Green Kirkland Partnership

20-Year Forest and Natural Areas Restoration Plan

October 2015

The Partnership's mission is to restore and maintain healthy forested and natural parklands by building a supportive community that works together to protect Kirkland's valuable natural resources for current and future generations.

CITY OF KIRKLAND WASHINGTON

GREEN KIRKLAND PARTNERSHIP

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ACKNOWLEDGMENTS

In 2004, the Green Seattle Partnership established a new method of evaluating and managing urban forests and natural areas. This effort set the stage for engaging the public in ongoing stewardship of forests and natural areas in urban environments. The Green Kirkland Partnership was founded officially in 2005, and Kirkland became the second Puget Sound city to use the model that is now replicated across seven cities: Seattle, Kirkland, Tacoma, Kent, Redmond, Everett, and Puyallup. Its initial 20-Year Forest Restoration Plan was approved by City Council resolution in 2008. This updated 20-Year Forest and Natural Areas Restoration Plan is funded by a grant from the King Conservation District.

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Big leaf lupine in flower

EXECUTIVE SUMMARY

The City of Kirkland benefits from a robust network of forested and natural area parkland that provides the City with valuable ecosystem, economic, and public health benefits. These benefits include reduced stormwater runoff, improved water and air quality, stronger property values and attractive communities, reduced greenhouse gases, increased habitat for native wildlife, and improved quality of life. Kirkland's parklands, however, face numerous threats found in urbanized natural areas and forests across the Puget Sound region, including fragmentation of natural areas, an invasive-dominated understory that inhibits native species from regenerating, a declining dominant forest, and resource limitations on restoration and maintenance.

In 2005, Kirkland began working to reverse this trend and restore the health and resiliency of its forest and natural area parklands by partnering with Forterra (formerly Cascade Land Conservancy) and Kirkland community members to found the Green Kirkland Partnership. Kirkland became the second Green City Partnership and is now one of seven Green Cities in the Puget Sound region serving as leaders in community-based stewardship. In 2008, the Kirkland City Council approved the Partnership's first comprehensive 20-Year Forest Restoration Plan, which outlined strategies for restoring and maintaining Kirkland's then 372 acres of forested and natural area parks and developing a community-based stewardship program. During the past 10 years, the Green Kirkland Partnership has enrolled nearly 60 acres into restoration, recorded more than 60,000 volunteer stewardship hours, and planted more than 30,000 native trees, shrubs, and ground covers. In addition, the City has developed a small but dedicated staff of Green Kirkland employees to lead restoration and community-based stewardship efforts.

As the Partnership has grown, so has the City of Kirkland: since the publication of the first 20-Year Forest Restoration Plan, it has annexed the Finn Hill, North Juanita, and Kingsgate areas. These new neighborhoods, which were formerly part of unincorporated King County north of Kirkland, encompass approximately 7 square miles and include more than 31,000 residents. Along with new neighborhoods and residents, the City has also gained a number of open space and natural area park sites, including Juanita Heights, Edith Moulton, and Kingsgate Parks. With the new parks, the total natural area acreage within the jurisdiction to be served by the City's Green Kirkland Partnership has increased by 115 acres, for a total of 487 acres.

The purpose of this plan is to outline the accomplishments of the Partnership since 2005, reassess the resources needed to achieve the program's mission, and provide direction for future actions to expand and improve the management of forested and natural area parkland in Kirkland. To this end, the plan articulates measurable goals and objectives, strategies for achieving these goals, and a strategic plan with benchmarks for evaluation. This updated Green Kirkland Partnership 20-Year Plan seeks to build on the City's Urban Forest Strategic Management Plan (2013), Natural Resource Management Plan (2003), and the updated Parks, Recreation, and Open Space Plan (PROS 2015) and specifically supports the PROS plan's goals regarding community engagement, conservation and stewardship, planning, and management of Kirkland's natural parklands. The community's investment and input into this plan and the Partnership as a whole are highly valued. Therefore, the plan also includes public input obtained from an open house and online survey.

The projected total cost to restore 487 acres of forested and natural area parkland outlined in the updated 20-Year Forest and Natural Areas Restoration Plan is approximately $12.5 million (2015 dollars). Cost estimates were developed using an updated model built on the previous10 years of program development, including actual budgets, anticipated restoration costs and field crew needs, estimates for continuing the Partnership's successful community-based stewardship program, and overall program management and operations. Volunteers are forecasted to provide substantial leverage — approximately $9.6 million in additional value to the Green Kirkland Partnership during the next 20 years. The plan outlines a strategy of gradually increasing the budget over time. Funding will come from a variety of sources, primarily through the 2012 Parks Levy. Additional funding sources will include grants, foundations, and partnerships with other government and non-profit organizations to leverage resources.

This updated plan provides a suite of near- and long-term benchmarks to guide and track the progress of the Green Kirkland Partnership. This plan is ambitious, but if the financial investment is not made during the next 20 years, the current ecological conditions of the restoration sites will further decline, costing the City of Kirkland even more in future restoration costs as well as the economic benefits that healthy forests and natural areas provide to the City.

INTRODUCTION

Pathway between restoration areas at Kiwanis Park

Forests and natural areas play a vital role in the environmental, economic, and public health of our cities. Kirkland's forested and natural area parklands are valuable natural resources that provide ecosystem services for all areas of the City. Healthy forests and natural areas absorb stormwater runoff and stabilize steep slopes, thereby reducing erosion. The vegetation and soils of these forests filter polluted runoff, providing clean water; air quality is improved through the capture of particulate matter by the forest tree canopy. As well, forests and natural areas enhance the aesthetics and livability of our neighborhoods and provide habitat for urban wildlife.

Historically, development has been the largest threat to forests and natural areas in urban and suburban centers in the Puget Sound region. Public agencies and land trusts throughout the region have worked to reduce this threat by purchasing and conserving natural areas — land conservation is an important first step in preserving the region's natural resources. Many conserved properties have been set aside to allow nature to take its course, with the goal of minimizing adverse environmental effects. However, forests and natural areas in urban environments face unique pressures that render passive management an inadequate strategy to maintain a high quality of environmental health. Invasive species, litter, pollution, changes in surrounding land use, and forest fragmentation reduce a natural area's ability to thrive within cities and suburban areas.

In 2005, the City of Kirkland and Forterra partnered to develop a coordinated restoration, maintenance, and stewardship program — called the Green Kirkland Partnership — to address these challenges. To guide the work of the Partnership, a 20-Year Plan was developed to comprhensively assess the habitat conditions of Kirkland's forested and natural area parklands (i.e., land under current management of the City's Parks and Community Services Department). The plan also assessed the City's financial resources to support restoration efforts, partner coordination, and capacity; laid out a framework for a community-based stewardship program; and established short- and long-term benchmarks to guide and assess the goals of the Partnership.

In 2005, Forterra also launched the Cascade Agenda, a 100-year vision for conservation and economic growth in the Pacific Northwest, with a central focus on building livable urban communities. The City of Kirkland is a Cascade Agenda City, and the second of seven Green Cities now active in the Puget Sound region (the other Green Cities are Everett, Puyallup, Redmond, Kent, Seattle, and Tacoma). The Green Kirkland Partnership plays a key role in helping meet shared regional goals that seek to achieve environmental, social, and economic vitality.

Since its inception, the Green Kirkland Partnership has grown and thrived. In the past ten years, the Partnership has assembled a small, dedicated staff to lead a vibrant community-based volunteer stewardship program and a team of 26 Green Kirkland Stewards. The Partnership has enrolled nearly 60 acres into restoration, recorded more than 60,000 volunteer stewardship hours, and planted more than 30,000 native tree, shrubs, and ground covers. The Partnership has also utilized professional field crews to accomplish work in sensitive areas such as steep slopes and wetlands. The Partnership has accomplished much, but the continued threats faced by Kirkland's parkland are outpacing the city's ability to restore and maintain it. There is still much work to be done.

A New 20-Year Restoration Plan

On June 1, 2011, Kirkland annexed the Finn Hill, North Juanita, and Kingsgate areas north of the City. These new neighborhoods, formerly part of unincorporated King County, encompass approximately seven square miles and include more than 31,000 residents. In 2011, the City of Kirkland's post-annexation population was estimated at 80,505 people, within a land area totaling 18 square miles, making Kirkland the sixth-largest city in King County, and the 12th largest in the state.

Along with new neighborhoods and residents, the City of Kirkland also gained a number of natural area park sites, including Juanita Heights, Edith Moulton, and Kingsgate Parks. It now owns and manages 588 acres of publicly owned parkland, 487 acres of which are forests and natural areas (see Figure 1 for a map of Kirkland's neighborhoods and parkland). The parks of Big Finn Hill (King County owned), Juanita Woodlands (King County owned), and Totem Lake (King Conservation District owned) are not included in natural area acreage managed by the City of Kirkland. Although O.O. Denny Park is owned by the City of Seattle, its acreage is included in new City parkland because the park is maintained by the City of Kirkland. The Cross Kirkland Corridor is not included in park acreage; it is a transportation facility and will be addressed separately.

To assess and address the needs of the new neighborhood communities and the natural resource management needs of the new natural areas, the City of Kirkland obtained a King Conservation District grant to develop a new 20-Year restoration plan. The plan will also assess the program's progress, evaluate on-the-ground habitat conditions, and develop updated goals and benchmarks based on the experience and lessons learned from the first 10 years of the program.

This updated restoration plan identifies 487 acres of Kirkland's forested and natural area parkland — which includes wetlands, and riparian areas — to be enrolled into active restoration and maintenance during the next 20 years. Although this is an ambitious task, restoration, maintenance, and stewardship is crucial for the health of the City's parklands — and the City itself. To achieve these natural resource goals in 20 years using the current level of resources is not realistic; the City needs to take a comprehensive approach that continues to build the Partnership's successful community-based stewardship program as well as supports the need for professional field crews in sensitive areas not suitable for work by volunteers.

Investing in Kirkland's Natural Parkland: Ecosystem, Economic, and Public Health Benefits

Restoration of Kirkland's forested and natural area parkland provides clear benefits. Research indicates that forests and natural areas in urban environments provide people a higher quality of life, create opportunities to improve physical and mental health, allow for enjoyment of nearby nature, and provide many ecosystem services (Dwyer et al. 1992). Urban forests and natural areas help make the air and water cleaner, provide habitat for native wildlife, and create more livable and beautiful communities. In 1998, American Forests, a nonprofit citizens' conservation organization, analyzed the Puget Sound region's urban forests. The study revealed that trees in our region removed 38,990 tons of air pollution — a service that was then valued at $166.5 million. The study also showed that these trees created a 2.9 billion-cubic-foot reduction in runoff, a service valued at $5.9 billion (American Forests 1998).

In 2011, Earth Economics completed an ecological economic characterization of parkland under management by Metro Parks Tacoma. The analysis assigned economic values based on the level of habitat quality and degradation as described in the City's 20-Year Green City Restoration Action Plan and describes the reduced ecosystem service values of unrestored sites versus anticipated value of sites under full restoration. The report showed that habitat within the Metro Parks

Tacoma system generates at least $34.9 million to $47.2 million in economic asset value per year; ecosystem services examined included habitat and biodiversity, water regulation and quality, soil retention, and recreation (Christin et al. 2011). If our forests and natural areas are not restored, the dollar values provided would become the costs associated with building new infrastructure, such as stormwater treatment or flow control facilities, necessary to carry out equivalent functions.

Forests and natural areas also help combat climate change and the effects of air pollution. A city with abundant and healthy vegetation enjoys significantly improved air quality. Trees, as they grow, capture carbon dioxide through the process of photosynthesis and help remove soot and other pollutants through their leaves and branches. Trees store the carbon from the absorbed carbon dioxide in the woody mass of their branches and trunks, and release oxygen into the air. Conifers in particular 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 (Logvasi et al. 2008).

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 2001). Each acre of healthy, mature 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). As a comparison, the average passenger vehicle emits 4.7 tons of carbon dioxide per year, while every acre of healthy forest removes carbon dioxide emissions equivalent to approximately 234 vehicles (Environmental Protection Agency 2014).

While invasive plants such as English ivy and Himalayan and evergreen blackberry also carry out photosynthesis to sequester carbon and create oxygen, these plants are shorter lived and contain less biomass than mature conifers. This makes invasive plants less effective at removing carbon dioxide from the atmosphere and storing it. Additionally, invasive plants often do not supply adequate habitat for local native wildlife and are much less effective at providing other ecosystem services in comparison to healthy native Northwest forest plant communities. For example, while some birds will nest in blackberry bushes, it takes a variety of native plants to provide nesting opportunities for all our local bird species (Marzluff 2000). Invasive plants create monocultures that inhibit native plant establishment and fail to provide the species diversity that keeps forested and natural area parkland healthy and stable.

Natural areas within an urban setting also contribute to a community's public health and overall livability, and provide opportunities for recreational activities such as using trails and viewing wildlife. Trails through natural parkland allow for physical exercise, such as hiking and walking, as well as passive recreational activities such as bird-watching, viewing educational signage, or simply observing the natural environment. Living within half a mile of parkland appears to help reduce obesity rates, and the presence of trees and natural areas can lower blood pressure and decrease the risk of heart disease (Jennings and Gaither 2015). Experiences in nature provide a respite from the pressures of city living and aid in stress reduction and depression. These experiences also help people learn more about the environment and local natural history, and further their connection to, understanding of, and appreciation for forests and natural areas. Natural areas serve as a living classroom where adults and children can participate in educational and cultural experiences, such as learning about the ethnobotanical uses of native plants, including edible plants. In addition to supporting an individual's physical and mental health, forested and natural area parkland provide opportunities for community building and increased neighborhood cohesion as people of different backgrounds recreate together and participate in community events.

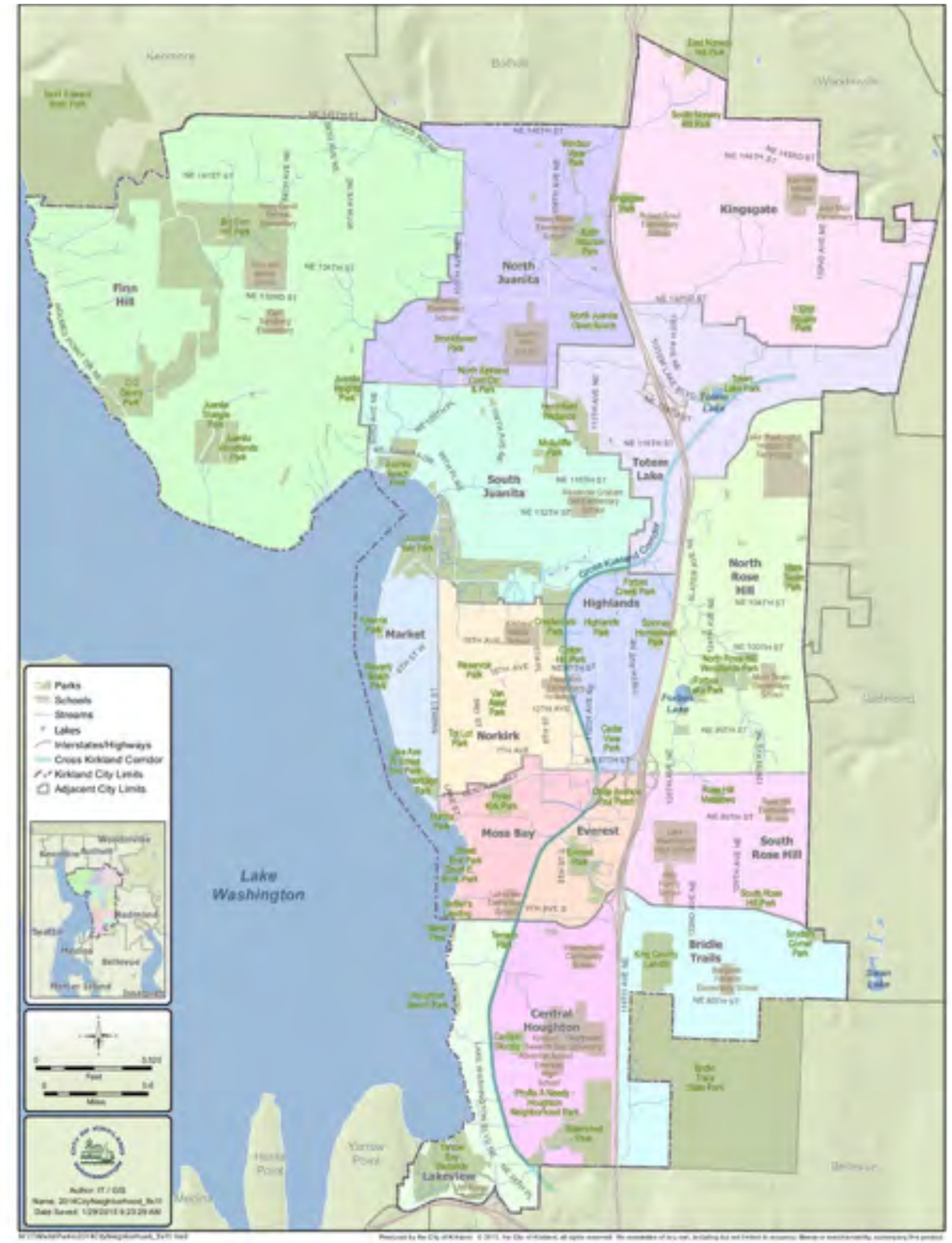


Figure 1. City of Kirkland neighborhood and parkland map

REDUCE STORMWATER RUNOFF	Tree canopies reduce the rate at which rain falls to the earth. Water enters the ground more slowly under trees and is better absorbed and filtered into groundwater than when it runs off paved and nonporous surfaces. Since conifers and other evergreen plants grow year-round, more water moves up from the ground, through plant tissues, and into the atmosphere as water vapor. 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 2012). Green streets, rain barrels, and tree planting are estimated to be 3-6 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. Forested buffers around streams have been shown to reduce sediment and nutrient pollution levels (Osborne and Kovacic 1993).
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. Although raccoons and crows adapt well to urban environments, many native species do not. They require a variety of plants and multiple layers of canopy to forage and nest. Healthy urban forests under restoration have been demonstrated to increase species diversity (Ruiz-Jaén and Aide 2006).
REDUCE ENERGY USE & COMBAT CLIMATE CHANGE	A 25-foot tree reduces annual heating and cooling costs of a typical residence by an average of 8%-12% (University of Washington 1998). Trees absorb carbon dioxide and store the carbon in woody tissues, reducing the amount of carbon dioxide in the atmosphere. Urban forests have the capacity to lower energy consumption in urban environments by lowering ambient temperatures and to create microclimates conducive to air movement. Lowering energy consumption reduces electricity use and the amount of carbon dioxide emitted into the atmosphere from power plants (Nowak and Crane 2001). Each year, an acre of trees absorbs the amount of carbon produced by driving a car for 26,000 miles (Nowak et al. 2002).
BOOST LOCAL & REGIONAL ECONOMY	Urban forestry supports job creation and retention, resulting in added individual income and increased local, state, and federal taxes (CalFire 2011). Homes that border urban forests may be 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). Forested parklands provide residential properties with an adjacent natural area for walking and passive recreation activities such as bird-watching.

Table 1. Ecological and public health benefits of forested and natural area parklands

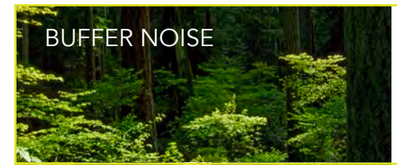
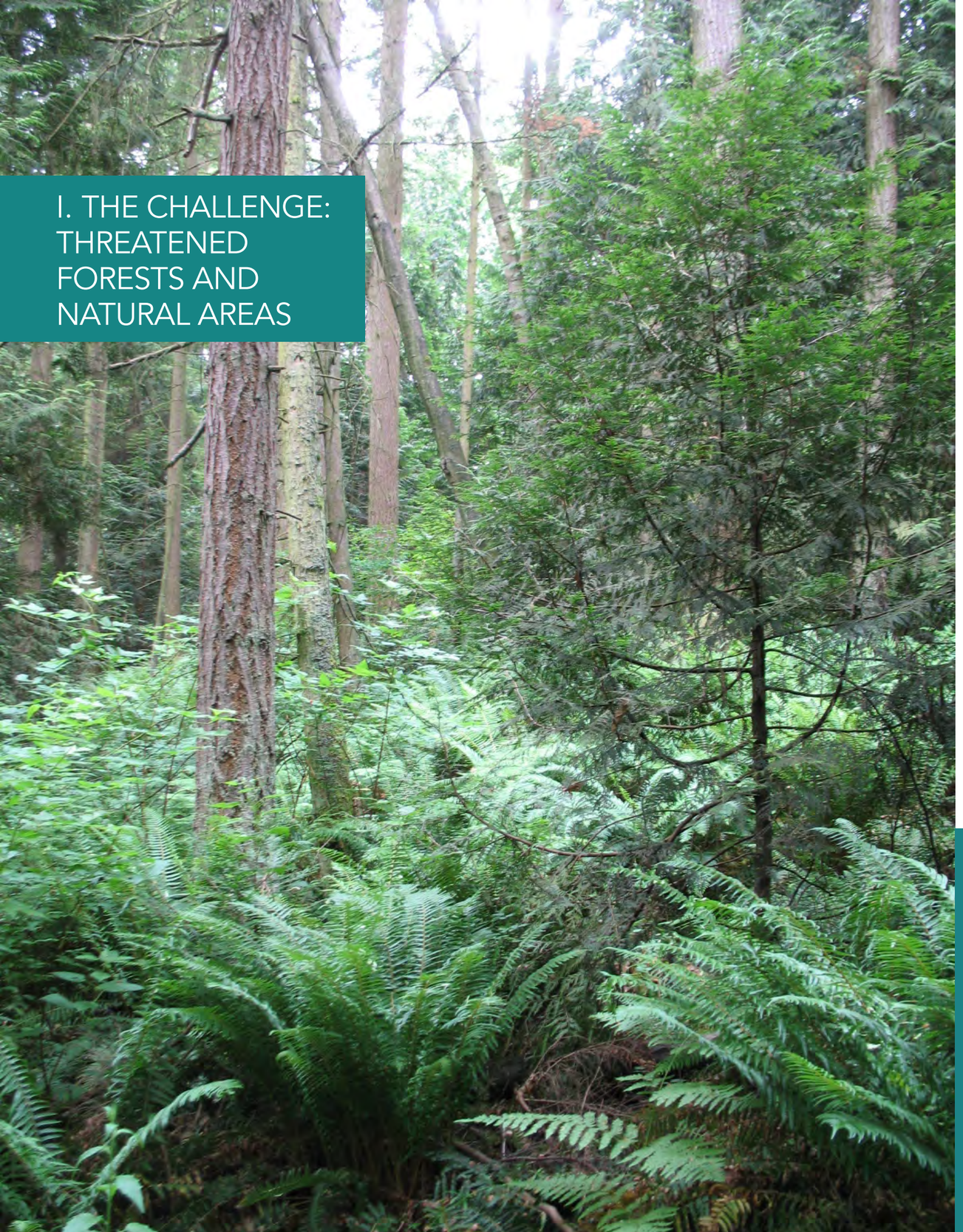
 BUFFER NOISE	Tree canopies dampen sound by intercepting sound waves (Herrington 1974). Noise buffers composed of trees and shrubs can reduce 50% of noise detectable by the human ear (USDA 1998), including high-frequency noise, which is most distressing to people (McPherson et al. 2001).
COMMUNITY BUILDING	Physical features, particularly nature, play an important role in creating vital neighborhood spaces (Sullivan et al. 2004). Urban greenspaces and parks provide a gathering place for people of different backgrounds to connect with each other. Strong community relationships are built from exchanging information and working together to achieve common goals (e.g., open-space improvements). Residents who are more attached to their community have higher levels of social cohesion and social control, less fear of crime, and display more signs of physical revitalization of the neighborhood (Brown et al. 2003).
MAKE COMMUNITIES MORE ATTRACTIVE	Vegetation provides visual relief from the built environment. Trees and stretches of parkland can soften the angular edges of buildings, while the natural tones of bark and foliage are easy on the eyes. Trees are known to be 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 2001), graffiti, vandalism, and littering (Brunson 1999).
PHYSICAL WELLNESS & FITNESS	Physical exercise and activity has been shown to reduce the risk of hypertension, coronary heart disease, stroke, diabetes, and breast and colon cancer (World Health Organization 2010). 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). People in communities with high levels of greenery or greenspace are more likely to be physically active, and less likely to be overweight or obese (Maas et al. 2006 and Ellaway et al. 2005).
MENTAL HEALTH& FUNCTION	Physical activity has also been linked to decreases in symptoms of stress and depression (U.S. Dept. of Health 1999). The opportunities to exercise provided by trails through forested parks and natural areas is therefore relevant to the treatment of these mental health ailments. Even basic mental function is improved, as the experience of nature helps restore the mind after the mental fatigue of work or studies, improving productivity and creativity (Kaplan 1995 and Hartig et al. 1991).
CHILD DEVELOPMENT	Experience with nature helps children to develop cognitively, emotionally, and behaviorally by connecting them to environments that encourage imagination, cognitive and intellectual development, and social relationships (Isenberg and Quisenberry 2002 and Heerwagen and Orians 2002). Green settings and green play areas also decrease the severity of attention deficit in children (Taylor et al. 2001).
HEALTH BENEFITS OF STEWARDSHIP ACTIVITIES	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-lb person can burn 340 calories from digging, gardening, and mulching; 306 calories from planting trees; and 292 calories from raking leaves (www.calorie-count.com).

Table 1. Ecological and public health benefits of forested and natural area parklands

I. THE CHALLENGE: THREATENED FORESTS AND NATURAL AREAS



Forests and natural areas in cities and towns throughout the Puget Sound region are threatened by decades of development and invasion from aggressive nonnative plant species. Throughout the 19th and 20th centuries, the region's natural resources were deeply affected by urbanization, forest clearing, agricultural development, and road, dam, and railroad construction. In many urban, suburban, and rural communities, forests and natural areas are left in an unsustainable condition in which native plant communities and healthy ecological functions have been displaced by monocultures of exotic invasive species and compacted and eroded soils.

Kirkland's Forest and Natural Area Parklands

The City of Kirkland is located within the Cedar River-Lake Washington Watershed (Water Resource Inventory Area [WRIA] 8). Land use in the City is characterized by commercial, industrial, and low- and high-density residential land uses. Kirkland owns and manages approximately 487 acres of forested and natural area parklands that include a mosaic of upland forests, trails, wetlands, streams, shorelines, and riparian buffers representing about 4% of the City's total land base. Kirkland's park system includes two high-quality wetland systems, Juanita Bay Park and Yarrow Bay, that together account for approximately 169 acres, according to the 2014 FLAT Assessment. From the half-acre Brookhaven Park to Watershed Park's 77 acres of contiguous upland forest, the City's parklands provide critical habitat for terrestrial plants and animals, as well as healthy buffers along salmon-bearing streams; and maintain natural ecological processes within a highly developed setting.

For the purposes of this plan, forests are defined as the portion of parklands with forested plant communities that have greater than 25% tree canopy and are not mowed or landscaped. The plan also encompasses natural areas with less than 25% tree canopy — from riparian and wetland buffer areas dominated by woody shrubs to forest edges dominated by invasive species. Open-water areas, such as those found in Lake Washington adjacent to Yarrow Bay Wetlands and Juanita Bay Park, are not included in the Partnership's overall scope of work.

