution of the dominant overstory composition by MU acres

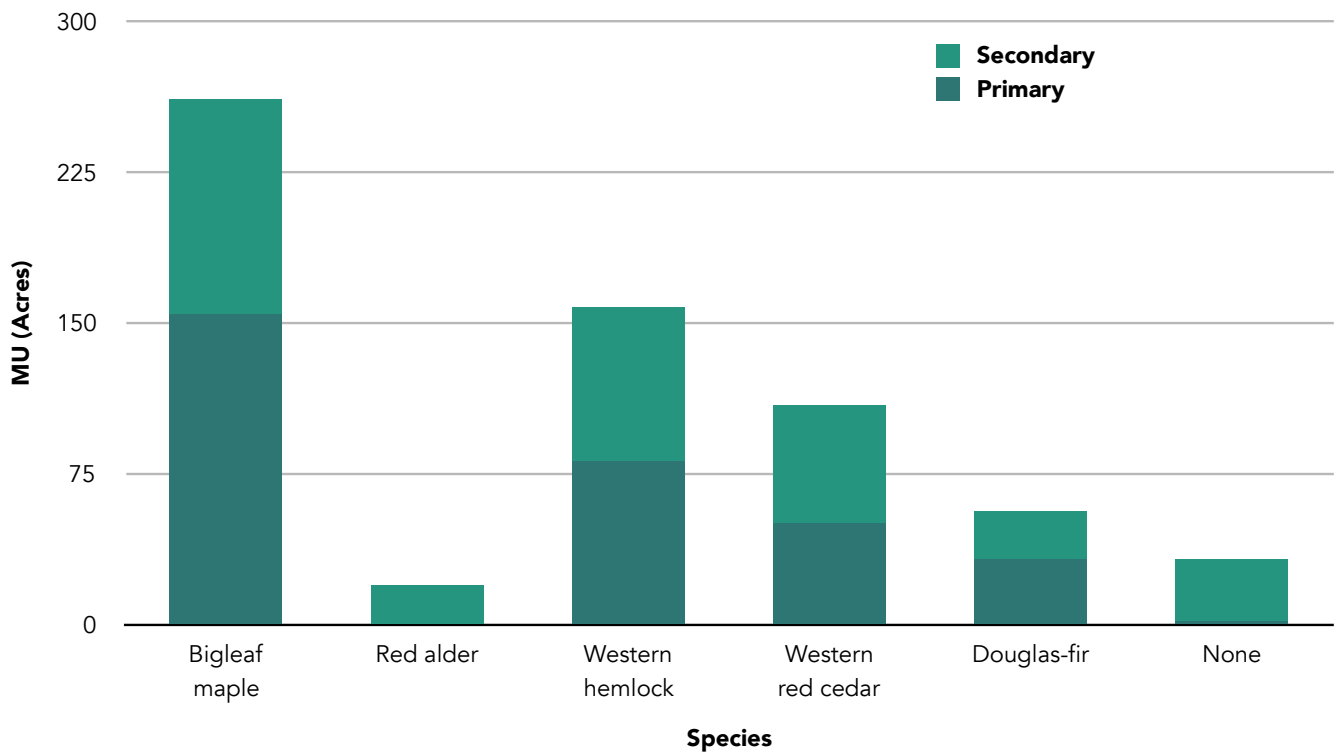


Figure 15: Distribution of the top five regenerating overstory species by MU acres

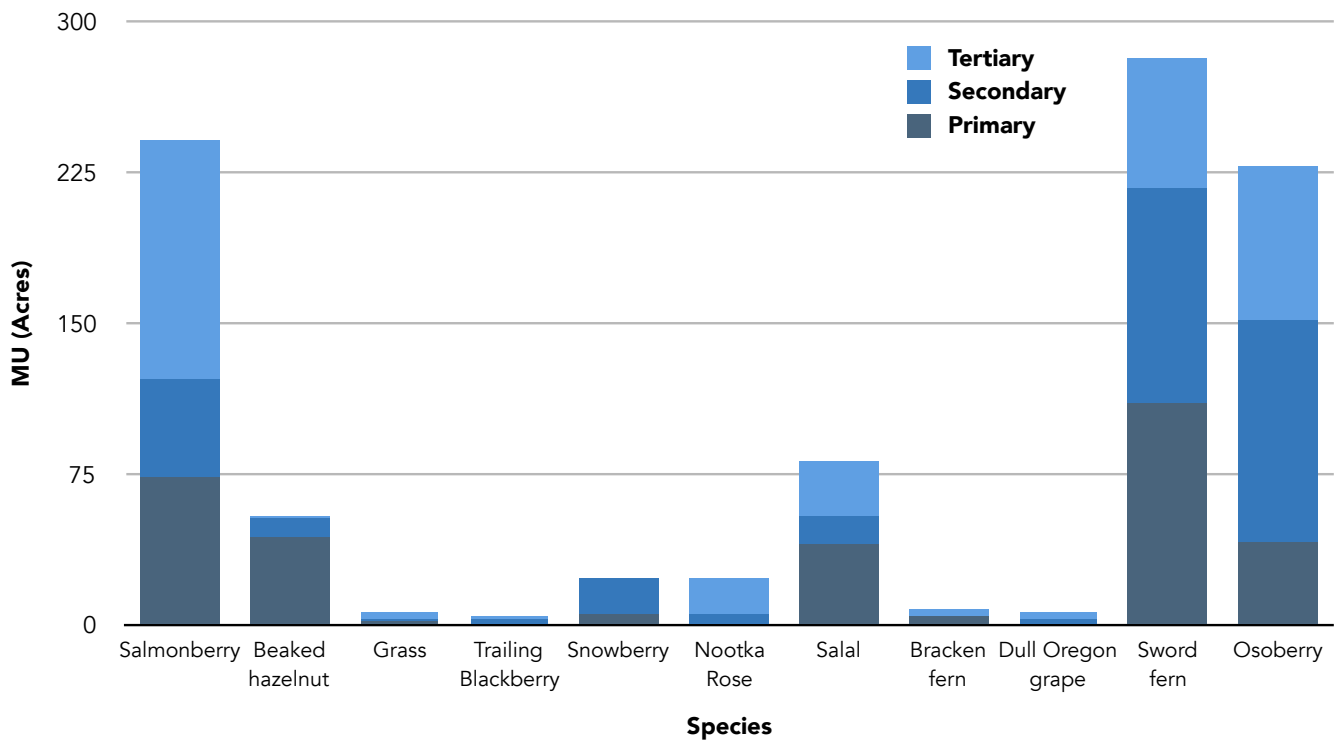


Figure 16: Distribution of the most common native understory species across MU acres

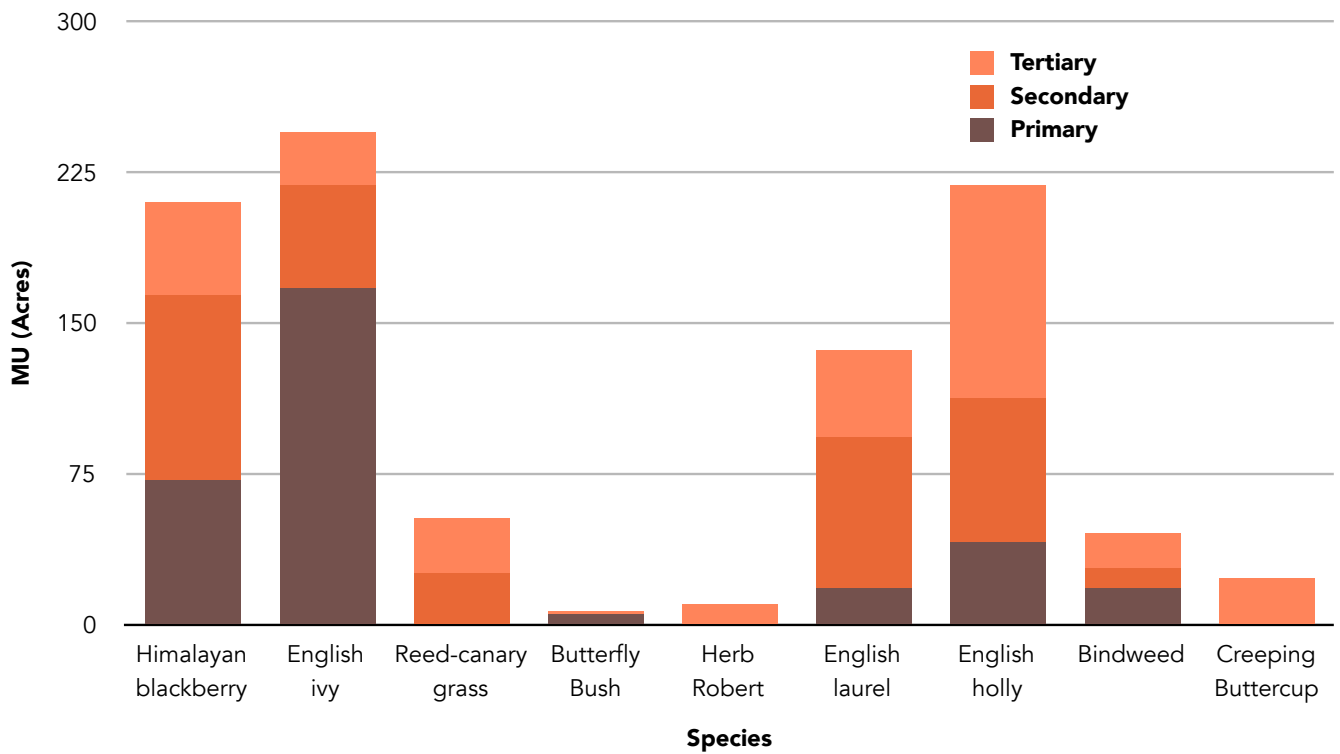


Figure 17: Distribution of the most common invasive species across MU acres

Overstory Species

The 2017 FLAT results show that Burien’s forested parks and natural areas are dominated by older stands of primarily deciduous tree species, including bigleaf maple and red alder; 53% of lands surveyed had an overstory that was dominated by deciduous trees. Bigleaf maple was the dominant overstory tree in more than half the surveyed acres. This short-lived species, although a native, is characteristic of forest that grew back after logging. In order to increase conifer dominance, the Partnership will help return the forest to a healthier mix by planting more native conifer seedlings. Douglas-fir, western hemlock, and western red cedar were documented as the other dominant overstory species; see Figure 14. In this figure, primary refers to acres where the species is dominant, secondary is the second most dominant within a given MU, and tertiary is where the species is third most dominant within a given MU, measured in acres of each respective MU.

Regenerating Overstory Species

The top five regenerating tree species documented were bigleaf maple, red alder, Douglas-fir, western hemlock, and western red cedar. Bigleaf maple was the most prevalent regenerating tree species in the Green Burien project area (see Figure 15). Regenerating trees are indicative of the sustainability and future of the forest canopy, as these trees serve as the next generation of **dominant overstory in Burien’s parks and natural areas. Three MUs, 6 acres of land, had no regenerating species at all, and 31 acres had no secondary regeneration.** This is potentially due to the inability for natives to reseed because of pressures from invasive species and prior development.

Native Understory Species

Burien’s forested parks and natural areas have a variety of native species in the understory, which contributes to the biodiversity of the urban forest and supports wildlife such as birds and pollinators. Many of these plants produce fruits and seeds that are food for larger animals. Salmonberry, sword fern, salal, and osoberry are the most common (see Figure 16) understory plants found in the surveyed sites.

Invasive Species

Invasive species pose a very large threat to the understory in Burien’s parks and natural areas, but with some intervention, they can be significantly reduced. Only 5% of

the acres in the project area were categorized as having a high level (more than 50%) of invasive cover.

In each MU, the five most abundant invasive species were documented. Figure 17 illustrates the top five shrub and ground species, as well as the top two invasive trees, across all MUs. English ivy, Himalayan blackberry, and English holly are the biggest threats. Out of 326 total acres in the project area, English ivy was either the primary, secondary, or tertiary invasive species found in 244 acres. Himalayan blackberry was present on 210 acres. Reed-canary grass and English laurel were also common, with other invasive species found throughout the project area.

Slope

Slope is also an important consideration, as it greatly affects the difficulty of restoration activities. For safety reasons, volunteers can only work on relatively flat terrain, and even professional crews need special equipment for very steep work. As a general rule, work on slopes steeper than a 40% grade requires additional professional resources and increases the cost of restoration significantly. According to the FLAT analysis, 44% of the Green Burien Partnership project area includes slopes steeper than 40%. Many of these areas have extensive infestations of English ivy that are already impacting the canopy. We suggest that these areas be considered when developing stewardship plans and that professional crews be employed to work there. The cost model in Chapter 7 factors the need for this specialized experience in the cost of restoring these areas.

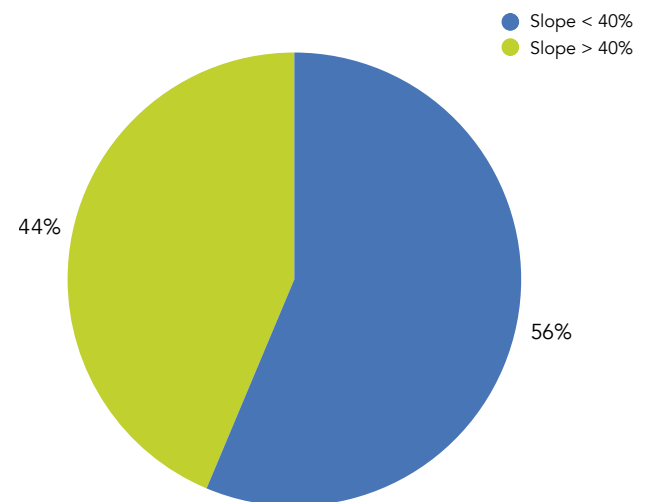


Figure 17: Slope of Burien’s forested parkland



7. MOVING FORWARD – THE NEXT 20 YEARS

As in the other Green City Partnerships, we employed a Balanced Scorecard approach to develop and adapt the Green Burien Partnership implementation strategy (see Table 4). The Balanced Scorecard is a widely used business tool that both helps develop a strategy and monitor progress as that strategy is carried out.

The Balanced Scorecard helps define and align the efforts of complex organizations to achieve targeted outcomes. With these metrics, the Partnership can track the success of various activities and set benchmarks during the plan's 20-year course. The traditional private-sector scorecard balances profits, customer satisfaction, and employee welfare by listing goals and quantifying measures that indicate if actions meet the goals. For the Green Burien Partnership, the layers are modified to reflect the goal of a healthy and sustainable urban forest supported by a healthy and sustainable community. These layers include the plan's key elements: field, community, and resources.

- The **field** element looks at how on-the-ground strategies will be carried out to restore and promote Burien's urban forest.
- The **community** element assesses how an engaged community and a prepared workforce will be maintained in the long term, and how private landowners will be educated and encouraged to complement the Partnership's efforts.
- The **resources** element examines how sufficient financial, staff, and volunteer resources will be garnered to implement the plan.

The three elements have reciprocal relationships. For example, volunteers are critical to accomplishing fieldwork, while demonstrating progress in fieldwork is essential to motivating and retaining volunteers. Similarly, the Partnership needs community support to secure the financial and volunteer resources to restore and monitor sites in the long term. By looking at the complete picture in layers that build on one another, the Partnership can coordinate efforts across various work areas so that activities are interconnected and mutually supportive.

Managers will track and report progress throughout the plan's entire 20-year cycle. This will allow challenges and barriers to be identified early; in response, managers can modify or adapt the program to address and resolve those challenges. See Chapter 8 for further discussion regarding the Balanced Scorecard and adaptive management. See

Appendix F for information regarding the Green Cities Toolbox, which is available online and has updated best management practices, detailed how-to guides, and reproducible materials that can guide field, community, and resources work.



Table #4 | Balanced Scorecard

OBJECTIVE		METRIC
Increase the health and resiliency of Burien’s Urban Forest by increasing canopy cover and restoring and maintaining all 326 acres of forested and natural-area parklands by 2038.		# of acres in restoration to annual goal, # of new trees planted
Field: Begin increasing canopy cover and enroll all 326 acres in restoration by 2038.		
Evaluate	Prioritize sites for tree planting using plantability and social vulnerability data and prioritize forest restoration sites using tree-riage model.	# sites evaluated, prioritized
Plan	Develop annual work plan for each active park. Develop a work plan for increasing canopy cover in the 6 priority areas identified.	<ul style="list-style-type: none"> Annual work plan completed identifying specific restoration to be implemented at each active park Completion of plan for planting additional trees over the next 20 years.
Implement	Implement restoration and planting projects optimizing ecological function and community benefits.	<ul style="list-style-type: none"> # of acres entered into restoration and maintenance # and location of trees planted Best practices evaluated annually and updated as needed
Monitor	Establish monitoring program. Monitor and maintain sites over the long term.	<ul style="list-style-type: none"> Annual monitoring report # of acres entered into Phase 4 work Survey the health of newly planted trees Maintenance is performed as indicated
Community: An informed, involved, and active civic community supports the Green Burien Partnership.		
Residents, local businesses, schools, etc.	Educate and engage the community about the importance of the urban forest and encourage positive engagement with trees and forested parks.	<ul style="list-style-type: none"> Outreach and education program materials developed and distributed # events held
	Community supports and desires a healthy urban forest supported by active management with widespread understanding and support of the Green Burien Partnership.	<ul style="list-style-type: none"> Outreach and education program materials developed and distributed # events held
	Encourage businesses to contribute to program goals.	<ul style="list-style-type: none"> # of businesses supporting program through sponsorship, in-kind contributions, or volunteer events

Volunteers	Engage youth and community organizations in restoration and monitoring.	<ul style="list-style-type: none"> • # of groups participating in events • # of hours contributed
	Recruit and train Forest Stewards in restoration and BMPs.	<ul style="list-style-type: none"> • # of active Stewards • # of Steward events
	Demonstrate appreciation for volunteers and seek their input into the program.	<ul style="list-style-type: none"> • # of volunteer suggestions implemented • # of volunteer-recognition activities
Resources: Sufficient resources are available to actively manage sites and provide long-term maintenance.		
Financial	Continue current contract funding until it expires.	\$ budgeted and sourced to meet management requirements
	Develop one or more long-term, stable public funding sources.	Mechanisms in place sufficient to meet projected needs
Paid staff & labor	Provide sufficient staff to support fieldwork, volunteer management, and Partnership programs.	<ul style="list-style-type: none"> • # staff/crew dedicated to supporting the program • % of requests for crew/staff assistance completed
	Deploy skilled field crews for priority sites lacking volunteer support or sites with difficult conditions.	<ul style="list-style-type: none"> • # of acres in restoration due to crew/staff • % of skilled field crews trained in BMPs
Volunteer labor	Increase number of individual volunteers as well as the overall number of volunteer hours.	<ul style="list-style-type: none"> • # of hours to annual goal • Estimated value of volunteer contribution
	Increase productivity by providing support and materials to volunteers.	<ul style="list-style-type: none"> • \$ and hours/acre enrolled • Staff cost per volunteer hour • # of tool/material requests processed
Administration: With structures, planning and reflection the work will be supported and successful.		
Management structure	Develop a management structure comprised of primary Partners to provide oversight of the three main 20-year plan elements.	<ul style="list-style-type: none"> • Management structure in place to meet administrative needs • Partners attend monthly meetings
Annual work plans	Develop annual work plans as a communication tool and guide for all Partners and stakeholders.	<ul style="list-style-type: none"> • Work plans developed collaboratively among Partners to achieve plan objectives
Annual reports	Public-facing report to stakeholders that provides accomplishments and updates on Partnership activities.	<ul style="list-style-type: none"> • Annual reports distributed to the general public, Parks Commission, City Council, and all Partnership stakeholders

Field

Green Burien will have two implementation focuses: enhancing canopy cover throughout the city and actively managing the dense forests found in parks and natural areas.

Across Burien, the field component (Objectives 1 and 2 below) will be to enhance the urban forest by increasing canopy cover through tree planting, tree giveaways, and tree-related trainings. Using the land-cover analysis and areas the community identified as priorities for planting, Green Burien will promote equity in tree-planting initiatives and work with partners such as Highline Public Schools.

Active management of Green Burien Partnership sites in parks and other natural areas (Objectives 3 through 6) will target removing invasive plants and establishing native vegetation in each site. The citywide habitat assessment of Burien's parks and natural areas will be used to assess progress in acres already enrolled in restoration, characterize baseline ecological site conditions of new acres, prioritize restoration efforts, and guide goal development.

Field Objective 1: Begin to equitably increase canopy cover.

The partnership will employ several field-based strategies to increase canopy cover in Burien. The intention is that these highly visible initiatives will draw attention and public support, which will assist the City in halting canopy loss. In order to increase canopy cover, the Partnership intends to host community tree-planting events on public lands such as libraries, schools, and community gardens. The Partnership also intends to engage the community in the greening of residential areas through a tree-disbursal initiative. Residents could apply for and be given trees for their homes, as well as training on how to plant and care for their new trees. Finally, tree-related trainings and walks, outlined in the community section, will empower people to be caregivers to trees across the entire city.

Although it is not within the Partnership's scope, reviewing Burien's current tree codes and policies, and assessing where they could be stronger, would be a first step in halting canopy decline. Strengthening current tree protection would dramatically decrease the canopy loss in Burien due to development. As a Tree City and a Green City, Burien could be a model for other municipalities in how to develop sustainably and maintain vital urban canopy. Burien currently has 30% canopy cover and could

benefit from monitoring this metric throughout the next 20 years. Other cities, such as Redmond and Vancouver, Washington, could serve as models for maintaining urban forest and increasing canopy cover through citywide initiatives and public policy. Burien's current canopy cover goal is 40% canopy disbursed equitably across the entire city. In order to achieve this additional canopy, Burien would have to add approximately 39,000 trees which would add 7.3 million dollars in ecological benefits (Appendix K).

Field Objective 2: Monitor and maintain trees throughout the City of Burien.

Keeping the urban forest healthy is a project all who work and reside in Burien can be a part of. Landowners, privately owned schools, churches, and businesses can monitor their trees for signs of aging and disease. Instead of simply removing a mature tree, well-informed owners can monitor and care for it. With proper maintenance, such as pruning and watering, our mature trees can continue to give us the myriad of ecological, social, and health benefits mentioned in Chapter 2. City policies can protect these trees in the long term by regulating how and when mature trees can be removed.

Partnership volunteers can help maintain and monitor community trees on public lands, such as libraries, community centers, along historic drives, and more. The Partnership will host tree-planting parties and offer educational tree walks, as well as tree-care learning sessions. This program may also be able to alert the City or any landowning agencies when a hazard tree is identified.

Field Objective 3: Prioritize parks and natural open-space sites.

Tree-age analysis results show that there are 326 acres of forested parks and natural open space in Burien in need of various levels of restoration, maintenance, and long-term stewardship. In addition, residents in partnership with the City have projects under way at several sites, including Seahurst and Mathison Parks. The Adopt-a-Park program helps connect projects, but there are few resources available to effectively make these efforts collaborative. A goal of the Green Burien Partnership is to take a comprehensive, citywide look and coordinate projects at different sites into a single overarching effort.

Currently active project areas will continue to be priorities for restoration in 2019 and 2020. The Partnership will prioritize new sites based on a site's ecological condition, and community interest and investment (see Figure 19).