There are some park areas administered by the City of Kirkland that are not part of the Green Kirkland Partnership project acres. Park areas that include ball fields, playgrounds, beaches, orchards, or open fields provide important open-space benefits but are not considered appropriate for forest and natural area restoration. Stormwater detention ponds and impervious portions of parks, such as parking lots and hard courts, are also excluded from the project acres (See illustration on page 16).

History and Impact

Historically, large, long-lived conifer forests dominated the Pacific Northwest. These forests included Douglas-fir, western redcedar, grand fir, and western hemlock trees. Conifer forests covered much of the landmass and extended throughout the Puget Sound region. The Lake Washington-Cedar River Watershed (WRIA 8) basin was home to a mosaic of upland conifer, riparian, forested wetland, and emergent wetland plant communities.

The Duwamish Tribe was the first to settle the eastern shores of Lake Washington, drawn to the area's rich natural resources and salmon-bearing creeks. European homesteaders arrived in the late 19th century; agriculture and the hope of industrial development led to widespread logging and home building. Over time, the urban landscape flourished, as creeks were channelized and piped, and wetlands drained and filled. While today's landscape would be nearly unrecognizable to those settlers, Kirkland is still home to a rich array of natural resources in need of conservation and stewardship.

Some of the natural areas originally cleared due to logging, agriculture, residential development, and industry have been recolonized by short-lived, fast-growing native deciduous species such as bigleaf maple, black cottonwood, willow, and red alder.

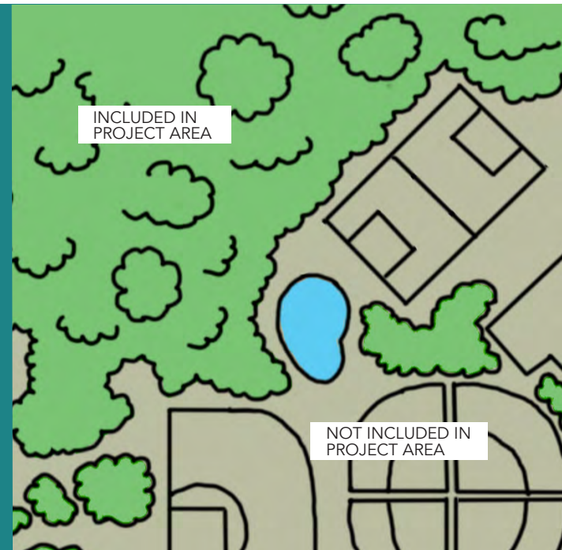
Defining The Project Area

Included in the Green Kirkland Partnership area:

- Forests
- Meadows
- Wetlands
- Streams
- Shorelines
- Buffers

Not included in the Green Kirkland Partnership project area:

- Ballfields
- Playgrounds
- Beaches
- Orchards
- Landscaped gardens
- Open fields
- Mowed stormwater detention ponds
- Hardscaped portions of parks and open spaces e.g., parking lots and hard courts



With a healthy seed bank in the soil and without further disturbance, western redcedar and Douglas-fir will eventually reestablish and move the forested habitats back to a predisturbance condition. This process, known as succession, typically takes about 100 to 150 years in the Pacific Northwest, in areas where ideal growing conditions for trees and plants exist.

Forests and natural areas in cities and towns throughout the Puget Sound region are threatened by decades of development and invasion from aggressive nonnative plant species. Throughout the 19th and 20th centuries, the region's natural resources were deeply affected by urbanization, forest clearing, agricultural development, and road, dam, and railroad construction. In many urban, suburban, and rural communities, forests and natural areas are left in an unsustainable condition in which native plant communities and healthy ecological functions have been displaced by monocultures of exotic invasive species and compacted and eroded soils.

Challenges and Threats to Sustainability

Forests and natural areas in urban settings face unique challenges and pressures that require specific attention. The following section outlines six primary issues that prevent forested and natural area parklands from sustaining themselves or pose risks to current and future ecological sustainability:

- Fragmentation
- Declining habitat quality
- Invasive species
- Native vegetation struggling to regenerate
- Illegal activity
- Climate change

Fragmentation

Habitat fragmentation is a problem common to urban environments and occurs when contiguous open spaces are divided, often by development, landscaping, sports fields, and roads. This decreases valuable internal habitat areas and increases "edge effects" along the exterior, thereby increasing the habitat's exposure to human impacts. Edge effects refer to the transition between two different habitat types and its effects on the plant and animal communities in the remaining isolated open space. A greater proportion of edge increases a forest's or wetland's susceptibility to encroachment by invasive plants from adjacent landscaped areas and the likelihood of water-quality issues due to polluted runoff (Brabec 2000). Habitats for birds, amphibians, and mammals become isolated from each other with the loss of connectivity through greenbelts or connecting corridors. Because of this unique pressure on forest and natural areas in urbanized environments, restoration and maintenance of these areas is distinct from that of large swaths of rural forests, for example, and requires continuous vigilance against the spread of invasive plants and other edge effects.

Declining Habitat Quality

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

The high proportion of deciduous trees in Kirkland's upland forests indicates that there will be a pronounced decline in tree canopy in the near future. In many areas, the conifer seed bank has been lost through past logging and development. Many of the deciduous trees — both native and nonnative — are nearing the end of their natural life spans. As they die, more sunlight is allowed to 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 Kirkland's natural areas, inhibiting the growth of native trees and understory. Without intervention to help ensure that enough young native trees are present in the understory to make up 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 a third or more of Kirkland's forest overstory (Figure 2).

Additionally, past removal of vegetation, urban development, and channelization along Kirkland's streams and wetlands resulted in a loss of native species cover. Large portions of Kirkland's many streams, such as Juanita Creek, Forbes Creek, and Yarrow Creek, are now buried under a canopy of invasive species such as Himalayan blackberry or Bohemian 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.

Invasive Species—Plants

Invasive plants now outcompete native understory plants in many of Kirkland's forested and natural area parklands. Aggressive, nonnative shrubs and vines cover the ground, blocking sunlight from, and competing for nutrients with, the native species. Robust Himalayan and evergreen

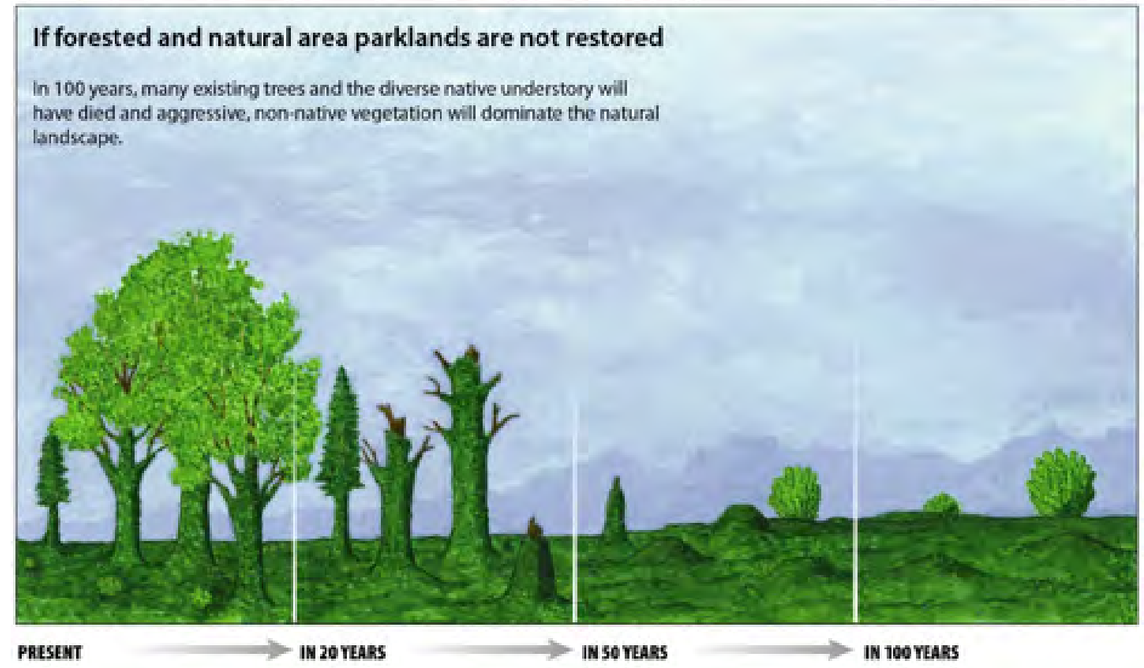


Figure 2. If forested and natural area parklands are not restored

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 are found in a significant portion of Kirkland's riparian areas. Himalayan blackberry is the dominant invasive in 80% of the Partnership's project area, with English ivy and English holly coming second, documented in approximately 50% of the area.

English ivy can kill a healthy deciduous tree within 20 years by spreading up from the understory into the tree canopy. Ivy can easily spread from neighboring residential landscapes into nearby parks, where it will become a serious problem, as experienced by many other cities throughout the region. Once ivy becomes established, an intense investment of time and resources is required to remove it. Where English ivy is in the early stages of blanketing forest floors and trees in Kirkland, the opportunity exists to remove the existing growth and prevent further spread.

The native understory is an important food source for native Pacific Northwest wildlife and provides much-needed cover and shelter from predators and the elements. In addition to Himalayan blackberry and ivy, other invasive species, such as reed canary grass, Scotch broom, English holly, and morning glory, grow in the understory, crowding out ferns, shrubs, and other native plants. As invasive species begin to dominate the understory, 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.

Blankets of Himalayan blackberry on stream banks displace native riparian vegetation. Lack of riparian tree cover also decreases shade along creeks, causing water temperature to rise, which reduces the amount of dissolved oxygen that the water can contain. These altered conditions impair water quality and overall suitability of salmon habitat in Lake Washington and the streams that make up Kirkland's watersheds.

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.

Invasive Species—Insects

Native insect activity is a natural part of a healthy forest ecosystem. In fact, insects such as the native Douglas-fir beetle are a needed food source for wildlife and continue natural ecological processes (Zobrist 2011). However, even small infestations of exotic, invasive insects, in the context of the small, fragmented, and oftentimes stressed forest stands that we find in our urban environments, can negatively impact the sustainability and resilience of Kirkland's trees and forests.

Exotic, invasive insects can have catastrophic effects on a region's natural resources and do not contribute to the natural ecological processes found in healthy natural open spaces. For example, states from Michigan to Colorado have seen urban and rural forests decimated by the emerald ash borer. This wood-boring insect targets ash trees, a deciduous hardwood species. First documented in Michigan in 2002, borers have now killed millions of ash trees in 22 states and two Canadian provinces (Herms et al. 2014). They also pose a threat to Kirkland's native Oregon ash (Fraxinus latifolia) — a significant component of riparian vegetation in Puget Sound lowlands.

Another wood-borer, the Asian citrus long-horned beetle (Anoplorophera chinensis) — a species native to Southeast Asia — was documented in a Washington State nursery in 2001 and 1,000 trees were removed from an area infected in Tukwila (Boersma et al. 2006). Although the eradication was successful and a population of these beetles does not yet exist in our region, Puyallup and its surrounding areas still face the risk of introduction. Wood-boring beetles have been documented in the northeastern U.S. and California since 1996. The Asian long-horned beetle (Anoplorophera glabripennis) and the Asian citrus long-horned beetle, which arrives on wood pallets from Asia, is known to attack and kill maple trees and other deciduous hardwoods (Haack et al. 2010).

Outbreaks of Asian and European gypsy moths have also been documented in the Pacific Northwest, 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 Kirkland's forests and natural areas, the Green Kirkland Partnership will need to stay abreast of potential invasive insect outbreaks in the region. Information is available to staff and Green Kirkland Stewards through the Washington Invasive Species Council and U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service. The Green Cities program, with funding from the USDA Forest Service, has developed a monitoring protocol for Asian long-horned beetle species. This monitoring protocol is specifically designed for citizen scientists and volunteers to assist in detection and could be offered as training for Green Kirkland Stewards.

As the Green Kirkland Partnership implements its updated 20-year Plan, insect pests and other forest health threats should be monitored at each restoration site as part of a detailed park stewardship plan to manage forest health.

Native Trees Struggling To Regenerate

Native-tree-canopy regeneration — especially of conifers — is greatly limited in Kirkland's forest and natural areas for several reasons. The landscape-scale loss of native conifer trees due to residential and commercial development has reduced the seed bank for these trees. At the same time, invasive plants have reduced native-tree regeneration by outcompeting or smothering those tree seedlings that do grow. Removal of nonnative invasive plants and planting native trees, shrubs, and ground covers can help the process of native-tree regeneration move forward. This is critical to ensure the future vitality of the City's urban tree canopy and the many ecosystem and human health benefits provided by the forest overstory.

Illegal Activity

In addition to the indirect effects of human development, illegal activity has had a direct impact on urban forest and natural areas as well. Trees are damaged and cut for views or firewood, or in acts of vandalism. Dumped garbage and yard waste, which is prohibited on park property per Kirkland Municipal Code 11.80.160, is a common problem in parks and natural areas throughout the City. Yard waste forms a layer of debris that smothers and kills native vegetation and contributes to slope instability as it becomes water saturated and heavy. Garbage can leach chemicals into the ground, attract rodents or other pests, and smother understory vegetation. Encroachments onto public land from adjoining private property and encampments bring with them any number of problems for natural areas, including removal of native habitat for the establishment of ornamental landscaping, lawns, personal views, access paths from private property, 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. Additionally, the sanctuary from built environments that forest and natural areas provide can be a refuge for other forms of illegal activity, such as drug use and violent crime. This is an unfortunate reality of open space management, especially in an urban setting, that challenges many communities. When enough illegal activity takes place, forest and natural areas can become known more for the illegal pursuits they might harbor than for the valuable benefits they provide. Reversing this reputation takes a concerted effort to bring more attention and activity in general to such areas. Problems can often arise when people think of undeveloped parks as "empty" or "abandoned" property.

However, as an important aspect of responsibly caring for Kirkland's parklands, and for public spaces in general, addressing illegal activity provides significant opportunities for community engagement. Restoration projects led by the community help reclaim such areas as positive public spaces for everyone by regularly bringing more watchful attention to an area and increasing a sense of public ownership and responsibility. The city also has policies and procedures in place to ensure the safety of park visitors and volunteers. Expanding public awareness and continuing to build a robust Steward program that has high ownership and valuation of forests and natural areas is therefore one of the main tenets of the Green Kirkland Partnership.

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). Conservation and restoration of urban forests and natural areas therefore become increasingly important in addressing these changes by reducing urban heat island effects, sequestering carbon, and mitigating stormwater impacts from increased precipitation. Climate change, however, 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).

The Green Kirkland Partnership's restoration efforts are essential to preserve forest and natural area health, and ensure the critical ecosystem functions these resources provide. To improve the ability of forests and natural areas to mitigate as well as adapt to climate change stressors, Green Kirkland Partnership managers will need to integrate adaptation and resilience strategies into their general management practices and site-level stewardship plans.

Resource Limitations on Forest and Natural Area Restoration and Maintenance

Historically, resources for natural area restoration and maintenance have been limited. The idea that forests and natural areas in urban environments could take care of themselves tended to discourage allocating sufficient funds for planting native species or removing invasive plants. Many forest and natural areas across the Northwest 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 has directly led to declining health in unsupported urban forests and other natural areas.

The Green Kirkland Partnership has sought to reverse this trend and has made great strides through its implementation of the 2008 20-Year Forest Restoration Plan. In fact, the City of Kirkland and its community have invested in their parklands by passing the 2012 Parks Levy, which provides base funding to Green Kirkland stewardship efforts in perpetuity. In addition, Green Kirkland staff continues to leverage this investment with outside grant funding.

The Partnership now has a dedicated team of employees that oversees management of the community-based restoration program. Unfortunately, the level of need continues to exceed current staffing and funding. Logistically, not all 487 acres of parkland under the Partnership's jurisdiction are suitable for restoration by volunteers. Nearly half of Kirkland's natural parklands include sensitive areas — steep slopes, wetlands, and riparian corridors — that require skilled professional field crews to conduct restoration activities. Staff to coordinate volunteers and support volunteer activities will also need to expand as the Partnership grows and continues to bring on additional Stewards and general volunteers. By continuing to engage the community in a more structured effort to manage Kirkland's parklands, this plan seeks to leverage volunteer matches and identify strategies and a timeline to garner the needed field and operations staff to meet these needs.

II. MEETING THE CHALLENGE

Volunteer planting at Cotton Hill park.

The Mission And Vision

The Green Kirkland Partnership's mission is to restore and maintain healthy forested and natural parklands by building a supportive community that works together to protect Kirkland's valuable natural resources for current and future generations.

The Partnership will continue to serve as a leader in natural area restoration and community-based stewardship for the City of Kirkland and collaborate with other city and county departments, nonprofit conservation organizations, educational institutions, and Kirkland's community and businesses to realize its vision of a city with healthy forested and natural area parklands. Sustainable natural areas, specifically forests, will contain a multi-age canopy of trees, where invasive plants pose a low threat and a forest floor with a diverse assemblage of native plants that provide habitat for native wildlife (see Figure 3).

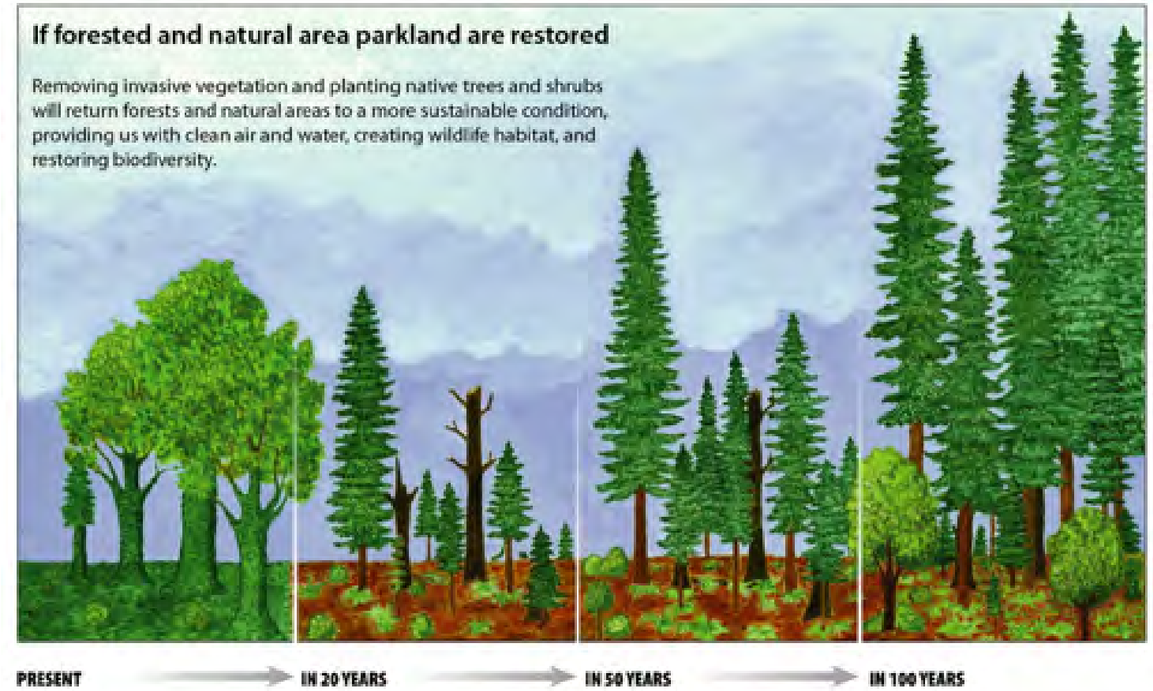


Figure 3. If forested and natural area parklands are restored

Outcomes

Achievement of the Green Kirkland Partnership's long-term vision is important and beneficial in a variety of ways. The Partnership will help preserve, restore, and maintain Kirkland's forested and natural area parkland with their many benefits, while at the same time educating and engaging the community to support the City in caring for these spaces. Specifically, the Partnership anticipates that during the next 20 years, the following outcomes will occur:

1. All 487 of Kirkland's public forested and natural area parklands enrolled in restoration and active maintenance by 2035.
2. A restoration program with capacity for long-term stewardship of forested parks and natural areas; increased public awareness of, and engagement in, protecting, restoring, and maintaining healthy habitats.
3. A robust Green Kirkland Steward program, with at least one Steward in each natural area park and dedicated staff to recruit, train, and retain volunteer stewardship leaders.
4. A successful volunteer program that engages a diverse community of individuals and families, schools, businesses and non-profit organizations.
5. Protection of critical forest and natural areas that provide important ecological and public benefits.
6. Sustainable funding, operations, and field staff resources to accomplish long-term restoration objectives.

Goals

For the Green Kirkland Partnership's vision and outcomes to succeed, several goals — short-, mid-, and long-term — must be achieved during the next 20 years. The following goals, along with benchmarks for evaluation, were developed based on the habitat assessment and the capacity of city and partner staff to support restoration, maintenance, and community-based stewardship efforts. Monitoring and tracking the program's success is described in more detail in Chapter V, "Adaptive Management."

SHORT-TERM GOALS (1–5 YEARS)

1. Identify new priority parks for restoration and maintenance, and implement enrollment according to available resources and funding.
2. Maintain acres already enrolled in restoration and prioritize sites that continue to have high levels of invasive cover threat.
3. Develop stewardship plans for individual parklands as needed to support and implement restoration.
4. Continue to develop, support, and implement the Green Kirkland Steward Program as it recruits, trains, and retains a growing number of dedicated volunteers.
5. Expand outreach, education, and engagement efforts, particularly in the new Kirkland neighborhoods.
6. Continue to build collaborative relationships and partnership opportunities with community groups, agencies, and nonprofit conservation organizations.
7. Establish the financial resources to contract with nonprofit restoration crews or professional contractors; or establish and fund a Kirkland field crew to conduct restoration and maintenance on high-priority Partnership projects, particularly in sensitive areas and those acres not suitable for volunteers.
8. Develop and deliver an annual status report to the community that highlights and celebrates the Partnership's accomplishments and successes.

MIDTERM GOALS (6–10 YEARS)

1. Reevaluate restoration benchmarks and obtain resources needed to accomplish them.
2. Expand the Green Kirkland Steward Program to more forest and natural area parklands identified in the 20-Year Restoration Plan. Recruit Stewards for the highest-priority sites.
3. Develop stewardship plans for individual parklands as needed to support and implement restoration.
4. Provide training opportunities for Green Kirkland Stewards and staff to help ensure their efforts benefit from restoration best practices.
5. Establish resources to sustain the Partnership's management staff, community-based stewardship program, and field crew to ensure long-term maintenance and program success.
6. Continue to build collaborative relationships and partnership opportunities with community groups, agencies, and nonprofit conservation organizations.
7. Continue to deliver an annual status report to the community that highlights and celebrates the Partnership's accomplishments and successes.
8. Host a five-year "State of the Partnership" open house for Green Kirkland Stewards, stakeholders, partners, and City staff.

LONG-TERM GOALS (11–20 YEARS)

1. Reevaluate restoration benchmarks and obtain resources needed to accomplish them.
2. Update the habitat assessment as needed or appropriate.
3. Expand the Green Kirkland Steward Program to any remaining forest and natural areas identified in the 20-Year Restoration Plan and additional parcels acquired by the City.
4. Provide training opportunities for Green Kirkland Stewards and field staff to help ensure their efforts benefit from restoration best practices.
5. Continue to deliver annual and midterm (10-year review) status reports to the community and hold community open houses to celebrate the Partnership's successes.

Partnership Roles and Responsibilities

The Green Kirkland division of the Kirkland Parks and Community Services Department plays a crucial role in the restoration and maintenance of the City's natural resources and in development of community-based stewardship programming. Over the past 10 years, Green Kirkland's staff, expertise, funding, and community engagement have expanded. The following outlines the roles and responsibilities of all City departments that currently support the work of the Partnership through in-kind staff support, as well as interdepartmental teams on which the Partnership serves. Additional key partner roles are also defined, such as nonprofits and community members. This serves to illustrate the collaborative nature of the Green Kirkland Partnership and its importance in the success of the City's commitment to sustainable natural resource stewardship.

Management

The Parks and Community Services Department, with its advisory Park Board, has primary responsibility for implementation of all Green Kirkland Partnership activities; oversight is provided by the Parks and Community Services director. Additional support and coordination may be provided by the interdepartmental Green Team, Tree Team, Environmental Communication and Outreach (ECO) Team, and Volunteer Service Team. A Community Advisory Committee might be added in time. The proposed Community Advisory Committee would be made up of representatives from all stakeholders, including the public, and contribute in an advisory capacity to the Partnership Management Team's work. Table 2 illustrates the Green Kirkland Partnership management structure and overall roles and responsibilities.

Park Board

The City of Kirkland Park Board, made up of eight adult citizens and one youth appointed by the City Council, serves as the main advisory committee for the Green Kirkland Partnership. The Partnership submits monthly activity reports and presents annual updates to the Board.

City of Kirkland

Parks and Community Services Department

The Kirkland Parks and Community Services Department manages the city's recreational programs; land acquisition and park planning, development, and maintenance; community services, and the Green Kirkland Partnership. It is ultimately responsible for maintaining and restoring the city's forested and natural parkland, guided by the City's Parks, Recreation and Open Space Plan (PROS).

In 2015, the Green Kirkland Partnership was involved in drafting an update of the PROS plan to ensure that planned and implemented efforts to restore forests and other natural parkland were included.

Staff members from the Green Kirkland and Parks Maintenance divisions are directly involved in the Green Kirkland Partnership, providing technical expertise and a skilled workforce. Staff also plan and coordinate restoration work; set annual restoration goals and site priorities to perform restoration and maintenance activities in forested and natural area parklands; and where appropriate, fund commercial crews to supplement this work.

Green Kirkland Division

The Green Kirkland Division functions as the publicity and community-involvement branch of the Parks and Community Services Department, specifically regarding the restoration of forested and natural parklands. The Green Kirkland Division promotes the Partnership throughout the Kirkland community to recruit volunteers to participate in restoration events and activities. Volunteer Green Kirkland Stewards are trained and authorized to conduct restoration activities and host volunteer events. The Green Kirkland Division supports Green Kirkland Stewards and other volunteers with training, educational materials, field supplies and equipment, and event publicity, and takes pride in acknowledging volunteers for their contributions.

In 2007, Parks hired a part-time (0.5 FTE) environmental education and outreach specialist to help increase volunteer participation and investment in natural area restoration through the Green Kirkland Partnership. The program grew rapidly, and one grant-funded staff position was inadequate to manage and support a growing program that involves more than 8,000 volunteer hours each year.

Fortunately, with the passing of the Parks Levy in 2012, three Green Kirkland employee positions were hired in 2013: supervisor, program assistant, and senior groundsperson. In 2015, a part-time (0.5 FTE) environmental outreach specialist was added. A seasonal laborer position will be hired for a six-month period in 2015 and 2016. These employee positions are dedicated to work in the Green Kirkland Division. They provide program support at its current capacity.

Parks Maintenance Division

The Parks Maintenance Division is responsible for the grounds and structural maintenance of 46 parks, 22 green spaces, seven city/school playfields, and four other sites, which total 682 acres. The division also maintains the City's Heritage Hall, Forbes House, Performance Center,

Peter Kirk Community Center, Teen Union Building, Peter Kirk Pool, library, cemetery, and five residential rental homes, as well as its public art. In addition, the Division maintains and manages a Pea Patch Program, Sharing Program, recreational and commercial tour pier operation, park vendors, athletic field coordination for 38 fields, and park rental operations.