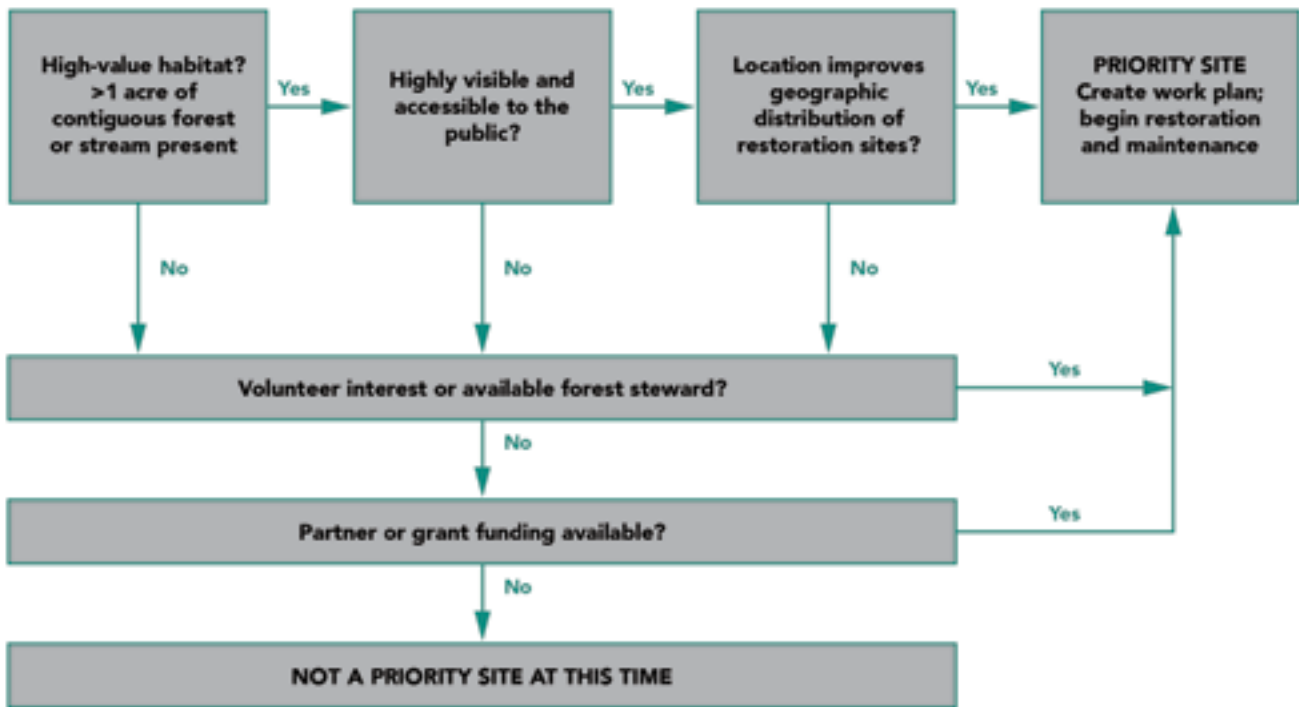


Figure 19: Decision tree for prioritizing restoration sites

The Partnership will also try to ensure that restoration efforts are distributed throughout Burien so that they are accessible from every neighborhood. For parks with an interested Steward or active volunteer base, sites will be chosen that are appropriate for volunteers (i.e., less than 40% grade) and where tools and restoration materials can be easily accessed. Since community engagement and education are key components in the Partnership’s success, sites with high public visibility and high value to Burien residents will be chosen to extend education and program promotion.

Field Objective 4: Prioritize restoration work zones within sites.

There are 18 sites included in the tree-iage analysis, each of which contains management units assigned one of the nine tree-iage categories, with each unit having different needs. As individual parks are enrolled into active management, forest stands and other natural areas within these sites should be prioritized for annual and multiyear restoration plans. The first priority should be existing projects, in order to ensure that prior and current restoration efforts continue moving forward — if they don’t, these areas could revert to pre-work condition. Not only is “backsliding” expensive, it is also particularly

discouraging to the public. The second priority is to expand sites already enrolled in restoration by continuing to clear invasive species in areas contiguous with previously cleared sites.

As new sites are brought into restoration (Figure 19), the tree-iage model can be used within parks and sites with multiple MUs as a guide to anticipate needed restoration. For example, MUs with high-quality habitat and few to no invasive plants (tree-iage category 1) can immediately be given the protection of annual monitoring and maintenance. Other high-value habitats, including conifer-dominated forests or wetlands made up of a mosaic of native shrubs and emergent plants (tree-iage categories 2 and 3), will be considered high priorities for protection and restoration. Additional factors, such as public access and safety, and the presence of wetlands, streams, or shorelines, are also taken into consideration. Providing maintenance for recently restored sites is a priority as well.

Field Objective 5: Identify areas that are appropriate for professional-crew intervention.

As noted above, not all restoration sites in the Green Burien project area are suitable for volunteers; some

require the use of professional, trained field staff. Sensitive areas such as steep slopes, wetlands, and riparian buffers require the expertise and training of such staff. In addition, some best management practices (BMPs) require the use of herbicides, such as cut-stump treatments for invasive trees like English holly, English and cherry laurels, or stem injection for knotweed species that aggressively invade critical riparian habitat. Herbicide treatment must be conducted by a licensed professional staff member.

Many sites in the identified areas will require this level of expertise. As identified previously, 44% of targeted sites have more than a 40% slope. Also, with the need for herbicide intervention mentioned above, the use of crews will be essential to reaching a goal of enrolling all acres in active management. The Partnership will need to assist City of Burien staff and others in securing funding for these projects. Crew work is already being done with EarthCorps, through King Conservation District funding, and is targeting these areas and projects not suitable for volunteers. Volunteer work in other units can be used to match these and any other incoming funds. Sites that have support available through the City or otherwise-funded crews will be given priority status for restoration, as well as sites where noxious weed control is mandated by and has support from the King County Noxious Weed Control Program (www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds/program-information.aspx).

Field Objective 6: Implement best practices in restoration and stewardship on all project sites.

Best Management Practices

Restoration ecology is an interdisciplinary science that draws from the fields of ecology, forestry, and landscape horticulture. As more restoration projects are completed in urban environments, field practices are refined and improved. Field experience and best available science will continue to be integrated to improve techniques and restoration success now and in the future. Ongoing restoration projects within the Green Cities Network and other partner natural-resource organizations will inform and guide BMPs for Burien's fieldwork, including site planning, invasive control methods, planting and plant establishment, and volunteer management.

In 2012, the Green Seattle Partnership created a Forest Steward Field Guide of BMPs suitable for volunteer

restoration work, which has since been updated by and adapted for other cities in the Green Cities Network. The Green Burien Partnership will adapt this field guide for Burien's Forest Steward Program. Program staff and volunteer stewards will be trained in the BMPs. Supplemental coursework and training programs will be recommended for all staff involved in restoration and maintenance of Burien's forested parks and natural areas.

The Four-Phase Approach to Restoration Fieldwork

An important BMP, developed by the Green Seattle Partnership, is the four-phase approach to restoration fieldwork, which has been highly successful. It recognizes that restoration activities fall into four major phases, and that, at some sites, it takes several years to move through all the phases:

1. Invasive plant removal
2. Secondary invasive removal and planting
3. Plant establishment and follow-up maintenance
4. Long-term stewardship and monitoring

These activities are tracked on work logs, and these work logs inform which phase each site is in. The work logs and phases will be entered into a database that is then accessed to report progress. Because habitat health varies from site to site, and some work is ongoing, not every site will start at phase 1. Each site, however, will need to receive an on-the-ground assessment before work begins in the appropriate phase.

Phase 1; Invasive Plant Removal

The first phase aims to clear the site of invasive plants, focusing on small areas at a time in order to ensure thoroughness and minimize regrowth. Specific removal techniques will vary by species and habitat type, and it may take more than a year to complete the initial removal.

Major invasive-plant reduction will be required on sites with 50% or greater invasive cover (high threat from invasive species: tree-iage categories 3, 6, and 9). Many of these areas will require skilled field crews or special equipment. Given the extent of invasive cover, these sites will also require a large investment of both funding and community volunteers to help ensure restoration success. Areas between 5% and 50% invasive cover (medium threat from invasive species: tree-iage categories 2, 5, and 8) will also require invasive removal. Invasive growth in these spots is patchy. Generally, projects in these sites

are appropriate for community volunteers. Areas with 5% invasive cover or less (low threat from invasive species: tree-iage categories 1, 4, and 7) require little or no removal, and phase 1 work in these areas may simply involve walking through to check that any small invasive growth is caught before it becomes a larger problem.

Phase 2; Secondary Invasive Removal and Planting

Before planting, a second round of invasive removal is done to target any regrowth before it spreads, and to clear the site for young native plants to be established. Staff will work with each site on a case-by-case basis to develop an appropriate plant palette and work plan.

For example, forested habitats with more than 50% conifer canopy cover (tree-iage categories 1, 2, and 3) will require the least amount of planting but may need to be filled in with ground cover, shrubs, and small trees in the understory. Areas with more than 25% native tree cover but less than 50% conifer cover (tree-iage categories 4, 5, and 6) will generally be filled in with native conifer species. Areas with less than 25% native tree-canopy cover that can support tree canopy cover (tree-iage categories 7, 8, and 9) will require extensive planting with native trees, shrubs, and ground cover. Restoration practices and planting requirements will, of course, vary, depending on the habitat type and target native-plant population. Most phase 2 planting projects are appropriate for community volunteers. The Green Burien Steward Field Guide will provide volunteer-appropriate BMPs once a planting plan has been established.

Phase 3; Plant Establishment and Follow-up Maintenance

This phase repeats invasive plant removal and includes weeding, mulching, and watering newly planted native plants until they are established. Although native plants have adapted to the area's dry summer climate, installed container plantings and transplanted plants both experience shock, which affects root and shoot health; therefore, most plants require at least three years of establishment care to help ensure their survival. Sites may stay in phase 3 for many years.

Phase 4; Long-Term Stewardship and Monitoring

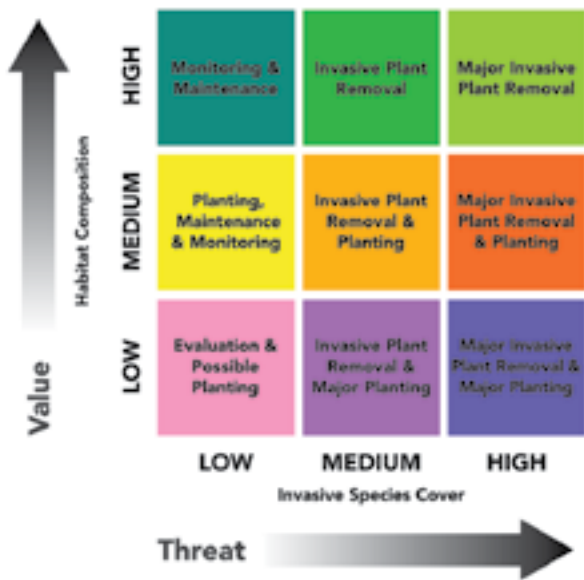
The final phase is long-term site stewardship, including monitoring by volunteers and professionals to provide information for ongoing site maintenance. Monitoring may be as simple as neighborhood volunteers patrolling park trails to find invasive species, or it could involve regular measuring and documentation of various site characteristics and plant survivorship rates. Maintenance will typically consist of spot removal of invasive regrowth and occasional planting where survivorship of existing plants is low. Individual volunteers or small quarterly or annual work parties can easily take care of any needs that come up, as long as they are addressed promptly before problems spread. The number of acres in phase 4 is programmed to grow every year, with the goal that all 326 acres will be enrolled in the restoration process and graduate to this phase.

Without ongoing, long-term volunteer investment in the monitoring and maintenance of areas in restoration, Burien's natural areas will fall back into an unhealthy state. For that reason, volunteer commitment needs to be paired with city resources. Work is then compared against the best available science to define optimal plant stock and sizes, watering regimes, soil preparation, and other natural open-space restoration techniques.

Monitoring will be conducted more frequently in the early phases of the program as the Partnership discovers how the sites respond to restoration. For example, MUs that currently have less than 5% invasive cover and more than 50% native conifer-forest cover or healthy wetland vegetation (tree-iage category 1) would already be in phase 4 and suitable for enrollment into a monitoring and maintenance plan. Most MUs will need some preliminary restoration in phases 1 through 3.

In 2012, the Green Cities program developed a Regional Standardized Monitoring Program in order to understand the success, value, and effectiveness of restoration activities throughout the Partnerships. These protocols provide procedures for baseline and long-term data collection that can be replicated in the future to measure changes in site characteristics. The data shows the composition and structure of a site, which can be an important indicator of overall habitat health.

Table 5 | Restoration Strategies and Tree-iage Categories



Application to the Tree-iage Categories

The four-phase approach can be applied to the tree-iage categories as shown in Table 5. Each tree-iage category can be assigned appropriate management strategies.

TREE-IAGE CATEGORY 1:

High Habitat Composition, Low Invasive Threat
Acres in project area: 23,82

Condition

This category contains the healthiest forest areas in Burien’s system of forested parks. Typical stands have more than 50% evergreen canopy. This category includes stands of mature conifers and the mixed conifer/deciduous stands found in forested wetlands. In scrub-shrub or emergent wetland areas, where full conifer coverage would not be appropriate, this category has full cover by native vegetation appropriate to the site. These stands are under low threat because the invasive cover is less than 5%.

Management Strategy: Monitoring and Maintenance

Work is focused on protecting these areas’ existing high quality and making sure that invasive plants do not establish themselves.

TREE-IAGE CATEGORY 2:

High Habitat Composition, Medium Invasive Threat
Acres in project area: 94,57

Condition

Similar to category 1, these forest stands contain more than 50% conifer or evergreen broadleaf canopy, or appropriate native wetland vegetation. Forests in this category are at risk because the invasive cover is between 5% and 50%. In these areas, invasive growth is expected to be patchy with diffuse edges.

A forest in otherwise good condition but subject to a number of moderate threats may degrade if left untreated. If unattended, this level of invasive coverage could prevent native seedlings from establishing and could compete with existing trees for water and nutrients. However, the forest would persist in good condition if threats were mitigated in a timely manner.

Management Strategy: Invasive-Plant Removal and Prompt Action

The main activity is removing invasive plants. Typically, these sites will also require site preparation (e.g., mulching) and infill planting. Projects in these areas are appropriate for volunteers. Removing invasive plants from these areas is a very high priority for the first five years.

TREE-IAGE CATEGORY 3:

High Habitat Composition, High Invasive Threat
Acres in project area: 4,07

Condition

As in categories 1 and 2, forest stands in this category have mature conifers, madrones, forested wetlands, or wetland vegetation where appropriate. Category 3 areas have a high threat from greater than 50% invasive cover.

A forest in this category is in a high-risk situation and contains many desirable trees or highly valuable habitat or species. If restored, forests in this category can completely recover and persist in the long term.

Management Strategy: Major Invasive-Plant Removal and Prompt Action

Without prompt action, high-quality forest stands could be lost. Category 3 areas require aggressive invasive removal. Soil amendments and replanting are needed in most cases. Restoration efforts in this category are a top priority for the first five years.

TREE-IAGE CATEGORY 4:

Medium Habitat Composition, Low Invasive Threat
Acres in project area: 17.52

Condition

Forests assigned a medium tree-composition value are typically dominated by native deciduous trees but have at least 25% native tree cover. Between 1% and 50% of the canopy is made up of native conifers. In wetland areas not suitable for conifers, these areas have between 1% and 50% cover by appropriate wetland vegetation. Category 4 areas have low levels of invasive plants, covering less than 5% of the MU.

Management Strategy: Planting and Monitoring

We expect planting in these areas to consist of infilling with native species and establishing conifers to be recruited into the next generation of canopy. Often these sites require some invasive removal and site preparation (e.g., amending with woodchip mulch). Many of these sites may be converted to a conifer forest by the addition of appropriate conifer trees.

Addressing category 4 forests is a high priority during the first five years. They offer a high likelihood of success at a minimum investment. These sites are well suited to community-led restoration efforts.

TREE-IAGE CATEGORY 5:

Medium Habitat Composition, Medium Invasive Threat
Acres in project area: 168.06

Condition

Areas in this category have between 5% and 50% invasive cover. Invasive growth is expected to be patchy with diffuse edges. These areas are estimated to have greater than 25% native canopy cover but less than 50% coniferous or broadleaf evergreen canopy cover. In the case of wetland forests, it is greater than 50% native tree canopy cover. In wetland areas not suitable for conifers, these areas have between 1% and 50% cover by appropriate wetland species. These forest stands contain many desirable native trees that are under threat from invasive plants.

Management Strategy: Invasive-Plant Removal and Planting

These sites will require invasive removal and infill planting. While some restoration work is planned for these areas in the first five years, aggressive efforts are required throughout the life of the Green Burien Partnership.

TREE-IAGE CATEGORY 6:

Medium Habitat Composition, High Invasive Threat
Acres in project area: 7.35

Condition

These areas are typically dominated by native deciduous trees but have at least 25% native tree cover. Between 1% and 50% of the canopy is made up of native conifers. In wetland areas not suitable for conifers, these areas have between 1% and 50% cover by appropriate wetland vegetation. Invasive plants cover more than 50% of the MU.

A forest that retains important plant elements but is already partially degraded by a high-level risk factor may still have the potential to recover if remediation is prompt. Because these stands are at greater risk than category 5 forests, they also require greater labor investment.

Management Strategy: Major Invasive-Plant Removal and Planting

Extensive invasive removal, site preparation (e.g., amending with woodchip mulch), and replanting with natives are required. Initial invasive removal may be done with the aid of mechanical tools and equipment, and may require professionals. Planting in these areas consists of infilling with native species.

TREE-IAGE CATEGORY 7:

Low Habitat Composition, Low Invasive Threat
Acres in project area: 5.30

Condition

These forests are estimated to have less than 25% native canopy cover in a setting that could support full canopy cover under good conditions. Forested wetlands will have less than 25% trees or shrubs appropriate to the site. Levels of invasive plants are low. Parks in this category may include areas with large canopy gaps (perhaps due to windthrow or die-off of mature deciduous trees), sites of recent landslides, unstable slopes, sites with large amounts of fill, and/or areas dominated by nonnative trees.

Management Strategy: Evaluation and Possible Planting

The reasons underlying these sites' low value can differ greatly, and the stands will be addressed on a case-by-case basis. Because of low levels of invasive plants, restoration may be quite cost-effective in some sites. Sites will be evaluated to determine whether conditions and timing are appropriate to move these areas toward a more native forest and what the appropriate composition of that forest should be. In some cases, it may be desirable to remove

nonnative trees, especially if they are aggressive. Areas that are ready for conversion to native forest would be a high priority during the first five years.

TREE-IAGE CATEGORY 8:

Low Habitat Composition, Medium Invasive Threat
Acres in project area: 0.66

Condition

Areas that are estimated to have less than 25% native tree-canopy cover or forested wetlands with less than 25% cover by trees, and 5% to 50% invasive cover fall into this category. Invasive growth in these areas is likely to be patchy with diffuse edges. A forest in this category might be chronically degraded by a variety of threatening processes and might have lost much of its value in terms of habitat quality or species complement.

Management Strategy: Invasive-Plant Removal and Major Planting

Restoration efforts in these areas require a large investment of time and resources. Although some work will be directed here, this is not a priority category for the first five years. The Partnership will support efforts that contain the spread of invasive plants, try out new techniques, or help enthusiastic community-led efforts. These sites will require major invasive removal and site preparation, such as mulching and infill planting. Planting within these areas will consist of infilling with native species.

TREE-IAGE CATEGORY 9:

Low Habitat Composition, High Invasive Threat
Acres in project area: 4.90

Condition

Areas estimated to have less than 25% native tree-canopy cover or appropriate forested wetland vegetation and greater than 50% invasive cover fall into this category.

Management Strategy: Major Invasive-Plant Removal and Major Planting

Category 9 sites are not likely to get much worse during the next five years. These sites require many years of major invasive removal and site preparation in the form of mulching and infill planting, and will almost definitely require the attention of professionals. Although work will be directed to category 9 forests in the future, this is not a priority category for the first five years. The Partnership will support efforts that contain the spread of invasive plants, try out new techniques, or bolster enthusiastic community-led efforts.

Community

An engaged and aware community that actively supports the city's urban forest is key to the Green Burien Partnership's success. Volunteers are a valuable resource and are crucial for completing on-the-ground Partnership goals. In order to foster community, the Partnership has set out several objectives.

Community Objective 1: Promote community awareness about, and engagement with, trees in neighborhoods and public spaces.

Through social media, the Green Burien website, large community celebrations, community work parties, tree plantings, trainings, and educational walks, the Partnership will help create excitement about, and advocacy around, our shared urban forest. Based on the community feedback we received, many initiatives and messages should focus on the positive community-health aspects of the work, especially cleaner air and water. The community also expressed a desire for more food trees planted through the Partnership, and careful planning should occur to prioritize safe and accessible locations for these trees.

A tree-disbursement initiative would create an opportunity for residents to deeply engage with trees. Applicants would be matched with a tree that best fits their living arrangements, including species options, size options, pipe- or powerline-safe options, and even patio-safe options. Efforts to extend the tree disbursement for those who rent could include assistance with gaining permission from landlords or a commitment from apartment managers to allow for the planting of trees at their homes.

Through work parties and other volunteer events, participants can assist the Partnership in enhancing the urban forest by planting new trees and restoring and monitoring project sites in parks. Each event should include a warm welcome; training on the tasks to be accomplished that day; something warm or cool to drink, depending on the weather; a chance to get to know other volunteers; and an invitation to have some fun. Whenever possible, barriers to participation should be addressed, such as making the event child-friendly, having an interpreter at larger events, planning a variety of tasks that accommodate many ability levels, encouraging rest and hydration, and providing meals or, at the very least, snacks. For tree-related walks and trainings, providing verbal explanations in addition to printed materials can create a more inclusive event.

It is vital that participants are made to feel welcome in all aspects of the work done by the Partnership. Providing opportunities for diverse community members to connect around a cup of coffee or a newly planted western red cedar are foundational to the Partnership's success. Because so much of this work will take place on public land, it is important to ensure events are inclusive and welcoming to all. By working together, the residents of Burien can help prevent the loss of precious resources. With an active and engaged community, Burien will not only be "greener" — it will be a better city for everyone who lives and works there.

Community Objective 2: Promote positive engagement with parks and natural open space.

This foundational objective drives most of the Green Burien Partnership's work. The Partnership is centered in the belief that Burien's residents, employees, and visitors deserve great parks and natural areas, and that they shouldn't have to travel far to get to those places. Natural areas are essential — both for their environmental services and their benefits to health and well-being — to the future of the city and its people.

Restoration and active maintenance are critical for the enjoyment of these natural areas, so that trees can thrive and we don't lose our green spaces altogether. Parks that have been viewed as unsafe or neglected will benefit from the added presence and tender care of volunteers. Well-loved parks will benefit from the diversity of voices in the Green Burien Partnership. Volunteer projects that build community among neighbors also increase a sense of ownership over public spaces and foster a special connection to them, in addition to just getting people outside. The Partnership will hold events that get more people out into Burien's parks and natural areas, and encourage and inspire them to see these places as the incredible public resources that they are.

Community Objective 3: Use Partnership efforts to prioritize and contribute to Burien's public safety.

Safety is also a key priority for the Partnership. Active maintenance and regular community events promote more active use of public spaces. As both volunteers and staff frequent a site, care and stewardship become evident and decrease the sentiment that parks are forgotten, abandoned places; as well, providing more "eyes" on the park discourages illegal activity. Volunteers

will be provided with training and tools for how to avoid dangerous situations and how best to protect themselves (e.g., from discarded needles), when necessary.

Green Burien projects will utilize Crime Prevention Through Environmental Design (CPTED), a set of landscape-design principles aimed at increasing safety. From relatively straightforward trail-planning and maintenance best practices to optimize safe view corridors to complex challenges for activating spaces, these principles will provide valuable insights. Forterra has developed a CPTED training guide, applicable to both city staff and Forest Stewards, that applies these principles to forest-restoration projects.

Community Objective 4: Develop and implement a community outreach and engagement plan to equitably serve Burien's diverse residential population.

Burien's population is incredibly racially and ethnically diverse. Creating programs that are culturally relevant, accessible, and enjoyable for the many people who call Burien home will be essential to forming a Partnership that equitably serves this community. By continuing to build relationships with local organizations, community groups, and houses of worship, and by continuing to reach out and listen to local residents, we hope to provide a variety of ways for them to engage with the Partnership.

There are existing programs that have already had success in engaging Burien's recent immigrant and refugee community, and it would be a great asset to collaborate with them on stewardship efforts. The New Arrivals Program, offered by ECOSS, helps recent immigrants get oriented in their new cities and can foster a positive relationship with local natural areas. Green Burien staff intends to work with this program to create events and experiences that traditionally underrepresented residents can relate to and enjoy.

Community building and an ethic of environmental responsibility are at the core of the Green Burien Partnership and the Green Cities Network across Puget Sound. Community members are encouraged to participate in caring for our shared public urban forests and natural areas regardless of age, income, ethnicity, or languages spoken at home. Volunteer restoration projects provide an opportunity for neighbors, classmates, families, friends, and strangers to come together to restore health to their parks, build community through shared experiences, and deepen ties to the natural world and each other.

The Green Burien Partnership seeks to build a successful volunteer program by strengthening efforts to provide equitable and inclusive opportunities for the entire Burien community. Environmental conservation organizations across the country and here in Puget Sound typically have difficulty engaging communities of color, recent immigrants, and low-income families (Taylor 2014). Burien's population has become increasingly diverse, with 35% of families speaking a language other than English in their home, most of them in addition to English. Per the US Census Bureau's website, in 2017, 23% of Burien residents were not born in the United States, with more than 60% of those people immigrating before 2010.

In addition to seeking opportunities to work with existing successful community-engagement programs, the Green Burien Partnership will need to employ creative strategies of its own during the next 20 years in order to equitably engage the city's diverse population.

Community Objective 5: Work with local businesses to encourage corporate support for the Partnership.

Corporate support will be needed for the Partnership to reach its goals. Local businesses have already been involved in restoration projects in Burien and should be called upon for advice and future assistance. The Partnership will continue to build on these relationships and expand to work with other businesses as well. Corporate support could come in the form of encouraging employees to volunteer, providing in-kind resources, or financial support through grants and donations. Partnership staff will, in turn, support Burien businesses both large and small.