The Parks Maintenance Division has 24 FTE employees in four areas: horticulture, ball fields and events, natural parks, and support. Together with seasonal workers and volunteers, staff members perform a variety of duties to keep parks clean, safe, and aesthetic. These include mowing, landscaping, restroom cleaning, arboriculture (tree care), athletic field maintenance, litter pickup, trail maintenance, irrigation, skilled trades, working with volunteers, and providing special-event support.

Parks Maintenance coordinates with the Green Kirkland Division to provide tree care, tool and mulch deliveries for joint projects, shared heavy equipment, supplemental work in sensitive areas, and a varying level of support for other natural areas restoration activities. Although no Parks Maintenance employees are dedicated to working full-time in natural areas, interdepartmental collaboration and resource sharing are important for the successful functioning of the Green Kirkland Partnership.

Planning and Community Development

The Planning and Community Development Department develops and implements codes and policies to manage the city's built and natural environment. The policies apply both to private and public land. The department has a 0.5 FTE urban forester position, responsible for guiding the city's overall urban forestry program and implementing the Urban Forestry Strategic Management Plan (adopted in 2013), which includes Green Kirkland Partnership's forest restoration work. The department utilizes additional funding for a contract arborist to review tree removal permits and development applications for compliance with the city's tree regulations.

The Green Kirkland Partnership is consulted in the development of city codes, mainly by providing best management practices for invasive tree and plant removal, and information about the planting of native plant species. The Green Kirkland Partnership is involved in the City's Comprehensive Plan update (www.kirklandwa.gov/Residents/Community/Kirkland2035.htm), mainly in the Parks and Open Space section, and also in the Environment section.

Public Works

The Public Works Department is responsible for habitat restoration along city streams and other significant water bodies, such as Lake Washington. Other publicly owned sensitive areas, such as steep slopes, roadside ditches, and stormwater ponds, also contribute to the city's natural areas acreage. Most Public Works staff incorporates natural area issues in their work; however, currently no staff member is entirely devoted to natural areas.

Public Works: Surface Water Utility Division

Surface Water Utility (SWU) goals are to reduce flooding, improve water quality, and restore aquatic habitats in watersheds. The SWU is part of the Public Works Department. SWU interests intersect with Green Kirkland Partnership's forest and natural areas restoration efforts that directly contribute to water quality, stormwater management, and habitat, especially near streams. The Parks and Community Services Department collaborates with SWU when planning restoration events along streams — SWU provides guidance and support, and continues public outreach and education on the importance of forested and other natural areas to water quality and other Public Works programs. SWU also engages volunteers in a water quality monitoring program for lakes and streams, such as Forbes Lake, Totem Lake, and Forbes Creek, and conducts city-funded riparian and fish passage habitat improvements.

SWU can budget resources for initial riparian habitat restoration projects, which are typically conducted by contractors and sometimes include volunteers, but it's harder for SWU to provide ongoing maintenance because Public Works grounds crews typically work in rights-of-way areas. Thus, there is concern about "orphaned" stream bank restoration efforts in park stream channels. This issue was raised in Appendix L of the City's Surface Water Master Plan, with planning to start funding maintenance in riparian restoration sites during the 2016-2017 budget cycle.

The SWU is funded by fees on each tax parcel, with rates set based on the amount of impervious surface on that parcel. As such, SWU funds must be spent on programs that directly impact management of stormwater runoff. The SWU currently funds the 0.5 FTE urban forester, who supports efforts to increase tree canopy. Partnership forest restoration efforts contribute to conserving and increasing the city's tree canopy. In turn, maintenance and increase of tree canopy has a direct impact on the amount and quality of stormwater runoff.

Public Works: Public Grounds Division

The Public Grounds Division (PGD) is responsible for removing invasive plants along city paths and trails, sidewalks, rights-of-way (including the Cross Kirkland Corridor), and neighborhood and regional surface water detention facilities, and to work cooperatively with other City divisions and departments, including Parks and Community Services, on a proactive tree management program. PGD considers location, exposure, budget, and degree of required maintenance when selecting trees to replant. Various selections have been made over the years, and the current focus is to utilize more drought-tolerant and native species. The Green Kirkland Partnership collaborates with PGD to implement best management practices for invasive plant removal and planting native species.

PGD works with the City's Geographic Information System (GIS) Department to manage the Public Tree Inventory, which is an inventory of every street tree in city rights-of-way and includes tree species, condition and health, and monetary value for each street tree. The Public Works field arborist helps evaluate and restore trees within the City's rights-of-way, on public grounds (fire stations, City Hall, and turf medians), and in public parks, occasionally working in natural areas.

The Public Grounds lead is responsible for implementing good stewardship practices in City rights-of-way and public grounds. Stewardship practices include removing invasive plants, limiting pesticide use (including using the least-toxic chemicals) and selecting the appropriate plants.

Including the Public Grounds lead, PGD staff consists of five FTE employees, an FTE field arborist, and several seasonal workers. The Public Grounds staff time is not dedicated or allocated to parkland natural area restoration and maintenance efforts.

Interdepartmental Teams and Committees

Green Team

The City of Kirkland's Green Team is an interdepartmental committee that coordinates environmental stewardship and sustainability activities among City of Kirkland departments and programs. Green Team work includes environmental education projects, salmon protection, and vegetation management, all guided by the City's Natural Resource Management Plan (2003). Staff members from the following departments serve on the City's Green Team: Parks and Community Services, Planning and Community Development, Public Works, Finance, Information Technology, Fleet Management, and the City Manager's Office. A Green Kirkland Partnership staff member regularly attends Green Team meetings to participate in interdepartmental collaboration on sustainable practices, and to promote the coordination of projects involving the restoration of natural areas throughout the City. An example of a collaborative Green Team project is the City's Climate Protection Action Plan (2009) and associated annual reports.

The Green Team has identified the City-owned, 5.75-mile-long Cross Kirkland Corridor (CKC), a former rail corridor turned into a trail, as having the potential to be a model of sustainability and livability. The City's Transportation Plan guides CKC development and maintenance and a Cross Kirkland Corridor Master Plan was adopted by City Council in June 2014. The CKC provides connectivity to schools, parks, businesses, and neighborhoods. Its potential includes multimodal transportation opportunities to build a recreation and business corridor that reflects Kirkland's commitment to balanced transportation; economic development; and parks, open spaces, and recreational services. In 2015, the Green Team hosted an eco-charrette, a public input workshop, to explore ways that the CKC could be a world-class, world-famous example of sustainability and livability. The Green Kirkland Partnership's work is connected to the visionary CKC's potential through natural area parkland restoration work in areas that border the corridor and in sharing best management practices for invasive plant removal and planting of native vegetation.

Tree Team

Kirkland's Tree Team consists of representatives from the Public Works, Planning and Community Development, and Parks and Community Services departments. The Tree Team is led by the City's urban forester, who coordinates citywide tree- and vegetation-management activities, initiatives, and programs, including tree planting and maintenance, urban forestry, policy development, grant-writing, education, and outreach. Tree Team efforts are guided by the City's Urban Forestry Strategic Management Plan (2013).

The Green Kirkland Partnership actively participates in Tree Team membership and meetings to provide input on tree-related policies, and to encourage interdepartmental collaboration in the restoration of forested natural areas throughout the City. Since 2007, the City's urban forester and Green Kirkland Partnership have coordinated annual Tree City USA Arbor Day ceremonies and activities. Green Kirkland volunteer hours count toward the City's annual tree-related expenses for Tree City USA eligibility. This collaborative effort between Green Kirkland Partnership and Planning and Community Services is expected to continue.

Environmental Communication & Outreach (ECO) Team

The City of Kirkland's interdepartmental Environmental Communication and Outreach (ECO) Team comprises employees whose job responsibilities include providing environmental stewardship, education, public outreach, publicity, and technical assistance to Kirkland residents. Public Works, Parks and Community Services, Planning and Community Development, and the City Manager's Office are represented on the ECO Team. Employees share and coordinate program goals, internal and external messaging, and upcoming events to provide a clear, one-city, environmental message for City residents. Green Kirkland Partnership staff are actively involved in the ECO Team.

Volunteer Service Team

The interdepartmental Volunteer Service Team, led by the city's volunteer coordinator, is comprised of City staff members who work with volunteers. The group meets quarterly to discuss volunteer policies and management, and to coordinate volunteer opportunities across the City. The Volunteer Service Team members collaborate to hold volunteer recognition events, the largest of which is an annual volunteer appreciation evening at which City volunteer awards are presented. The Green Kirkland Partnership is the largest volunteer program managed by the City, and Partnership employees work regularly with the volunteer coordinator to recruit and connect groups and individuals with suitable natural area restoration volunteer events.

GIS User Group

Tracking progress by mapping natural areas in restoration is an important part of the Green Kirkland Partnership's activities. Datasets, such as shapefiles defining park management units and restoration status, are stored in the City's GIS database and can be accessed by the public through Kirkland Maps (http://maps.kirklandwa.gov), an online mapping portal. The GIS User Group provides a venue where users from multiple departments, including Parks and Community Services, Planning and Community Development, Public Works, and Fire and Building Services, can discuss their needs and problems with staff from the GIS Department. A Green Kirkland Partnership staff member represents Parks and Community Services at GIS User Group meetings.

Nonprofit Organizations

Forterra

Forterra is the state's largest conservation and community building organization working to create great communities and conserve great lands. Forterra's Green Cities Department supports all Green City Partnerships in some way, and works to keep all Partnerships connected through the Green Cities Network. The Green Cities Network facilitates quarterly focus groups open to all Partnership staff; distributes training, grant, and other announcements via the Network listserv; and offers technical and general assistance through web-based and in-person methods.

Forterra has worked with the City of Kirkland since 2005 to develop and guide community-based stewardship efforts. In 2006, Forterra was contracted to develop the City's first 20-Year Forest Restoration Plan, which was approved by City Council resolution in 2008. In 2014, Forterra was contracted to develop this updated 20-Year Forest and Natural Areas Restoration Plan.

In January 2011, Forterra received a USDA Forest Service grant to fund program development work through the Seattle-Tacoma Urban Forest Restoration Project. Through this funding, the Green Kirkland Partnership and Forterra developed volunteer training and restoration planning tools to enhance and support its existing community restoration efforts.

Forterra will continue to work with the Partnership and community to articulate and advance the goals of the Green Kirkland 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.

Other Nonprofit Organizations

The Partnership has successfully collaborated with numerous organizations that share common goals, including EarthCorps, King Conservation District, Washington Native Plant Society, Kiwanis Kirkland Sunrisers Club, The Melody S. Robidoux Foundation, Eastside Audubon, and the National Wildlife Federation (through Kirkland's Community Wildlife Habitat Program), as well as with educational institutions such as the University of Washington Restoration Ecology Network, other colleges, and schools. Green Kirkland will continue to strengthen and leverage community support through these valuable partnerships and seek to expand connections with new partners.

Regional organizations with skilled field crews, such as EarthCorps, The Student Conservation Association, Washington Conservation Corps (WCC), and Mountains to Sound Greenway, play a significant role in Pacific Northwest forest and natural area restoration and maintenance. These organizations provide hands-on learning and job-training opportunities for participants and offer high-quality, skilled field crews. For the Green Kirkland Partnership, these groups may supplement work performed by current partners through grant- or contract-funded work in the following capacities:

- Organize, recruit, support, lead, and/or train community volunteers.
- Facilitate involvement of youth, civic, business, and community organizations.
- Perform restoration work in areas that volunteers cannot serve, such as steep slopes, critical areas, or in areas where the city identifies the need for supplemental work.

YMCA Earth Service Corps volunteers at North Juanita Open Space.

Volunteers

Community volunteers provide valuable labor for restoration and maintenance of Green Kirkland Partnership parklands. Volunteers bolster community interest and support for local forest and natural areas through advocacy. The Partnership is responsible for working with volunteers and Green Kirkland Stewards to provide restoration training and site planning that will ensure community efforts provide the greatest benefit possible. Developing committed, repeat volunteers may lead to interest in greater levels of Partnership participation. An active and educated group of Stewards is essential to expanding the Partnership's capacity to work in multiple forest and natural areas simultaneously. Recruitment of individual volunteers and groups will support Stewards with restoration and maintenance efforts.

Commercial Field Crews

Professional field crews and contractors are an additional resource that the Partnership may hire to achieve restoration goals. The professional field 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.

Funders, Donors, and Sponsors

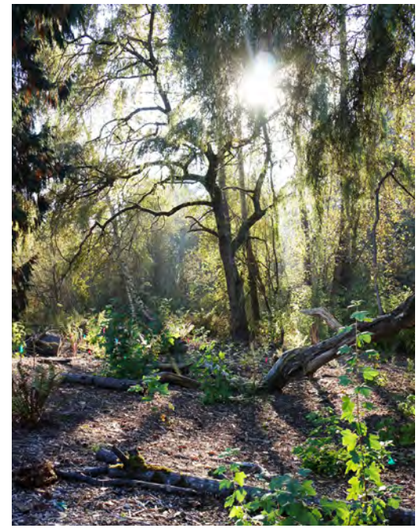
Corporate sponsors, foundations, private donors, and other grant-making entities are key partners and stakeholders in the Green Kirkland Partnership. Grants, sponsorships, and donations address any funding gaps associated with implementing the Partnership. Corporate sponsors will have opportunities to support the Partnership beyond financial donations, as many corporations offer employees chances to volunteer on community projects. Partner staffs invite corporations and local businesses to participate in large volunteer restoration and maintenance events, which provide a substantial volunteer labor resource. Also, sponsors may be asked to make other contributions as appropriate; for example, some companies help defray expenses by donating event supplies, coffee and snacks, or services such as graphic design, advertising, or event planning. In return, sponsors receive the opportunity to engage with the community and contribute to a healthier, vibrant city.

Kirkland Parks Foundation

The Kirkland Parks Foundation was established to support the community in actively enhancing parks and quality of life for Kirkland citizens. It has the goals of being a voice for the community and enabling citizens to raise funds for various projects in City parks. The Foundation started working with community partners in 2015 to conceptualize, plan, fund, and implement park improvements and activities, including Green Kirkland Partnership projects. The Foundation's first Partnership project will be to raise funds to purchase native plants for the Partnership's first Green Kirkland Day in November 2015.

Private Landowners

Private and public lands create a patchwork of forest and natural areas across the City of Kirkland. Private lands serve as vital connectors between fragmented public parklands. Many of the pressures on Kirkland's forest and natural areas are related to the actions of people, which can either enhance surrounding areas or contribute to their degradation.



Juanita Bay Park restoration site.

Indian plum in fruit.

Landscaping choices and lack of maintenance on private property are major sources of invasive plants that spread to public natural open spaces. Illegal dumping of yard waste in public forest and natural areas also leads to the spread of invasive plants and smothers healthy plant communities. Kirkland landowners who live adjacent to public parkland and other natural areas should be encouraged to be more active in 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 and outreach programs will help the Partnership generate a community that cares about the well-being of forested and natural area parklands, both on their own lands and in Kirkland's public parks. Engaging landowners as invested stakeholders could mobilize an important corps of advocates and volunteers to reverse the trend and improve the health of their property and public spaces.

GUIDE	CITY COUNCIL Provides policy for larger Partnership goals and resource allocations. PARK BOARD Provides advisory guidance.			
PLAN	GREEN KIRKLAND DIVISION MANAGEMENT TEAM Implements Partnership goals, creates work plans, tracks accomplishments, and manages the Partnership's resource allocations. Program oversight and direction are provided by the Parks and Community Services director. The Management Team comprises Green Kirkland Division staff responsible for enabling the work in the four program areas below. The Management Team collaborates regularly with Parks Maintenance and coordinates restoration activities with Public Works and Planning and Community Development staff.			
	FIELD Plans, oversees, and tracks fieldwork, best management practices, and restoration training for volunteer sites and professional crews. Coordinates requests for tools, materials, and assistance.	COMMUNITY Plans outreach and marketing strategies for recruitment and retention of community volunteers and Stewards.	RESOURCE Tracks budget and contracts, explores and pursues grants and fund-raising opportunities.	ADMINISTRATION Plans and oversees Partnership, develops and implements data management procedures, and compiles annual summary report.
IMPLEMENT	PUBLIC City of Kirkland Management and staff Skilled field crews Greater Kirkland Community Volunteers Green Kirkland Stewards Schools		NONPROFITS Forterra EarthCorps Kirkland Parks Foundation Other	PRIVATE Contractors and consultants Local business partners Property owners Schools

Table 2. Green Kirkland Partnership management structure

THE STATE OF THE PARTNERSHIP: 2005–2014

The Green Kirkland Steward Program

Green Kirkland Stewards are the heart and soul of the volunteer program. These community leaders are recruited, trained, and authorized to conduct restoration activities and host events where they lead other volunteers. Stewards become resident experts on the park where they lead restoration. The Green Kirkland Partnership supports Stewards by providing training, annual goal setting, native plants and other materials, event publicity, and opportunities to network and celebrate successes.

Nine Green Kirkland Stewards (including five Stewards trained by Washington Native Plant Society) started working in 2009 in four parks. In the seven years that the Steward program has been in existence, it has expanded to train and support 26 Stewards who are leading events in 11 parks throughout Kirkland. Stewards' ability and excellence at leading events has drastically increased the restoration accomplished by the Partnership. In 2014, 90% of the 189 work parties that took place throughout the year were led by Stewards.

In addition to leading restoration events, Green Kirkland Stewards also take on special projects to advance the goals of the Partnership. In 2010, a Green Kirkland Steward initiated a native plant nursery at McAuliffe Park to provide native trees, shrubs, and groundcovers for planting projects. Volunteers propagate native plants from seeds or cuttings, pot up bare root plants for later use, and care for donated and purchased plants prior to distribution to restoration sites. In 2014, volunteers cared for 2,920 plants, 1,127 of which were either propagated from seed in the nursery or potted as bareroot plants. The remaining 1,793 plants were ordered from commercial nurseries and cared for at the McAuliffe Park native plant nursery for one to eight weeks. Native plants were then distributed to eight Green Kirkland Partnership Parks.

Having Stewards leading events and projects creates a network of community members who serve as ambassadors of the Green Kirkland Partnership, spreading the word about volunteer opportunities, native plants, and invasive plants, whether they are leading an event, shopping at the grocery store, or hosting a birthday party for their children. These volunteer leaders provide credibility to our program and instill confidence in our work.

General Volunteers and Community Engagement

The Green Kirkland Partnership has built an active and engaged volunteer base in the time that it has been working to restore the City's natural parklands. Between 2005 and 2014, volunteers donated a total of 60,080 volunteer hours working in 11 of Kirkland's forested and natural area parklands. Figure 4 illustrates volunteer hours invested per year beginning in 2005. Each year, thousands of community volunteers, many of whom are led by Green Kirkland Stewards, volunteer for two to four hours at a time removing invasive plants, mulching cleared areas, weeding invasive regrowth, and planting native trees, shrubs, and ground covers. Volunteers range from individuals and families looking to give back to their communities to businesses and faith-based organizations coordinating Volunteer Days. In 2014 alone, 76 different organizations, schools, faith-based organizations, and community groups were represented at Green Kirkland volunteer events.

This dedicated body of volunteers allows the Green Kirkland Partnership to leverage its staff and material resources at a value of $1.2 million dollars in labor and

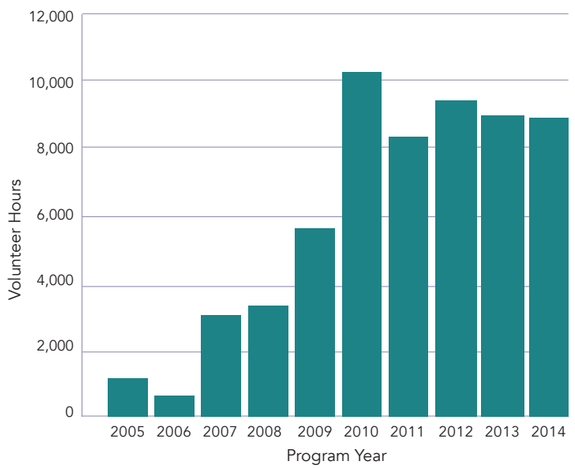


Figure 4. Volunteer hours: 2005–2014

accomplish more group restoration work than otherwise would be possible. Volunteers not only do restoration, but also assist with data entry in the Green Kirkland office, take photographs at volunteer events, and help recruit more volunteers by doing outreach at community fairs and farmers' markets.

Red columbine in bloom.

CASE STUDY: COMMUNITY ENGAGEMENT SUCCESS AT NORTH JUANITA OPEN SPACE

In mid-2013, the City of Kirkland was able to convert a city-owned greenspace ringed by a series of single-family homes and dominated by invasive blackberries into a neighborhood open space. The North Juanita Open Space was originally supported by Green Kirkland staff, but volunteer events allowed neighbors to take an active role in the restoration of the 1.2-acre greenspace, turning it from a dense, impenetrable blackberry bramble into a small lawn area ringed by a nascent native forest. Neighbors of the Open Space turned out in great numbers, filling events to capacity and bringing snacks to share with fellow volunteers. After six months of staff-led events, two neighborhood volunteers stepped into the role of Green Kirkland Stewards and, in the fall of 2014, began Steward-led volunteer events that provide neighbors with ongoing opportunities to build community and increase the resiliency and health of the North Juanita Open Space's young native forest.

Restoration Accomplishments: 2005–2014

During the past 10 years, the Green Kirkland Partnership has developed a successful community-based stewardship program to restore its forested and natural area parklands. By the end of 2014, Green Kirkland Steward volunteer leaders were active in 11 parks: Carillon Woods, Cotton Hill Park, Crestwoods Park, Everest Park, Juanita Bay Park, Juanita Beach Park, Juanita Heights Park, Kiwanis Park, McAuliffe Park, North Juanita Open Space, and Watershed Park. Staff-led restoration activities were active in two additional parks: Brookhaven Park and Heronfield Wetlands. Since 2005, the Partnership has enrolled nearly 60 acres into restoration (Figure 5) that includes first-time invasive species removal and maintenance — more than 500 native trees freed of ivy and 4,600 invasive trees removed (e.g., English holly, cherry laurel, Portugal laurel, bird cherry, English hawthorn) — and planting of more than 30,000 native trees, shrubs, and ground covers.

The Green Kirkland Partnership has also made progress with site-level restoration planning. With the support of grant funding from the USDA Forest Service provided in partnership by Forterra, the Partnership developed five park stewardship plans: at Carillon Woods, Cotton Hill Park, Crestwoods Park, Kiwanis Park, and Watershed Park. Restoration projects were then implemented at each of these parks using a WCC field crew and a private contractor. The professional field crews conducted work on steep slopes and invasive tree removal and treatment, which are tasks not suitable for volunteers. These Forest Service funds also supported the development of the Green Cities Stewardship Planning Guide and the Steward Annual Plan Workbook, two tools that will support and guide restoration planning into the future. Partnership staff also implemented new strategies for data management and tracking of acres enrolled in restoration, by mapping restoration sites using GIS.

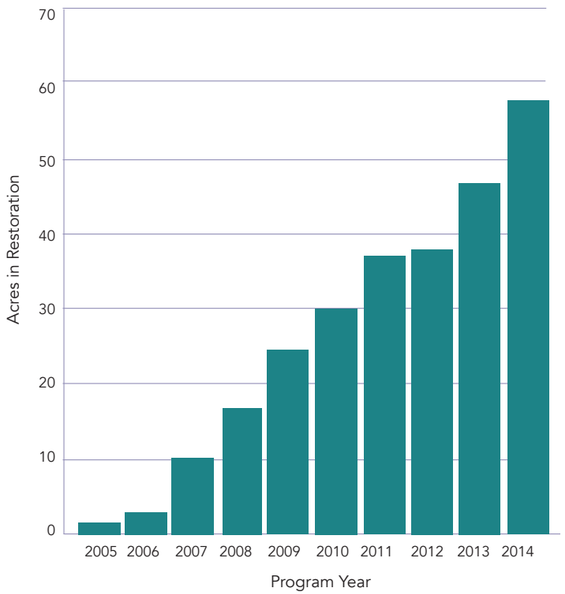


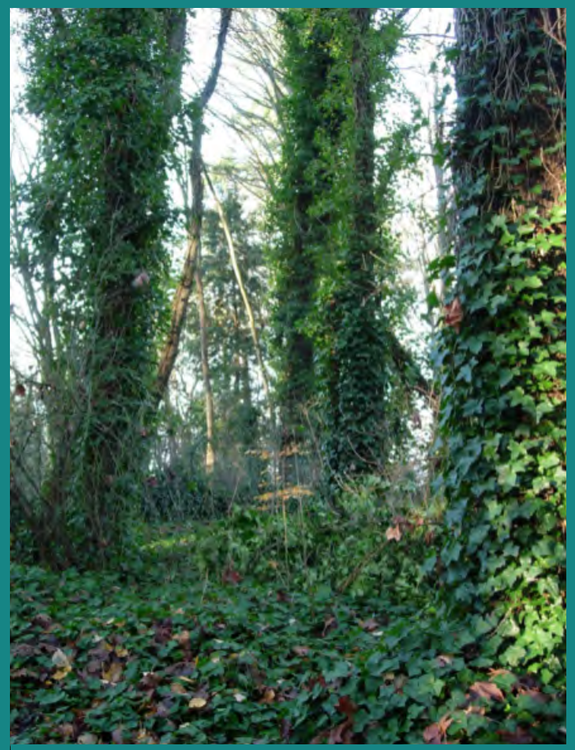
Figure 5. Acres in restoration: 2005–2014

CASE STUDY: LEVERAGING RESOURCES TO ACCOMPLISH RESTORATION GOALS AT CARILLON WOODS

Carillon Woods is an 8.71-acre park located in the Central Houghton neighborhood. Situated on a west-facing slope above Lake Washington, the main feature of this forested park is a steep-sloped ravine in the western part of the park which forms the headwaters of Carillon Creek. A number of factors have impacted the health of the forest, starting in the early 1900s when large areas of the park were logged and cleared of vegetation. Common to most urban natural areas, deciduous trees replaced the once conifer-dominated canopy, and nonnative plants such as English ivy and Himalayan blackberry invaded the forest understory (City of Kirkland 2014).

As of December 2014, 7.2 acres of a total 9.4 acres of parkland and adjacent right-of-way have been enrolled in restoration. Carillon Woods' restoration accomplishments, community engagement successes, and leverage of funding resources serve as an example of the Green City Partnership model at work.

With the inception of the Green Kirkland Partnership in 2005, Carillon Woods was enrolled as the first park to begin community-based stewardship efforts and has had a dedicated Green Kirkland Steward since 2009. During the past 10 years, Carillon Woods has received incredible investment from the community, with a total of 4,887 volunteer hours served at 67 events. Each year, Partnership staff and Stewards have recognized national days of service at Carillon Woods, including Martin Luther King Day of Service, United Way Day of Caring, and Arbor Day, each drawing between 50 to 150 volunteers. In addition to individual volunteers, Carillon Woods has been supported by numerous schools, youth groups, faith-based organizations, and other community-based organizations such as Northwest University, YMCA Earth Service Corps, Microsoft, Friends of Youth, Eastside Preparatory School, Children's School, Kirkland's Community Wildlife Habitat Team, and Christ Church Academy. In all, at Carillon Woods, the Green Kirkland Partnership has planted more than 1,000 native trees and shrubs and removed almost 8,000 cubic yards of invasive plants — a pile of removed vegetation that is 20 yards long, 20 yards wide, and 20 yards high. Figure 6 compares the Carillon Woods forest before restoration, in 2004, and after more than 10 years of restoration, in 2015.



2004. Trees and forest floor at Carillon Woods draped in English ivy.

2015. After removal of English ivy and other invasive plant species, beginning in 2005. Native plants are reestablishing in the understory.

Figure 6. Carillon Woods then and now

In 2011, Kirkland's Community Wildlife Habitat Team installed a butterfly demonstration garden in the northeast corner of the park, funded by a Neighborhood Connections Grant and a Boeing grant to the regional office of the National Wildlife Federation. Kirkland was certified as a Community Wildlife Habitat by the National Wildlife Federation in October 2009 — the 34th community in the nation since 1973, and the first in the state east of Seattle (McCaslin 2011). This butterfly garden was designed and planted by volunteers coordinated by the city's Community Wildlife Habitat Team and serves as an important educational component to the overall habitat restoration under way by the Partnership.

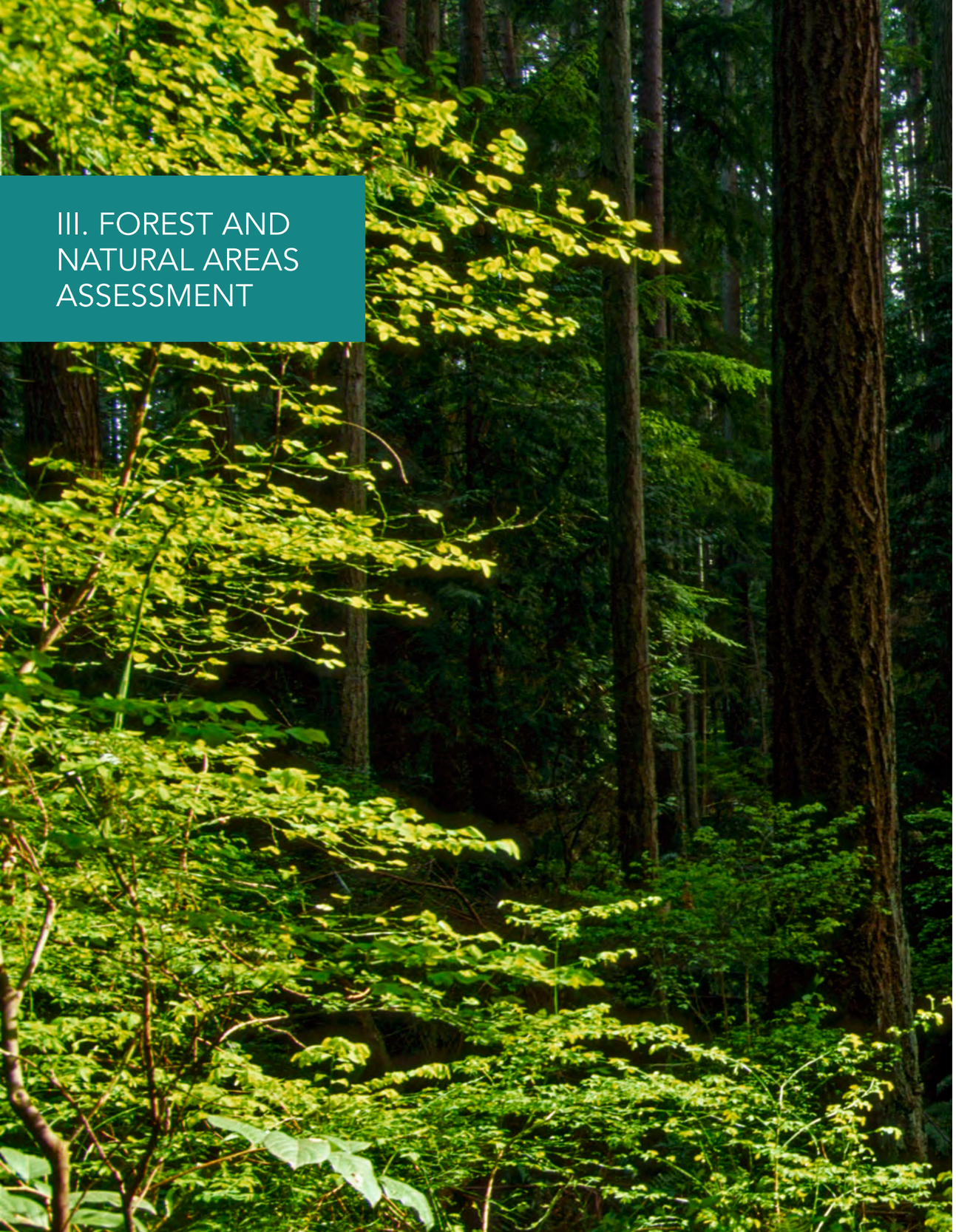
Professional Restoration Staff and Crews

Green Kirkland Partnership has collaborated with Public Works to determine appropriate work by staff and professional crews on sensitive steep slopes and in riparian areas.

From 2011 to 2014, Green Kirkland participated in a Green Cities–wide urban forestry initiative managed by Forterra and funded by the USDA Forest Service. Through these Forest Service funds, the Partnership was able to hire a graduate-level intern to develop a site-level stewardship plan at Carillon Woods with the support of restoration experts from Forterra and EarthCorps Science.

The Partnership has also utilized professional field staff and crews to accomplish restoration goals for Carillon Woods. Each of the crews was funded through grant dollars provided by state and nonprofit partners. In 2013 and 2014, WCC crews, paid for by Forest Service funds and by the Washington State Department of Natural Resources Urban Forestry Restoration Project, conducted restoration on the steep slopes of the ravine — work not suitable for volunteers.

Carillon Woods serves as a compelling example of the Green Kirkland Partnership's comprehensive collaborative model, in which city funds are leveraged with volunteer investments and grant dollars, and the Partnership's in-house restoration and community-based stewardship expertise is leveraged with that of the larger professional restoration community.



III. FOREST AND NATURAL AREAS ASSESSMENT

Effective and efficient natural resource management can only be accomplished if planners, field staff, and decision makers have the environmental information on which to base restoration actions. Armed 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.

In 2006, the Green Kirkland Partnership conducted its first forest assessment to characterize habitat conditions across the city's parklands and develop its citywide restoration plan. With the addition of 115 acres of natural parkland and 58 acres enrolled in restoration, the Partnership decided to embark on an update of its 20-Year Plan and a reassessment of its forests and natural areas. The methodology used in the first plan was effective, but did not capture the value of Kirkland's high-quality wetlands and riparian areas. With this update, the Partnership took the opportunity to use a habitat assessment method to more adequately assess the varied habitats that make up Kirkland's parklands.

Also included in this chapter are the results of the city's Gap Analysis for future parkland acquisition. In 2014, the City of Kirkland conducted the analysis as part of the PROS plan update. The findings of this analysis are presented here as they pertain to forested and natural area parkland.

Methods

The Partnership's habitat assessment focused on the 487 acres of forested and natural area parkland owned and managed by the City of Kirkland's Parks and Community Services Department. The parcels included in the Partnership's scope are 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, they have not been included in the current scope of work.

Tree-iage and the Forest Landscape Assessment Tool

Baseline ecological data was collected during the fall of 2014 using a rapid assessment data collection protocol called the Forest Landscape Assessment Tool (FLAT) developed by the Green Cities Research Alliance (www.fs.fed.us/pnw/research/gcra; see "Urban Landscape Assessment"). 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, in press).

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

Rapid assessment methodologies such as FLAT produce an 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 Kirkland 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, natural areas within Kirkland's parks were classified 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. Hardscaped and landscaped areas, since they are not suitable for active native vegetation management, were removed from the total acreage targeted by the Partnership.

In the field, each MU was surveyed to identify its specific habitat type (e.g., conifer forest, deciduous, riparian shrubland, etc.). MUs were also surveyed 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.) See Appendix C for the FLAT-modified data collection flowchart for the tree-iage habitat composition component of the model.

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 cover, 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-iage Categories

After habitat composition and invasive species cover values were assigned, a matrix system was used to assign a tree-iage category or priority rating for each MU (Figure 7). Categories range from one to nine. One represents high quality habitat and low invasive species threat and nine represents low quality habitat and high invasive species threat. An MU that appears in tree-iage category three 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 eight based on the tree-iage model.

It is important to reiterate that this data was collected to provide a broad view of the habitat conditions of Kirkland's natural open spaces. Data collection occurred at the management unit scale. But because MUs are different sizes (most range between 0.001 acre to 18 acres), results are presented 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 Kirkland's forests and natural areas can be assessed in the future.

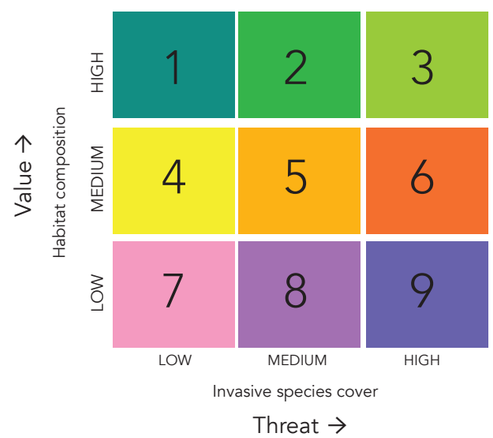


Figure 7. Tree-iage legend

Results

Tree-iage Matrix

From the data gathered on all MUs during the FLAT assessment, a picture of Kirkland's forest and natural areas begins to form. Figure 8 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 (487 acres) currently has low, medium, or high habitat value, and how much currently has low, medium, or high threat from invasive species.

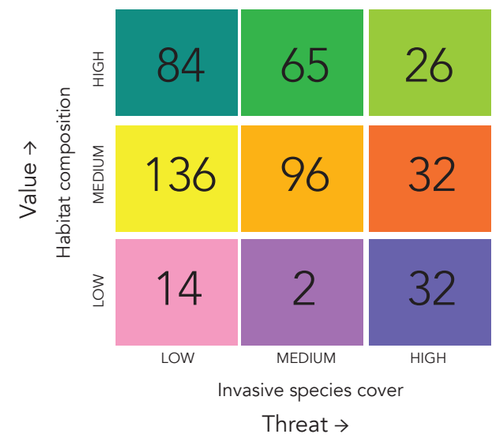


Figure 8. Distribution of management unit acres across tree-iage matrix

Seventeen percent of the project area in Kirkland's forest and natural area parklands is in exceptional condition (tree-iage category 1) with high-value habitat and low invasive cover threat. Looking only at the first axis of the tree-iage matrix, habitat composition, categories 1, 2, and 3 combined represent 36% of the acreage. Just over half of the acres have medium canopy composition (54% in categories 4, 5, and 6). And about 10% of the acres fell into the low-value habitat range (categories 7, 8, and 9).

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. Eighteen percent of Kirkland's forested and natural area parklands have a high invasive species threat (categories 3, 6, and 9). Thirty-three percent of the project area falls in the medium category (categories 2, 5, and 8) for invasive species threat and 48% have low invasive species threat (categories 1, 4, and 7). Appendix D lists the tree-iage category acres per MU acre per park.

Considering conditions from the 2006 habitat assessment, we see some informative shifts in the percentage of MU acres assigned to each tree-iage category. A number of different factors contribute to this difference that do not allow us to do a direct comparison of tree-iage values across the board for all the original parks: (1) the boundaries of some parks were either corrected or updated in GIS to include rights-of-way and (2) a different data collection method was used to characterize habitats, which accounted for non-forested areas such as wetlands. Due to the updated assessment method, some MUs that were originally given a low habitat-quality rating were upgraded to medium to high quality because they were shrub or emergent wetlands.

Tree-iage Category	2006		2014	
	MU Acres	Percent of Project Area	MU Acres	Percent of Project Area
1	13	3.5%	84	17.2%
2	22	6.0%	65	13.4%
3	2	0.5%	26	5.2%
4	140	37.6%	136	28.0%
5	77	20.7%	96	19.8%
6	7	1.8%	32	6.5%
7	71	19.0%	14	2.9%
8	4	1.1%	2	0.4%
9	36	9.8%	32	6.5%
Total Acres	372	100.00%	487	100.0%

Table 3. Tree-iage categories by percentage of project area: 2006 versus 2014

In addition, as acres are enrolled in restoration, we expect to see a shift in invasive species cover on those acres. In the long term, as native trees and shrub plantings mature, we expect to see an improvement in habitat quality as well. From an overall programmatic planning standpoint, the new breakdown of tree-iage categories provides us with the percentages of where Kirkland's overall acreage falls in the threat matrix. See Table 3 for a comparison of tree-iage categories by percentage of project area for the 2006 and 2014 habitat assessments. This data informs the cost model discussed in Chapter IV and is used to develop high-level cost estimates for the Partnership during the next 20 years.

Overstory Species

The 2014 FLAT results show that Kirkland's forested parklands are dominated by middle-aged stands of mixed conifer/deciduous tree species, including bigleaf maple, red alder, western redcedar, and Douglas-fir. Shrub and forested wetlands are dominated by willow species, red alder, and black cottonwood. Mature bigleaf maple and red alder were documented as the most dominant overstory species (Figure 9). Additional overstory species include mature western redcedar, Douglas-fir, and black cottonwood, and, Aup as a tertiary overstory or regenerative tree species. Note that trees were recorded in order of dominance within each MU. Primary refers to acres where the species is dominant, secondary is second most dominant, and tertiary is where the species is the third most dominant.

Regenerating Overstory Species

The top five regenerating tree species documented include red alder, Pacific willow, bigleaf maple, western redcedar, and western hemlock (Figure 10). Each management unit was given a combined estimated stocking class for the two most abundant regeneration species. This is measured in trees per acre (Table 4). Regenerating trees indicate the sustainability and future of the forest canopy, as these trees serve as the next generation of dominant overstory in Kirkland's parklands.

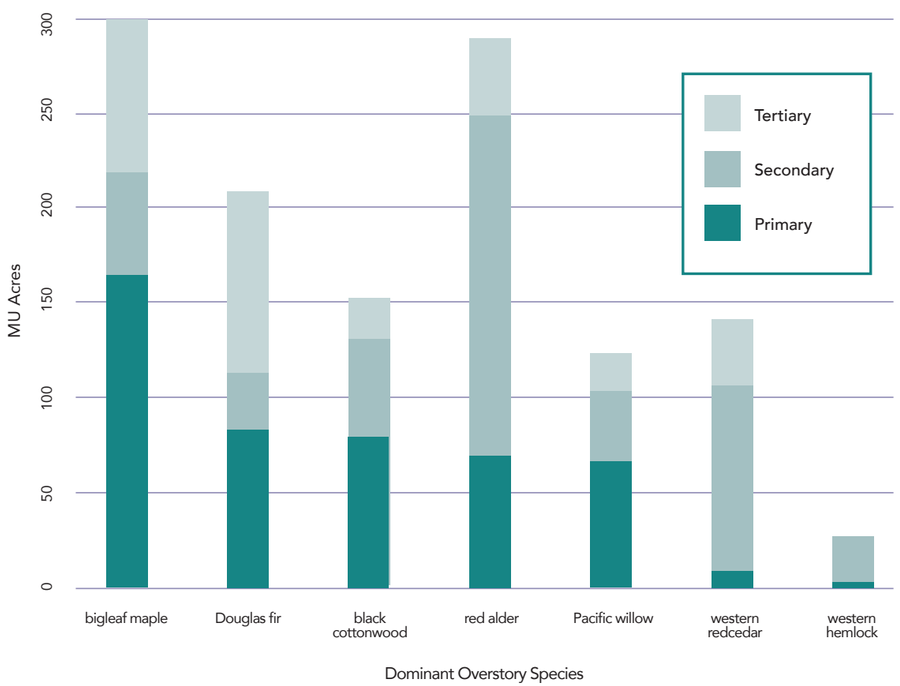


Figure 9. Overstory tree species distribution by management unit acres

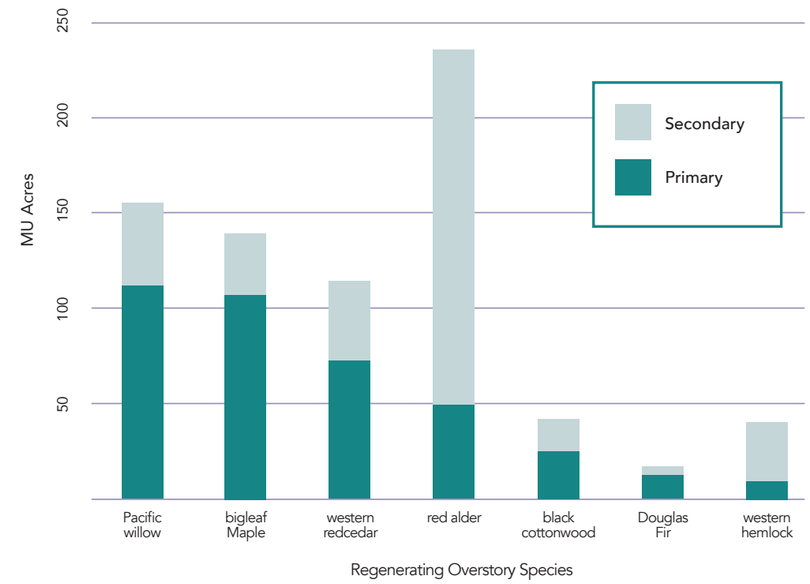


Figure 10. Regenerating overstory species distribution by management unit acres

TREES PER ACRE	REFERENCE	MU ACRES
0-49	More than 30' x 30'	288.13
50-149	Between 30' and 16' spacing	77.86
150+	Less than 16' x 16'	16.07

Table 4. MU Acres of Overstory Regeneration in Trees per Acre

Native Understory Species

Kirkland's forested and natural area parklands have a moderately healthy understory consisting of native shrubs and ferns (see Figure 11). Salmonberry, sword fern, and Indian plum dominate the understory of the forested sites, with Scouler's willow and grass species dominant in natural area sites. For a complete list of native species documented during the FLAT assessment, see Appendix F.

Invasive Species

Native understory species account for most of the primary and secondary understory species documented per management unit. Invasive species, however, are ubiquitous throughout Kirkland's parkland and were documented in more than 350 acres. For each MU, the top five most abundant invasive species were documented. Figure 12 illustrates the most prevalent species per MU acre. This includes the top five shrub or ground species as well as the top two invasive trees. Himalayan blackberry is present in 80% of the project area acres with English ivy in just over 50%. English holly is documented in nearly 50% of MU acres. See Appendix G for a breakdown of all invasive species documented in the FLAT analysis.

Environmentally Sensitive Areas

To assist in assessing the potential resources needed for restoration, a GIS analysis was conducted to identify critical or environmentally sensitive areas within the Partnership's project area. This will be used as a starting point to determine which sites will require professional field crews versus volunteer-led restoration efforts. As a general rule, volunteer stewardship can be conducted on upland forest sites with a slope of 40% or less. Steep slope work as well as restoration in wetlands and riparian habitat requires additional professional resources. Some exceptions may be made for some volunteer efforts in sensitive areas on a site-by-site basis and with professional supervision. According to the findings of the analysis, just under half of the Partnership's project area (239 acres) consists of sensitive areas (Figure 13). As specific parks are identified for restoration, site-level stewardship plans will provide more-detailed analysis of sensitive area site conditions and the resources needed to accomplish restoration.

During the plan's 20 years, the Green Kirkland Partnership will monitor and periodically collect restoration site data to evaluate changes in acreage among the tree-iage categories. Individual sites will receive more-detailed analysis to address their needs as restoration continues.

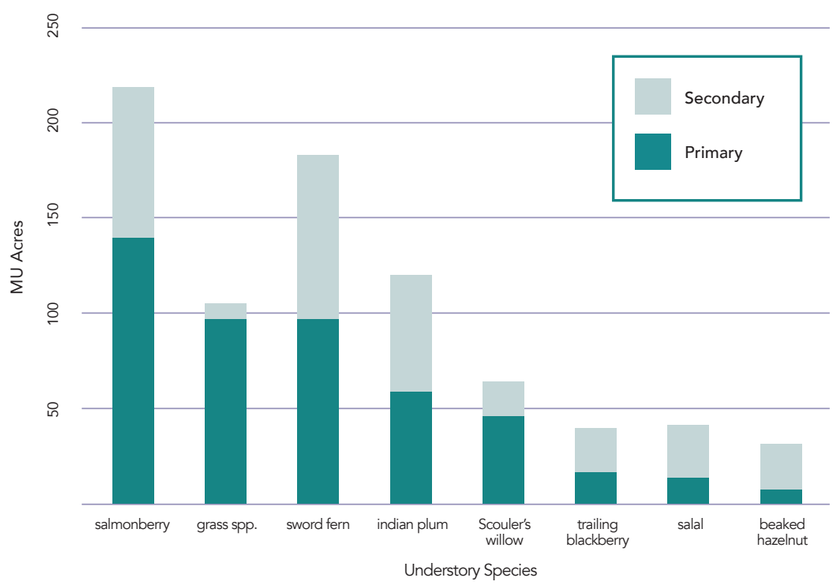


Figure 11. Common native understory distribution by management unit acres

Volunteer preparing young native tree for planting at Crestwoods Park.

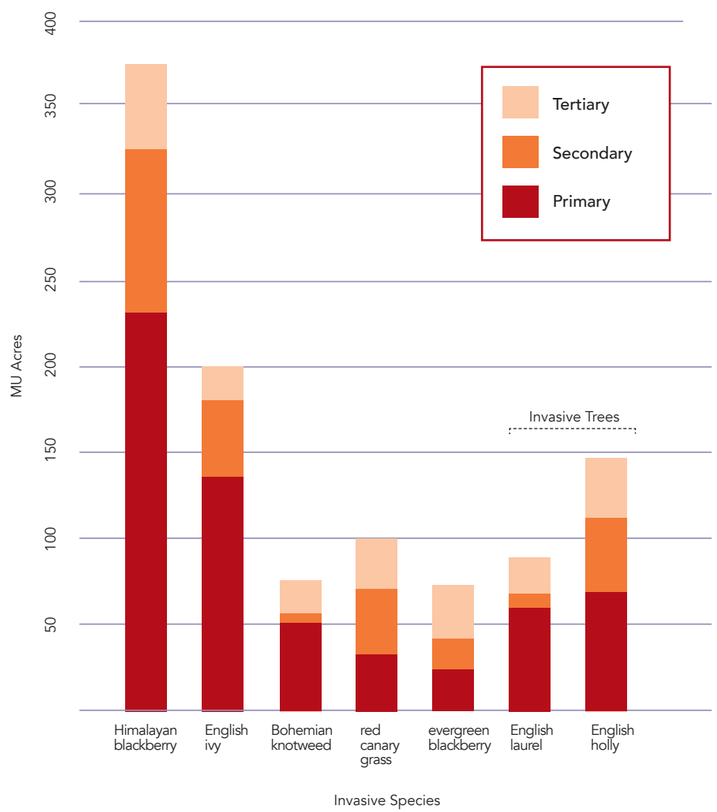


Figure 12. Most common invasive species distribution by management unit acres

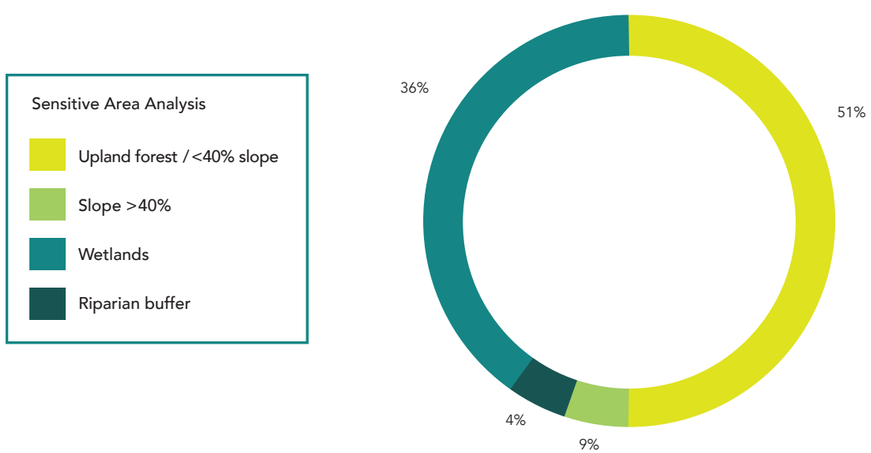


Figure 13. Percent of sensitive area acres

Gap Analysis: Acquisition of Forested and Natural Area Parkland

Kirkland's diverse park system includes more than 588 acres of parkland and open spaces, including community and neighborhood parks and natural areas managed by the City. Other public parks and open spaces, such as Big Finn Hill Park (owned by King County), and school partnership sites, add another 366 acres of parkland.

Kirkland's population is anticipated to grow from approximately 81,730 to 94,400 in 2030. To meet the needs of current and future residents, the City's 2015 PROS Plan proposed the acquisition of additional parklands according to the following guidelines:

Community Parks: These are large park sites, 15 to 30 acres in size, which serve residents within a one-mile drive, walk, or bike ride from the site, and generally include a wide array of passive and active recreational facilities. The City is currently meeting the acreage guideline of 2.25 acres per 1,000 people proposed in the PROS Plan, but will need to acquire an additional 14 acres of parkland to meet the needs of future residents. Opportunities to acquire such large park sites in Kirkland are limited, and the City will have to think creatively and foster partnerships to provide the desired park amenities.

Neighborhood Parks: The City's goal is to provide a neighborhood park within walking distance (quarter mile) of every resident. These are smaller parks, generally 3 to 5 acres in size, designed for unstructured, nonorganized play and limited active and passive recreation. With projected population growth, the City will need to acquire an additional 39 acres of neighborhood parkland to meet the desired acreage guideline of 1.5 acres per 1,000 residents for neighborhood parks.

Natural Parks and Open Space: Some of the forested and natural area parkland under the jurisdiction of the Green Kirkland Partnership is located within neighborhood and community Parks described in the PROS Plan. Residents will often find mixed uses within an individual park. The PROS Plan proposed the elimination of numeric guidelines for natural parks and open space and does not propose a specific number of natural area acres for acquisition. While numerical planning guidelines are common for helping determine a desirable number of neighborhood parks per 1,000 residents, they may not be the most appropriate measure to use when deciding which sites should be prioritized for conservation. Instead, the priority might be better served by the acquisition of, or negotiation for, additional forested and natural area parcels adjacent to existing parklands and other natural resources to ensure that unique or special habitat areas are protected, habitat connectivity is maximized, and sufficient land is available to accommodate future trail connections.

To better understand where acquisition efforts should be directed, a Gap Analysis of the park system was conducted to assess the current distribution of parks throughout the city. The analysis reviewed the locations and types of existing facilities, land use classifications, transportation/access barriers, and other factors as a means to identify preliminary acquisition target areas. In assessing opportunities to fill identified gaps, the focus was on residentially zoned lands, since these are the areas primarily served by neighborhood parks. Additionally, walksheds, i.e., the area that can be conveniently reached on foot from neighborhood parks, were defined using a quarter-mile primary and half-mile secondary service area, with travel distances calculated along the road network starting from known and accessible access points at each neighborhood park.