Community Objective 6: Seek opportunities to engage youth and provide education.

The Green Burien Partnership will work with Highline Public Schools to engage youth in outdoor experiences and environmental stewardship. For example, the Waskowitz Environmental Leadership Service would be a fantastic program to collaborate with students on planting projects and educate them about the process of active management used in parks. The Partnership hopes that opportunities like this will serve as pilot projects and guides for other potential collaborations with schools.

Studies have shown that students' productivity and creativity is increased by experiencing natural surroundings, due to nature's calming effect and its ability

to reduce mental fatigue (Kaplan 1995; Hartig et al. 1991). By working with local partners to provide engagement opportunities for youth of all ages, we seek to create a pathway of engagement from elementary school through high school, and job-skills training for the post-high school years. The Student Conservation Association and US Youth Conservation Corps summer crews are a great opportunity for paid summer work and restoration-skills training for high school students. EarthCorps and DIRT Corps are local training crews for young people, who can make a living while contributing to projects that improve local environmental health. All these programs are currently available to Burien youth. The Green Burien Partnership will link them together, pursue funding opportunities that would provide support for these efforts, and provide additional opportunities for youth and families to volunteer together in their local parks and green spaces, further improving their access to safe and healthy outdoor public places.

Community Objective 7: Build a Steward Program to promote and support community leadership.

The intent of the Green Burien Steward Program is to build an educated, engaged, and active volunteer base around management, monitoring, and stewardship of Burien's urban forest. The program provides volunteers with an opportunity to take on leadership responsibilities, expand their skill set, tackle larger challenges associated with restoration and maintenance, and receive support and guidance to complete projects that improve the health of public spaces they care about.

Two potential subgroups of Stewards could exist:

- **Forest Stewards:** Working directly with PARCS, this group will be responsible for the active management of forested parklands identified previously.
- **Community Stewards:** This will be a program piloted in 2020, the first full year of implementation, that may continue with help from various City departments, primarily Public Works.

Trained Stewards will work with the Partnership in the following ways:

- Attend regular training events, including a program orientation and skill-specific training as resources allow.
- Serve as key contacts for the Green Burien Partnership projects in their site.

- Organize and lead volunteer events and activities with support from Partnership staff.
- Coordinate with staff to develop site-restoration plans.
- Request tools, materials, and assistance as needed.
- Track and report progress on activities via the Partnership’s work log.

The Partnership will support them with staff time, resources, and guidance in site-planning and restoration work.

Community Objective 8: Appreciate volunteers and publicly celebrate Partnership successes.

The Green Burien Partnership will celebrate volunteers’ achievements and emphasize the crucial role they play in restoring and maintaining Burien’s urban forest. Stewards and volunteers are the very heart and soul of the Partnership and are valued for their expertise and the rich, diverse perspectives they bring, not only to community engagement, but also on-the-ground stewardship practices. The Partnership will regularly seek the advice of volunteers on which best management practices work well and which may need reassessment. The Green Burien Partnership will host volunteer-appreciation activities, such as an annual celebration for Green Burien Forest Stewards and volunteer appreciation at community planting events. The Partnership seeks to find a variety of ways to recognize Stewards and other volunteers for their valuable efforts.

Community Objective 9: Engage and educate residents and private landowners.

While stewardship of public forest and natural areas is an important step toward protecting wildlife habitat, improving air and water quality, and providing public recreational opportunities, private properties cover a greater portion of Burien’s land area. Plantings on private lands can either greatly enhance or greatly degrade the condition of the city’s urban forest despite best efforts to restore, maintain, and steward it. For instance, English ivy growing as a border plant in a landowner’s backyard can quickly escape into a forested or natural-area park either by spreading beyond the property line or by birds dispersing the seeds. Many invasive species also spread when yard waste is illegally dumped.

Alternatively, landowners can be a great resource for their neighborhood parkland by engaging their neighbors, schools, community groups, clubs, and businesses to help support the Partnership’s efforts. Private land can also be a main source for enhancing tree canopy and expanding current forest canopy and habitat. Privately owned forest and natural areas in good health, such as homes, private school grounds, or churches, can serve as important buffers to adjacent public lands and help mitigate habitat fragmentation and edge effects.

Potential ways for the Green Burien Partnership to engage private landowners as an important constituency include:

- Developing outreach materials to educate them about the problems facing the urban forest, the benefits of removing invasive species from their property and replacing them with native or noninvasive ornamental species, how to care for trees and recognize hazard trees, and how to get involved in the Partnership.
- Providing information about the Green Burien Partnership’s efforts on the Partnership’s website, in park kiosks, and in neighborhood newsletters and local newspapers.
- Connecting them with programs such as the National Wildlife Federation’s Certified Wildlife Habitat or Schoolyard Habitats.
- Training them in tree care and best management practices through the Green Burien Steward Program.
- Disbursing trees through a Neighborhood Tree Disbursement program. Trees would be offered free of charge to homeowners and landlord-approved renters who have been matched by the Partnership with a site-appropriate tree. These trees would be collected at a nearby event, and owners would be trained in planting and initial tree care, such as pruning techniques.

Resources

For the purposes of this planning document, Forterra attempted to address the known costs associated with continuing the enhancement of Burien’s urban forest and restoring forested parkland over a 20-year time frame.

Enhancing the Urban Forest

The Urban Forest Stewardship initiatives can be scaled greatly, depending on the resources available to the

Green Burien Partnership. Some of the administrative costs of creating and supporting a Community Steward program, for example, can be covered by the overhead costs outlined in the cost model below. It is important to note that many grants and funding sources are specific to urban-canopy-enhancement programs, and these initiatives could be funded through sources unavailable to restoration initiatives.

During the next 20 years (2019–2038), the Partnership will need at least an estimated \$7 million in funding (in 2019 dollars), as well as volunteer support, to accomplish the proposed plan. However, we expect more than 74,000 hours volunteer investment over the life of the program, which will leverage an additional value of \$2.3 million as a match to the estimated \$7 million in direct costs. (Volunteer time is valued at \$31.72, based on the 2019 Independent Sector valuation of a volunteer hour in Washington State.) The following section provides an overview of the components used to develop these cost estimates and identifies resource objectives and strategies to achieve the Partnership’s goals.

Estimating Program Costs

This plan is designed to address both urban canopy enhancement and urban canopy health. For cost purposes,

it is assumed that canopy-enhancement initiatives will be housed within the Green Burien Partnership program costs listed below. In order to achieve a 10% increase in its tree canopy, the City of Burien will need to add approximately 39,000 trees. To achieve this 40% canopy-cover goal, we recommend finding grants to engage residents in order to plant trees on private land. Some trees will also need to be added on City and other public lands; in research done for the City of Portland, it was estimated that each City-owned tree, not planted on private land, would cost approximately \$47 (in 2019 dollars) per year for maintenance and upkeep (Davey Resource Group 2009). The purchasing, planting, maintenance, and upkeep costs of these trees is an additional cost not calculated into the totals below. See Appendix K for more information on increasing Burien’s canopy cover.

In 2005, the Green Seattle Partnership estimated the costs of restoring 2,500 acres of forested parkland for a 20-year period. It relied on estimates of past costs for removing invasive species, replanting, and ongoing maintenance, as well as staff needs and costs associated with additional fieldwork, materials, planning, program design and management, funding development, outreach and marketing, and field and office overhead. For the Green Burien Partnership, we used a cost model

Table 6 | Estimated Cost of Restoration per Tree-lage Category

Tree-lage Category	Green Burien Acres	Average Cost/Acre	Total Cost/Category Rounded to nearest thousand
1	23.82	\$8,800	\$ 210,000.00
2	94.57	\$20,000	\$ 1,900,000.00
3	4.07	\$28,400	\$ 116,000.00
4	17.52	\$16,700	\$ 293,000.00
5	168.06	\$23,100	\$ 3,882,000.00
6	7.35	\$36,300	\$ 267,000.00
7	5.30	\$22,000	\$ 117,000.00
8	0.66	\$33,400	\$ 22,000.00
9	4.90	\$47,700	\$ 234,000.00

adapted from the Green Seattle Partnership’s original estimates (inflated to 2019 dollars), adjusted to reflect the experience of the other Green Cities. Given that Burien’s park system is much smaller than Seattle’s, the Green Burien Partnership will require lower overall field costs, fewer staff, and lower overhead than the Green Seattle Partnership. For this plan, all cost estimates and leverage volunteer values are listed in 2019 dollars.

Using a cost model that enrolls a percentage of acres from each tree-iage category every year over 20 years, the average cost per acre going through the four phases of restoration and ongoing maintenance can be calculated (see Table 6). For the Green Burien Partnership, the model estimates that enrolling all 326 acres in active management will cost from \$8,800 per acre for tree-iage category 1 acres to \$47,700 per acre for tree-iage category 9 acres. This estimate includes projected program and administrative staff, plus field supplies and support, with a built-in 15% overhead on field expenses and 7% overhead on staff time. These costs per tree-iage category are specific for Burien and the length of the program; they will need to be adjusted for use in other areas and program durations.

The cost per acre for each tree-iage category is the total estimated cost from the time it is enrolled until the end of the plan in 2038. For example, the model projects enrolling 2 new acres in 2019, with a combined first-year program cost of \$80,000 for staff, field expenses, and overhead. The average cost per acre in the first year is higher than in subsequent years due to a higher investment of staff time to set up the program and recruit volunteers; the average annual cost per acre will decrease as the program becomes established and takes on more acres. The cost model accounts for the 2 acres enrolled in 2019 with subsequent planting, plant establishment, and maintenance during the full 20 years. As more new acres are added each year, the cost model accounts for various phases and maintenance of the total accumulation of acres enrolled.

Based on the adjusted estimates, the model forecasts that it will cost approximately \$7 million in 2019 dollars to implement the Green Burien Partnership through 2038. Although the total is a high number, the cost of effectively managing these lands solely using commercial crews would be more expensive — and more importantly, would not ensure long-term success from community ownership in the program.

Table 6 shows the estimated cost per year, along with the value of the match provided by volunteers according to the goals set for our volunteer program.

Resource Objective 1: Continue current City funding and build capacity for future growth.

The cost model projects an estimated cost of \$80,000 in 2019, which peaks at \$570,000 in 2032. In 2019, small portions of the general operating budget for Burien’s Parks Department will support activities and events defined by the Green Burien Partnership, including sites, such as Seahurst Park, already in active restoration. Support from the Port of Seattle’s ACE Fund is set to expire at the end of 2020, and the City of Burien will need to secure additional funding from other sources. Additional funding sources will need to be secured in order to reach the targeted 326 acres of active restoration, increase Burien’s canopy cover, and engage the community in protecting their green infrastructure.

Resource Objective 2: Leverage City funds through partnerships and develop long-term funding to support the work.

Forterra and the Port of Seattle are already active partners with the City, working on restoration projects within the Green Burien project area. By bringing in additional partners, strengthening partner relationships, and seeking outside funding to support partners working together, City funds will be leveraged to achieve this plan’s outcomes.

Several possible mechanisms could be evaluated for consideration, either separately or in combination, to meet the funding goal, such as the following:

- Federal, state, and local grants from such entities as the King Conservation District, Washington State Recreation and Conservation Office, Washington State Department of Natural Resources, and King County Conservation Futures Program
- Reallocated and/or increased City of Burien departmental funding
- Establishment of a financial nexus between the restoration and maintenance of forested and natural area parkland and stormwater-management infrastructure or other ecosystem services related to utility infrastructure
- Separate state and federal discretionary funding for forest and natural area restoration
- Market-based mechanisms (e.g., carbon credits and stormwater mitigation), if determined feasible
- Contributions from local corporations and businesses

Resource Objective 3: Provide sufficient staff and resources to support fieldwork, volunteer outreach and management, community engagement, and program administration.

Volunteer Management

Currently, volunteers are providing an unknown number of hours each year supporting the type of stewardship work in Burien's parks and natural areas that the Partnership seeks to expand. There are many volunteers participating across departments and especially within PaRCS, but without a database to record this work, there is currently no way to track restoration or tree-related support.

As well, Burien's Parks Department does not currently have a dedicated full-time volunteer-coordinator position, although it does have staff who are currently involved in the Adopt-a-Park program who could manage Green Burien volunteers. As the Green Burien Partnership approaches its goal of 5,000 volunteer hours at its peak in 2030, experience suggests that at least one employee will need to dedicate half their time (and perhaps more) to managing and coordinating the Partnership's volunteer restoration efforts. This position would track volunteer time, recognize volunteer achievements, and recruit additional volunteers, and could also run the Forest Steward Program, discussed below. Forterra will initially play a major role in volunteer management, conducting regular volunteer events to help incorporate the experience gained through implementing the other Green City Partnerships. As a structure becomes established, the City or another partner can take the lead in volunteer management internally or continue to contract these services with a professional provider.

Steward-Program Management and Training

In its first full year, the Green Burien Partnership will recruit and train Forest Stewards, supported by Forterra, at two parks within the project area, chosen with direction from PaRCS staff and building off of existing efforts. If there are potential stewards who are already working for Adopt-a-Park or other programs, the Partnership will help provide them with support: tools, other volunteers, and any additional training they desire. Throughout the Green Burien Partnership, but especially in the first five years, the Partnership will continue to recruit and train additional volunteers who are interested in a higher level of commitment than attending occasional

staff-led volunteer events. These Stewards will allow the Partnership to increase community leadership on the ground and, therefore, its capacity to reach more restoration sites. Stewards will lead volunteer events, create work plans, track restoration progress, and apply for small grants to manage their sites. This program will also keep regular volunteers interested by providing a challenging and diverse array of work, and increased ownership of the results.

The success of the Steward Program is dependent upon a staff member being able to coordinate the program, including training new Stewards, working with them to develop site plans, providing support and encouragement, coordinating their efforts with other city staff, and keeping track of their accomplishments in relation to Partnership goals. This role could be incorporated into the duties of the volunteer coordinator mentioned above or filled by a different staff member.

Recommended Staff Capacity

The Partnership recognizes that adding staff capacity would benefit urban forest management and the Green Burien Partnership. These two potential positions would be of great benefit to the City:

Volunteer Coordinator:

This potential full-time or half-time FTE position could help manage Stewards for both PaRCS and other programs. It would be ideal for this position to be able to assist with all City of Burien volunteers and work interdepartmentally. This capacity could be met internally, with additional City staff, or by Forterra or another contractor.

Urban Forester/Arborist:

A best practice for Urban Forestry is for each city to employ a Certified Arborist (interdepartmental half- or full-time). Often this person can fill the role of managing and monitoring the city's urban forest as well as accessing and caring for city-owned trees. This position also has the potential to work with other agencies such as Washington Department of Transportation or Highline Public Schools.

Outreach and Education

Staff time devoted to education and outreach will be critical in helping increase volunteer capacity to 1,667 volunteer participants by 2030 and hosting many appreciation and public-engagement events each year. Reaching the broader Burien public will require a staff person to devote a portion of time to Green Burien Partnership outreach and education. Forterra can help fill some of this role during the program's first year, or longer as needed and if resources allow. This person or team of people should also coordinate with the City of Burien Communications Department for guidance and expertise in how best to engage the diversity of Burien's residents.

Communications and Marketing

Communications and marketing are linked to the duties of volunteer management, outreach, and education. This work will be started by Forterra in the first two years of the program and includes creating and implementing a communications and marketing plan. This will help the Partnership increase visibility and recruit volunteers, as well as increase the potential for generating additional program funding by reaching a wider audience.

Field Restoration

Current City of Burien staffing alone cannot meet the management needs of restoring and maintaining all 326 acres by 2038. Through the Green Burien Partnership, partner agencies and community leadership will play a major role in filling the gap. PARCS staff will continue to play a lead role in evaluating and managing Burien's forested parks and natural areas, especially as more volunteers are brought in to help restoration work. Besides these staff members, the City may contract with skilled field crews for some fieldwork on sites that are not appropriate for volunteers, and partner agencies will either use their own crews or contract as well. In the first couple of years, training in restoration best management practices and volunteer management will help ensure that all staff are up to speed with the same techniques and approach that are being taught to Forest Stewards, in addition to crew-specific practices that volunteers are not permitted to perform. This coordination will be one of the functions of the Green Burien Management Team.

Tree Disbursement and Neighborhood Tree Planting

The team at Burien's Public Works Department will

help oversee any street-tree planting that occurs during the Partnership. The team already oversees hundreds of these trees and manages the infrastructure that supports them. The department has teamed with DIRT Corps in the past to offer free trees to private landowners; the Partnership intends to support and extend that program in order to provide more trees, as well as training, for tree recipients. If at any time Burien is able to hire a part- or full-time arborist, as mentioned in the callout above, the Partnership should work directly with that person to develop a monitoring program for all community trees that are planted. The arborist could also help develop a plant list for the city and the Partnership, as well as diagnose hazard trees and commit to maintenance or removal.

Fund Development and Management

Stable funding is crucial to supporting the Partnership's efforts. As has worked in other Green Cities, thinking creatively about funding sources and how they apply to urban forestry and forest enhancement will be of benefit to the City and the Partnership.

Uniting existing projects, such as Burien's Public Works Department's tree-disbursement project and the Parks Department's current restoration in parks, can help build a narrative for funders of the important work the City is already doing. Nonprofit partners such as EarthCorps and DIRT Corps, who are working on the aforementioned projects, could assist the City in applying for grants to cover various portions of the Green Burien Partnership projects. The successful approval of this plan could serve as another opportunity to attract funders.

The role of coordinating funding may be large if many small funding sources are compiled, or less intensive if funding is derived from one or a few larger sources. This role may incorporate grant writing, policy creation, and more.

Resource Objective 4: Coordinate efforts by partner staff and volunteers to maximize joint success and share resources.

Partner agencies — including both landowners such as the City of Burien, partners such as Forterra and the Port of Seattle, and others helping to implement the work outlined in this plan — will need to work together across ownership boundaries. All partners will need to communicate and coordinate their efforts so the work on the ground and in the community is conducted in a

way that addresses needs in a comprehensive, rather than piecemeal, manner. In order to take advantage of opportunities to share resources and avoid duplicating efforts, all active partners will meet regularly as a Management Team. The Management Team will hold quarterly meetings in the first year of the Partnership and may meet more often and/or form committees to address certain topics as the Partnership grows. The Management Team will also be in communication with other relevant local groups, such as the Des Moines Memorial Drive Preservation Association, ECOSS, and the Green Cities Network.

Resource Objective 5: Deploy skilled field crews, prioritizing those that offer training and job-skills development to Burien residents.

Professional crews will be needed for priority sites that lack sufficient volunteer support or sites with difficult conditions that are unsafe or otherwise inappropriate for volunteers. Some sites containing extreme invasive plant infestations, steep slopes, riparian areas, and wetlands may be better suited to skilled field crews.

The Partnership will seek to contract with organizations that focus on forest-habitat management, prioritizing those that provide training and job-skills development to local residents, especially youth. The following activities will support this objective:

- City and partner staff will continue to work on key management efforts, volunteer support, and training for Stewards to increase community capacity.
- Nonprofit and training crews (such as Washington Conservation Corps, the Student Conservation Association, EarthCorps, Duwamish Valley Youth Corps, and DIRT Corps) will have priority to be hired, as needed, for fieldwork at difficult sites and occasionally for volunteer management at large events, given their expertise. Crews that offer jobs and job training to Burien residents will be further prioritized.
- Private landscaping and habitat-restoration companies (commercial crews) will be hired for highly technical projects as budget and need dictate.

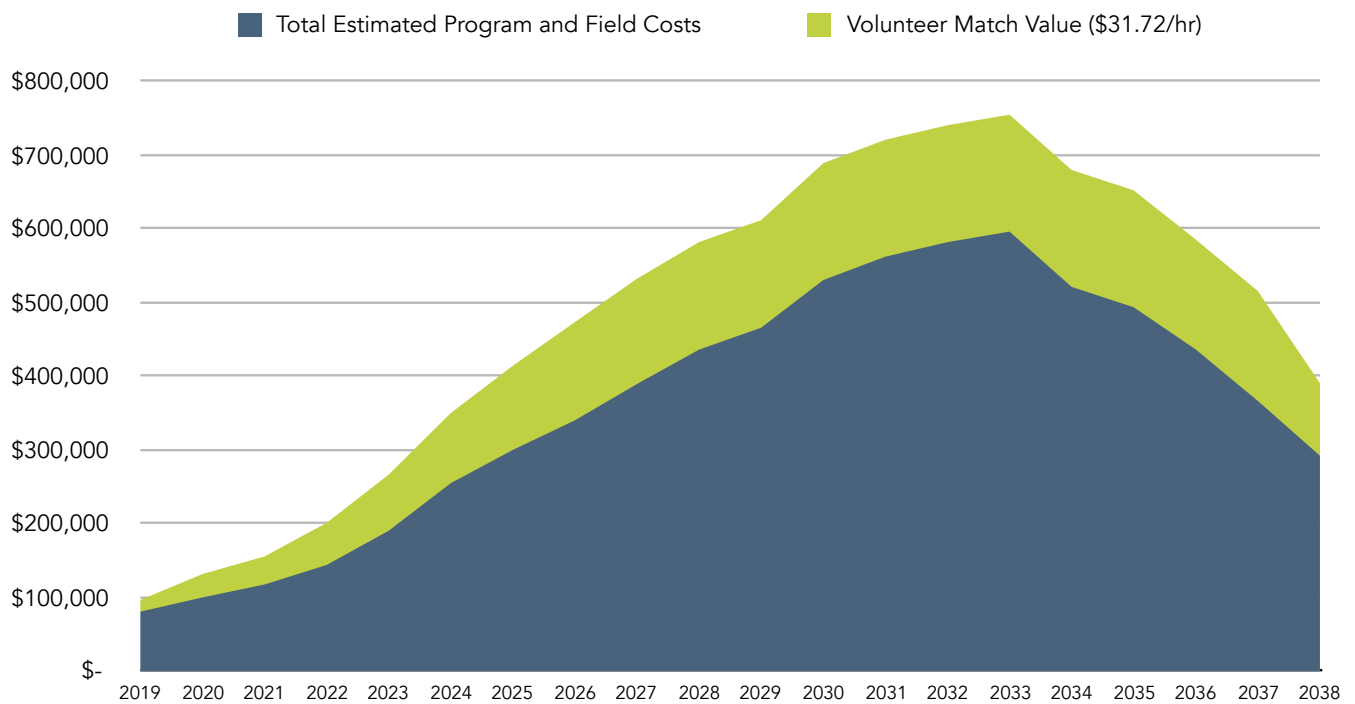


Figure 20: 20-year projection of program costs and volunteer match per year

Resource Objective 6: Increase volunteer engagement to leverage support from the community.

Over 20 years, our goal is for volunteers to provide more than 74,000 hours, valued at \$2.3 million, based on the 2019 Independent Sector valuation of a volunteer hour at \$31.72 in Washington State. To put this number in perspective, if every Burien resident contributed just 1.45 hours during the entire 20-year program, the plan would achieve its community-engagement goals. If every resident contributed just 3 hours (one work party) over the entire 20-year program, the Partnership would double its restoration goals and be able to significantly enhance the urban canopy through planting projects, monitoring, and other neighborhood tree events.

Increased levels of volunteerism will be encouraged. Volunteers who participate in one-day events with a business or community group will be invited to continue their participation in ongoing work parties. Frequent volunteers may be interested in becoming Forest Stewards to increase their involvement. To do this, there will be a need to keep existing volunteers motivated by showing them how their efforts, in concert with those of many other volunteers, have a significant impact in maintaining and restoring Burien's forested parks.

The Partnership provides opportunities for individuals of varying physical ability and time commitment to get involved. There are numerous volunteer activities for those who are uninterested or unable to participate in physical fieldwork, or who require a more flexible schedule, including photography, database and administrative work, publicity and marketing, fund-raising, sponsor recruitment, community event support, and bringing snacks and beverages to work parties.

Diversity within the Partnership will strengthen work efforts and build community. An important component of outreach efforts will involve contacting communities that have not traditionally participated in environmental restoration or stewardship. Outreach to these communities can be increased by working with local groups, youth organizations, schools, and businesses, looking for ways to collaborate on projects that offer mutual benefit and culturally relevant ways to participate. Informational signs at park sites can be posted describing the work under way and inviting participation. The existing partnership between the City of Burien and Highline Public Schools can be strengthened to provide opportunities for students who want to complete

community-service requirements and participate in planting and other projects on school grounds within the Green Burien project area.

Resource Objective 7: Support local businesses.