The Gap Analysis indicated that parks are generally well distributed throughout the city, with the most notable gaps occurring in the recently annexed northern portions (see Appendix B for the Gap Analysis map and list of priority acquisition areas).

While the targeted acquisition areas do not identify specific parcels for consideration, the area encompasses a broader region in which an acquisition would be ideally suited. These acquisition targets represent a long-term vision for improving community and neighborhood parkland distribution throughout Kirkland. The City's 2014 Surface Water Master Plan recommends property acquisition analysis for the City's Surface Water Utility (item CW-24), which could complement land acquisition analysis by Parks and Community Services.

IV. MOVING FORWARD — THE NEXT 20 YEARS

Green Kirkland Steward leading an event at Cotton Hill Park.

As in the other Green City Partnerships, a Balanced Scorecard approach is used to develop and adapt the Green Kirkland Partnership implementation strategy (see Table 8). 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. Its layers focus on increasing shareholder value. For the Green Kirkland Partnership, the layers are modified to reflect the ultimate goal of a healthy and sustainable network of natural open spaces. 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 487 acres of natural open spaces.

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 plan's guiding structure and administration element, described in Chapter II, "Meeting the Challenge," is also included in the benchmarks, as it provides the overall structure for the Partnership, ensures that objectives in the three main program elements are moving forward, and stresses the importance of clear organizational structure and communication among partners — key elements to every successful partnership.

The objectives within each element 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 each other, the Partnership can coordinate efforts across various work areas so that activities are interconnected and mutually supportive.

The ability of managers to track progress during the next 20 years will allow challenges to be identified early. In response, managers can modify or adapt the program to address and resolve those challenges. See Chapter V, "Adaptive Management," for further discussion regarding the balanced scorecard and adaptive management.

FIELD

The Green Kirkland Partnership will build upon its successful restoration efforts begun in 2005. Active management of field sites will include restoration, maintenance, and monitoring. The work will target removing invasive plants and establishing native vegetation as appropriate. The citywide habitat assessment of Kirkland's forest and natural area parklands 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: Prioritize Parks

Tree-iage analysis results show there are 487 acres of forested and natural area parklands in Kirkland in need of various levels of restoration, maintenance, and long-term stewardship. To date, the Partnership has initiated restoration projects in 13 parks: Brookhaven Park, Carillon Woods, Crestwoods Park, Cotton Hill Park, Everest Park, Heronfield Wetlands, Juanita Bay Park, Juanita Beach Park, Juanita Heights Park, North Juanita Open Space, Kiwanis Park, McAuliffe Park, and Watershed Park. Eleven of these parks have active Green Kirkland Stewards. These currently active project areas will continue to be priorities for restoration in 2015.

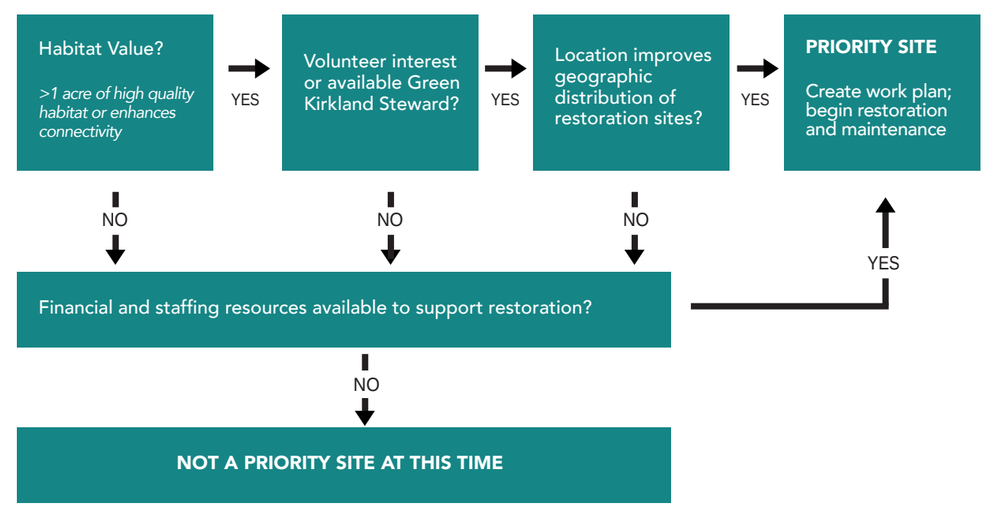


Figure 14. Decision tree for prioritizing restoration sites

The Partnership will prioritize restoration efforts based on site's ecological condition, and community interest and investment (Figure 14). Parks with high volunteer commitment, such as a neighborhood park with a motivated Green Kirkland Steward, will also be prioritized. The Partnership will try to ensure that restoration efforts are distributed equitably throughout all of Kirkland's 15 neighborhoods. Ultimately, the driving factor in whether a park can be prioritized will be the financial and staffing resources available to conduct restoration, support volunteers, and/or hire professional field staff.

Through an online survey and at an open house held in March 2015, Kirkland residents provided input regarding which park sites should be prioritized. During the open house discussions, three primary themes emerged: (1) Prioritization of parks in high-density and underserved areas, (2) Expansion of restoration in existing parks to improve corridors or connections between neighboring parklands, and (3) Expansion of restoration along the Cross Kirkland Corridor adjacent to natural area parks. Appendix H provides an overview of the issues discussed and participants' comments. These ideas have already been integrated into various sections of the 20-Year restoration plan and will continue to be considered as the plan is implemented.

Field Objective 2: Prioritize Sites within Parks

As an established, community-based stewardship program, Green Kirkland Partnership's first priority will be to maintain and continue restoration in the 59 acres already enrolled in the program. Of these 59 acres, 12 were documented as tree-iage category 3, 6, and 9, with greater than 50% invasive cover. Maintenance of these areas should be prioritized. Recently cleared sites will also be prioritized for planting and ongoing maintenance. Particular attention should be paid to existing projects to keep restoration efforts moving forward. 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 parks are prioritized for restoration, the tree-iage model can be used as a guide to anticipate needed restoration management practices. 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.

For parks with a Green Kirkland 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 is a key component of the Partnership's efforts, sites with high public visibility will be chosen to extend education and program promotion.

Field Objective 3: Identify Sensitive Areas That Require Professional Crew and Staff Support

As noted in field objective 2, not all restoration sites in the Green Kirkland project area are suitable for volunteers; some require the use of professional, trained field staff such as a crew from Public Works, EarthCorps, WCC, or a private contractor. Sensitive areas such as steep slopes, wetlands, and riparian buffers require the expertise and training of professional staff. In addition, some best management practices require the use of herbicides, such as cut-stump treatments for invasive trees such as English holly or cherry laurel, or stem injections for knotweed species that aggressively invade and degrade critical riparian habitat. Herbicide treatment must be conducted by licensed professional staff. The Partnership has utilized professional crews at many of its parks enrolled in restoration, primarily to conduct steep slope and herbicide work.

Partnership staff conducted an analysis to identify the number of acres that include sensitive areas; result of this analysis can be found in Chapter III, "Forest and Natural Area Assessment." As parks are prioritized for restoration, these results will be further examined to help determine the financial and staffing resources needed to implement restoration in sensitive areas.

Sites that have support available through Public Works or agency-funded crews will be given priority status for restoration, as well as those where noxious weed control is mandated by King County and that have support from the King County Noxious Weed Program (www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds/program-information.aspx).

Field Objective 4: Implement Restoration 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 best management practices (BMPs) for Kirkland's fieldwork. These BMPs include 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. The Green Kirkland Partnership has adapted this field guide for Kirkland's Steward Program (Green Kirkland Steward Field Guide). Program staff and volunteer stewards will be trained in the BMPs. Supplemental course work and training programs will be recommended for all staff involved in restoration and maintenance of Kirkland's forested and natural area parklands.

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 ongoing maintenance
4. Long-term stewardship and monitoring

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. The four-phase approach also provides ranges of labor investment needed to accomplish each phase, allowing for estimates of cost and time per acre (see Table 5).

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 help 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 with 5% to 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 covers, 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 covers. 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 Kirkland Steward Field Guide provides volunteer-appropriate BMPs once a planting plan has been established.

Phase 3. Plant Establishment and Ongoing 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 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 monitoring and maintenance

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 487 acres will be enrolled in the restoration process and graduate to this phase.

Without ongoing, long-term volunteer investment in monitoring and maintenance of areas in restoration, Kirkland's natural areas will fall back into neglect. 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. Management units that currently have less than 5% invasive cover and more than 50% native conifer forest cover or healthy wetland vegetation (tree-iage category 1) may already be in phase 4 and suitable for enrollment into a monitoring and maintenance plan. Most 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 baseline and long-term data collection procedures 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. The Green Kirkland Partnership participated in this program in 2012 and 2013, and has 11 plots installed at sites in Cotton Hill, Carillon Woods, Juanita Bay, Crestwoods, Edith Moulton, Everest, Juanita Heights, Kiwanis, McAuliffe, and Watershed Parks. It is recommended that data be collected at these plots at least once every five years so it can be used to assess progress and inform restoration strategies and approaches.

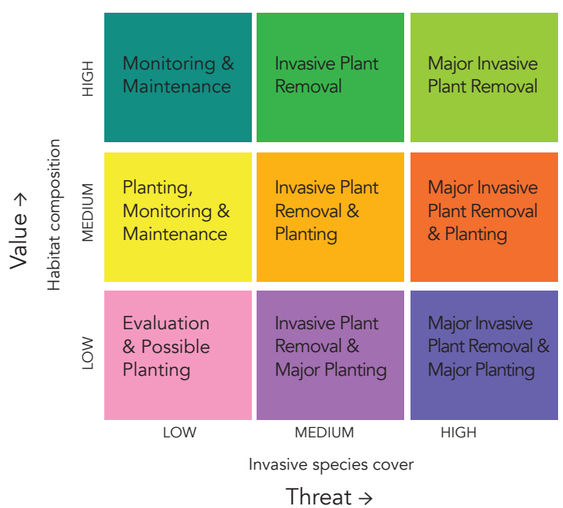


Figure 15. Restoration strategies and tree-iage categories

APPLICATION TO THE TREE-IAGE CATEGORIES

The four-phase approach can be applied to the tree-iage categories as shown in Figure 15. Each tree-iage category can be assigned appropriate management strategies.

TREE-IAGE CATEGORY 1: High Habitat Composition, Low Invasive Threat
Acres in project area: 84

CONDITION: This category contains the healthiest forest areas in the Kirkland system of natural open spaces. 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: 65

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

A habitat 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

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

Resilient forest stand dominated by native conifers with little to no invasive species threat.

Mixed age conifer overstory with Himalayan blackberry in the foreground

TREE-IAGE CATEGORY 3: High Habitat Composition, High Invasive Threat
Acres in project area: 26

CONDITION: As in categories 1 and 2, habitats 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. Habitats in this category are in a high-risk situation and contain many desirable trees or ecologically valuable species. If restored and maintained, habitats in this category can completely recover and persist in the long term.

MANAGEMENT STRATEGY: Major Invasive Plant Removal

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

Healthy mixed age conifer overstory with greater than 50% Himalayan blackberry cover in the understory

TREE-IAGE CATEGORY 4: Medium Habitat Composition, Low Invasive Threat
Acres in project area: 136

CONDITION: Forests assigned a medium habitat 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 native wetland vegetation. Category 4 areas have low levels of invasive plants covering less than 5% of the MU.

MANAGEMENT STRATEGY: Planting, Maintenance 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 trees.

Addressing category 4 habitats 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.

Red alder stand with healthy understory of sward fern and native shrubs

TREE-IAGE CATEGORY 5: Medium Habitat Composition, Medium Invasive Threat
Acres in project area: 96

CONDITION: Areas in this category have greater than 5% but less than 50% invasive cover. Invasive growth in these areas is expected to be patchy with diffuse edges. These areas are estimated to have greater than 25% native upper canopy cover but less than 50% upper canopy coniferous or broadleaf 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 areas have between 5% and 50% cover by invasive plants. These habitats 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 planted for these areas in the first five years, aggressive efforts are required throughout the life of the Green Kirkland Partnership.

Medium quality canopy with invasive English laurel regenerating in the understory

TREE-IAGE CATEGORY 6: Medium Habitat Composition, High Invasive Threat
Acres in project area: 32

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 area.

Habitats that retain important plant elements but are 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 habitats, 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 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.

Mixed deciduous-conifer stand inundated by English ivy

TREE-IAGE CATEGORY 7: Low Habitat Composition, Low Invasive Threat
Acres in project area: 14

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 in category 7 forests.

Parks in this category may include recent acquisitions, 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 of the category 7 forests. Sites in this category will be evaluated to determine whether conditions and timing are appropriate to move these wooded 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.

Healthy native understory consisting of trailing blackberry and salmonberry

TREE-IAGE CATEGORY 8: Low Habitat Composition, Medium Invasive Threat
Acres in project area: 2

CONDITION: Areas that are estimated to have less than 25% native overstory 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.

Mixed native and non-native invasive understory consisting of Himalayan blackberry and common horsetail

TREE-IAGE CATEGORY 9: Low Habitat Composition, High Invasive Threat
Acres in project area: 32

CONDITION: Areas estimated to have less than 25% native upper 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.

Heavily degraded natural area dominated by invasive Scotch broom, Himalayan blackberry, and knotweed.

Field Objective 5: Ongoing Monitoring and Maintenance

The sustainability of Kirkland's natural open spaces hinges on ongoing maintenance. As each management unit moves through the process of restoration (phases 1 through 3), it enters into monitoring and maintenance: phase 4. For a complete discussion on field monitoring, see Chapter V, "Adaptive Management."

COMMUNITY

During the next 20 years, the Green Kirkland Partnership will continue to build its successful community-based stewardship program and engage all sectors of the city in forest and natural area restoration through business volunteer days, neighborhood associations, Girl and Boy Scouts of America, faith-based organizations, youth groups, community service, and school groups. Committed volunteers are an essential component of the Partnership's success and serve as motivators, fundraisers, and an inspirational force advocating for necessary resources to achieve goals. Volunteers complete much of the physical restoration work. Their committed efforts allow the Partnership to meet many of its goals and benchmarks identified in the strategic plan. Partner staff shaped the following community objectives and benchmarks based on their past 10 years of program development as well as other Green Cities Partnership efforts in the Puget Sound region. The community program area includes the following objectives:

1. Expand the Green Kirkland Steward Program.
2. Develop and implement strategies to achieve social equity and inclusion of a diverse community of volunteers.
3. Continue to provide outdoor education and service-learning opportunities to Kirkland's youth and families.
4. Engage and educate private landowners.
5. Encourage businesses and organizations to help further Partnership goals.
6. Expand community engagement and educational efforts to reach residents, community organizations, and businesses based in Kirkland's new neighborhoods.
7. Appreciate volunteers and celebrate Partnership successes.

Community Objective 1: Expand the Green Kirkland Partnership Steward Program.

The intent of the Green Kirkland Steward Program is to build an educated, engaged, and active volunteer base around restoration, maintenance, and stewardship of Kirkland's forested and natural area parkland. The program provides volunteers with an opportunity to take on more leadership responsibilities, expand their skill set, tackle larger challenges associated with restoration and maintenance, and receive support and guidance to complete multiyear projects. The Partnership launched the Green Kirkland Steward Program in 2009, and now supports 26 Stewards. In the next five years, the Partnership hopes to recruit, train, and retain about eight or more additional Stewards, who will lead other volunteers in the field and serve as stewardship leaders in the community. Green Kirkland Stewards will have the opportunity to do the following:

- Organize and lead volunteer events and activities at their selected park.
- Serve as key contacts for Green Kirkland Partnership projects with their neighborhood and the larger Kirkland community.
- Attend regular trainings and workshops, as resources allow.
- Coordinate with partner staff to ensure the successful implementation of site-specific stewardship plans.
- Request tools, materials, and assistance, as needed.
- Track and report progress on restoration activities via the Partnership's work log.

Green Kirkland staff understand that serving as a Steward is a big commitment, and that some people may want more responsibility than a regular volunteer, but not as much as a Steward. In response to this, the Partnership offers the opportunity to serve as a Support Steward. Support Stewards receive training around volunteer management and restoration BMPs, and assist lead Stewards in outreach and community engagement.

Community Objective 2: Develop and implement strategies to achieve social equity and inclusion of a diverse community of volunteers.

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

Green Kirkland Partnership seeks to continue its successful volunteer program by strengthening efforts to provide equitable and inclusive opportunities for the entire Kirkland community. Environmental conservation organizations across the country and here in Puget Sound typically struggle to engage communities of color, recent immigrants, and low-income families (Green Cities Community Engagement Guide, in development). Yet Kirkland's population in the last two decades has become increasingly diverse, with Asian Pacific Islander and Hispanic populations growing the most rapidly (Kirkland Community Profile Draft, 2013). Green Kirkland has already seen some success in engaging a more diverse community through its work with local schools. To expand these efforts, Kirkland will need to employ additional creative strategies during the next 20 years. The following is a summary of suggested strategies to enhance social equity and diversity, with input from the City of Kirkland, Forterra, and diversity engagement best practices researched and undertaken by the Green Redmond Partnership:

- Understand the demographics of Kirkland's neighborhoods as well as the needs and priorities of the communities that live there.
- Attend Kirkland neighborhood association or other community-sponsored meetings, prioritizing those reaching communities of color, recent immigrants, and low-income families. Develop an understanding of this cohort's values and goals, and how Green Kirkland can support the neighborhood's own efforts to build community.
- Work cooperatively with human services staff at Kirkland Parks and Community Services, King County Housing Authority, King County

  Library System, and local nonprofit organizations to engage low-income and underserved communities.
- Work with local community groups to craft and host their own Green Kirkland events to increase inclusion in the planning process and create a strong community-driven program.
- Consider cultural competency training for Partnership staff and be mindful of differences within cultural groups. Don't make assumptions: be sensitive to the traditions and views of the groups the Partnership is working with.
- In an effort to ensure that public communication materials for projects or events can be understood by target residents, the Partnership can utilize King County's language translation resources to conduct neighborhood-specific language needs assessments. This resource is based on five sources of Limited English Proficiency data and includes GIS "language maps" that enable staff to identify the language needs of populations specifically within the City of Kirkland's various neighborhoods. In addition to using this resource, City staff can also utilize the Lake Washington School District enrollment profiles for neighborhood schools to help supplement the county's information.
- When working with Limited English Proficient volunteers, language interpretation should be provided throughout the volunteers' Green Kirkland experience, including during recruitment and pre-event communication, at the restoration event itself, and following the event, in order to build future engagement. The Partnership may choose to start with one language, such as Spanish, and build from there based on need and community interest.
- Create public-facing materials that specifically show diverse community members, so that potential volunteers can see themselves in Green Kirkland. Utilize inclusive language such as "everyone can help," and seek feedback from volunteers themselves on how to make events as welcoming as possible.
- Provide a continuum of opportunities in various parks and neighborhoods that are easily accessible by public transportation. Identify other barriers to participation and address them as resources allow.
- Consider providing food and other hospitality. Sharing a simple meal together, even if it is a picnic at a natural area park, is an effective community-building tool. If working with a specific cultural group, research customs and norms, if any, surrounding food. When in doubt, ask community members about their preferences.
- Look for opportunities to connect with and celebrate different community's connections to the environment, greenspaces, and/or volunteerism through cultural holidays or in other ways.
- Find new places to spread the word by asking community members where they gather and where they get news. Utilize ethnic media outlets, and post flyers in popular local businesses.
- Focus on helping more volunteers of color, recent immigrants, and low-income families move up the chain of engagement and become leaders in their own communities. Look for barriers to higher engagement and address them.

Community Objective 3: Continue to provide outdoor education and service-learning opportunities to Kirkland's youth and families.

- The Green Kirkland Partnership has engaged Kirkland's youth through school-based projects, faith-based organizations, and Boy Scouts and Girls Scouts. The Partnership will continue to seek new and innovative ways to welcome children of all ages into stewardship efforts. The Partnership will:
- Develop relationships with public and private school administrators and teaching staff to develop field-trip and service-learning opportunities for their students.
- Reach out to high school club/group advisors (e.g., National Honor Society) in Lake Washington School District's middle and high schools and in local private schools to develop stewardship opportunities for students.
- Engage low-income youth and families by reaching out to Lake Washington School District schools that predominantly serve low-income families, such as John Muir Elementary and Rose Hill Elementary.
- Reach out to neighborhood schools' Parent-Teacher-Student Associations to engage students and their families in Green Kirkland events.

Community Objective 4: Engage and educate private landowners.

While stewardship of public forest and natural areas is an important step toward protecting habitat for wildlife, improving water quality, and providing public recreational opportunities, private lands cover a greater portion of Kirkland. Plantings on private lands can greatly degrade the condition of the City's parklands despite best efforts to restore, maintain, and steward these areas. 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 in parkland. In fact, these are the most common ways public forest and natural areas become infested with invasive species.

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 retaining trees and expanding current forest canopy and habitat. Privately owned forest and natural areas in good health can serve as important buffers

to adjacent public parklands and help mitigate habitat fragmentation and edge effects.

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

- Developing mailings and handouts to inform them about the problems facing forested and natural area parklands, the benefits of removing invasive species from their properties and replacing them with native or noninvasive ornamental species, and ways to get involved in the Partnership.
- Providing information about the Green Kirkland Partnership's efforts on the Partnership's webpage, in park kiosks, and in neighborhood newsletters and local newspapers.
- Connecting private landowners with programs such as the National Wildlife Federation's Certified Wildlife Habitat Program or Schoolyard Project.
- Training landowners in BMPs through the Green Kirkland Steward Program.
- Continuing to work with other City departments to disseminate a stewardship-friendly plant list for developers and landowners that discourages invasive species and promotes native or noninvasive species and tree retention.

Community Objective 5: Encourage businesses and organizations to help further Partnership goals.

The Partnership has established a successful relationship with the Kirkland business community over the past several years and will continue to offer businesses the opportunity to support and participate in Green Kirkland stewardship efforts. The recruitment of corporate sponsors to hold employee stewardship events at Green Kirkland Partnership sites is an important element for program success. In some cases, corporate sponsors may also be in a position to contribute supplies and materials necessary for stewardship events. In turn, Green Kirkland can offer incentives such as special recognition and publicity for supporting the Partnership.

Landscape supply businesses will also be encouraged to support the mission and goals of the Partnership by refraining from selling plants listed as "Weeds of Concern" by the King County Noxious Weed Control Board. These plants include butterfly bush, morning glory, yellow flag iris, and English ivy. The Partnership could provide education on invasive plants and suitable alternatives, and seek opportunities to convey its message at local garden fairs and clubs.

Business contributions to the Green Kirkland Partnership can include:

- Employee and team-building opportunities through event participation
- Cash donations
- Sponsorship of volunteer events such as Green Kirkland Day
- In-kind contributions (such as equipment, native plants, materials, and food for volunteer events)
- Refraining from planting or selling invasive plants

Community Objective 6: Expand community engagement and educational efforts to reach residents, community organizations, and businesses based in Kirkland's new neighborhoods.

The outreach and engagement strategies outlined in the previous community goals will be implemented citywide, with special focus on welcoming the new neighborhoods of Finn Hill, North Juanita, and Kingsgate to the Green Kirkland Partnership community. The Partnership has begun outreach with community members to assess these neighborhoods' needs, interests, and capacity for stewardship of their forested and natural area parklands.

Community Objective 7: Appreciate volunteers and celebrate Partnership successes.

The Green Kirkland Partnership will continue to celebrate volunteers' achievements and emphasize the crucial role they play in restoring and maintaining Kirkland's forested and natural area parklands. In the past, Green Kirkland Stewards have been nominated and recognized by the Washington Department of Natural Resources and the City of Kirkland as outstanding stewardship volunteers. Partnership staff regularly recognizes the outstanding efforts and service of volunteers on the Green Kirkland Partnership website, through the City of Kirkland's interdepartmental teams, and through the Green Cities Network.

The City of Kirkland hosts an annual recognition event for volunteers in which Green Kirkland Stewards and other volunteers are recognized for their service. Volunteers are a valuable resource and crucial for completing on-the-ground Partnership goals. Stewards and volunteers are the very heart and soul of the Green Kirkland Partnership and are valued for their expertise and the rich and diverse perspectives they bring, not only to community engagement, but also on-the-ground stewardship practices.

Social Media — Tools for Outreach and Engagement

Since the Green Kirkland Partnership's founding in 2005, the use of social media outlets such as Facebook, Twitter, and Instagram have changed the way communities and individuals share information. These outlets now provide the Partnership with an effective tool to reach large segments of Kirkland's community. The Partnership will continue to utilize various "old-school" media outlets to publicize volunteer events or information on its progress (e.g., the Kirkland Reporter newspaper, neighborhood association newsletters, and citywide publications), but the Green Kirkland webpage, digital media, and contributions to local blogs will continue to be prominent tools in volunteer recruitment and educational outreach.]

The Green Kirkland Partnership also hosts its own volunteer appreciation activities, such as an annual picnic for Green Kirkland Stewards and volunteer appreciation at annual Green Kirkland Day events. The Partnership seeks to find a variety of ways to recognize Stewards and other volunteers for their valuable efforts.

Resources

Financial resources, staff capacity, and volunteer contributions will affect the Green Kirkland Partnership's ability to restore and maintain the 487 acres identified for stewardship in this plan. During the next 20 years (2015–2035), the Partnership will need an estimated $12.5 million in funding (2015 dollar value), as well as volunteer support, to accomplish the proposed goals. The needed volunteer investment is estimated at approximately 350,000 hours over the life of the program. This will bring an additional value of $9.6 million as a match to the estimated $12.5 million in direct costs. This is an ambitious plan that relies on additional resources. 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

Background

In 2005, the Green Seattle Partnership estimated the costs of restoring 2,500 acres of forested parks and natural areas in Seattle for a 20-year period. Green Seattle relied on estimates of past costs for restoration activities, staff costs associated with planning and management, materials, funding development, outreach and marketing, and overhead. In 2008, the Green Kirkland Partnership developed similar cost estimates based on Seattle's original model for its newly emerging program, which was the best available model for predicting restoration costs at the time. The original 2008 cost estimate to enroll 372 acres by 2028 was $5.2 million (with an additional $4.4 million in volunteer contributions). By the end of 2014 (seven years after plan development and 10 years after initial 2005 restoration efforts), 59 acres were enrolled in restoration, representing 62% of projected acre goals. Dedicated funding for the Partnership between 2005 and 2014 totaled $1.6 million dollars. During the first ten years, funding benchmarks fell below target, but were met beginning in 2013 when levy funds were allocated. Not meeting previously projected restoration acre goals was largely due to unstable funding prior to 2013.

It should be noted that Kirkland's original cost estimates assumed a slightly different program structure because Seattle's program already had access to additional external resources and support such as truck drivers (for mulch deliveries), tools from existing volunteer coordinators, and other existing resources; therefore, these resources were not included in the anticipated expenses for Green Seattle. When the Green Kirkland Partnership was initiated, there were not as many existing resources, and all costs were being assigned directly to the Green Kirkland division's program budget. Comparing Seattle's cost estimates with those of other Green Cities is thus not entirely feasible as the operating and funding structures, staff capacity, and resource distributions differ.

The 2015 Cost Model

Unlike other Green City 20-Year Plans, which are aimed at initiating new Green City Partnerships, the updated 2015 Kirkland cost estimates take into account the program development and restoration that has occurred between 2005 and 2014. Therefore, the 59 acres already enrolled in restoration were accounted for and used the Partnership's current primary funding source (2012 Parks Levy dollars) as the baseline cost and operating budget upon which subsequent years were built. This resulting cost estimate accounts for a projected increase in operational and administrative staffing needed to grow and manage community-based stewardship efforts, as well as increased funding for field supplies and a professional crew to support restoration efforts on the 239 acres of sensitive areas outlined in chapter III. Also included is a built-in 15% overhead on field expenses and 7% overhead on staff time to capture some of the additional costs associated with doing business over time. For this plan, all cost estimates and leveraged volunteer values are listed in 2015 dollars.

Cost Model Assumptions:

Contractor and Field Costs

Estimated field costs include paid crews to lead volunteers and/or implement restoration work not suitable for volunteers, as well as restoration supplies, plants, and tools. These are only estimated averages for the purposes of projecting the total budget needed to meet the program goals. Each actual project will vary, depending on the site conditions and who is performing the work.

Staff and Program Costs

The estimated staff and program costs include staff support for running the program; planning and development; monitoring restoration and tracking progress; recruitment, supervision, and support for Kirkland Stewards; promoting work parties, social media, recruiting and coordinating general volunteers; managing paid crews and other contractors; ordering and delivering field supplies; grant writing and implementation; marketing; overhead expenses; and other operating costs.

Estimating Volunteer Labor Match

The Green Cities cost model was adapted with a slight increase in the average volunteer hours per acre because the Green Kirkland Partnership is heavily invested and reliant on volunteers to implement restoration rather than paid crews. The labor estimates outlined in Table 5 are used for estimating the anticipated number of labor hours needed per acre of restoration, either by volunteers or paid labor. The range of hours accounts for the difference in labor investment needed for different tree-iage categories within each phase of restoration. The Partnership assumes on average:

Restoration Phase	Range of Labor (volunteer or paid) Investment (Hours/Acre)	Average (Hours/ Acre)
Phase 1	50–1,500	750
Phase 2	94–376	150
Phase 3	31–155	90
Phase 4	1–25	13

Table 5. Range of labor estimates per restoration phase

The volunteer match estimate is then calculated by taking the estimated number of volunteer hours needed and multiplying it by the 2014 Independent Sector volunteer labor value of $27.54/hour for Washington State (www.independentsector.org/volunteer_time). The number of volunteer occurrences and volunteer hour calculations assumes that a volunteer spends four hours on average at a large Green Kirkland work party.

Green Kirkland Partnership Cost Estimates 2015–2035

The estimated overall $12.5 million needed to reach restoration goals starts with the current 2015 budget of $468,000 and slowly builds each year, increasing by $65,000 in 2019. This is to allow for some restoration crews to enroll new acres. Program costs peak in 2025 (year 10) at $710,000, which would be an additional $240,000 (approximately a 50% increase) from the current 2015 allocated Partnership budget. This would allow for a full-time restoration crew and added capacity to support a larger volunteer program.

The Near- and Long-term Strategic Plan and Benchmarks (Table 7) illustrates how acre enrollment, volunteer hours, and estimated program costs ramp up over the 20-year period based on output from the cost model. For example, the model projects a cost of $468,000 in 2015 to initiate restoration and maintenance efforts on 4 new acres. This accounts for staff, field expenses, and overhead needed to recruit and support an estimated 1,045 volunteers and 8,363 volunteer hours (a value of $223,460). If this level of funding is not acquired, the 20-year timeline will be pushed out and current conditions of the restoration sites will further decline, costing the City even more to restore its forested and natural area parklands in the future.

The cost per acre for each tree-iage category is the projected total estimated cost from the time restoration and maintenance begins in 2015 until the end of the plan in 2035. Table 6 illustrates the estimated cost of 2015-2035 restoration per tree-iage category. These are high-level predictions used for long-range planning and do not reflect a fine-scale analysis. The calculated average costs per acre going through the four phases of restoration are derived from a cost model that enrolls a percentage of acres from each tree-iage category every year during the next 20 years. The model estimates that initiating restoration and maintenance on all 487 acres will cost from $21,600 per acre for tree-iage category 1 acres to $33,500 per acre for tree-iage category 9 acres.

Based on the adjusted estimates, the model forecasts that completing proposed Partnership goals will cost approximately $12.5 million in 2015 dollars through 2035. The model also forecasts a volunteer match of $9.6 million during the 20-year time period. Figure 16 illustrates the relationship between direct costs, volunteer match, and the enrollment of acres per year into restoration over the life of the program.

Tree-iage Category	Acreage	Established Average of Paid Labor and Program Costs/ Acre*	Total Cost per Tree-iage Category (Acres x Cost)
1	84	$21,600	$1,814,400
2	65	$24,900	$1618,500
3	26	$27,300	$709,800
4	136	$24,700	$3,359,200
5	96	$27,200	$2,611,200
6	32	$29,500	$944,000
7	14	$26,700	$373,800
8	2	$31,200	$62,400
9	32	$33,500	$1,072,000

Table 6. Estimated cost of 2015–2035 restoration (in 2015 dollars) per tree-iage category

*Combines estimated paid labor (contracts and staff) and program costs; does not include volunteer labor. Totals are rounded to the nearest whole number.

The resources component of this plan comprises the following five objectives:

1. Continue current City funding and build capacity for future program growth.
2. Provide sufficient staff to support fieldwork, volunteer outreach and management, and program administration as the Partnership grows in the future.
3. Review and update current programs and policies to improve interdepartmental stewardship results.
4. Increase volunteer engagement to a cumulative total of 350,000 hours during the next 20 years.
5. Increase volunteer productivity by providing support and materials to volunteers and Green Kirkland Stewards.

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

Between 2007 and 2012, the Green Kirkland Division was funded through the city's general fund, Capital Improvement Plan funding, and King Conservation District grant support. Additional grant dollars and

support from the USDA Forest Service (through Forterra), Washington Department of Natural Resources, and the Melody S. Robidoux Foundation also supported program development and on-the-ground restoration. Beginning in 2013, the Partnership is now primarily supported by monies from the 2012 Park Levy, along with continued grant and Capital Improvement funding. These funding sources support the Partnership's work at current 2015 capacity.

In order to continue to grow the program to achieve the benchmarks outlined in the Near- and Long-Term Strategic Plan (Table 7a and 7b), the Partnership should explore various other funding sources to meet anticipated costs over the next 20 years. Continued public resources, corporate partners, foundations, grants, and private donors will play an important role in funding beyond the current budget.

Several possible funding 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 King Conservation District, Washington State Recreation and Conservation Office, Washington Department of Natural Resources, and King County Conservation Futures Program
- City of Kirkland departmental funding (reallocated and/or increased)
- Establishment of a financial nexus between 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 (carbon credits and stormwater mitigation), if determined feasible
- Contributions from local corporations and businesses
- Financial contributions from the public, if volunteering is not an option

Resources Objective 2: Provide sufficient staff to support fieldwork, volunteer outreach and management, and program administration as the Partnership grows in the future.

Field Restoration Staff

Current Green Kirkland Division capacity alone cannot meet the restoration and maintenance needs of all 487 acres by 2035. Volunteer efforts and community leadership will play a major role in achieving restoration and maintenance goals. Currently, the Partnership has one full-time field staff member supporting and supplementing Green Kirkland Stewards' field efforts. This involves delivering mulch, providing restoration expertise, and completing some high-priority restoration tasks not suitable for volunteers, such as herbicide application. As field efforts ramp up in the coming years and the Partnership enrolls more acres in restoration and maintenance, one field person will not suffice to support Stewards and volunteers. In 2015 and 2016, funding from the Parks Levy for a seasonal laborer position will support field efforts.

In addition to the increase in volunteer-driven restoration projects, there are some acres that require the expertise of a professional field crew. For onetime or short-term projects, this could include hiring a commercial or nonprofit professional crew. Alternatives include developing a dedicated city-funded natural areas crew or contracting an external professional field crew. Crews could be dedicated to the Green Kirkland Division or shared among other City departments, partner organizations, or other Green City Partnerships. The Partnership could serve as the lead sponsor and look to other City divisions or local nonprofits to share the cost.

Steward and Volunteer Program Management

The Partnership currently has one full-time staff member who is dedicated to managing the Green Kirkland Steward program and serves as the overall volunteer coordinator; this person manages upwards of 9,000 volunteer hours per year and currently supports 26 active Stewards. As the Partnership expands its volunteer and Steward Program to meet its field objectives, the Partnership could be managing more than 20,000 volunteer hours annually (about 5,000 volunteers). To adequately support these volunteers both in the field and administratively, the Partnership will likely need to expand its staffing by at least one full-time employee.

The Partnership should continue to recruit, train, and retain additional volunteers interested in a higher level of commitment than attending occasional volunteer events. The Green Kirkland Steward program allows the Partnership to increase on-the-ground community leadership, thereby building partner capacity to initiate restoration and maintenance. Stewards, who lead volunteer events, assist with creation of activity work plans, and track restoration progress could apply for small grants to further efforts at their park; however, all grants would require staff support. Success of the Steward Program depends upon Partnership staff's ability to coordinate the program, including training new Stewards, working with participants to develop activity work plans, coordinating efforts with other city staff, and keeping track of accomplishments.

Marketing and Community Outreach

Additional staff time devoted to education and outreach will be critical in helping increase volunteer capacity to more than 20,000 hours during the next 20 years. In order to recruit volunteers and engage and educate the public, Partner staff should commit a significant amount of time to marketing and fundraising, which would require more staff time. The Partnership now has fundraising and volunteer recruitment brochures to assist with outreach efforts. The Partnership should create and implement a communications and marketing plan or approach that aligns with and enhances outreach and education work. Outreach, education, communications, and marketing efforts will increase Partnership visibility, build the needed volunteer base and community awareness, and increase the potential for generating additional program funding by reaching a wider audience.

Program Management and Fund Development

Stable funding is crucial to supporting the Partnership's efforts. The Partnership should identify and solidify additional funds to supplement the 2012 Parks Levy funding and also identify ways to maximize use of existing dollars. Using its new fundraising brochure, among other resources, the Partnership should integrate donor recruitment into its ongoing marketing and community outreach efforts. Developing a committed base of small donors is important and should be done in concert with developing larger, more stable funding sources.

Currently, the Green Kirkland Partnership supervisor conducts fund development and overall Partnership management, with oversight from the Parks and Community services director. The supervisor is also responsible for budget management, annual reporting, overseeing field and operations staff, and contractors. Additional administrative tasks to develop and implement are monitoring and tracking, creating and distributing annual summary reports, facilitating the Green Kirkland Management Team, grant writing, and pursuing new funding sources. As the program expands, the Partnership may consider establishing a separate fund development and marketing position, whose responsibilities would include supporting staff with outreach and engagement, recruiting corporate sponsors, securing funds from donors and foundations, and grant writing.

Resources Objective 3: Review and update current programs and policies to improve interdepartmental stewardship results.

The Partnership has been implementing interdepartmental stewardship goals since the City council approved the 2008 20-Year Forest Restoration Plan and should continue interdepartmental collaboration as follows:

- Provide restoration expertise to other departments and develop a recommend plant list for public properties that includes suitable native plants and excludes all invasive plants.
- Coordinate restoration, stewardship, outreach, and educational efforts across appropriate city departments, divisions, and programs to maximize volunteers, resources, funding, and staffing capacity.
- Explore possible future expansion of the Green Kirkland Partnership model to additional forest and natural areas acquired by the city or managed by other city departments.

Resources Objective 4: Increase volunteer engagement to a cumulative total of 350,000 hours during the next 20 years.

Between 2015 and 2035, volunteer contributions are forecasted to surpass 350,000 hours, valued at $9.6 million (based on the 2013 Independent Sector valuation of a volunteer hour at $27.54 in Washington State). To put this number in perspective, if every Kirkland resident contributed just over four hours during the entire 20-year program, the Partnership would achieve its proposed restoration and maintenance goals.

The Partnership anticipates reaching about 24,000 volunteer hours per year in 2029, when the program reaches its projected peak of new acres entered into restoration and maintenance. The growing contribution of volunteer time is integral to long-term stewardship. Volunteer work should be implemented in concert with Partnership field staff and crews to achieve acreage goals. After proposed 20-year goals are met, ongoing maintenance resources and volunteers will be needed to maintain the health of restored forested and natural area parks.

Anticipated levels of volunteer contributions and fieldwork require resources (funding, staff time, and materials). The projected $12.5 million budget includes added capacity for a dedicated restoration field crew, as well as additional operations staff to support a growing program with additional volunteer recruitment, coordination, training, and recognition. The ability to provide additional resources will help keep volunteer productivity high and ensure positive stewardship experiences.

Resources Objective 5: Increase volunteer productivity by providing support and materials to volunteers and Green Kirkland Stewards.

The Partnership will continue to work with Green Kirkland Stewards and volunteer groups to identify restoration and maintenance needs, obtain materials and tools, develop site-specific stewardship plans, conduct BMP trainings, coordinate large events, and write grant applications. Fieldwork efficiency can be increased by creating clear lines of communication, coordination, easy access to resources, and ample support.

The Partnership will continue to provide the following resources:

- New Green Kirkland Steward orientations, periodic training opportunities, and a *Green Kirkland Steward Field Guide*.
- Project monitoring and documentation to assess and track restoration efforts.
- Outreach materials and assistance in recruiting volunteers.
- Restoration materials such as plants, mulch, and tools, as resources allow.
- Networking opportunities for Stewards to share experiences and learn from work conducted at different forested and natural area parks.
- Assistance with maintenance and tasks deemed inappropriate for volunteers by providing professional staff or crews to complete work.

The Green Kirkland Partnership's primary goal is to restore the health of its forested and natural area parklands. The strategic plan and benchmarks outlined in this plan are ambitious, but as noted earlier, if the financial investment is not made during the next 20 years, the timeline will be pushed out and current ecological conditions of the restoration sites will further decline, costing the City of Kirkland even more for future restoration and ecosystem services that healthy forests and natural areas provide.

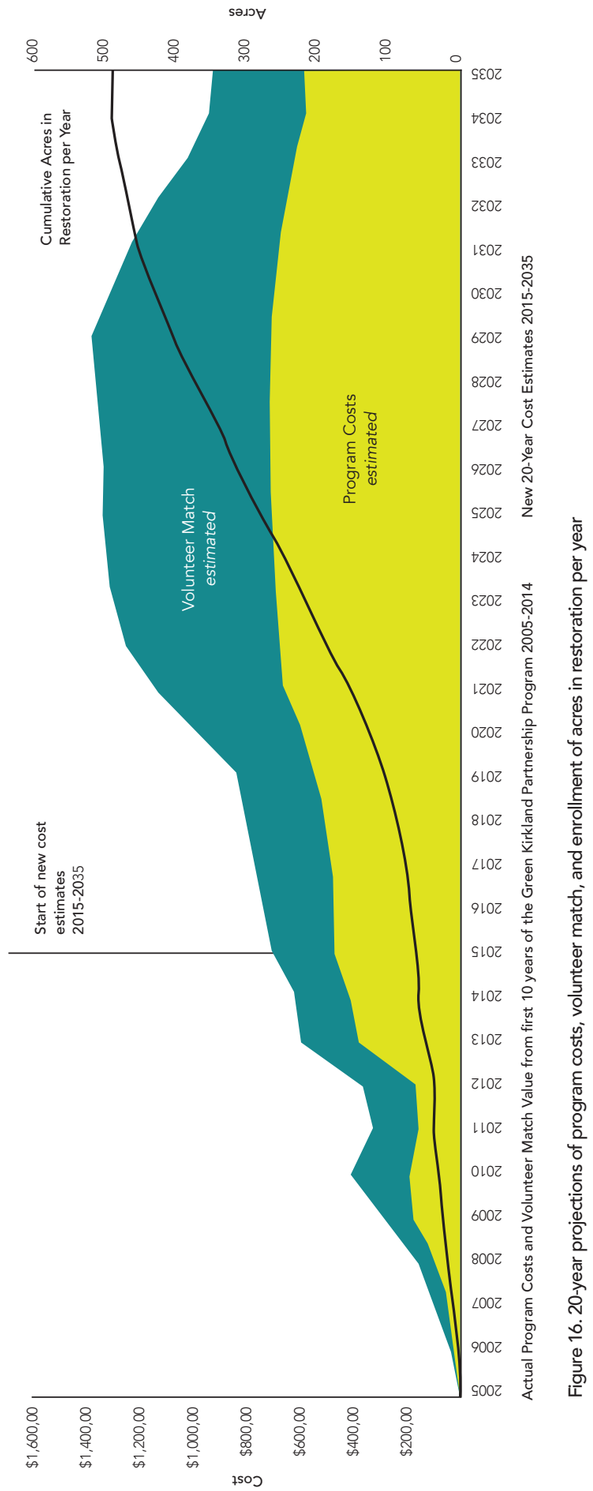


Figure 16. 20-year projections of program costs, volunteer match, and enrollment of acres in restoration per year

Table 7a: Near term strategic plan and benchmarks 2015-2019

FIELD				
2015	2016	2017	2018	2019
Initiate restoration on four new acres and continue efforts on 59 acres already enrolled	Initiate restoration and maintenance on five new acres and continue efforts on first 63 acres	Initiate restoration and maintenance on seven new acres and continue efforts on first 68 acres	Initiate restoration and maintenance on 13 new acres and continue efforts on first 75 acres	Initiate restoration and maintenance on 18 new acres and continue efforts on first 88 acres
Continue restoration activities in 13 active Green Kirkland parks	Identify one new priority park and continue to develop stewardship plans	Identify one new priority park and continue to develop stewardship plans	Identify one new priority park and continue to develop stewardship plans	Identify two new priority parks and develop stewardship plans 18 active parks with acres enrolled in restoration by end of 2019
Develop restoration monitoring plan to track on-the-ground restoration progress	Conduct restoration monitoring	Conduct restoration monitoring	Conduct restoration monitoring	Conduct restoration monitoring, analyze monitoring results and, provide report to stakeholders and field staff
Identify sites in currently active parks that will require professional field crews in sensitive areas Develop work plan and budget for these projects	Identify sites in currently active parks that will require professional field crews in sensitive areas Develop work plan and budget for these projects	Identify sites in need of professional field crews Develop work plan and budget for these projects	Identify sites in need of professional field crews Develop work plan and budget for these projects	Identify sites in need of professional field crews Develop work plan and budget for these projects

Table 7a continued. Near-term strategic plan and benchmarks: 2015-2019

COMMUNITY				
2015	2016	2017	2018	2019
Recruit and manage ~ 8,413 volunteer hours (~2,103 volunteers) Host volunteer appreciation event	Recruit and manage ~ 9,230 volunteer hours (~2,307 volunteers) Host volunteer appreciation event	Recruit and manage ~ 10,581 volunteer hours (~2,645 volunteers. Host volunteer appreciation event	Recruit and manage ~11,010 volunteer hours (~2,753 volunteers) Host volunteer appreciation event	Recruit and manage ~ 10,973 volunteer hours (~2,743 volunteers) Host volunteer appreciation event
Continue to support 26 Green Kirkland Stewards	28 active Green Kirkland Stewards Recruit and train support Stewards	30 active Green Kirkland Stewards Recruit and train support Stewards	32 active Green Kirkland Stewards Recruit and train support Stewards	34 active Green Kirkland Stewards Recruit and train support Stewards
Plan and host 1st Green Kirkland Day	Plan and host 2nd annual Green Kirkland Day	Plan and host 3rd annual Green Kirkland Day	Plan and host 4th annual Green Kirkland Day	Plan and host 5th annual Green Kirkland Day
Host one Green Kirkland Steward Orientation as well as trainings and continuing education workshops for Stewards	Host one Green Kirkland Steward Orientation as well as trainings and continuing education workshops for Stewards	Host one Green Kirkland Steward Orientation as well as trainings and continuing education workshops for Stewards	Host one Green Kirkland Steward Orientation as well as trainings and continuing education workshops for Stewards	Host one Green Kirkland Steward Orientation as well as trainings and continuing education workshops for Stewards
Publicize publication of 20-Year Plan and Partnership accomplishments in local media	Media outreach focused on youth and families and student participation in stewardship	Media outreach focused on public health benefits and ecosystem services provided by healthy forests and natural areas	Media outreach focused on success stories involving Green Kirkland Stewards, volunteers, and corporate participation	Media outreach focused on outcomes from first five years
Continue working with schools to develop youth stewardship opportunities	Evaluate youth steward opportunities and adapt as necessary	Continue working with schools to develop youth stewardship opportunities	Continue working with schools to develop youth stewardship opportunities	Continue working with schools to develop youth stewardship opportunities
Begin outreach and engagement efforts in two to three new neighborhoods Build relationships with community leaders	Continue outreach to remaining new neighborhoods Develop outreach plan to engage community members of diverse ethnic and economic backgrounds	Implement outreach and engagement strategies that welcome a diverse community of volunteers and Green Kirkland Stewards	Implement outreach and engagement strategies that welcome a diverse community of volunteers and Green Kirkland Stewards	Implement outreach and engagement strategies that welcome a diverse community of volunteers and Green Kirkland Stewards

Table 7a continued. Near-term strategic plan and benchmarks: 2015-2019

RESOURCES				
2015	2016	2017	2018	2019
Identify and pursue various funding sources	Identify and pursue various funding sources	Identify and pursue various funding sources	Identify and pursue various funding sources	Identify and pursue various funding sources
Recruit local businesses to contribute to volunteer events	Develop corporate and local business engagement plan	Implement corporate engagement plan Continue to engage businesses supporting Green Kirkland Steward projects	Evaluate corporate engagement plan and adapt as necessary Continue to engage businesses supporting Green Kirkland Steward projects	Continue to engage businesses supporting Green Kirkland Steward projects
Costs projected at $467,804 for 2015	Costs projected at $475,299 for 2016	Cost projected at $481,558 for 2017	Costs projected at $500,206 for 2018	Costs projected at $531,641 for 2019
ADMINISTRATION				
Hold weekly Partnership Management Team Meetings	Hold weekly Partnership Management Team Meetings	Explore developing Community Advisory Committee Hold weekly Partnership Management Team Meetings	Hold weekly Partnership Management Team Meetings	Hold weekly Partnership Management Team Meetings
Develop data management and reporting plan Investigate using online system	Finalize and implement data management plan Continue to report and record both field and volunteer data	Continue to report and record both field and volunteer data	Continue to report and record both field and volunteer data	Continue to report and record both field and volunteer data
Publish and distribute 20-year restoration plan	Write and distribute 2015 annual report	Write and distribute 2015 annual report	Write and distribute 2015 annual report	Write and distribute 2015 annual report
Develop 2016 work plan	Develop 2017 work plan	Develop 2018 work plan	Develop 2019 work plan	Develop 2020 work plan

Table 7b. Long-term strategic plan and benchmarks: 2020-2034

FIELD		
2020–2024	2025–2029	2030–2034
Enroll 23 to 31 new acres in initial restoration per year 23 parklands with acres enrolled in restoration Develop park-level stewardship plans` Continue restoration and maintenance on all previously enrolled acres Update habitat assessment to include new land acquisitions	Continue adding approximately 31 new acres in initial restoration per year 28 parklands with acres enrolled in restoration Revise park-level stewardship plans as needed Continue restoration and maintenance on all previously enrolled acres Update habitat assessment	Enroll remaining 56 acres. All acres in restoration by 2034 34 parklands with acres enrolled in restoration Revise park-level stewardship plans as needed Continue restoration and maintenance on all previously enrolled acres
COMMUNITY		
An active Green Kirkland Steward group working in approximately 50% of project areas by end of 2024	An active Green Kirkland Steward group working in 80% of project areas by end of 2029	Continue program with active Green Kirkland Stewards in 100% of project areas
Recruit and manage 14,253 to 22,188 volunteer hours (~3,563 to 5,547 volunteers) per year by 2024	Recruit and manage 22,712 to 24,309 volunteer hours (~5,678 to 6,077 volunteers) per year by 2029	Recruit and manage 12,751to 22,500 volunteer hours (~3,188 -5,625 volunteers) through 2034 Hours needed to support restoration efforts decrease as all acres are entered into restoration

Table 7b continued. Long-term strategic plan and benchmarks: 2020-2034

RESOURCES		
2020–2024	2025–2029	2030–2034
Reevaluate program costs based on first five years of fieldwork	Evaluate and update methodology	Evaluate and update methodology
Costs projected at $3.3 million for five years	Costs projected at $ 3.5 million for five years	Costs projected at $3.2 million for five years
Establish public funding base	Sustain public funding base	Ensure proper funding base for long-term maintenance and monitoring of all acres once 20-year plan is completed
ADMINISTRATION		
Conduct a 10-year evaluation and update of strategic plan and benchmarks Develop a midplan status report and share with partners and stakeholders Create five-year implementation plan	Create five-year implementation plan	Expand the Green Kirkland Partnership Program to city-owned land managed by other departments, as appropriate
Continue to report and record both field and volunteer data and publish annual progress reports	Continue to report and record both field and volunteer data and publish annual progress reports	Continue to report and record both field and volunteer data and publish annual progress reports
Convene Community Advisory Committee on an annual basis Hold weekly Partnership Management Team Meetings	Convene Community Advisory Committee on an annual basis Hold weekly Partnership Management Team Meetings	Convene Community Advisory Committee on an annual basis Hold weekly Partnership Management Team Meetings
Continue to develop annual work plans	Continue to develop annual work plans	Complete 20-year progress report and host community open house to report and celebrate accomplishments Develop long-term plan for continued maintenance of forested and natural area parkland and community-based stewardship efforts

V. ADAPTIVE MANAGEMENT

Professional crew member leading volunteer event.

The Green Kirkland Partnership's primary goal is to reestablish and maintain healthy, sustainable natural open spaces. The Partnership is an intensive, one-time intervention to restore the health of Kirkland's native habitats through community action, volunteer effort, and strategic restoration planning. After 20 years and restoration of the projected 487 acres in the program, labor and funding needs can be reduced to a maintenance level, but will continue to exist. The goal of a healthy natural forest or natural area park can be achieved only by careful management of resources.

Forests and natural areas are complex ecosystems influenced both by natural factors and the human systems that surround them. These human systems that impact and ultimately must care for these ecosystems are equally complex. Any strategy to restore and maintain forested parks and natural areas must systematically address all of the factors that affect the health of those lands. In response to this complexity, an adaptive management model has been developed.

Adaptive management systematically improves management policies and practices. It is a repeating cycle of six steps: problem assessment, strategy development, implementation, monitoring, evaluation, and strategy adjustment (Figure 17). 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.