The work of the Green Burien Partnership offers many opportunities to support Burien's economy and local businesses in the following capacities:

- Professional field crews for on-the-ground restoration and stewardship
- Local businesses to provide refreshments for volunteer and other community events
- Graphic designers, marketing and outreach specialists, and other professionals to help promote Partnership activities
- Photographers to help document events
- Skilled professionals to offer training to staff and volunteers in a wide variety of topics, from plant identification and ecology to ethnobotany, community engagement, and grant-writing
- Engagement opportunities, including corporate donations and volunteering, for businesses to get their name out in front of the community and offer team-building activities



Photo: Andrea Mojzak

TABLE 7 | Near-term Strategic Plan and Benchmarks 2019–2023

FIELD				
2019	2020	2021	2022	2023
<ul style="list-style-type: none"> Enroll 2 acres into restoration Develop stewardship plans for two priority sites Develop tracking plan Prioritize community tree-event sites using an equity lens 	<ul style="list-style-type: none"> Continue work on 2 previously enrolled acres Enroll 3.5 new acres into restoration Develop stewardship plans for any new sites Offer tree disbursal event Host 1–2 community tree events 	<ul style="list-style-type: none"> Continue work on 5.5 previously enrolled acres Enroll 1 new acre into restoration Develop stewardship plans for any new sites 	<ul style="list-style-type: none"> Continue work on 6.5 previously enrolled acres Enroll 2 new acres into restoration Develop stewardship plans for any new sites 	<ul style="list-style-type: none"> Continue work on 8.5 previously enrolled acres Enroll 4 new acres into restoration Develop stewardship plans for any new sites
COMMUNITY				
2019	2020	2021	2022	2023
<ul style="list-style-type: none"> Host kickoff community planting event Establish a Steward program Publicize in local media Select 2 sites for Stewardship Develop basic branded outreach and promotional items Host first annual Green Burien Day with support from PARCS staff Recruit and manage 500 volunteer hours 	<ul style="list-style-type: none"> Recruit and manage 1,000 volunteer hours Recruit 2 new Stewards; support all active Stewards Plan and host signature community planting event Host volunteer appreciation event Host 1 community appreciation event Work with schools on youth stewardship program 	<ul style="list-style-type: none"> Recruit and manage 1,400 volunteer hours Recruit 2 new Stewards; support all active Stewards Host signature community planting event Host volunteer appreciation event Host 2 community appreciation events Create updated branded outreach and promotional items 	<ul style="list-style-type: none"> Recruit and manage 2,000 volunteer hours Recruit 2 new Stewards; support all active Stewards Host signature community planting event Host volunteer appreciation event Host 3 community appreciation events 	<ul style="list-style-type: none"> Recruit and manage 2,500 volunteer hours Recruit 2 new Stewards; support all active Stewards Host signature community planting event Host volunteer appreciation event Host 4 community appreciation events Publicize first five years of work Update community engagement plan
RESOURCES				
2019	2020	2021	2022	2023
<ul style="list-style-type: none"> Convene agency partners for preliminary coordination meetings Develop business engagement plan 	<ul style="list-style-type: none"> Establish Management Team of working partners Seek additional partners Identify and pursue funding to support field, community, and administrative work, if needed 	<ul style="list-style-type: none"> Seek additional partners Identify and pursue funding to support field, community, and administrative work, if needed Expand business engagement 	<ul style="list-style-type: none"> Identify and pursue funding to support field, community, and administrative work, if needed Expand capacity for volunteer and community events 	<ul style="list-style-type: none"> Identify and pursue funding to support field, community, and administrative work, if needed Explore options for a more formalized management structure, if needed

8. ADAPTIVE MANAGEMENT

Adaptive management is the process of hypothesizing how an ecosystem works, monitoring the results of actions taken, comparing these observations with expectations, and modifying management plans and procedures to better achieve objectives. The process systematically improves management policies and practices. It is a repeating cycle of six steps: the theory of how the system works, strategy development, implementation, monitoring, evaluation, and strategy adjustment (see Figure 21). Once we have taken actions, managers use monitoring and evaluation to determine how our actions have affected the system and use that data to adapt our understanding of how the system works. Once an evaluation is complete, new information gathered from monitoring is used to reassess the problem and develop new strategies as needed. Then implementation, monitoring, and evaluation occur, and the cycle begins again. Adaptive Management allows staff to track the resources and community support necessary for accomplishing the fieldwork while considering the changing ecological and social realities of the urban forest.

Measuring Success

Two types of information will help in analyzing the Green Burien Partnership's effectiveness: program monitoring and field monitoring. Monitoring allows for improvement in Partnership program design and performance by measuring the effectiveness of strategies and techniques used. The results of monitoring are fed back into Partnership planning and methodology to increase effectiveness. Monitoring and evaluation will also provide accountability to funding sources and supporters, and help ensure that goals and benchmarks (see Appendix I) are met.

Table 4 illustrates the Balanced Scorecard for the four primary program elements of implementing the 20-year plan: fieldwork, community, resources, and administration. By measuring progress toward each objective, we can assess the effectiveness of the strategies described in the implementation section. The effectiveness of program strategies needs to be tracked throughout the life of the plan, and, through adaptive management, adjustments made when necessary.

Program Evaluation

At the close of each year, Green Burien Partnership staff will collect data on Balanced Scorecard measures and track progress toward the annual work-plan goals and benchmarks using the CEDAR database. This database will record information pertinent to these measurements throughout the year, including field and volunteer metrics, so that progress can easily be summarized at year's end. Metrics such as volunteer attendance, retention, and basic demographic information will be used to measure program effectiveness and reach. Field-based metrics will track the number of acres enrolled and the status of those acres. Successes and lessons learned will be shared throughout the Partnership. Progress will be celebrated, and effectiveness evaluated.

Field Monitoring

As the field program proceeds, the Partnership will continue to conduct routine monitoring of planting and restoration sites to track the condition and health of restored sites and gauge progress. On forested land, success will rely on developing and refining effective strategies to remove and control invasive plants and keep newly planted natives healthy. Refining plantings may need to occur if areas change due to climate, development,



Figure 21: Adaptive management cycle

or other realities. Newly planted street or community trees will need to be monitored for disease, drought, and other potential threats. Maintenance of these street trees includes regular pruning, removal of aggressive weeds, watering in the dry season, and more.

To monitor fieldwork, new acres will be tracked as they are brought into active restoration and mapped in GIS. Volunteer and skilled-field-crew time will be devoted to revisiting sites that have been previously worked on and assessing their ongoing needs as they move through the four phases of restoration. One component of monitoring is to track plant survival rates. Plant-survivorship thresholds are outlined in site-level stewardship plans and may vary depending on site conditions or habitat type; these forests and natural areas will always be subject to pressure from their surroundings. Although the work needed decreases dramatically each year that an area goes through the program, Phase 4 of restoration continues indefinitely.

As the Partnership enrolls more acres in restoration and plants more community trees, tracking successes can become complicated. Managing data entry and paperwork as the program grows has proven to be expensive in other Green Cities. CEDAR's assistance in tracking these projects will greatly reduce the need for staff management and streamline the project-reporting process. Thanks to Port of Seattle funding, this database can be employed by the Green Burien Partnership.

Resource Distribution

It is assumed that Green Burien Partnership funding will continue to be housed entirely within current active partners — the City of Burien, Forterra, and the Port of Seattle— for at least the first two years of the program (until December 2020). After that, partner staff will continue to oversee program funding and generate additional public funding (both from City and non-City sources) and donations from outside sources throughout the duration of the Partnership's 20-year span. The Partnership will allocate funds for the three program areas — community, fieldwork, and resources — in proportions that will change over time to help ensure that the program's basic goals are achieved. As it grows from single-site efforts to a systemwide program, the emphasis will shift from funding program development to fieldwork support.

At the front end, resources will be directed toward recruiting and supporting Forest Stewards, demonstrating on-the-ground results and success in the field, and hosting highly visible community events that foster engagement with Green Burien sites. These activities will ramp up during the first five years (2019–2023 as volunteer efforts grow. Once a strong volunteer program is established, some resources can shift to provide more field support for restoration projects.

As funding allows in the future, the field-management budget can expand from funding Partnership staff time and supporting volunteers to include additional skilled field crews.

As visibility and recognition increase, increased levels of public and private funding can support increased volunteer participation. The role of volunteers will continue beyond 2038, since parks and natural areas will need ongoing volunteer support and stewardship.

Reporting and Knowledge Sharing

The Green Burien Partnership's progress will be reported quarterly to the City Manager's office, as well as annually to the Burien City Council, Burien Parks and Recreation Board, partners, Forest Stewards and other volunteers, and the public. Annual work plans will be adjusted in response to available funding, monitoring results, and emerging knowledge of successful restoration techniques.

Partnership staff will utilize creative outreach strategies and network with regional restoration and arborist groups, which will provide an opportunity for staff to share information and learn from other agencies. As a member of the Green Cities Network, the Green Burien Partnership will have opportunities to share successes and challenges with other cities (including Issaquah, Shoreline, Seattle, Tacoma, Kirkland, Redmond, Kent, Everett, and Puyallup) that are dedicated to a similar goal and vision. Written materials, including this 20-year plan, will be posted on the Green Burien Partnership website (www.GreenBurien.org), and all parties using these resources will be given the opportunity to provide feedback on the Partnership's methods and material

Looking to the Future

Burien is a city known for innovative problem-solving and leaders who are planning for the future today. City leaders are considering ways to preserve the health of Burien's urban forest for generations to come. **By restoring canopy cover in forested parks and enhancing canopy cover throughout the city, the successful completion of this plan is an important first step in this process.** There are other opportunities for more research to develop tools that could assist the city manager in the future:

- Connect and stay up to date with the Green City Network and the Green City Toolbox in order to explore available tools, best management practices, resources, and funding as they become available.
- Consider each City department's role in caring for the urban forest and create a document outlining roles and responsibilities.
- Strengthen information on, and documentation of, street trees by creating an inventory and monitoring and maintenance protocols for those trees.
- Strengthen the policies around trees on private property in order to preserve half of Burien's current canopy cover.
- Create an approved plant list for future city plantings, especially street trees. Understand the maintenance requirements and costs associated with the trees on that list and plan accordingly.
- Increase staff capacity to meet the needs of a growing City and Green Burien Partnership in order to retain, and potentially expand, the benefits Burien currently receives from its urban forest.



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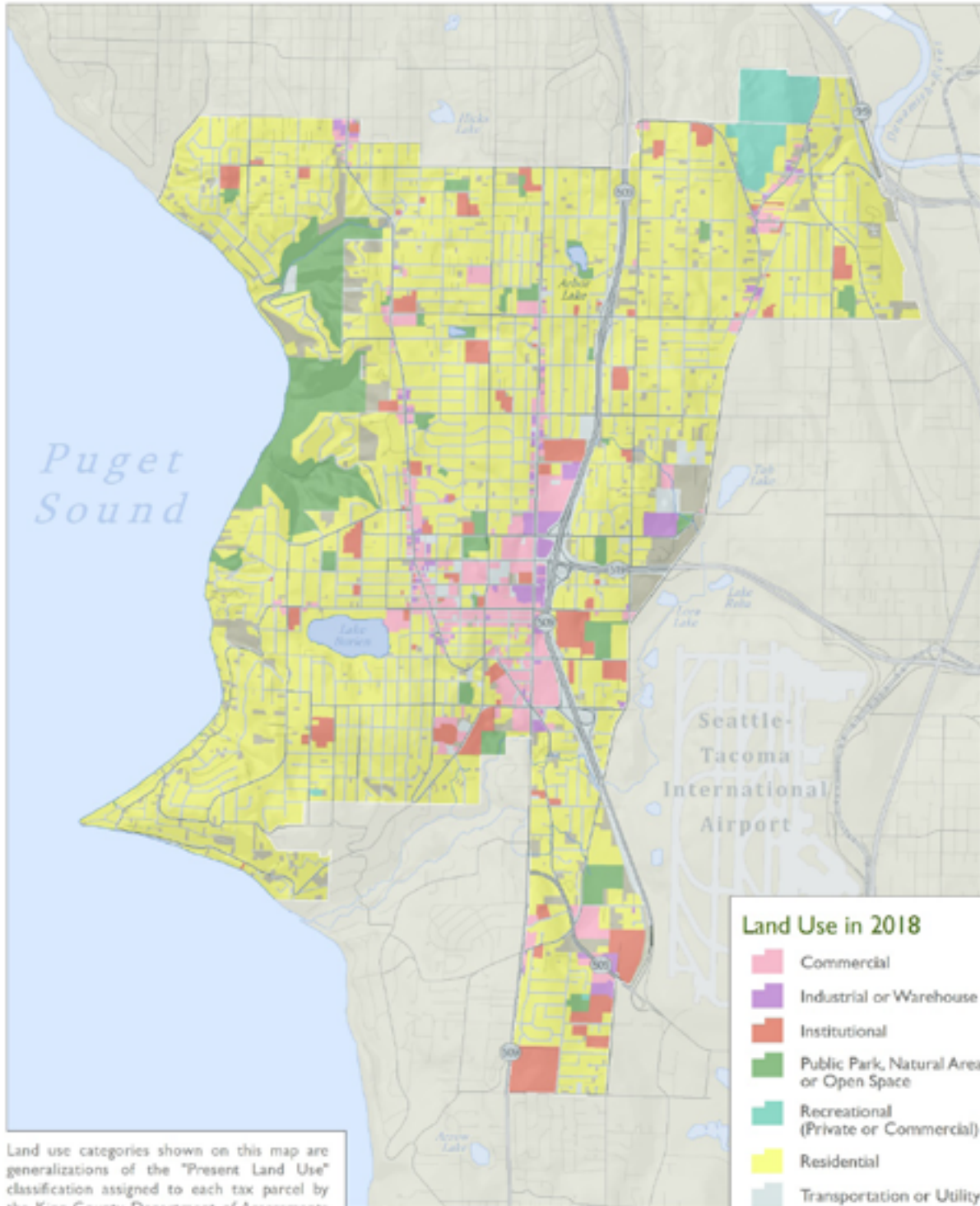
Zupancic, T., C. Westmacott, and M. Bulthuis. 2015. *The Impact of Green Space on Heat and Air Pollution in Urban Communities: A Meta-Narrative Systematic Review*. Vancouver, BC: David Suzuki Foundation. Accessed August 2, 2019, <https://david Suzuki.org/wp-content/uploads/2017/09/impact-green-space-heat-air-pollution-urban-communities.pdf>.



10. APPENDICES

Appendix A.

Map of Land Use in the City of Burien in 2018

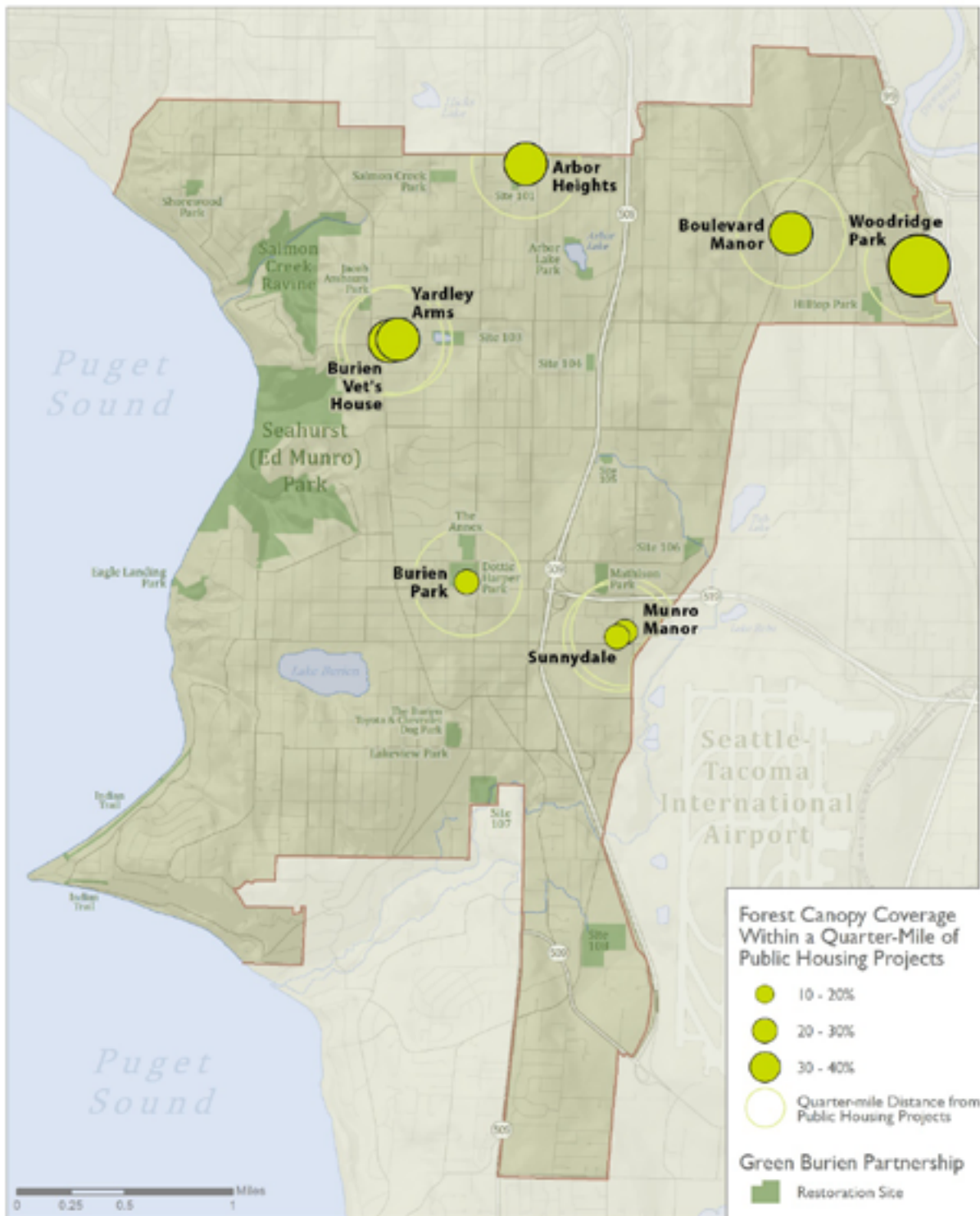


Land use categories shown on this map are generalizations of the "Present Land Use" classification assigned to each tax parcel by the King County Department of Assessments for tax year 2018.

Map created by FORTEBBA in partnership with the City of Burien with support from the Port of Seattle Airport Community Ecology (ACE) Fund.

Appendix B.

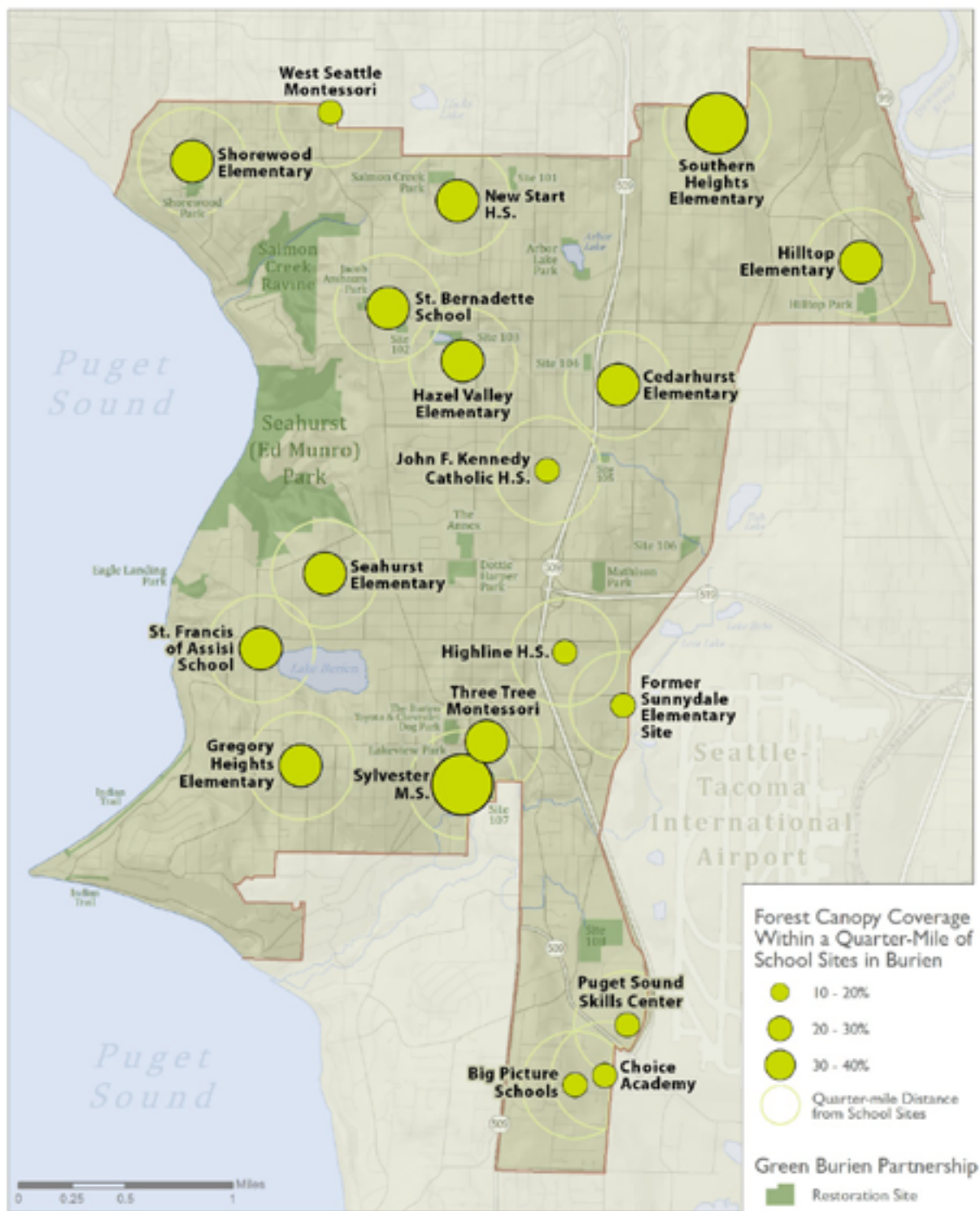
Map of Canopy Cover within a Quarter Mile of Public Housing Projects in Burien in 2017



Map created by FORTEIRA in partnership with the City of Burien with support from the Port of Seattle Airport Community Ecology (ACE) Fund.

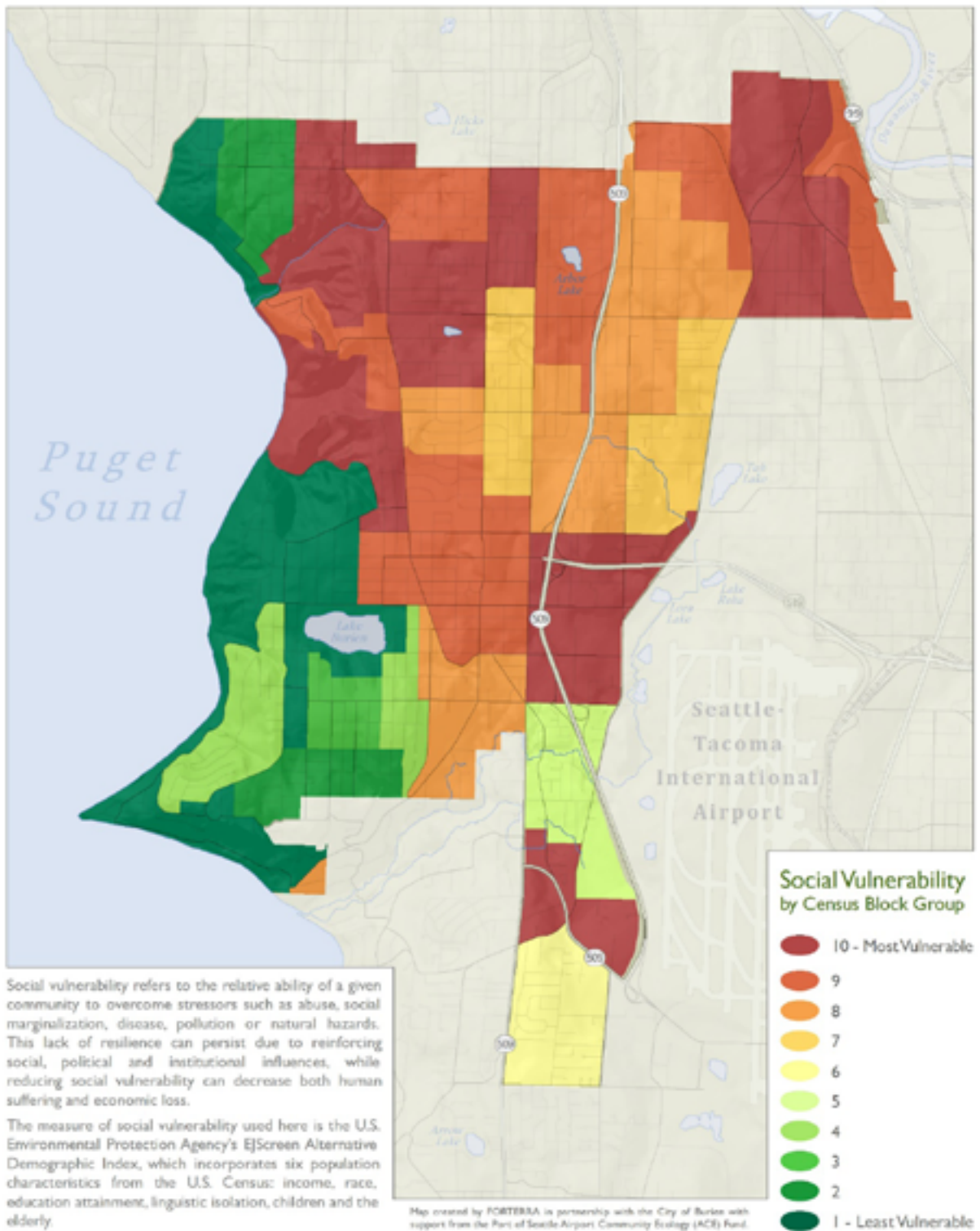
Appendix C.

Map Canopy Cover within a Quarter Mile of Schools in Burien in 2017



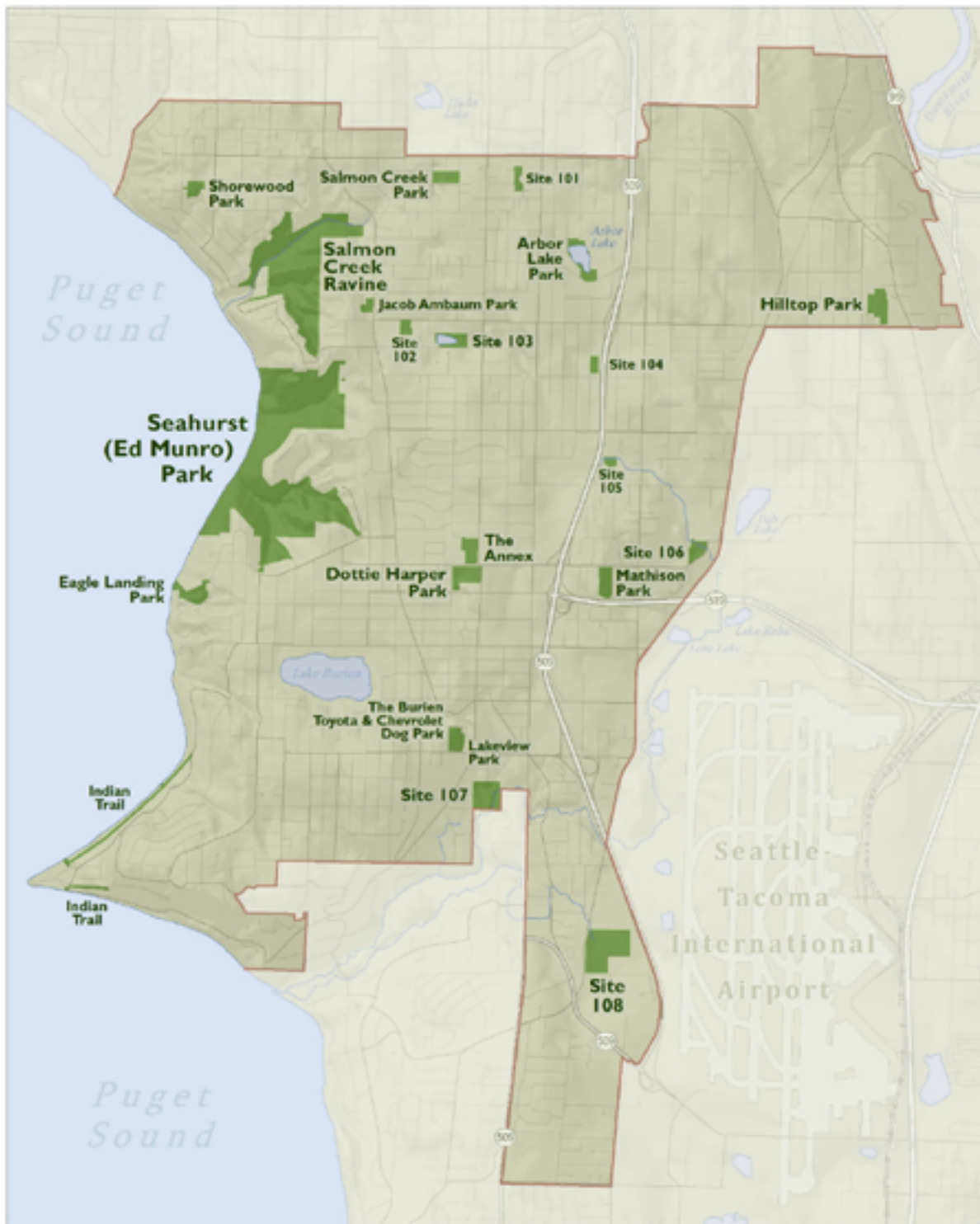
Appendix D.

Map of Social Vulnerability by Census Block in Burien in 2017



Appendix E.

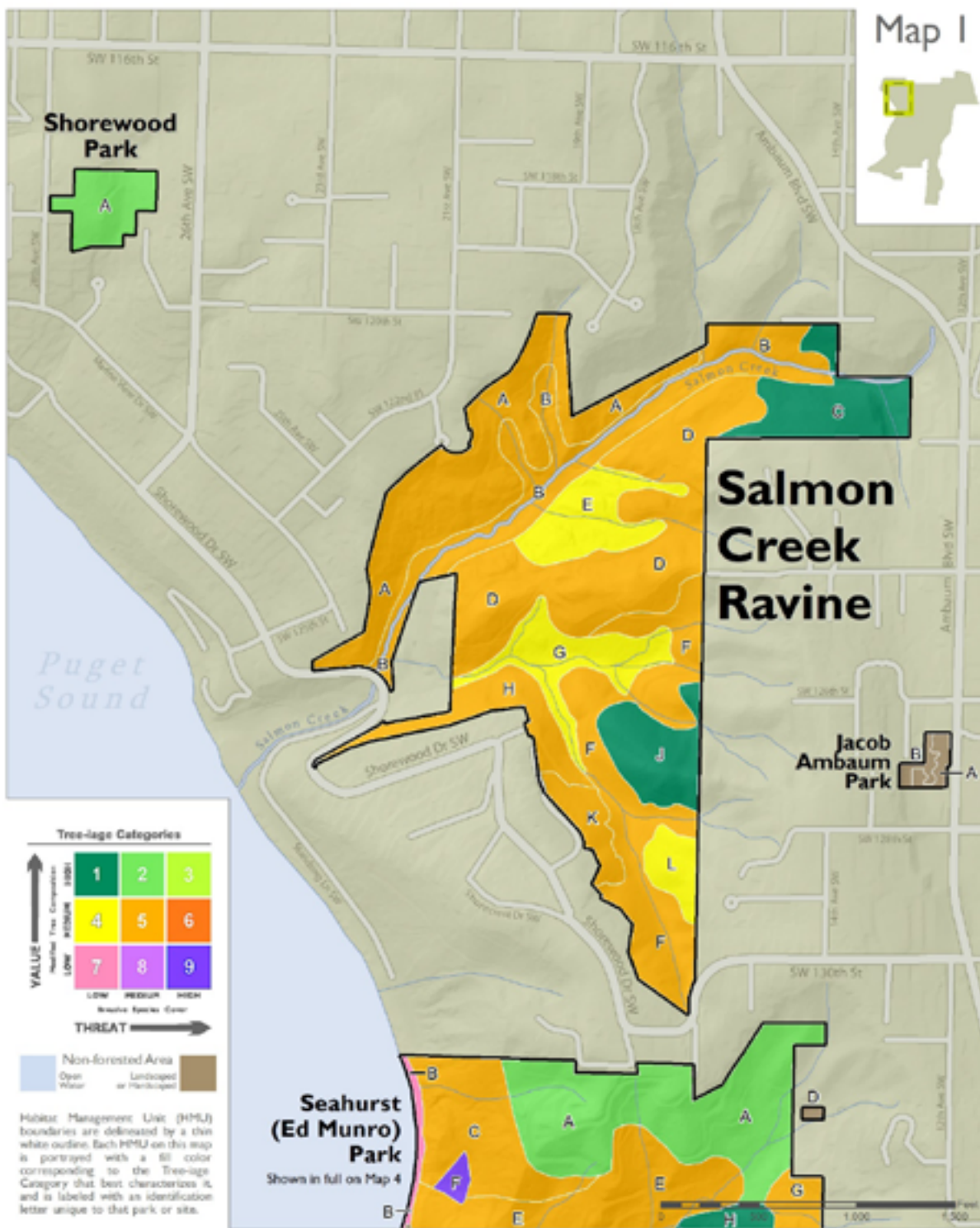
Map of Green Burien Partnership Sites: Forested and Natural Parkland



Map created by FORTEIRA in partnership with the City of Burien with support from the Port of Seattle Airport Community Ecology (ACE) Fund.

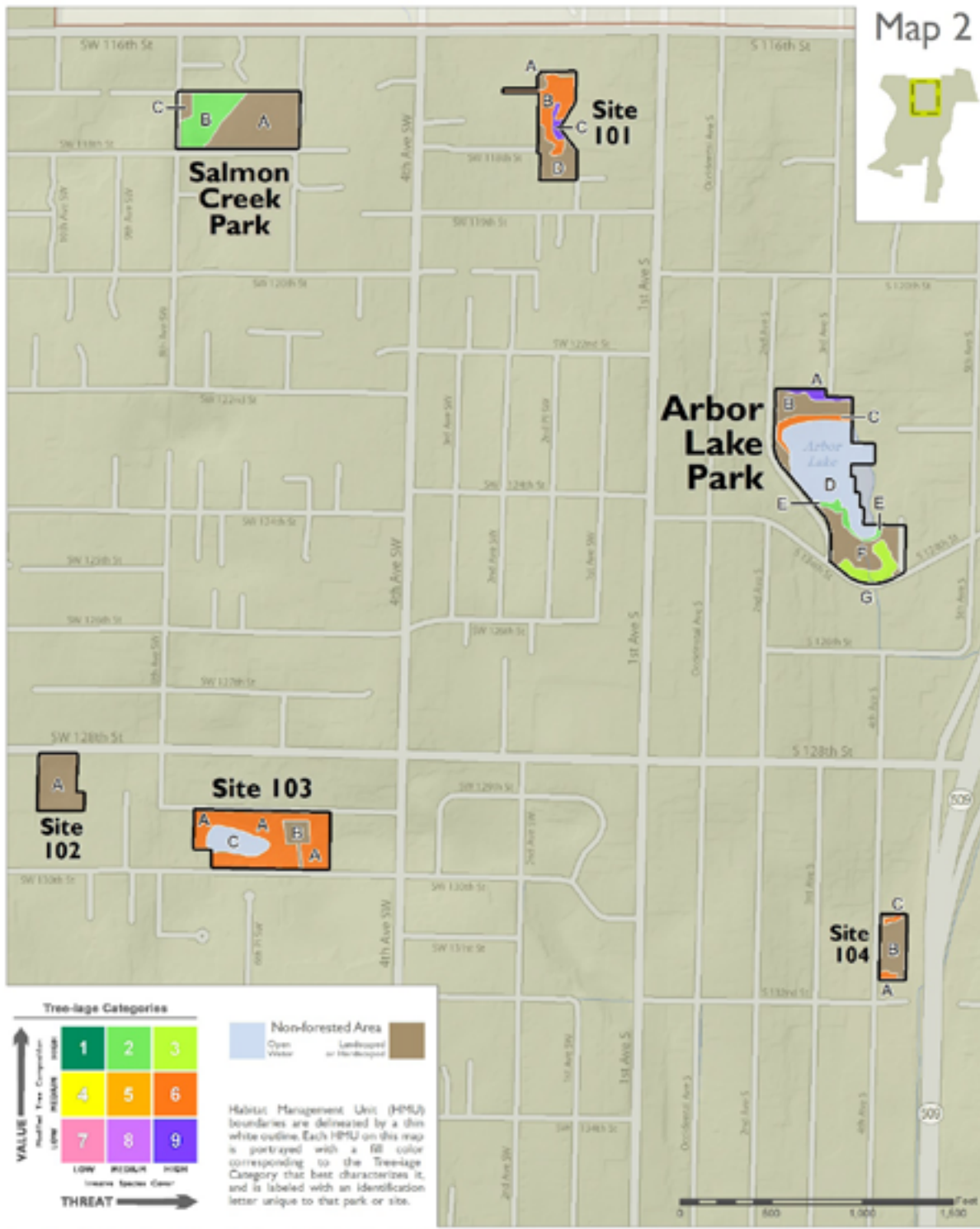
Appendix E1.

Detail Map of Green Burien Partnership Sites

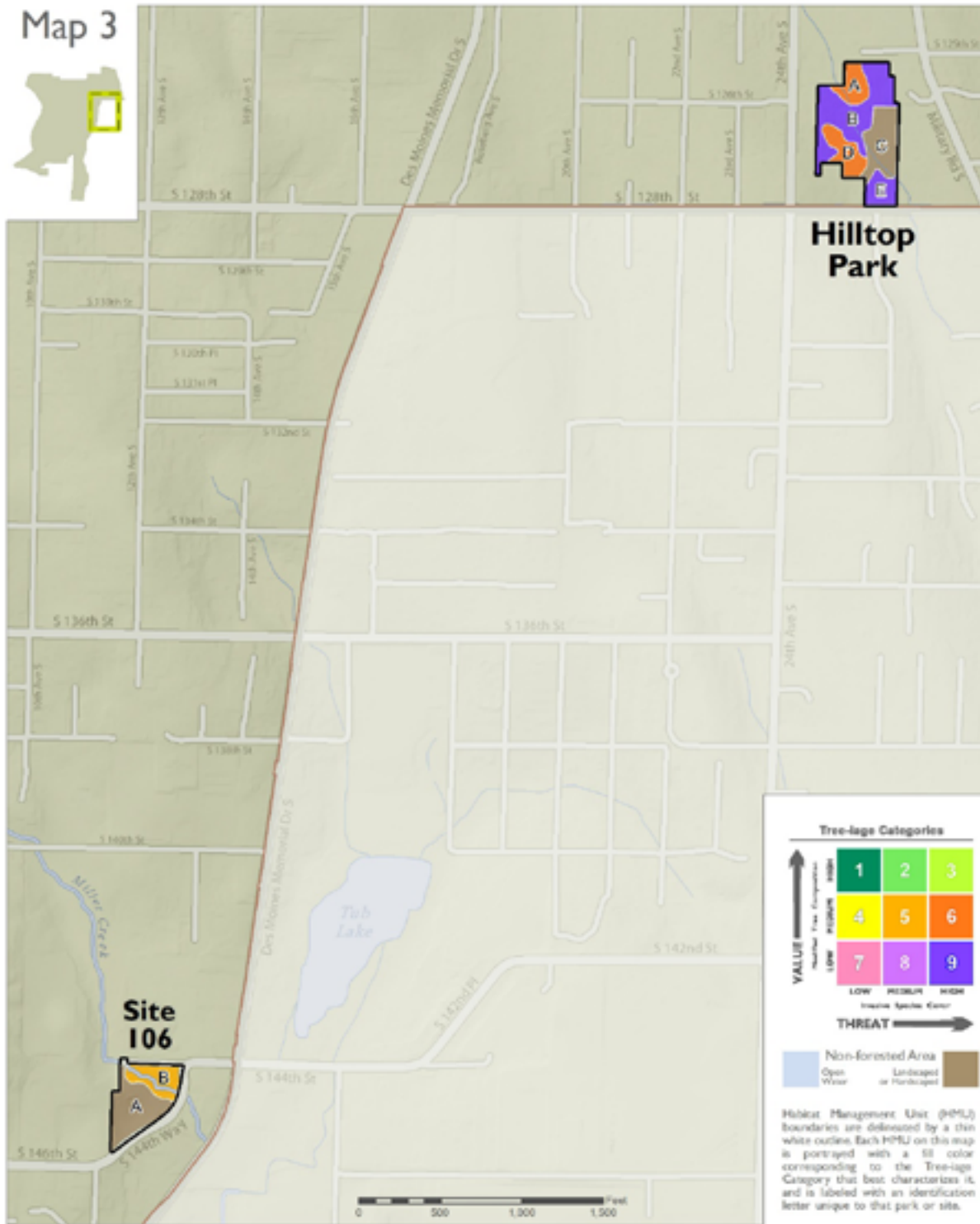


Appendix E2.

Detail Map of Green Burien Partnership Sites

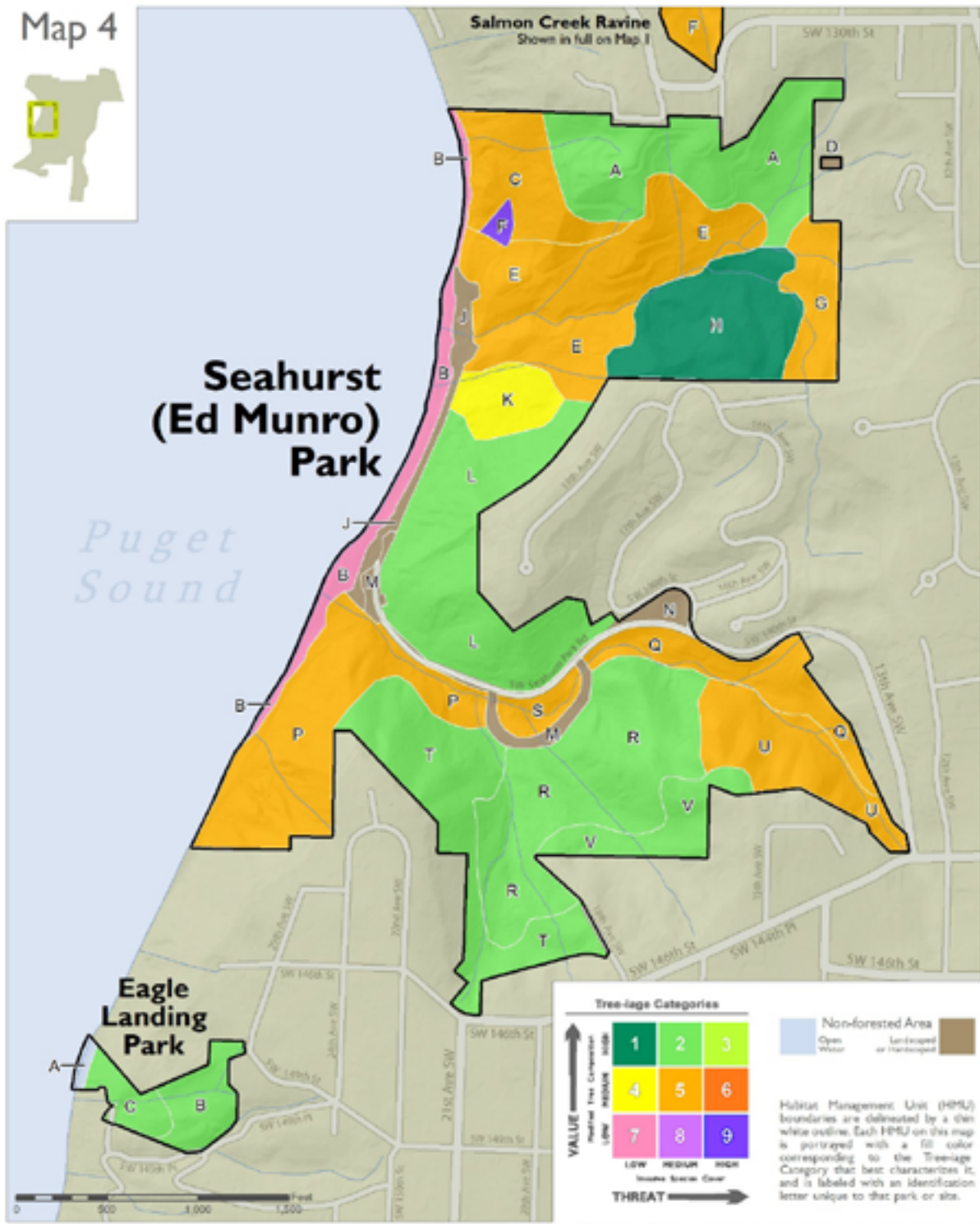


Appendix E3. Detail Map of Green Burien Partnership Sites

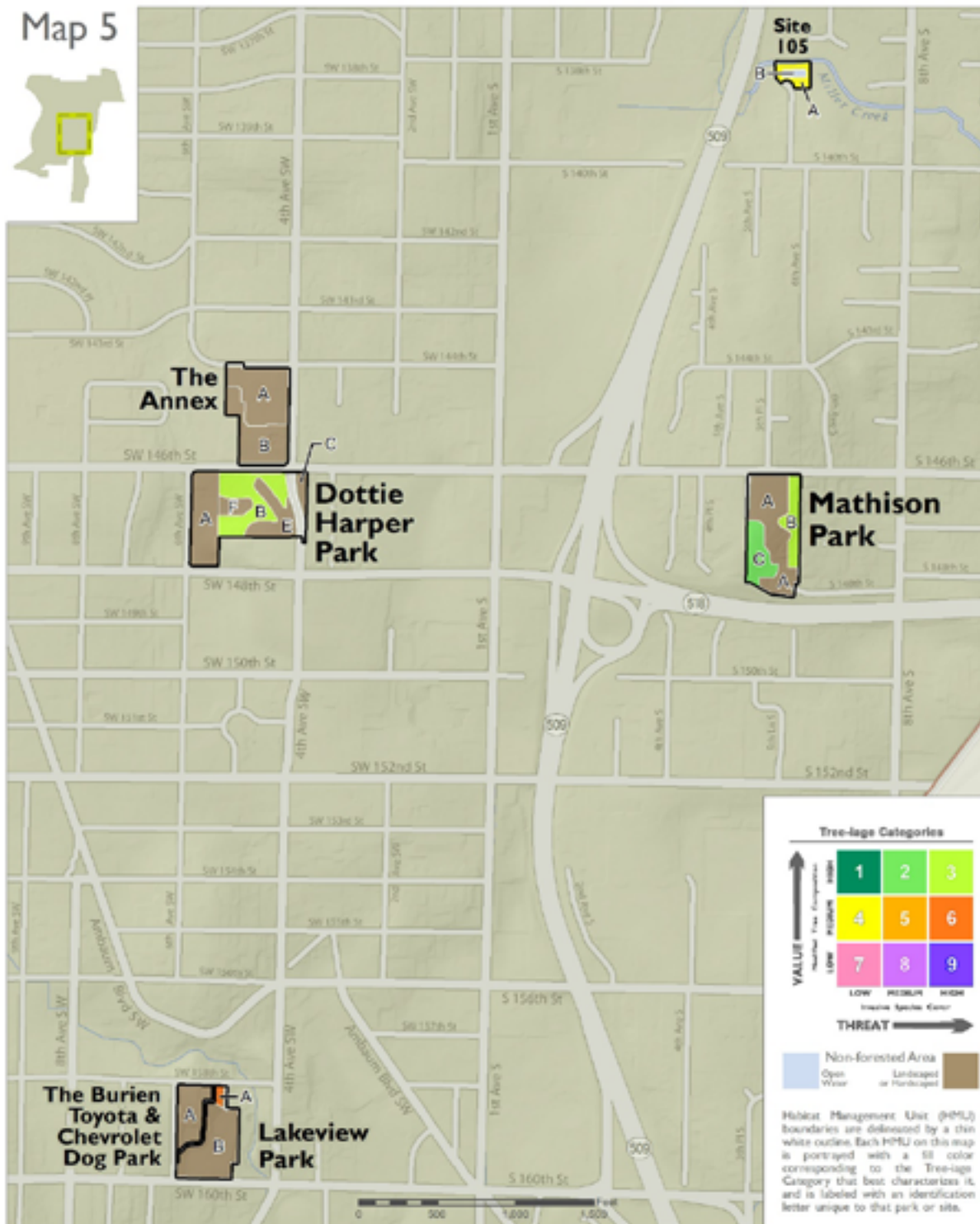


Map created by FORTERRA in partnership with the City of Burien with support from the Port of Seattle Airport Community Ecology (ACE) Fund Tree-IgE field assessment conducted by American Forest Management, Inc., December 2018.