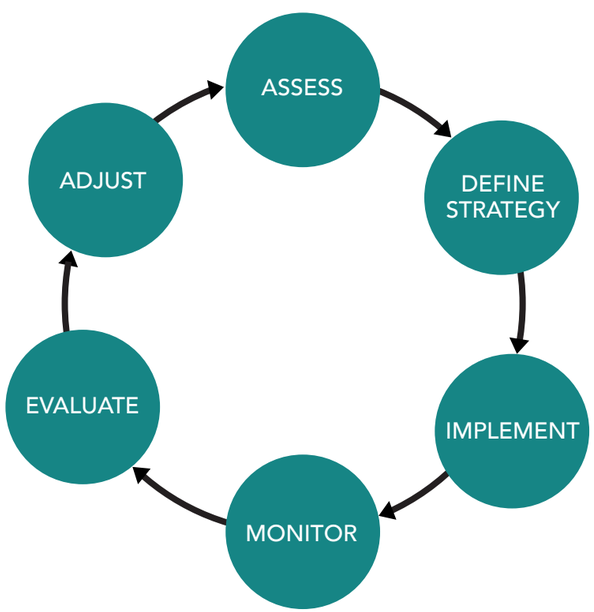


Figure 17. Adaptive Framework Cycle

This section describes how the Partnership will apply adaptive management and the Balanced Scorecard approach to track and monitor progress, distribute resources, and report on the Partnership's success. The Balanced Scorecard approach to strategy development and monitoring helps assess all aspects of the program (fieldwork, community, resources, and administration) necessary to reach the goal of enrolling all 487 acres in restoration by the end of 2035. Simply monitoring the outcomes of fieldwork would not allow staff to anticipate problems and make adjustments to other parts of the program. The Balanced Scorecard allows staff to track the resources and community support necessary for accomplishing the fieldwork.

Measuring Success

Two types of information will help in analyzing the Green Kirkland Partnership's effectiveness: program monitoring and field monitoring. Monitoring allows for improvement in the Partnership programs' 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 are met. Benchmarks are outlined in Tables 7a and 7b.

Table 8 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, one 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 Plan

At the close of each year, Green Kirkland Partnership staff will continue to collect data on Balanced Scorecard measures and track progress toward the annual work plan goals and benchmarks. Data management systems have been developed to record information pertinent to these measurements throughout the year so that progress can easily be summarized at year's end. Green Kirkland currently tracks the number of participants and hours they work each year and will continue to do so throughout the life of the program.

Field Monitoring Plan

As the restoration and maintenance program proceeds, routine monitoring of restoration sites will continue to be conducted to track the condition and health of restored sites and gauge progress. Success will rely on developing and refining effective strategies to remove and control invasive plants.

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 park 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, tracking can become complicated. Managing data entry and paperwork as the program grows has proven to be expensive in other Green Cities. The Partnership is in the process of addressing this issue and investigating database tools to streamline data management processes.

Resource Distribution

Funding for the Green Kirkland Partnership comes from a variety of sources and partners; however, the primary funding mechanism is the ongoing stable funding from the 2012 Parks Levy. Additional consistent annual funding will come from the real estate excise tax (Capital Improvement Program funding). These funding sources support the Partnership at its current capacity. As outlined in the resource objectives, the Partnership will need to determine the staffing and resources needed to further expand support for volunteer management, marketing and outreach, fund development, and professional field staff to meet long-term goals.

In the near term, the Partnership could consider directing resources toward sharing a field crew with another City division, partner organization, or Green City Partnership. This may be a cost-effective way to begin addressing restoration needs in sensitive areas and achieve restoration acre goals laid out in the plan.

Partners should focus on activities that build public interest in and awareness of the Green Kirkland Partnership and form critical relationships with supporters, such as restoration in parklands that intersect the Cross Kirkland Corridor. Increased visibility and recognition can lead to higher levels of public and private funding, corporate and individual donations, and greater volunteer contributions. As the Partnership continues to establish and expand its volunteer base for the program, partners may consider shifting resources to provide more support for additional new projects.

Reporting and Sharing Knowledge

The Green Kirkland Partnership's progress will be reported annually to the Kirkland City Council, Kirkland Park Board, partners, Stewards, 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 be encouraged to utilize and develop effective methods to restore and maintain forest and natural area parkland. Staff will also utilize inventive outreach strategies, and network with regional restoration 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 Kirkland Partnership will have opportunities to share successes and challenges with other cities (Seattle, Tacoma, Kirkland, Redmond, Kent, and Puyallup) that are dedicated to a similar goal and vision. Written materials, including this 20-year Plan, will be posted on the Green Kirkland Partnership website (www.greenkirkland.org), and all parties using these resources will be given the opportunity to provide feedback on the Partnership's methods and materials.

Table 8. Balanced scorecard

OBJECTIVE		MEASURE
Restore and maintain 487 acres of forested and natural area parklands by 2035		# of acres in restoration to annual goal
FIELD: *ALL 487 ACRES ARE ENROLLED IN RESTORATION BY 2035*		
EVALUATE	Evaluate conditions and prioritize sites for restoration using tree-iage model	◆ Annual work plan completed identifying specific restoration to be implemented at each active park
PLAN	Develop annual work plan for each active park	◆ Annual work plan completed identifying specific restoration to be implemented at each active park
IMPLEMENT	Implement restoration projects optimizing ecological function, using the four-phase approach	◆ # of acres entered into restoration and maintenance ◆ Best practices evaluated annually and updated as needed
MONITOR	Establish monitoring program Monitor and maintain sites over the long term	◆ Annual monitoring report ◆ # of acres entered into Phase-4 work ◆ Maintenance is performed as indicated
COMMUNITY: *AN INFORMED, INVOLVED, AND ACTIVE CIVIC COMMUNITY SUPPORTS THE GREEN KIRKLAND PARTNERSHIP*		
RESIDENTS, LOCAL BUSINESS, SCHOOLS, ETC.	Educate and engage the community about the problem and solution through Green Kirkland Partnership	◆ Outreach and education program materials developed and distributed
	Community supports and desires active management of forest and natural areas through widespread understanding of the issue and support of Green Kirkland Partnership as solution	◆ Outreach and education program materials developed and distributed
	Encourage businesses to contribute to program goals	◆ # of businesses supporting program through sponsorship, in-kind contributions, or volunteer events
VOLUNTEERS	Engage youth and community organizations in restoration and monitoring	◆ # of groups participating in events ◆ # of hours contributed
	Recruit and train Stewards in volunteer management and BMPs	◆ # of active Stewards ◆ # of Steward events
	Demonstrate appreciation for volunteers and seek input into program	◆ # of volunteer suggestions implemented ◆ # of volunteer recognition activities

Table 8. continued Balanced scorecard

RESOURCES: *SUFFICIENT RESOURCES ARE AVAILABLE TO ACTIVELY MANAGE SITES AND PROVIDE LONG-TERM MAINTENANCE*		
FINANCIAL	Continue current municipal funding Develop long-term, stable public funding source	◆ $ budgeted and sourced to meet management requirements ◆ Mechanisms in place sufficient to meet projected needs
PAID STAFF & LABOR	Provide sufficient staff to support fieldwork, volunteer management, and Partnership programs Deploy skilled field crews for priority sites lacking volunteer support or sites with difficult conditions	◆ # staff/crew dedicated to supporting the program ◆ % of requests for crew/staff assistance completed ◆ # 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 Increase productivity by providing support and materials to volunteers	◆ # of hours to annual goal ◆ Estimated value of volunteer contribution ◆ $ and hours/acre enrolled ◆ Staff cost per volunteer hour ◆ # of tool/material requests processed
MANAGEMENT STRUCTURE	Develop management structure comprised of primary Partners to provide oversight of three main 20-Year Plan elements	◆ 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	◆ 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	◆ Annual reports distributed to the general public, Parks Board, City Council, and all Partnership stakeholders

VI. CONCLUSION

The Green Kirkland Partnership intends to use this 20-Year Forest and Natural Areas Restoration Plan as a tool, resource, and roadmap to guide the Partnership in the restoration, maintenance, and stewardship of 487 acres of valuable forest and natural area parkland within the City of Kirkland. Forest and natural areas assessed in the plan will continue to face pressures and threats such as fragmentation, invasive species that prevent native species from regenerating, declining native plant and tree diversity, and resource limitations for restoration, maintenance, and stewardship activities. Pressures and threats to Kirkland's forest and natural areas diminish the important benefits they provide, such as reduced stormwater runoff, improved water and air quality, stronger property values and attractive communities, reduced greenhouse gases, increased habitat for native wildlife, and improved quality of life. The Green Kirkland Partnership has the opportunity to continue the work it started in 2005 to build a sustainable network of healthy parklands that provide community benefits for current and future generations.

The plan offers a snapshot of the ecological state of the City's forests and natural areas, using the FLAT analysis approach and tree-iage model to rank current conditions. Ecological data collected through the FLAT analysis occurred at the management unit scale, delivering average conditions associated with each management unit. Green Kirkland has reaffirmed and clarified its program vision and goals utilizing current partner staff capacity, volunteer contributions, information gained about each park, and lessons learned from nearly 10 years of experience. In addition, the plan outlines proposed costs associated with restoring, maintaining, and stewarding all 487 acres, and anticipated leveraged volunteer contributions over the next 20 years.

The Partnership understands that limited resources of funding and staff time will require effective, efficient, and priority-driven restoration and maintenance activities, and coordinated efforts with other City programs and divisions. Achievement of proposed goals will require exploration of additional sustainable, long-term funding options from various sources, which will allow the program to grow and support long-term stewardship. Partners should consider the Green Kirkland Partnership 20-Year Forest and Natural Areas Restoration Plan as a living document that will evolve as new ecological data becomes available, the Green Kirkland Steward Program and volunteer contributions grow, and the Partnership secures new funding sources. Working together, partners and community members can restore, maintain, and steward Kirkland's forested and natural area parklands, which support healthy ecosystems and a vibrant city.

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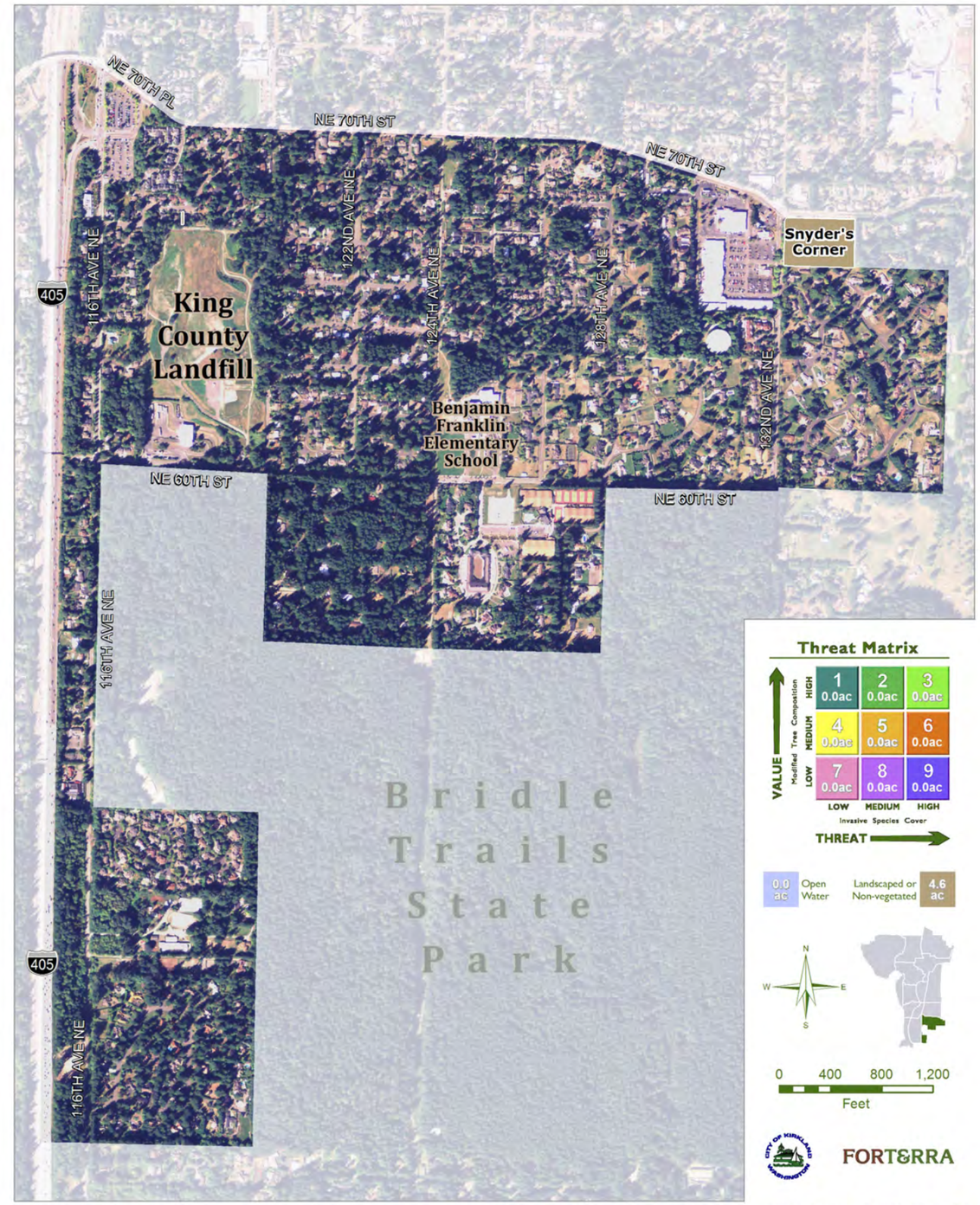
VIII. APPENDICES

GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation

Bridle Trails Neighborhood



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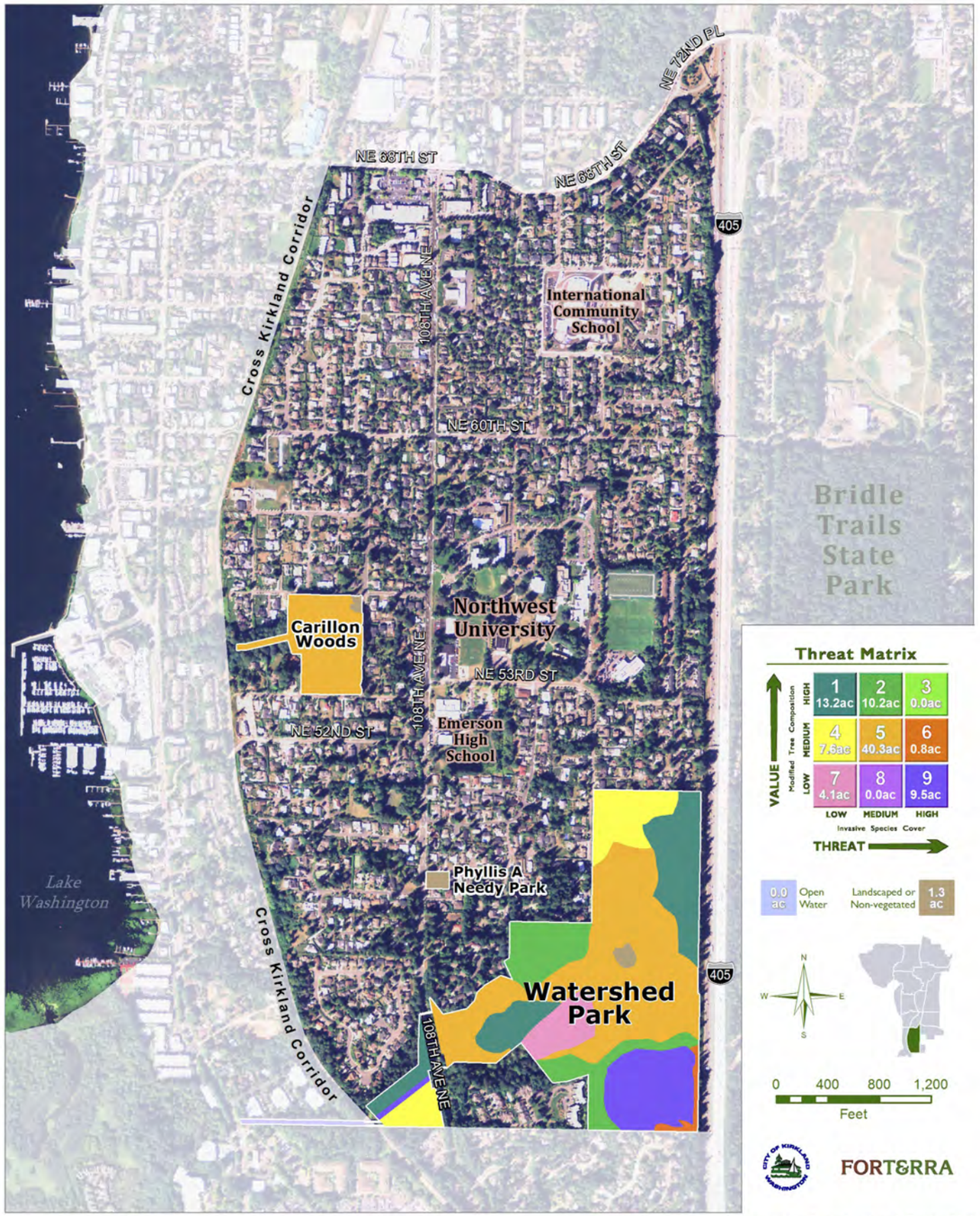
Field assessment conducted by American Forest Management, Inc., September through October 2014

GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation — Central Houghton Neighborhood



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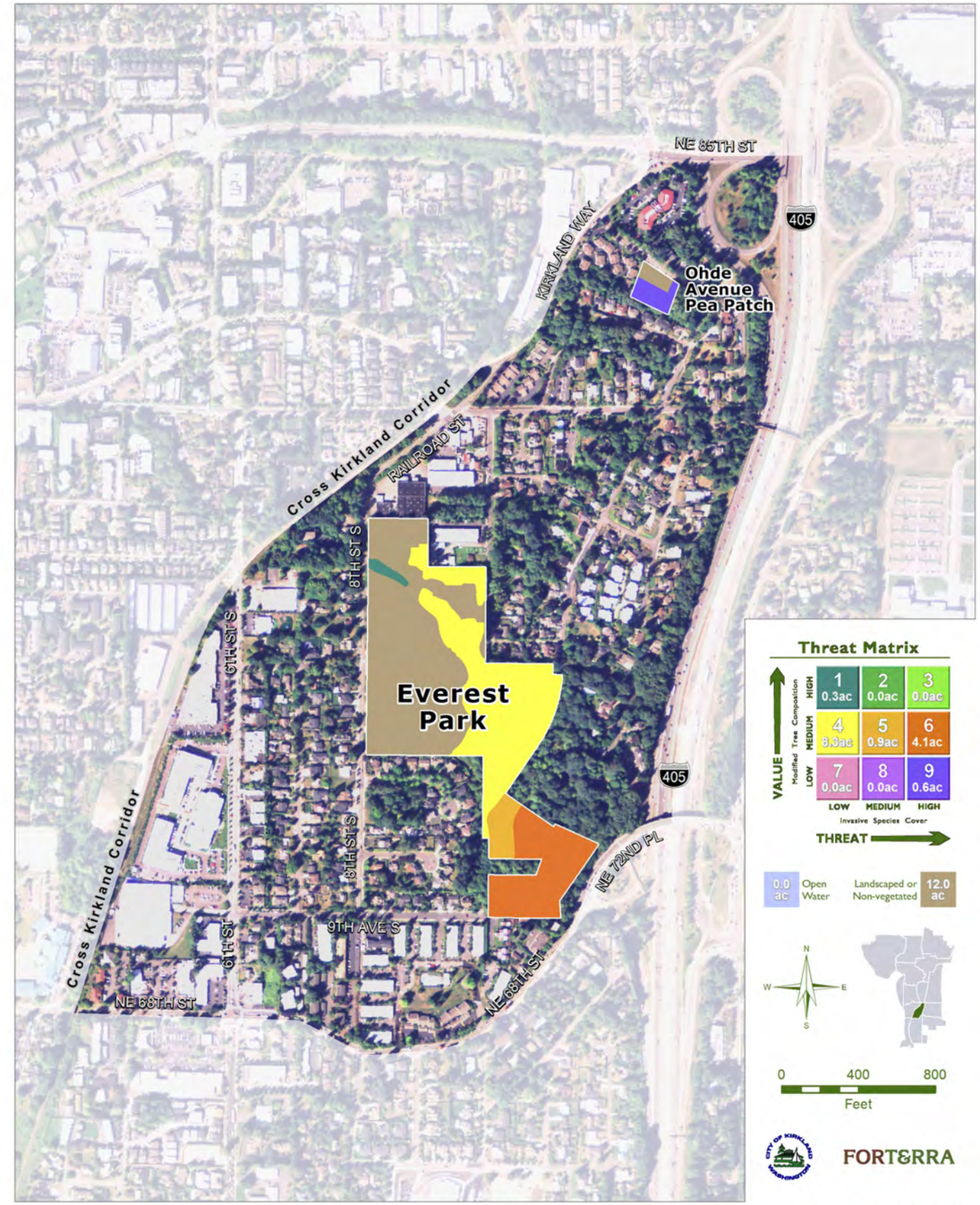
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation — Everest Neighborhood



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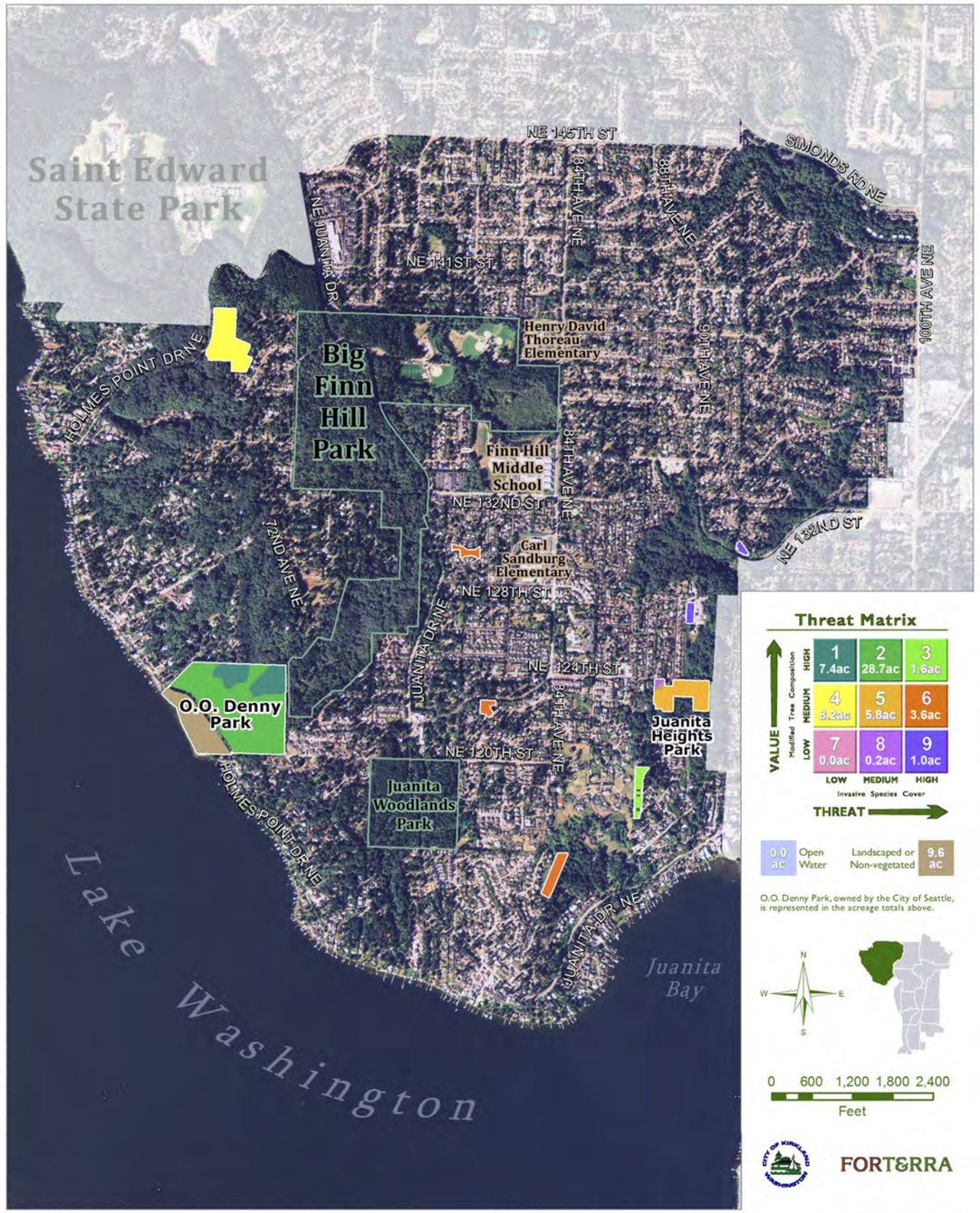
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation — Finn Hill Neighborhood



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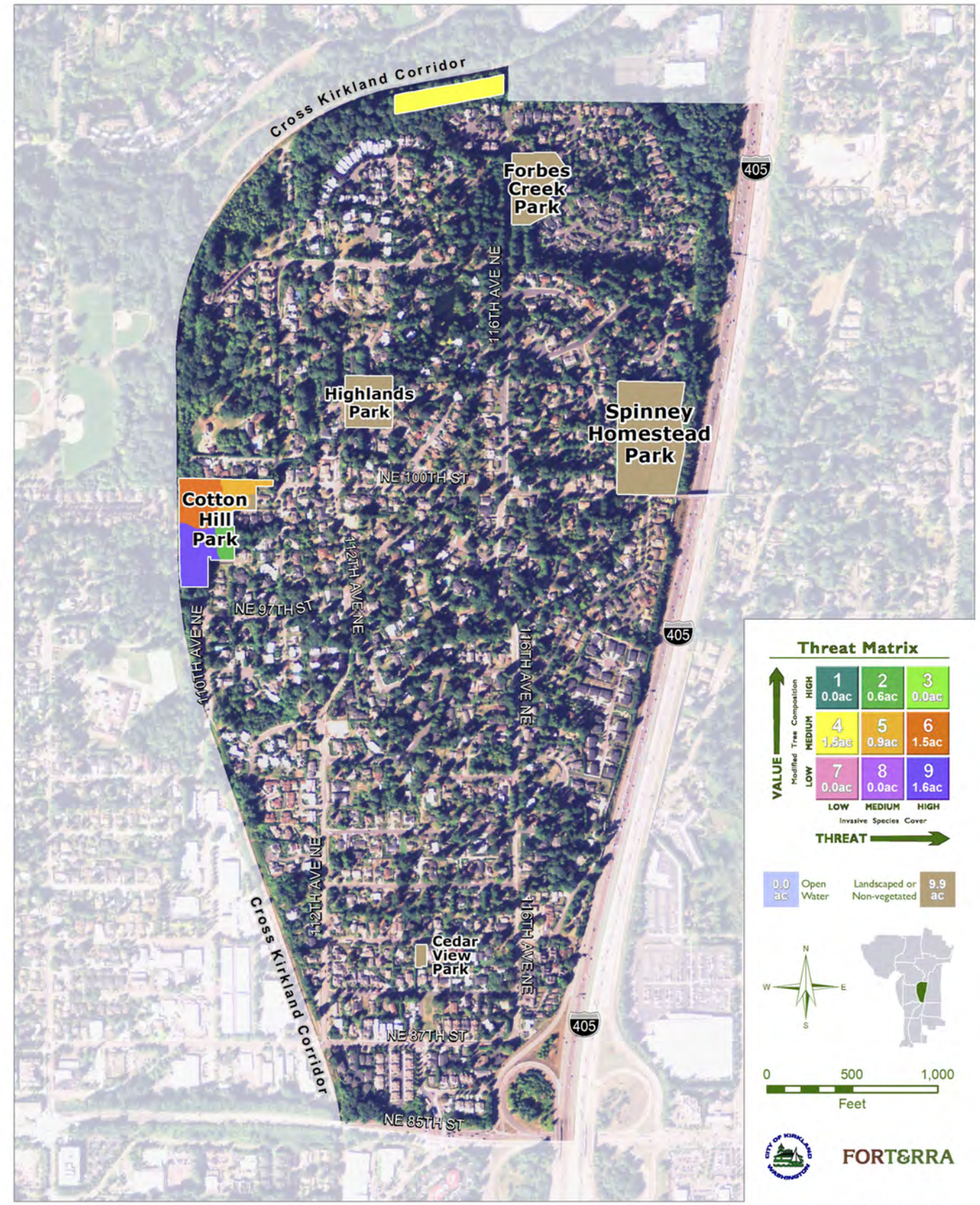
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation — Highlands Neighborhood