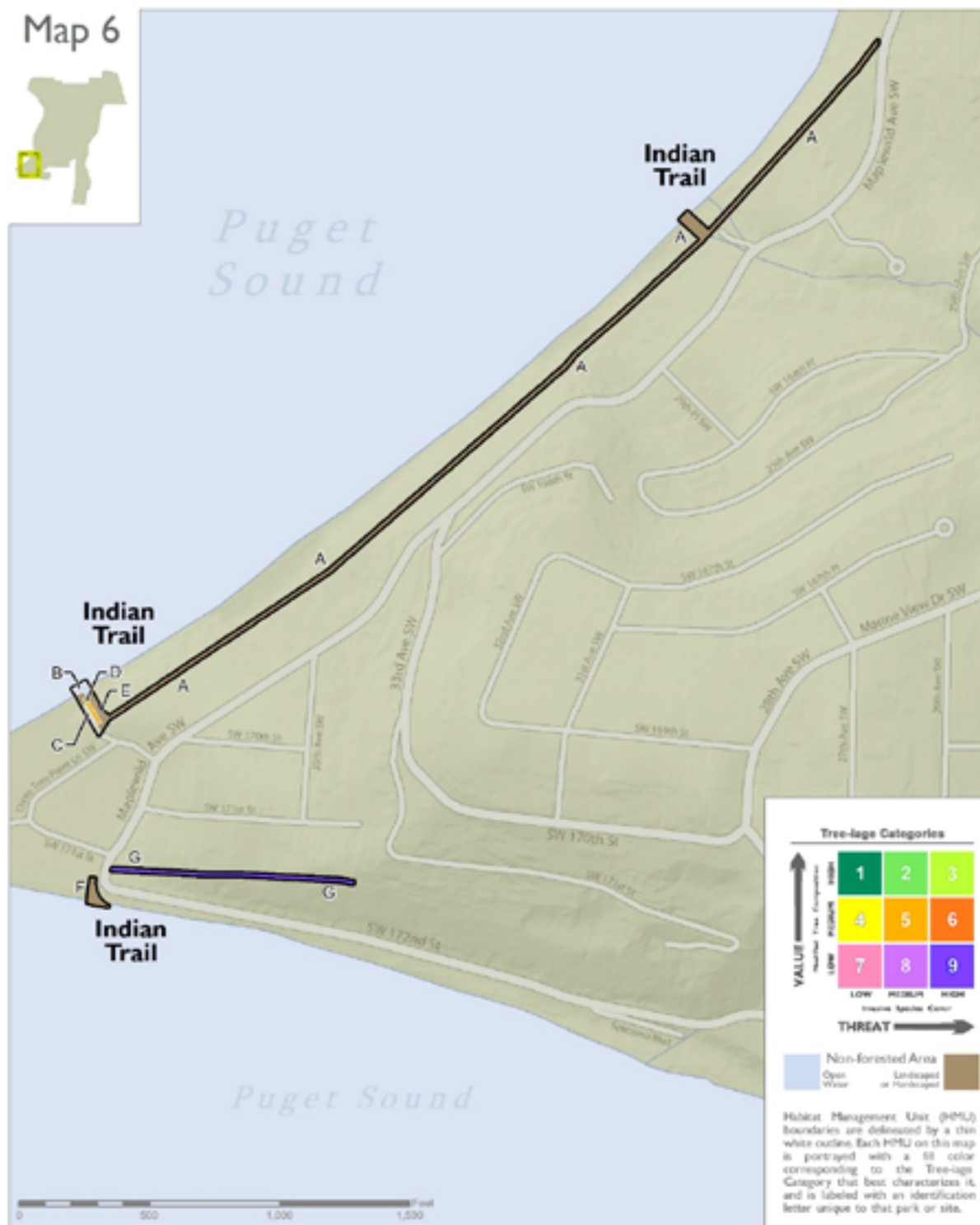
Appendix E4. Detail Map of Green Burien Partnership Sites



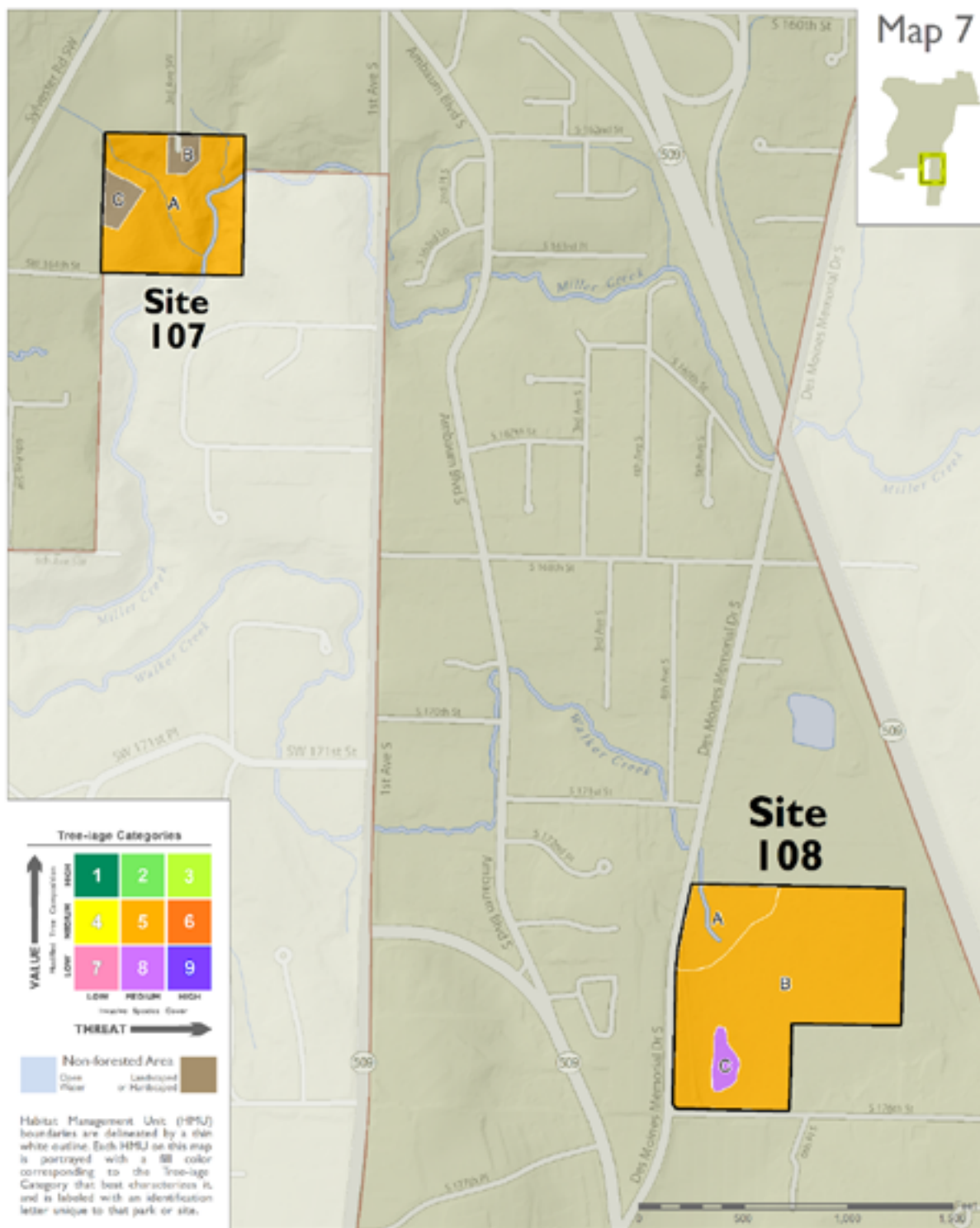
Appendix E5. Detail Map of Green Burien Sites



Appendix E6. Detail Map of Green Burien Sites



Appendix E7. Detail Map of Green Burien Sites



Appendix F. Green Cities Toolbox Information

Available at: <https://forterra.org/service/green-cities-toolbox>, the Green Cities Toolbox provides a wealth of information for Cities and Stewards.

In-depth information on these topics:



Restoration planning & implementation

Tools and expertise to plan and implement restoration at the park or site level. Includes step-by-step guides for site planning and best management practices (BMPs) for invasive plant removal, native plant installation, mulching, and maintenance.



Community engagement & volunteer management

Best practices for engaging youth, families, and diverse communities in stewardship activities, as well as tips for recruiting, managing, and retaining volunteers and running successful community restoration events.



Native plants

Native plant identification and propagation resources such as image libraries, keys, databases, and how-to guides.



Site safety

Information on Crime Prevention Through Environmental Design (CPTED) and other safety issues to consider in community-based stewardship.



Invasive species

Resources on the identification and management of aggressive non-native plants and insects.



City-specific volunteer resources











For current stewards and volunteers: Visit your Green City Partnership webpage for reporting forms, maps, and other documents specific to your Green City.



Restoration monitoring

Protocols and instructions for implementing short- and long-term monitoring of restoration sites.

Appendix G. Common Plants Referenced in This Plan

Invasive Plants		Native Plants	
	<p>Himalayan blackberry <i>Rubus armeniacus</i></p>		<p>Douglas-fir <i>Pseudotsuga menziesii</i></p>
	<p>English holly <i>Ilex aquifolium</i></p>		<p>Red alder <i>Alnus rubra</i></p>
	<p>Reed canary grass <i>Phalaris arundinacea</i></p>		<p>Bigleaf maple <i>Acer macrophyllum</i></p>
	<p>English ivy <i>Hedera helix</i></p>		<p>Black cottonwood <i>Populus balsamifera</i></p>
	<p>Bindweed <i>Convolvulus arvensis</i></p>		<p>Western red cedar <i>Thuja plicata</i></p>

Appendix H. Glossary of Terms

Adaptive Management

A structured, repeating process of decision making aimed at better understanding a management system through monitoring, evaluation, and development of new management strategies. The Green Burien Partnership utilizes an adaptive management strategy to inform its administrative and restoration practices over time.

Balanced Scorecard

A planning and management tool developed to measure both financial and nonfinancial performances against strategic goals. Burien's balanced scorecard measures performance across three key elements: fieldwork, community, and resources.

Biomass

The amount of living matter (as in a unit area or volume of habitat).

Canopy Cover

The percentage of a forest floor or specific geographic area covered by tree crowns. Assessed using aerial orthophotographs (see definition below) and ground-based techniques, it can be calculated for all trees in a given geographic area or specific individual tree species. Canopy cover has been shown to be an important ecological indicator for distinguishing plant and animal habitats, as well as assessing on-the-ground conditions in urban areas.

Climate Change

A change in global or regional climate patterns; in particular, a change apparent from the mid- to late 20th century onward and attributed largely to increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

Conifers

Cone-bearing trees, most of which are evergreen, with needle or scale-like leaves. Examples include pine, fir, hemlock, and spruce. The dominant conifers found in Burien's urban forest are Douglas-fir, western red cedar, and western hemlock.

Deciduous

A tree or shrub that loses its leaves or needles during the fall and winter months (in contrast to an evergreen plant). Examples found in Puget Sound forests include bigleaf maple, red alder, and snowberry.

Ecosystem

The interactive community or relationships of living (biotic) organisms such as plants, animals, and microbes with nonliving (abiotic) components such as air, water, soils, and weather.

Edge Effects

The change in habitat quality and plant species that occurs in the transition zone between two disparate habitat types. Urbanized forests and natural areas that are fragmented and isolated experience negative ecological changes at the abrupt transition between the built and natural environments. These include an increased susceptibility to encroachment by invasive plants; loss of plant-species diversity; loss of contiguous habitat for birds, amphibians, and mammals; and impacts from human activity.

Evapotranspiration

The process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants.

Forest Restoration

Actions and management to reestablish or enhance processes that support a healthy forest's structure, ecological functions, and biodiversity levels. Restoration actions may include removal of nonnative invasive plants, applying mulch, and planting native trees, shrubs, and ground cover. In an urban environment, the natural ecological processes may never be fully restored; therefore, forests will need ongoing management with long-term maintenance and monitoring.

Geographic Information System (GIS)

A computer program used for visualizing, storing, and analyzing data related to positions on the earth's surface. The Green City Partnerships use GIS to map and assess land cover, habitat types, and canopy cover. It is also used to track and assess acres enrolled in restoration.

Green Cities Network

The combined regional group of Green City Partnerships, which currently include Seattle, Kirkland, Tacoma, Redmond, Kent, Everett, Puyallup, Tukwila, and now Burien, SeaTac, and Des Moines. Three other municipalities — Issaquah, Shoreline, and Snohomish County — are currently in the planning phase and have committed to joining the Network. The Network is not a formally defined entity; rather, it is made up of the city partners, Forterra staff, other nonprofits, and participating volunteers who contribute to achieving the goals of each Green City. Network participants are invited to share best management practices, current relevant research, and funding opportunities.

Green City Partnership

A public-private venture involving a local municipality (e.g., parks departments, public works, utilities, and other government agencies), community groups, and Forterra. The vision of each Green City Partnership is to create a healthy, livable city with sustainable urban forests and natural areas that connect people to nature through community-based stewardship.

Hazard Tree

A tree that has a structural defect that makes it likely to fail in whole or in part.

Infiltration

The process by which water on the ground surface enters the soil.

Invasive Plants

Introduced nonnative plant species with traits that allow them to thrive outside their natural range and outcompete native plants. Invasive plants are typically adaptable and aggressive, with high reproductive capacity, and are likely to cause economic and/or environmental harm.

Madrone

Arbutus menziesii (aka Pacific madrone, madrona) is a broadleaf evergreen tree native to western North America, particularly to Puget Sound lowland forests. The bark is a rich orange-red color that when mature naturally peels away in thin sheets, leaving a smooth, greenish appearance. The Pacific madrone is in decline, especially in urban areas, and is a difficult species to reestablish. The species is found on drier slopes along shorelines or in areas with well-drained sandy or rocky soils. Areas with

madrone trees offer important habitat that often supports unique plant communities.

Management Unit (MU)

A defined geographic area within a park characterized by the vegetation type or conditions present. Open-space areas within the Green Burien Partnership sites were grouped into MUs based on one of five categories: forested, natural (nonforested), open water, hardscaped, or landscaped. Forested and other natural areas were further subdivided based on tree-age values.

Mechanical Tree Failure

Refers to the breakage of tree trunks and branches and the uprooting of trees caused by factors such as excessive force from high winds, structural weaknesses, pests, and diseases.

Mulch

A protective covering, usually of organic matter such as leaves, straw, bark, or wood chips, placed around plants to prevent weed growth, moisture evaporation, and the freezing of roots. Covering the ground with mulch is a maintenance practice used in urban forest restoration following invasive plant removal and native plant installation.

Natural Areas

Undeveloped parkland with less than 25% tree cover, in contrast to “forested areas,” which have more than 25% tree cover.

Orthophotograph

An aerial photograph that has been adjusted for topographic relief, lens distortion, and camera tilt. Because it is an accurate representation of the earth’s surface, it can be used to measure true distances, and is often used with geographic information systems (GIS).

Overstory

The uppermost layer of branches and foliage that forms the forest canopy. Common overstory trees found in Puget Sound forests include Douglas-fir, western red cedar, western hemlock, and bigleaf maple.

Photosynthesis

A process used by plants and some algae to convert light energy from the sun, carbon dioxide, and water

into carbohydrates that provide sustenance for those organisms. Photosynthesis takes place in the chloroplast cells of leaves. The primary by-product of photosynthesis is oxygen.

Phytoremediation

The treatment of pollutants or waste (as in contaminated soil or groundwater) by the use of green plants that remove, degrade, or stabilize the undesirable substances (such as toxic metals).

Riparian

Pertains to the terrestrial area along the banks of a river, stream, or lake.

Runoff

Runoff refers to unfiltered rainwater that reaches nearby water bodies by flowing across impervious surfaces such as roads, parking lots, driveways, roofs, and even compacted soils in landscapes. Where the landscape is undeveloped or soils are not compacted, rainwater soaks into forest and meadow soils, where it is filtered by natural processes, slowly feeding into underground aquifers, streams, and lakes. The filtration process removes pollutants such as motor oils, gasoline, fertilizers, and pesticides.

Scrub-Shrub Wetland

A forested wetland classification that includes areas dominated by woody vegetation less than 6 meters (20 feet) tall. The species present include willow, red osier dogwood, and hardhack.

Seed Bank

The natural storage of dormant and viable seeds present in the soils of an ecosystem. Soil seed banks play a critical role in the natural regeneration of many plant communities. In urbanized or highly disturbed forests and natural areas, the native seed bank is often destroyed due to soil degradation and colonization by invasive plants.

Stormwater Runoff — see Runoff.

Tree Canopy

The uppermost layer of the forest, formed by the leaves and branches of dominant tree crowns. The tree canopy forms the forest overstory.

Tree-Canopy Vigor

Vigor refers to a tree's active, healthy growth. Plants with low tree-canopy vigor have stunted growth, premature leaf drop, late spring-leaf development, sparse foliage, light-green or yellow foliage, twig and branch die-off, or other abnormal symptoms. A combination of factors (e.g., flooding, shifts in environmental conditions, or physical damage) reduces a tree's vigor. Stress on a tree can make it vulnerable to diseases and insects that accelerate its decline.

Tree-iage

A prioritization tool, modeled after traditional medical triage, used to assess urban habitat conditions and inform restoration-management planning. The tool uses measurements of habitat quality and invasive plant threat to assign each management unit a tree-iage category from 1 to 9. One represents high-quality habitat and low invasive species threat, and 9 represents low-quality habitat and high invasive species threat.

Understory

The vegetation that grows below the forest canopy. Understory plants consist of saplings of canopy trees, together with smaller understory trees, shrubs, and herbs. Examples of understory plants found in Puget Sound forests include vine maple, beaked hazelnut, tall Oregon grape, salal, and sword fern.

Urban-Heat-Island Effect

The increase in surface and atmospheric temperatures of urbanized landscapes caused by the replacement of vegetation and natural areas with impermeable surfaces such as roads, buildings, and other built infrastructure. Lack of vegetation in the built environment results in elevated energy consumption (due to increased demand for cooling and electricity), an increase in greenhouse gases and air pollutants, water-quality impairment (due to the heating of stormwater runoff entering streams and lakes), and human health problems such as respiratory illness, heat exhaustion, heat stroke, and heat-related mortality.

Urban Natural Areas — see Natural Areas.

Appendix I: Long-Term Strategic Plan and Benchmarks

FIELD		
2024–2028	2029–2033	2034–2038
<ul style="list-style-type: none"> • Enroll 12 to 20 new acres in initial restoration per year. • Prioritize sites in areas of social vulnerability and increase number of parks represented in restoration efforts. • Continue maintenance and restoration on all previously enrolled acres • Conduct 5-year monitoring and BMP review 	<ul style="list-style-type: none"> • Continue adding approximately 25 to 30 new acres in initial restoration per year. • Continue to diversify and add to parks with acres enrolled. • Revise park-level stewardship plans to reflect restoration. • Conduct 10-year monitoring and BMP review 	<ul style="list-style-type: none"> • Enroll all remaining acres in initial restoration • Access and enroll any additional sites, and acquisitions, if needed • Revise site stewardship plans as needed • Conduct 15-year monitoring and BMP review
COMMUNITY		
2024–2028	2029–2033	2034–2038
<ul style="list-style-type: none"> • Recruit and manage 4,700 volunteer hours annually • Support up to 10 active Stewards • Host annual signature community planting event • Host annual volunteer appreciation event • Host quarterly community appreciation events 	<ul style="list-style-type: none"> • Recruit and manage 5,000 volunteer hours annually • Support 12-15 active Stewards • Host annual signature community planting event • Host annual volunteer appreciation event • Host quarterly community appreciation events 	<ul style="list-style-type: none"> • Recruit and manage 5,000 volunteer hours annually • Support 12-15 active Stewards • Host annual signature community planting event • Host annual volunteer appreciation event • Host quarterly community appreciation events
RESOURCES		
2024–2028	2029–2033	2034–2038
<ul style="list-style-type: none"> • Evaluate needs, costs, and resources based on first five years of work • Identify and pursue funding to support field, community, and administrative work, if needed • Develop annual work plan and write annual report of accomplishments 	<ul style="list-style-type: none"> • Evaluate and update methods • Identify and pursue funding to support field, community, and administrative work, if needed • Develop annual work plan and write annual report of accomplishments 	<ul style="list-style-type: none"> • Evaluate and update methods • Identify and pursue funding to support field, community, and administrative work, if needed • Ensure proper funding base is in place for long-term maintenance, monitoring, and community engagement • Develop annual work plan and write annual report of accomplishments

Appendix J: Outreach Report

Green Cities Partnerships in SeaTac, Burien, and Des Moines Public Outreach Report

Project Background

Forterra’s Green City Partnerships bring together local government agencies, businesses, schools, nonprofit groups, and community members to create a sustainable network of healthy forested parks and natural spaces in urban areas throughout the region. These Partnerships create and implement community-based models that ensure ongoing restoration and stewardship of these vital outdoor spaces. Forterra works with cities to identify restoration opportunities within the jurisdiction, and recruits, trains, and supports passionate volunteers to participate in stewardship activities. The current Green Cities Network consists of Partnerships in 14 cities throughout Western Washington.

Airport Community Ecology Fund

Acknowledging the longstanding impacts of Port of Seattle activities on surrounding residents’ quality of life and health outcomes, the Port Commission authorized the Airport Community Ecology (ACE) Fund in 2016, dedicating \$1 million to support environmental stewardship in Burien, SeaTac, and Des Moines. Half of the fund was made available for the Small Matching Grants Program, which allows local community organizations to apply to receive funding for stewardship projects. The Port allocated the remaining funding to support long-term urban forestry efforts through the development of new Green Cities Partnerships in Burien, SeaTac, and Des Moines.

Given the high level of concern among local residents about the environmental impacts of Port activities, as well as the socioeconomic disparities present in South King County that serve to further exclude communities of color from decision-making processes, the Port and Forterra prioritized the role of public engagement in the Partnerships’ first year. Our community engagement work in Burien, SeaTac, and Des Moines represents Forterra’s first comprehensive effort to engage communities around the development of new Green Cities Partnerships. Our goal was to ensure that community perspectives — particularly those of residents from historically

marginalized groups — informed the priorities and activities of the new Partnerships from the outset.

Outreach Approach

Forterra conducted outreach in two main ways: tailored engagement via the Community Connectors model, which targeted individuals from difficult-to-reach communities; and traditional engagement in the form of Open Houses and surveys, which was meant to gather feedback from a broad audience. See Table K1 for a summary of outreach activities and associated metrics.

Community Connectors

In order to engage community members that are representative of the diverse populations of Burien, SeaTac, and Des Moines, Forterra used the Community Connectors model as a key element of our outreach strategy for the new Green Cities Partnerships. The model involves recruiting community leaders to act as liaisons between their communities and program/agency staff.

Forterra originally developed the Community Connectors program for the City of Tukwila in 2012, in partnership with the community-health organization Global to Local. The original intent of the program was to serve as a model for incorporating the perspectives of underrepresented communities in City processes. Since then, Forterra and Global to Local have continued to work together to employ the model for various outreach efforts in South King County, including the new Green Cities Partnerships in Burien, SeaTac, and Des Moines.

Connectors are leaders from a variety of language and cultural groups who represent communities that may be underrepresented in conservation efforts due to a history of exclusionary practices within the movement. Connectors have deep connections in their communities, the skills to facilitate outreach to and communicate with their respective communities, and the ability to provide culturally sensitive guidance to program staff on how to design and undertake effective outreach efforts. Forterra acknowledges that cultural groups cannot be represented by a single Connector, and that Connectors often identify with many different communities at once. We therefore believe that Connectors should not be viewed simply as representatives of a particular demographic group, but rather as “bridge-builders” who have the skills

and knowledge necessary to make connections with historically underrepresented communities in Burien, SeaTac, and Des Moines.

Green Cities Connectors

Global to Local was tasked with recruiting and supporting Connectors for the new Green Cities Partnerships in South King County. In total, nine Connectors were recruited, representing the Somali, Latinx, Filipino, and Kenyan communities, including four youth Connectors.

Connectors attended two trainings run by Forterra and Global to Local that oriented them to the Green Cities program and the expectations for the Connector role. They were also given the opportunity to provide feedback on the outreach materials and activities, including survey language and Open House times/locations.

In addition to attending trainings, the Connectors were tasked with the following responsibilities:

- Distribute and collect paper surveys
- Distribute Open House promotional flyers to community networks
- Recruit individuals to attend Open House events
- Help identify, coordinate, and facilitate small community meetings

Forterra and Global to Local recognize that a key element in the success of the Connector model is mutual respect and commitment on behalf of both the project host and the Connectors. In order to acknowledge and encourage the level of commitment expected, we compensated Connectors for the time spent engaging in the above activities. See Table K2 for a detailed outline of Connector responsibilities and associated compensation levels.

Small Community Meetings

The Partnership conducted two small community meetings in Burien and six, in total, in all three cities. These meetings were focused around groups not already represented in the surveys or community open houses.

Traditional Outreach

In addition to engaging Connectors, Forterra also conducted public outreach through more traditional channels. Our main avenues for soliciting feedback from

the general public were hosting a series of Open House events and distributing a survey.

Open Houses

Forterra hosted three Open House events throughout the fall of 2018: one in SeaTac on Saturday, October 20; one in Des Moines on Monday, October 29; and one in Burien on Wednesday, November 7. The two weekday events were held in the evening in order to accommodate individuals with daytime work schedules. The Open Houses served a dual purpose: to provide information to community members about the project and to gather input from residents about stewardship priorities in their neighborhoods.

Each event lasted two hours and used a drop-in model that allowed guests to come and go as they pleased. There were several “stations” set up around the room that provided participants the opportunity to learn more about Green Cities Partnerships, engage with research that has been conducted thus far, and provide both site-specific and general feedback on areas where they would like to see more trees and/or restoration efforts. The Port of Seattle also hosted a table with information on ACE Fund priorities and activities.

Survey

In addition to holding Open House events, Forterra also developed an eight-question survey designed to gather more quantifiable data on community members’ priorities related to urban forestry and green space. The survey contained questions meant to gain insight into residents’ relationships with parks, which environmental issues were most important to them, and ways that they would like to be engaged in stewardship and restoration activities as the partnerships evolve. The full survey is included in this Appendix.

When we designed the survey, our main goal was to develop questions that were broad enough for the average resident to be able to answer meaningfully, yet specific enough to the topic of urban forestry to be able to inform the more technical restoration work of the Green Cities Partnerships. Following survey-design best practices, we aimed to make the survey language as simple and jargon-free as possible. We also commissioned a translation agency to translate the survey into three non-English languages that are commonly spoken among the communities represented by the Connectors: Spanish, Somali, and Filipino. These translated surveys served to

lower barriers for non-English speakers to provide input into the program.

After the survey was developed, Global to Local distributed paper copies to the Connectors in their requested languages, and Forterra published an online version through Google Forms. Forterra also brought paper surveys in all languages to the Open House events for guests to complete.

Promotion and Communications

In order to publicize the Open House events and community feedback survey, Forterra promoted the events and the online survey through new and established communication channels. We created a flyer with information on the Open Houses and had it translated into the three priority languages: Spanish, Somali, and Filipino. We then disseminated the flyer and a link to the online survey through Forterra's social media networks, the Cities' communications channels, Highline Public Schools, and community partners to share with their networks. In addition to sharing the flyer, we promoted the events and survey link on Forterra's website, drafted a press release, and leveraged the Connectors' recruiting efforts.

Findings

As a result of our public-engagement efforts, Forterra gained valuable insight into community priorities related to stewardship and restoration activities in Burien, SeaTac, and Des Moines. Our findings from the community feedback survey, Open House events, and Connector-led small community meetings are summarized below.

Survey Responses

In total, we collected survey responses from 162 individuals. Of these surveys, 58 came through Connectors, 26 were completed at one of the Open House events, and 14 were completed at small community meetings. The remaining 64 surveys were completed online. Of the 162 respondents, 91% live in one of the three new Green Cities, indicating that the survey respondents are reflective of the program's overarching target audience of residents from the three cities. Looking at the demographic breakdown of the respondents, we can see that the respondents very roughly reflect the overall population of the three cities: of the 130 respondents that

specified their race, 48% identified as White/Caucasian, 23% identified as Black, 12% identified as Asian, and 12% identified as Latinx/Hispanic. In terms of gender identity, male-identifying individuals were underrepresented in this sample, making up only 35% of the respondents. It should be noted that approximately 22% of respondents declined to specify their race or gender, which may impact the accuracy of the above figures.

Survey Results

The most popular activity that respondents participate in when they visit parks in their neighborhood is “view[ing] nature, trees, flowers, birds, wildlife, etc.,” which was closely followed by “relax[ing].” These top two responses indicate that many community members see their neighborhood parks as peaceful and calming places to enjoy in a passive fashion.

When asked to select the three health- or environment-related issues that were most important to them, 70% of respondents chose air pollution and 55% chose water quality, the two most common responses. While clean air and water were the top environmental priorities for community members, a significant proportion of respondents also indicated that they valued access to nature/natural beauty, quality of life/mental health, and safe spaces for relaxing and having fun—these issues were each chosen by 41% of respondents.

In terms of potential stewardship activities, respondents indicated that they would be most interested in attending volunteer events to plant trees and engage in restoration activities (57% of respondents); receiving free trees to plant near their homes (54% of respondents), and learning more about forests, trees, and native plant species (51% of respondents). A significantly smaller proportion of people expressed interest in teaching others to plant trees at parks in their neighborhoods (30% of respondents).

When asked to identify areas in their city where they would like to see more trees, respondents identified sites that were both specific and general in nature. Overall, it was clear that parks were a priority for many participants, as well as community/public spaces such as churches, libraries, schools, and bus stops. Many people also mentioned roadways, indicating that street trees are also in demand among survey respondents. The idea of planting more trees to serve as a visual/sound buffer between residents and industry (e.g., airport activities, construction, warehouses) was also commonly mentioned. Finally, some respondents were interested in developing ways to incentivize homeowners to plant trees

on their property.

The comprehensive results from the survey are included in this appendix.

Open House Findings

Overall, we engaged 74 guests at our Open House events: 25 in SeaTac, 20 in Des Moines, and 29 in Burien. These numbers reflect individuals who signed in at the events and therefore may underrepresent the actual number of people who participated in the Open Houses.

From the Open House feedback activities, we gained general community feedback, as well as input related to site-specific stewardship priorities and types of landscapes where residents want to see more trees.

Much of the site-specific feedback reflected what we found in the surveys — many residents wanted to see restoration and stewardship activities take place in parks, near schools, and along streets. There were also several comments about planting trees near areas undergoing development in order to provide a buffer between residents and development activities. In terms of landscapes where residents would like to see more trees, most participants indicated that parks and schools were the top two priorities. When it came to general community feedback, many participants provided useful information on potential community partners to engage in our stewardship efforts. A full summary of feedback collected at the Open House events are included in this Appendix.

Community Engagement Challenges

While Forterra succeeded in gaining valuable feedback from stakeholders regarding the development of the Green Cities Partnerships in Burien, SeaTac, and Des Moines, we nonetheless faced challenges throughout the outreach process. These challenges presented opportunities for further aligning our work with community needs in order to ensure the long-term success of the project.

First, we found that we had difficulty recruiting community members to attend the Open House events. Some Connectors mentioned that, while many of their contacts expressed interest in participating in stewardship events such as tree plantings, it was difficult to get people to provide meaningful feedback on the narrow topic of urban tree canopy, let alone take the time to participate in the Open Houses. The lack of

community interest in the topic of urban forestry was particularly pronounced among historically marginalized groups. Community partners that were affiliated with these groups noted that the topics of urban forestry and urban tree canopy were not identified as priorities for many of these communities, as they oftentimes face more immediate needs, such as affordable housing, attainable education, and employment opportunities.

In addition to the challenges of engaging communities around the specific topic of urban forestry, we also faced issues with Connector attrition throughout the project cycle. Many Connectors worked full-time or were in school, and therefore had competing priorities that prevented them from being able to participate in outreach activities to the degree expected. This decline in Connector involvement throughout the course of the project may have been associated with the existing lack of community interest in the subject area, and ultimately served to compound the difficulties we faced recruiting community members to participate in outreach activities.

Finally, there were larger political issues outside Forterra's control that nonetheless posed challenges to our engagement goals. Firstly, we found that some community members associated our work with the Port's larger development activities and their related impacts on surrounding residents, and were consequently unreceptive to our outreach efforts. Some of these stakeholders attended our Open House events and strongly vocalized their opposition to the Port's development approach, which served to disrupt feedback activities.



Table K1: Summary of Outreach Activities

Activity	Date	Location	Metrics
Connector Training #1: Introduction to Green Cities Partnership	August 23, 2018	Global to Local	
Connector Training #2: Preparing for Outreach for Events & Surveys	September 17, 2018	Global to Local	
Survey Distribution	October 2 – November 7, 2018	N/A	148 surveys completed
SeaTac Open House	October 20, 2018	Tyee High School	25 attendees
Des Moines Open House	October 29, 2018	Des Moines Beach Park	20 attendees
Burien Open House	November 7, 2018	Burien Library	29 attendees
Small Community Meeting #1	December 12, 2018	SeaTac Community Center	18 contacts
Small Community Meeting #2	December 13, 2018	Waskowitz Environmental Leadership School	24 contacts
Small Community Meeting #3	December 21, 2018	Tyee High School	6 contacts
Small Community Meeting #4	January 11, 2019	Wesley Housing Community	32 contacts
Small Community Meeting #5	January 15, 2019	Des Moines Senior Center	52 contacts
Small Community Meeting #6	January 23, 2019	Highline College	28 contacts

Table K2: Connector Responsibilities and Associated Compensation

Activity	Date
Attend Connector Training #1: Introduction to Green Cities Partnership	\$80 per training session
Attend Connector Training #2: Preparing for Outreach for Events & Surveys	\$80 per training session
Attend at least 1 Community Open House (1 to be held in each city) and recruit 10 community members to participate	<ul style="list-style-type: none"> • \$100 per open house event attended • \$10 per recruited individual that also attends (up to 10 attendees)
Help identify, attend and lead one community meeting	\$100 for one community meeting
Help design and conduct surveys with 10 community members to gather feedback on stewardship goals	\$10 per individual surveyed (up to 10 surveys)
Attend two check-in meetings with staff from Global to Local	\$25 per check-in meeting

Community Feedback Survey (English)

We are collecting feedback from community members about your relationship with local parks and urban forests. The information you provide will help us improve the environment so you can enjoy it the most. This survey is anonymous, unless you choose to provide contact information to learn more. Thank you for taking time to fill out the survey!

1. What city do you live in?
 - Des Moines
 - SeaTac
 - Burien
 - Other (please specify): _____

2. Do you visit parks or other outdoor areas in any of these cities?
 - Des Moines
 - SeaTac
 - Burien
 - Other (please specify): _____
 - I don't visit parks or outdoor areas anywhere

3. If you visit parks in these cities, what activities do you do when you're at the park? (Select all that apply)
 - Relax
 - Play sports and games
 - Have picnics / gather for meals
 - Go to the dog park or walk dogs
 - Exercise
 - Go to the playground
 - View nature, trees, flowers, birds, wildlife, etc.
 - Other (please specify): _____

4. What are the three (3) most important environmental and community health issues to you? (Select 3)
 - Air pollution
 - Water quality
 - Safe places for relaxing and having fun
 - Access to healthy food
 - Access to nature/natural beauty
 - Quality of life and mental health
 - Wildlife protection
 - Other (please specify): _____

5. If you were able to get involved, what activities would you participate in? (Select all that apply)
 - Learn more about forests, trees, and native plant species
 - Attend volunteer events to plant trees and take care of the environment
 - Teach others to plant trees at a park in your neighborhood
 - Receive free trees to plant near your home
 - None of the above

6. Please list any locations in Des Moines, SeaTac, or Burien would you recommend for planting trees or making more beautiful outdoor spaces: _____

7. Where did you hear about this survey?
 - City website / social media
 - Local media / news
 - Friend / family
 - Community event
 - Other (please specify): _____

8. Are you interested in learning more about forests in parks near you? Y / N (Circle one)
 - If yes, please provide your email address: _____
 - Phone number if you prefer to be contacted by phone: _____

Demographic Questions

These questions are optional, but will help us understand more about you and your community so that we can better address your concerns about urban forests and parks.

9. What race or ethnicity do you identify with? _____

10. What gender do you identify as?
 - Female
 - Male
 - Other (please specify): _____

11. What is your age? _____

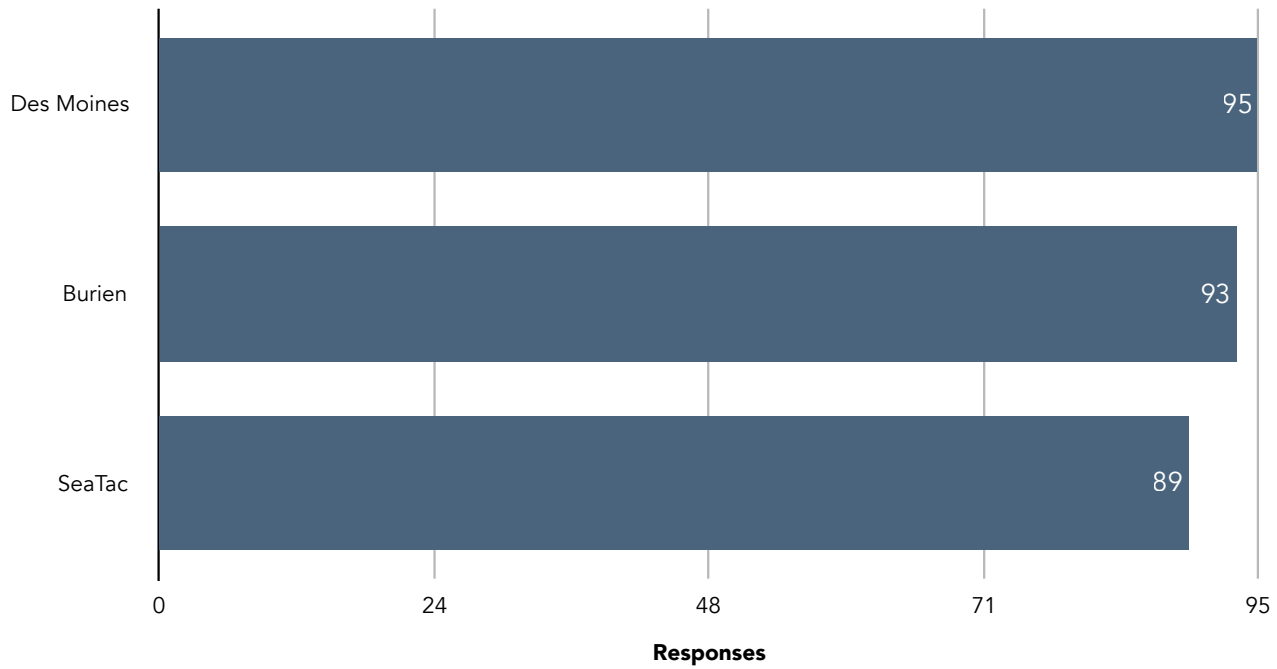
Community Feedback Survey (English)

To promote the Open House events and the community survey, Forterra engaged in the following communications activities:

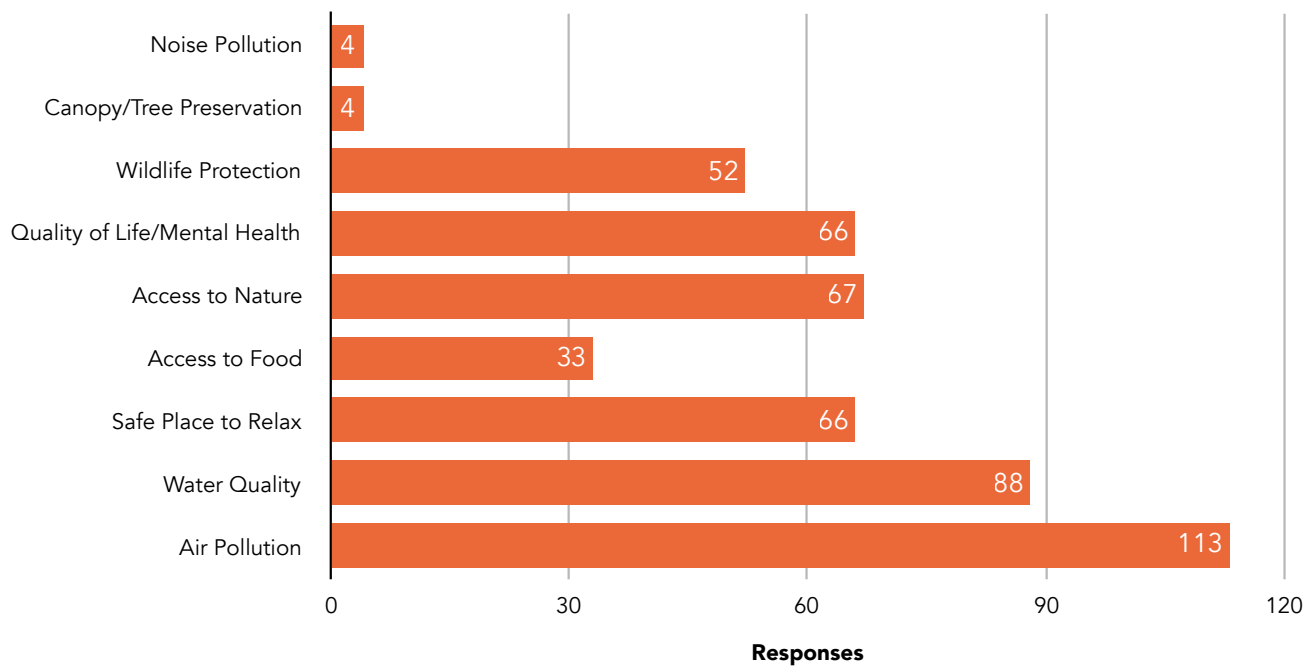
- Developed a flyer with dates, locations, and contact information for the Open House events, and had the flyer translated into the three priority languages.
- Posted paper version of the flyer at community sites in Burien, SeaTac, and Des Moines.
- Posted all Open Houses as events on Forterra’s website, and posted the dates, flyer, and link to the online version of the survey on Forterra’s Green Cities webpage.
- Invited other ACE Fund recipients to attend the Open Houses, and encouraged them to promote the events with the flyer.
- Sent a communications toolkit to each of the three cities that included a flyer (in the three priority languages), a link to the survey, links to event pages, and sample promotional language.
- Drafted and sent a press release to local media.
- Sent the flyer in English to 6,482 households in the Highline School District through Peachjar, a network that distributes information to parents within the district.
- Distributed flyers and surveys (in the three priority languages) to Connectors to use in their recruiting efforts.
- Shared the event links (hosted on Forterra’s webpage) on Forterra’s Facebook page as each Open House event approached, and tagged partner agencies so that partners could amplify the Facebook posts through their own networks.

Survey Results

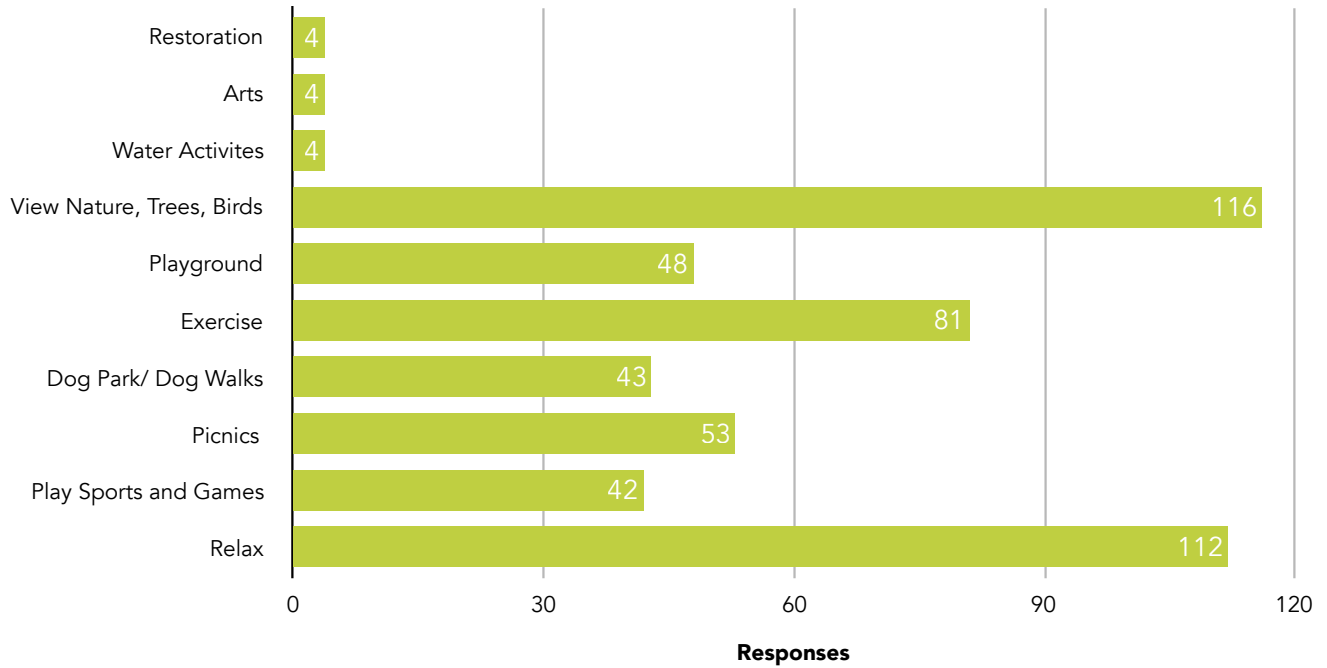
Where do you visit parks?



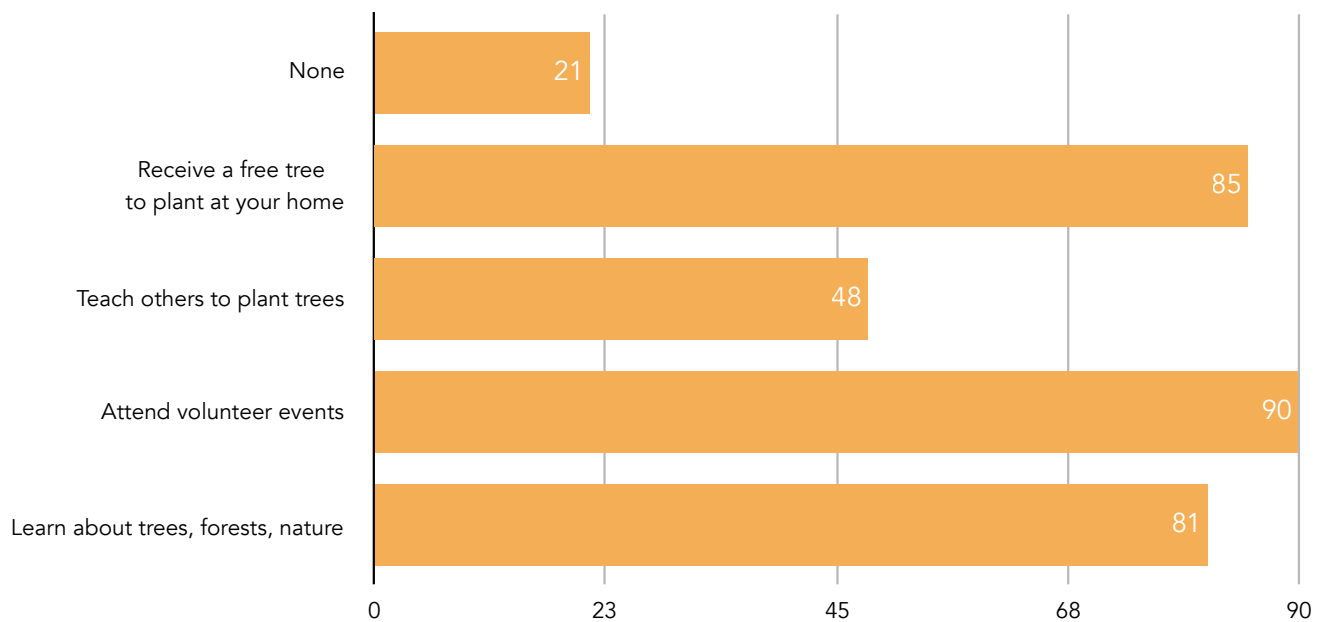
What are the 3 most important environmental and community health issues to you? (Select 3)



What activities do you do at the park?

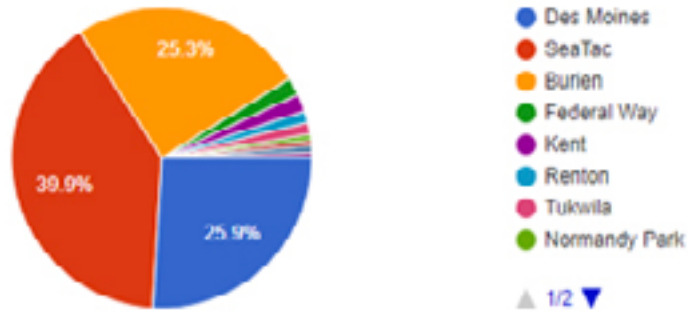


How would you like to be involved with the Green City Partnerships?



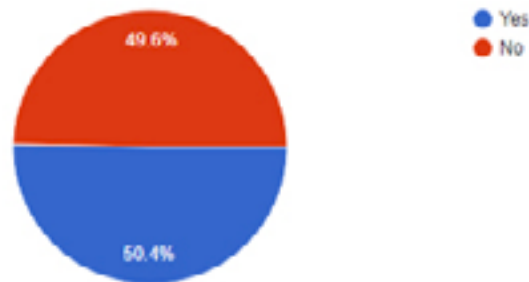
What city do you live in?

150 responses

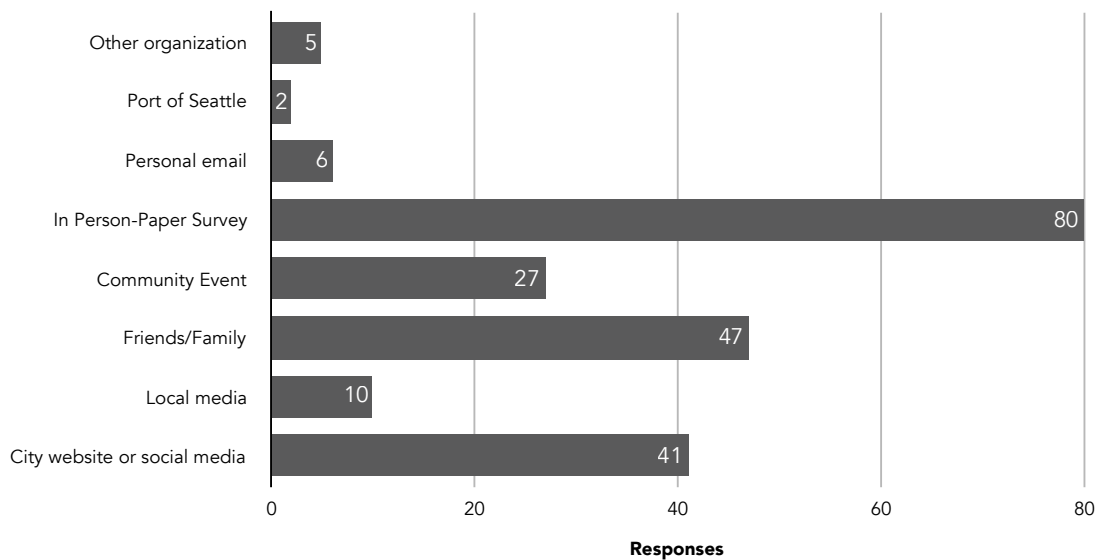


Are you interested in learning more about forests in parks near you? If yes, please provide your contact information below.

139 responses



Where did you hear about this survey?



*Contact information and self-reported demographic information are not shown.

Please list any locations in Des Moines, SeaTac, or Burien would you recommend for planting trees or making more beautiful outdoor spaces.

100 responses

the old golf course area south of the airport and the buffer zone immediately north of the airport between the end of the runway and south of 518. this is where the airport clear-cut 3000 trees!

North SeaTac park

The area by Des Moines Creek Trail, where the Port of Seattle is raping the land for warehouses!! There is no tree buffer between the runway & school on 24th in Des Moines. We need trees to filter the emissions. Horrible monsters at the Port of Seattle GREEDY!

North Hill neighborhood of Des Moines

I live in Des Moines, in the North Hill area, it would be great to have residential streets to be tree lined for beauty and air quality.

Along 200th, and anywhere along the flight path

Park area off S 178th in Seatac (not sure of the street, but close)

Conifers at N Seatac park

I'm going with all major thoroughfares for \$1000, Alex. Many along the SR-99 are now established and it's time to add trees so that in 50 years it looks more mature along with our cities.

I hope you will give us recommendations about places that you see which could be beautified and which could benefit from more trees and natural spaces - places that maybe we see every day but don't realize could be used as green space. I hope a plan for preserving nature in these communities will take into account the need to preserve what is already here, what people are already enjoying, in addition to protecting this and adding more. Also, the reason I will not be participating in the tree events that you list above is because I already do these things, and I think that the Port should be doing most of this work. The Port is the one taking out all of the trees and green spaces and polluting, and then they want to recruit volunteers from the communities around the airport to replant trees, and they want us to apply for grants from them to do this work? That is ridiculous and unjust. I think it's important to educate folks about the importance of nature and I'm pretty sure my neighbors and I already know about it. We are not the ones destroying our greens spaces and trees, we are mourning them. I would urge part of the 20 year plan to hold the Port accountable to funding this work and doing this work, with communities helping if they choose, but not required. I would also urge part of the 20 year plan to include Seatac, Normandy Park, Des Moines, Burien, Tukwila, and Federal Way to come together to preserve green spaces as we are all affected by tree canopies in these cities since the cities are so close together and so close to the airport. There is also non-airport development happening in these cities which is removing tree canopy, and which needs to be accounted for.

Downtown Des Moines's many empty Lots, Parks, Schools, Port of Seattle empty land

16th Avenue between 251st and 240th.

At the new Des Moines Elementary School, at the new Wesley Gardens, at any new construction where the land has been raped by bulldozers.

roadways

Tyee HS

Burien backyards. Tree give-away for people to plant trees in yards.

Des Moines, especially the Pacific Ridge neighborhood. We've lost significant Vegetation due to development and will lose the little vegetation strip that buffers us from I-5 when Sound Transit comes through

North Burien. Specifically, we need more street trees. Puget Sound Park and Hazel Valley Park. Also, focus on areas around schools.

I am not aware of any.

Lakeview Park and adjacent woodland area

All over to protect from airplane emission

Restore Tub Lake. Allow public access to Lake Burien.

North Hill

Des Moines Marina, downtown Des Moines

Boulevard Park! Recently incorporated into Burien, we're often forgotten about, whether it's stores that have healthy local food options, community arts and events, or making space for more shared beautiful outdoor space. We have a amazing resource in the North SeaTac Park just South of BP, but more could be done to make this neighborhood a more beautiful and inviting place.

I don't know

Seahurst elementary has room for more around the edges of the park - esp replacing those cut down ... reforest Eagle landing as trees fall naturally in the park. Encourage more trees in residents yards and near businesses on First ave. AND MOST OF ALL PLANT MORE CLOSER TO THE NOISY AIRPORT!!!!!!

Ambaum Blvd SW; First Ave So from 116th SW to 136TH.; Trees along 4th Ave SW from SW 128th to SW 116th.

The exit closest to the freeway

1st avenue

1 st avenue, Burien

Crystal Springs Park

valley ridge

Various places surrounding my neighborhood

Valley Ridge - mostly all the parks would be more beautiful if there was more green

Tyee High School playground - we should plant more trees instead of grass

Valley Ridge

the areas along Des Moines Memorial Drive that are being paved over by warehouses. the areas around 216th that are now filled with warehouses. There could be a lot more trees in that area, for example near the parking lots. Or replace some parking places.

Water District 54

Near the airport

Curbside trees in residential neighborhoods. Provide lists of pre-approved species of plants and trees residents can plant between streets and sidewalks without requiring costly permits and insurance. These will beautify neighborhoods and don't take up square footage of the host property.

Lake burien park could benefit from a few more trees along the perimeter. Keep the wonderful open grass playfield but ring it with rows of trees, two deep. Great for shade and air quality.

Turn vacant properties into bird sanctuaries. There's plenty of former commercial and even residential areas where we can get rid of the concrete and plant a bunch of trees and shrubbery.

Bus stops, train station, sidewalks

schools, churches, apartments

Sidewalks, bus stops, churches

Pavement, bus stops, public parking lots

sidewalks, bus stops, playgrounds, schools

SeaTac 192nd Street (currently no trees)

Everywhere! As many as possible since Port has cut down hundreds of trees

En los parques ("in the parks")

Valley Ridge Park

homeowners need help in reforestation & removal of invasive species; purchase of slope to east of I-5 from 204th N to 188th? to preserve green space on sensitive slope

Saltwater Park, parks in Des Moines, neighborhoods in Des Moines

Saltwater PK. Parkside Wetlands.

I would love to see more tree planting on private property to help connect the urban forest. It would be great if there were more incentives or education for developers and home builders regarding existing trees and maintaining tree canopy.

1st Ave corridor

All schools, many street trees (and care for existing street trees - in Burien on 6th Ave. near police station please), community centers and clubs, along all streams, native plants at libraries, along 1-5 and 518 to create buffer of green

I'm a photographer and I love parks, to capture the nature & wildlife. So seasonal trees really make the difference so there is something to have for each quarter.

North Part of Hazel Valley and JBLM campus

Wherever there are monstrous new developments
**advice on what and where to plant native plants

Angle Lake

library

Schools, library

Des Moines Beach Park
Along 16th Ave S

Midway, Redondo, All the Parks

Busstops, libraries, schools

Crestview Park Tukwila

bus stop & school

bus stops & school

seatac parks & Tye HS

The area around the airport. Pier in Des Moines

any location honestly would be good for new trees.

Bus Stops

bus stops

Veteran's drive in Kent

Burien apartments and parks

everywhere in Burien

food gardens, roadways,

roadways, food gardens,

ways- side walks, roadways

houses, schools,

gardens, houses, schools

houses, schools, gardens

schools, homes,

roadways, schools

roadside, parking lots, lightrail station

parks, libraries, schools

playgrounds, churches, community centers

public parks, stadiums,malls

schools, mosques, roadsides

Apartment buildings, bus stops, playgrounds

Community centers, schools, mosques

Seatac

Sea Tac/ Des Moines

around any store and apartment complex

Des Moines Creek Trail

Seahurst beach/park

The marina in Des Moines

Feedback from Open House Events

Event	Comment	City referenced in comment	Park/Location if applicable
Port ACE Fund Celebration	Opportunity to coordinate restoration efforts with the possible expansion and development of Disc Golf at Sunset Park, SeaTac	SeaTac	Sunset Park
Port ACE Fund Celebration	Opportunity to add more trees to Riverton Heights Park	SeaTac	Riverton Height Park (developed park)
Port ACE Fund Celebration	Pacific ridge (Des Moines) is losing a significant amount of vegetation due to development and light rail. We are wedged between 1-5 and Hwy99, SeaTac Airport and soon 509. We need vegetation to mitigate pollution	Des Moines	Pacific Ridge
Port ACE Fund Celebration	This slice of land should not be developed; it is a steep bank with many springs. Tukwila wants to incorporate and zone for business and SeaTac City council ignored recommendations of its planning staff and rezoned to high density residential. This remnant of forest serves as the green lungs of our community between 1-5 and the industrialized valley floor	SeaTac	Along I-5 adjacent to Kent near Angle lake
Port ACE Fund Celebration	Opportunity to partner with Friends of Saltwater Park and include in Green Des Moines efforts -note Saltwater Park is not included in FLAT because it is state property.	Des Moines	Saltwater Park
Port ACE Fund Celebration	Opportunity to collaborate with Env. Science Center at Seahurst Park	Burien	Seahurst Park

Event	Comment	City referenced in comment	Park/Location if applicable
Port ACE Fund Celebration	Opportunity to add trees/green landscaping at Gregory Heights School	Burien	Gregory Heights School
Port ACE Fund Celebration	Opportunity to partner with Highline School District, and Highline Council that oversees all the PTAs to engage schools and families	ALL	
Port ACE Fund Celebration	Comment: Think about integrating tree canopy and green stormwater infrastructure (talk to Futurewise) -Amy Wateman	ALL	
SeaTac Open House	Long-term opp at aviation site, no longer school after other schools rebuilt	Des Moines	Aviation High School
SeaTac Open House	Barnes Creek Trail from Des Moines Creek Park south - a lot of restoration opps	Des Moines	Barnes Creek Trail / Des Moines Creek Park
SeaTac Open House	Des Moines Elementary shut down - what happens? TBD. Community asset?	Des Moines	Des Moines Elementary
SeaTac Open House	Improving water quality w/ Massey Creek - salmon bearing. Creek needs invasive species work.	Des Moines	Massey Creek

Feedback from Open House Events (cont.)

Event	Comment	City referenced in comment	Park/Location if applicable
SeaTac Open House	At the new Des Moines Elementary at Zenith Park	Des Moines	Zenith Park
SeaTac Open House	Highline Campus	Des Moines	Highline College
SeaTac Open House	SeaTac Park needs more trees b/w Des Moines (?)	SeaTac, Des Moines	SeaTac Park
SeaTac Open House	Port-owned, took down houses. Still trees + ppl walk dogs - retain as green space	SeaTac	Pat Ryan Memorial Field?
SeaTac Open House	Perimeter of new school	SeaTac	Glacier Site (future middle school)
SeaTac Open House	Around the airport	SeaTac	SeaTac Airport
SeaTac Open House	More trees near Tyee	SeaTac	Tyee High School
SeaTac Open House	New sidewalk near 200th from SeaTac boundary to Des Moines Creek trailhead	SeaTac	200th St, Des Moines Creek trailhead
SeaTac Open House	Plan for old golf course? Very few trees, short plants.	SeaTac	Former Tyee Golf Course
SeaTac Open House	Lower growing greenery - not used as school	SeaTac	Maywood Site (former school)
SeaTac Open House	New rd. construction - check w/ WADOT re new 509 connections so not impacted	SeaTac	509, 99, Military Road

Event	Comment	City referenced in comment	Park/Location if applicable
SeaTac Open House	Save trees by Grandview	SeaTac	Grandview Park
SeaTac Open House	Residential yards from 204th + Military Rd East - neighbors have erosion problems, want to plant trees + remove ivy	SeaTac	204th and Military Rd East (private residences)
SeaTac Open House	Public purchase of land along slope to preserve green space?	SeaTac	Slope east of I-5
SeaTac Open House	Erosion issues here	SeaTac	Near S 178th st east of I-5
SeaTac Open House	More kid friendly. Trees (needed) not utilized	Burien	Saint Bernadette School, Jacob Ambaum Park- Based on location of post-it
SeaTac Open House	Replace trees that Port cut down	ALL	none
SeaTac Open House	Near hospitals for patient views	ALL	hospitals in general
SeaTac Open House	Apt. complexes	ALL	
SeaTac Open House	Trees that don't cause allergies	ALL	
SeaTac Open House	Trees that won't be too tall + fall on houses	ALL	
Des Moines Open House	Sidewalks in Des Moines	Des Moines	
Des Moines Open House	Work with wastewater treatment plant near Des Moines Creek Park	Des Moines	Des Moines Creek Park

Feedback from Open House Events (cont.)

Event	Comment	City referenced in comment	Park/Location if applicable
Des Moines Open House	Creek could use restoration along the banks	Des Moines	Des Moines Creek
Des Moines Open House	Increase coniferous canopy	Des Moines	
Des Moines Open House	Midway Elementary School	Des Moines	Midway Elementary School
Des Moines Open House	ST development -- crosswalk from HCC to Light Rail station with green features?	Des Moines	Area between Highline College and new Light Rail station
Des Moines Open House	More educational opportunities w/ streams/green space in the more urban areas	Des Moines	Where McSorley Creek goes through Sonju Park/Parkside Elementary
Des Moines Open House	More greenery around streams	Des Moines	
Des Moines Open House	Woodmont Park & Creek	Des Moines	Woodmont Park & Creek
Des Moines Open House	Restoration near Woodmont Park	Des Moines	Woodmont Park
Des Moines Open House	Greenery on walkway from the Light Rail station to the Airport	SeaTac	SeaTac Airport
Des Moines Open House	Blackberry near track & only grass - good place for more trees	SeaTac	Tyee Complex/Valley Ridge Park
Burien Open House	Trees at Puget Sound Park	Burien	Puget Sound Park

Event	Comment	City referenced in comment	Park/Location if applicable
Burien Open House	More residential trees (E. of 509 - 10th and 128th)	Burien	
Burien Open House	Trees for kids, kids for trees	ALL	E. of 509 - 10th and 128th
Burien Open House	More trees on streets in Seatac	Seatac	
Burien Open House	Replant trees on Des Moines memorial Drive	Burien	
Burien Open House	No more cutting trees at port!	SeaTac	Des Moines memorial Drive
Burien Open House	Trees and food forest at Woodside School campus	Burien	SeaTac Airport
Burien Open House	More trees along 1st Ave S	Burien	Woodside School
Burien Open House	Favorite tree in Burien standing in harm's way	Burien	1st Ave S
Burien Open House	Food Forest behind community garden	Burien	SW 154th St near Burien Library
Burien Open House	Need trees along every stream	ALL	Near 'the annex' and highline community center
Burien Open House	Trees along 2nd Ave SW	Burien	2nd Ave SW between SW 124th St. and SW 122nd St.
Burien Open House	Wastewater treatment at Salmon Creek is ruining the park	Burien	Salmon Creek Park

Feedback from Open House Events (cont.)

Event	Comment	City referenced in comment	Park/Location if applicable
Burien Open House	Remove Ivy at Salmon Creek Ravine	Burien	Salmon Creek Ravine
Burien Open House	Salmon Hatchery	Burien	Salmon Creek Ravine
Burien Open House	Remove invasives, plant natives at Salmon Creek Ravine near Ambaum Blvd.	Burien	Salmon Creek Ravine near Ambaum Blvd.
Burien Open House	Trees planted need to be nurtured	ALL	
Burien Open House	More/healthier trees in Seahurst Park	Burien	Seahurst Park
Burien Open House	Trees are getting old and dying, time to plant is now	Burien	Seahurst Park
Burien Open House	Japanese Smoke trees are beautiful in landscaping	Burien	
Burien Open House	Would be great to see retention/planting of native trees in private properties along parks	Burien	
Burien Open House	Lots of restoration work to be done at Seahurst Park	Burien	Seahurst Park
Burien Open House	Lots of restoration work to be done at Salmon Creek	Burien	Salmon Creek

Event	Comment	City referenced in comment	Park/Location if applicable
Burien Open House	More fish?	SeaTac	Miller Creek
Burien Open House	River Basin	Tukwila	
Burien Open House	Took down trees for condos, need more trees	SeaTac	SW portion of Angle Lake



General Feedback

SeaTac Open House

- General
 - The Port cut down hundreds of trees + now they want our input on planting shrubs???
 - Hypocritical to say the least
- What would be good to have at future events?
 - How about some plant give-away raffles?
- What would make it easier for you to volunteer/give feedback?
 - Online calendar of events?

Des Moines Open House

- General
 - Connection between trees + salmon + streams + sound = healthy orca!
 - Do not take down trees
 - We need our trees
 - Study the schools on 24th & 216th to Kent Des Moines Rd.
 - Citizen scientists can be trained
 - Better community awareness that an open house is happening
 - I agree!
 - Small replanted trees will NOT filter emissions as mature growth
 - Public Engagement:
 - Des Moines Community Page – FB
 - Des Moines CAN – FB
 - Next Door
 - Waterland Blog
 - Make a FB page – use it by boosting info videos
 - Farmers Markets
- Who else should we talk to?
 - Make sure you work with cities as you create plan
- What would make it easier to volunteer/give feedback?
 - Earth Day Event/Arbor Day Event

Burien Open House

- Who else should we talk to?
 - Local Audubon chapters
 - WABI
 - Community Visions
 - School District
- What would make it easier to volunteer/give feedback?
 - Fun, kid friendly
 - School credit for involvement
 - Work with YMCA
- What would be good to have at future events?
 - Nature sounds
 - Have better BMPs for tree maintenance under power lines to stop topping & stop letting big trees grow up
 - Seattle City Light
- What did you like about today? What could be better?
 - Like the native plants we brought
 - Would love to hear more about the benefits of reforestation for the environment
- General
 - Educate people about ivy, knotweed, etc. to encourage them to remove/limit on their own
 - Water runoff from street gutters into sound – no washing cars
 - Incentives for planting on private property

Appendix K: Achieving Additional Canopy Cover in Burien

For the purposes of this plan, the Green Burien Partnership considered two options for urban canopy enhancement in the City of Burien: increasing canopy cover by 10% and by 20%. Cities in King County are included in King Conservation District’s Canopy Planner Tool, Tree Plotter Inventory, (<https://pg-cloud.com/KingCD-Cities/>), which was created with PlanIT Geo in partnership with Forterra. This tool was used to identify the 11 census blocks that currently have low canopy cover while also holding the greatest potential for trees (see Figure 6).

In order to increase citywide canopy cover percentage, Burien must replace trees at the rate of removal and plant additional trees. This additional canopy should be considered a social, ecological, and economic asset to the city. For example, the tool quantifies or predicts values of ecological benefit, including improved air quality and carbon sequestration. There are many, many additional economic, health-related, and social benefits not quantified in the values listed below.

Using TreePlotter Canopy, the Partnership was able to consider the two options and calculate the number of trees that would need to be planted for each. Increasing Burien’s canopy cover by 10% for a citywide cover of 40% would be achieved by planting 38,906 trees (average size is 30 feet at crown height). These additional trees would provide \$7.3 million in ecological benefits to the city. At 40% canopy cover, Burien would receive over \$500,000 per year in ecological benefits related to carbon sequestration and air quality. Option two would increase Burien’s canopy cover by 20% in 20 years (for a citywide cover of 50%) by planting 78,000 trees. These trees would add \$14.7 million in ecological benefits and would result in \$1.2 million dollars of ecological benefits yearly. This would require planting almost 4,000 trees per year in the city, as well as replacing any trees that were lost.

While a 20% increase would make Burien a regional leader in canopy cover, at this time, the Partnership has set a goal of increasing Burien’s canopy cover by 10% within a 20-year time frame.

10% Increase in Canopy Cover – from 30% to 40%

Add 38,906 trees	Plant 1,900 trees per year over a 20-year time frame.	Trees planted will provide \$7.3 million in ecological benefits.	Once achieved, Burien’s total Canopy will provide about \$500,000 per year in ecological benefits
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Land-Use Type	Existing Canopy (%)	Canopy Goal (%)	No. Trees to Reach Goal	Annual Added Eco-Benefits (\$)
Central Business District	6	16	614	1,887
General Commercial	8	18	2,416	7,430
Industrial/Manufacturing	16	26	1,340	4,122
Mixed-Use Commercial/Residential	42	52	229	703
Multi-Family Residential	26	36	3,386	10,414
Office/Business Park	21	31	489	1,503
Park/Golf Course/Trail/Open Space	57	67	3,322	10,217
Single-Family Residential	31	41	27,082	83,299

20% Increase in Canopy Cover – from 30% to 50%

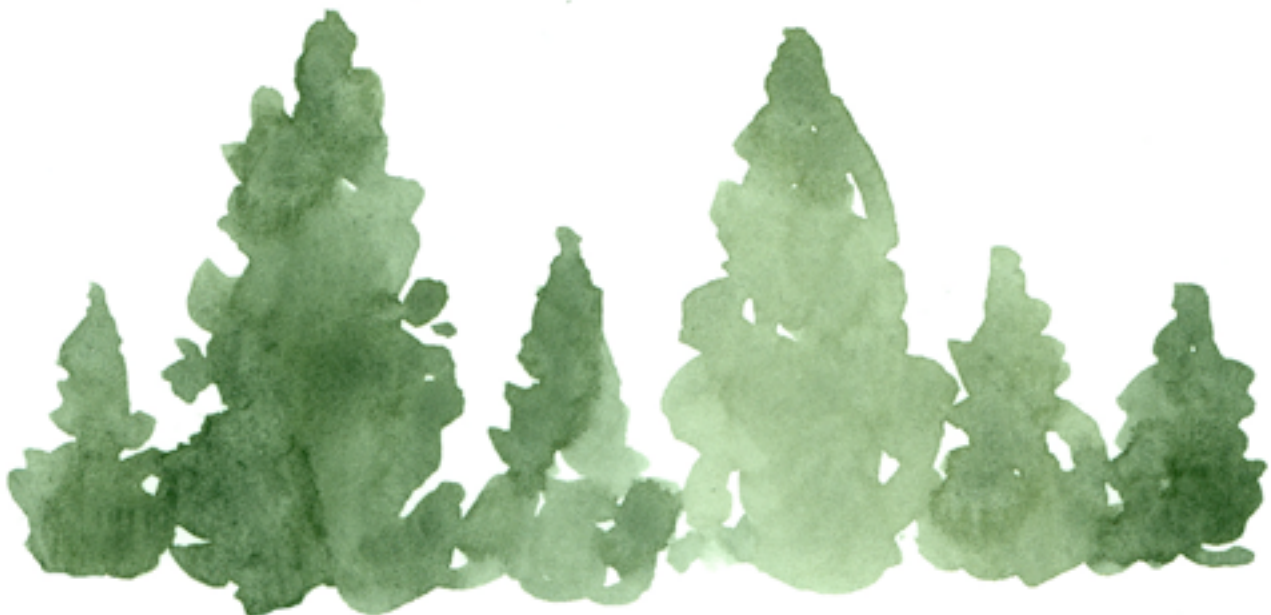
**Add
77,813 Trees**

**Plant 3,900 trees
per year over a
20-year time frame.**

**Trees planted
will provide
\$14.7 million in
ecological benefits.**

**Once achieved,
Burien's total Canopy
will provide about
\$1.2 million per year
in ecological benefits.**

Land Use Type	Existing Canopy (%)	Canopy Goal (%)	No. Trees to Reach Goal	Annual Added Eco-Benefits (\$)
Central Business District	6	26	1,227	3,774
General Commercial	8	28	4,832	14,860
Industrial/Manufacturing	16	36	2,680	8,244
Mixed Use Commercial/Residential	42	62	458	1,406
Multi-Family Residential	26	46	6,772	20,828
Office/Business Park	21	41	978	3,006
Park/Golf Course/Trail/Open Space	57	77	6,644	20,434
Single-Family Residential	31	51	54,164	166,598



For more information about the Green Burien Partnership, please visit: greenburien.org



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