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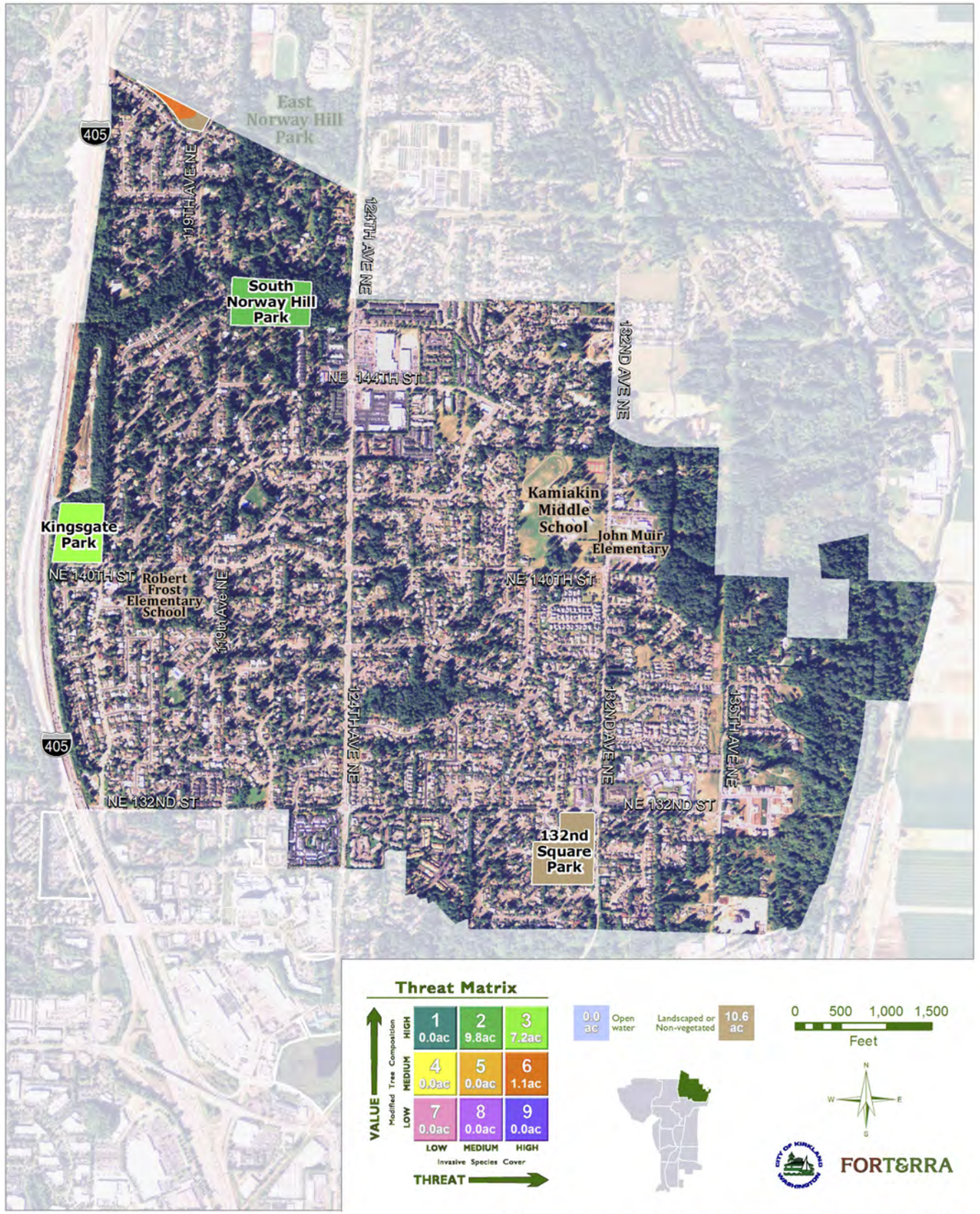
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation — Kingsgate Neighborhood



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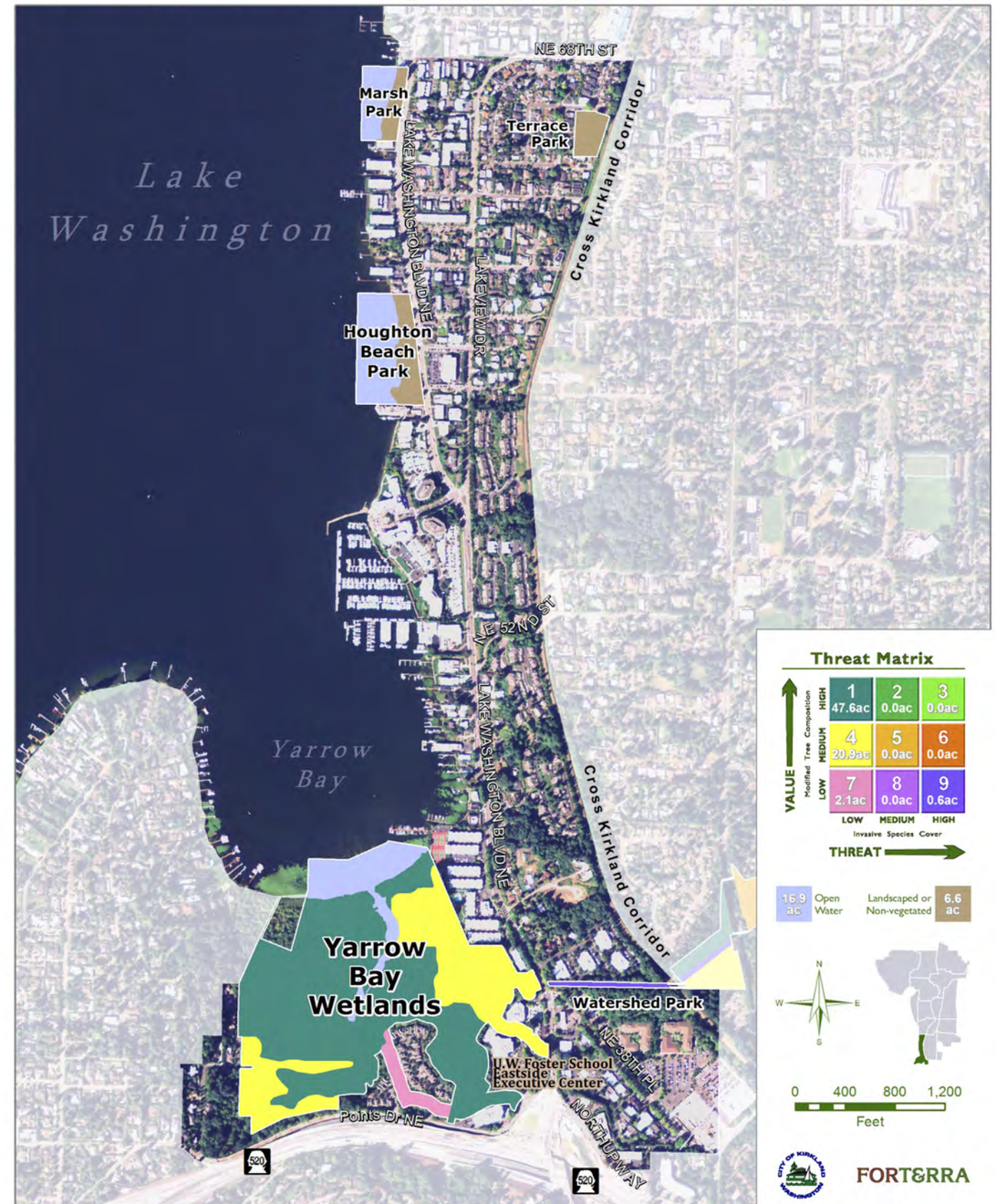
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation — Lakeview Neighborhood



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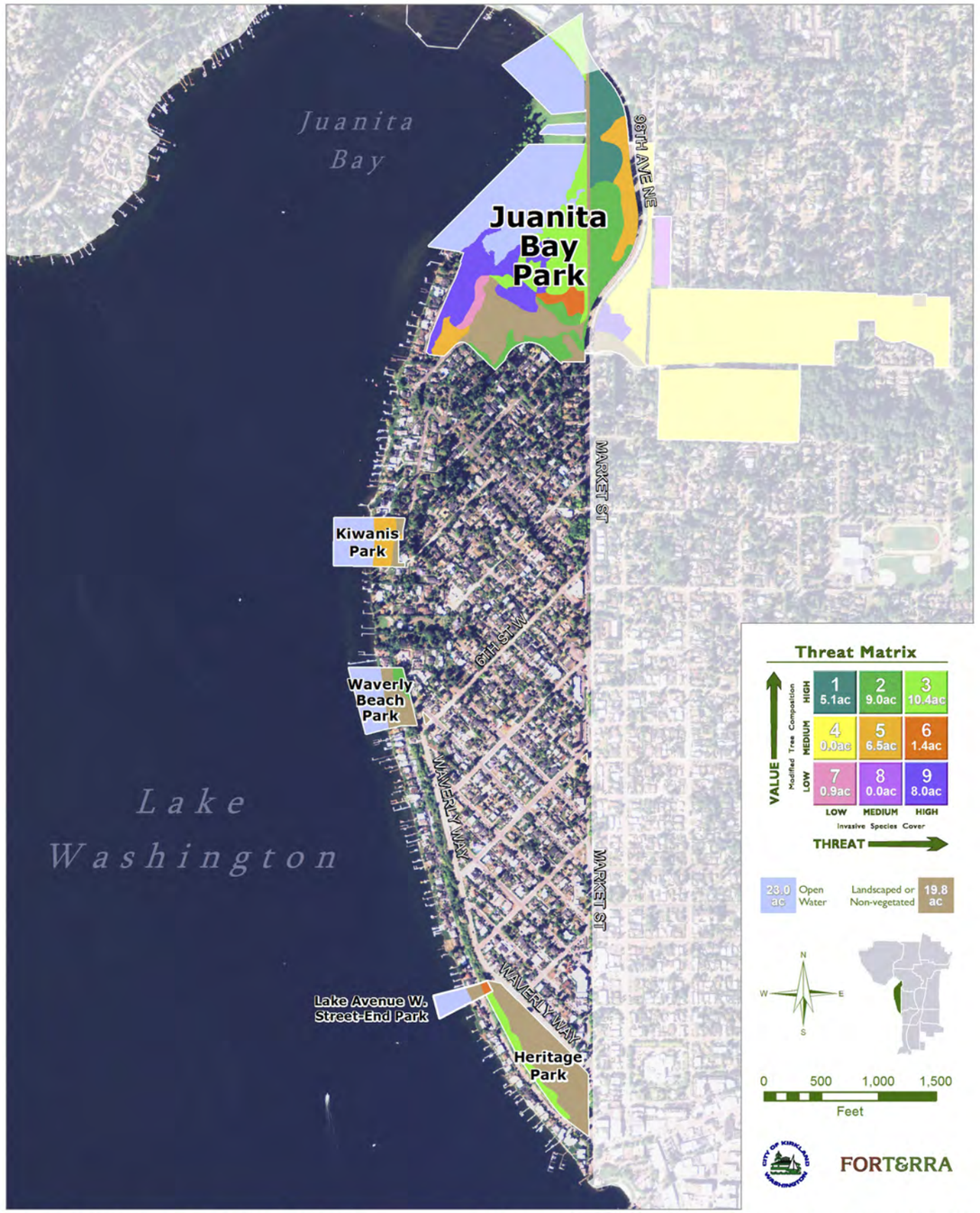
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation

Market Neighborhood



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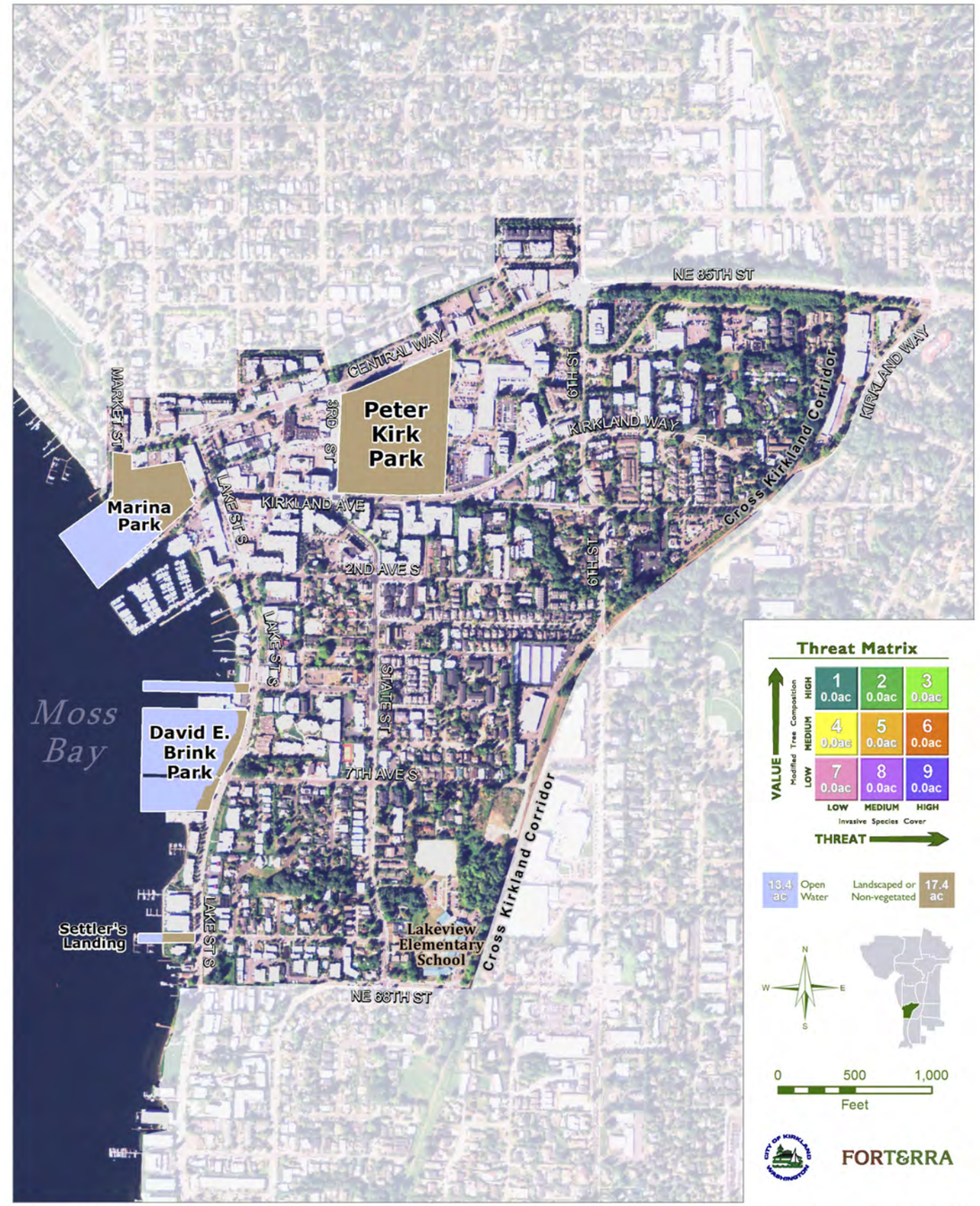
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation

Moss Bay Neighborhood



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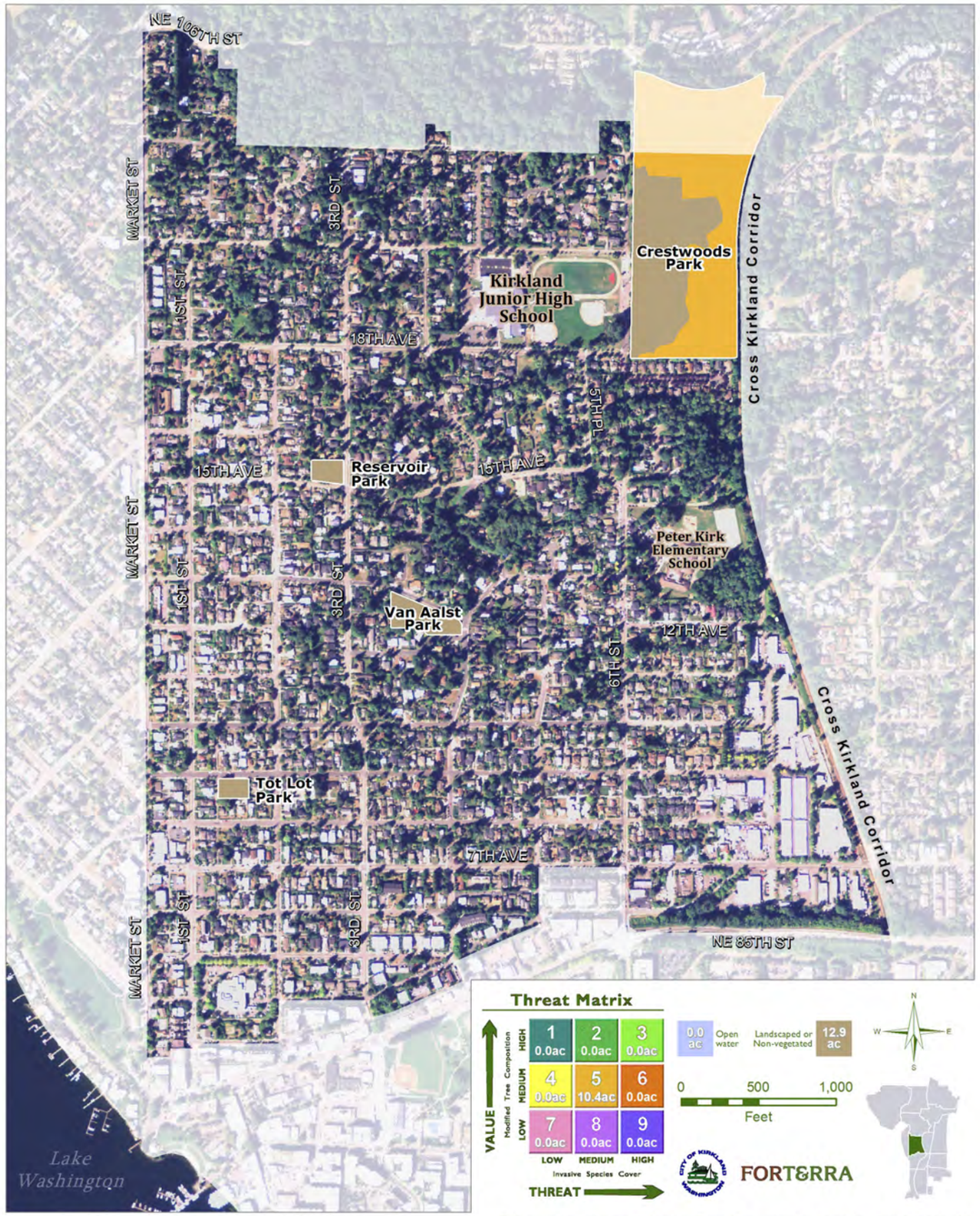
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation — Norkirk Neighborhood



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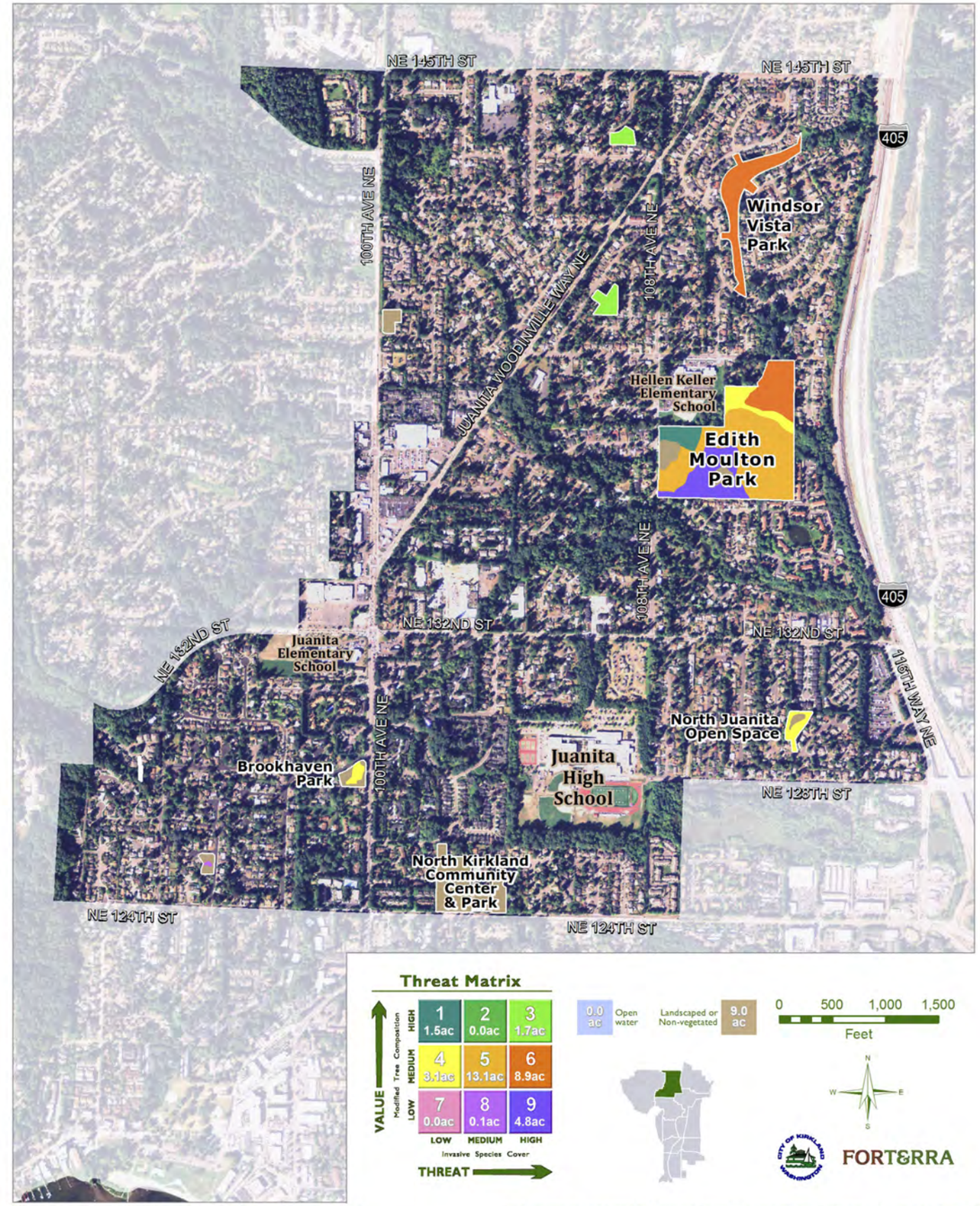
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation — North Juanita Neighborhood



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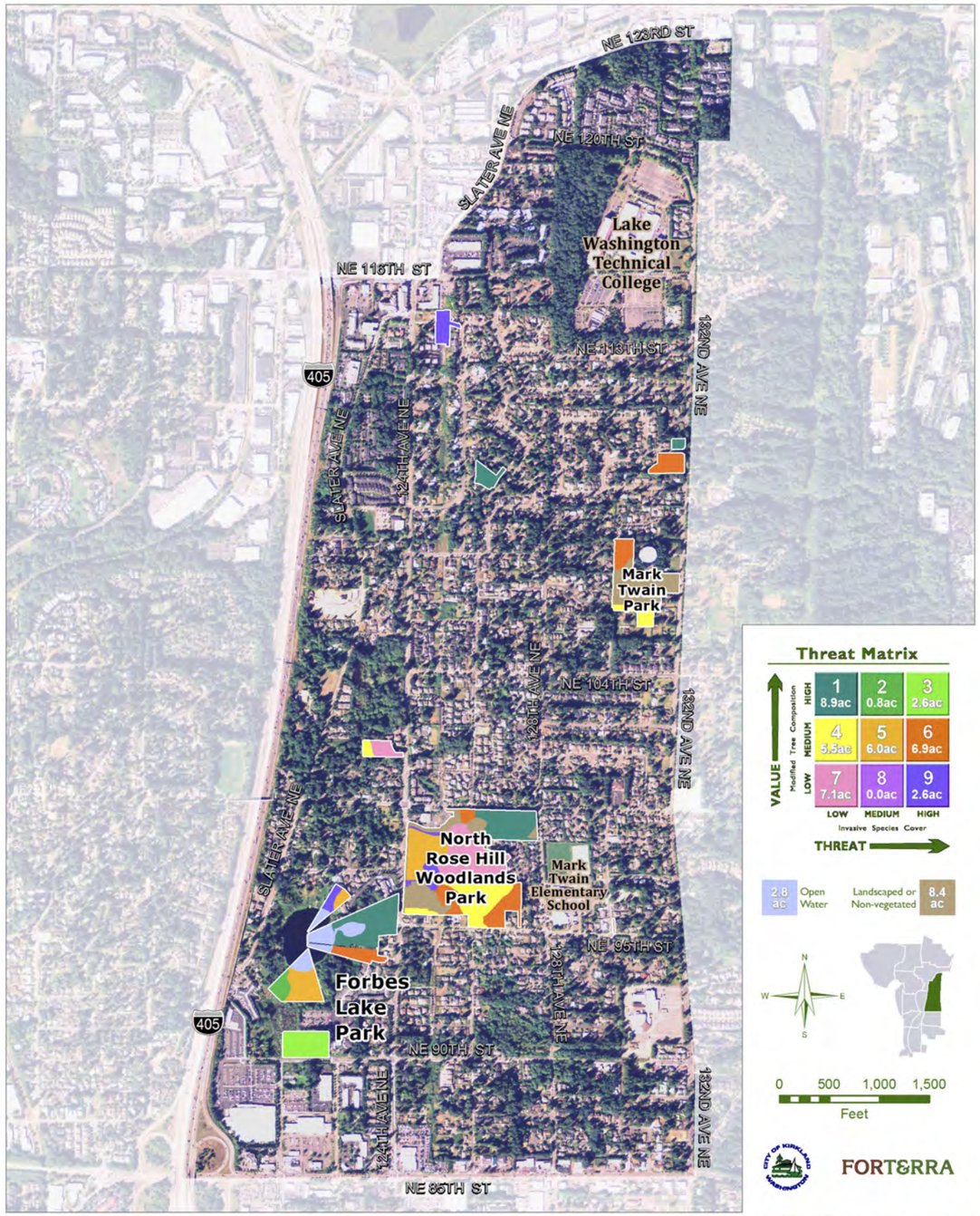
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation — North Rose Hill Neighborhood



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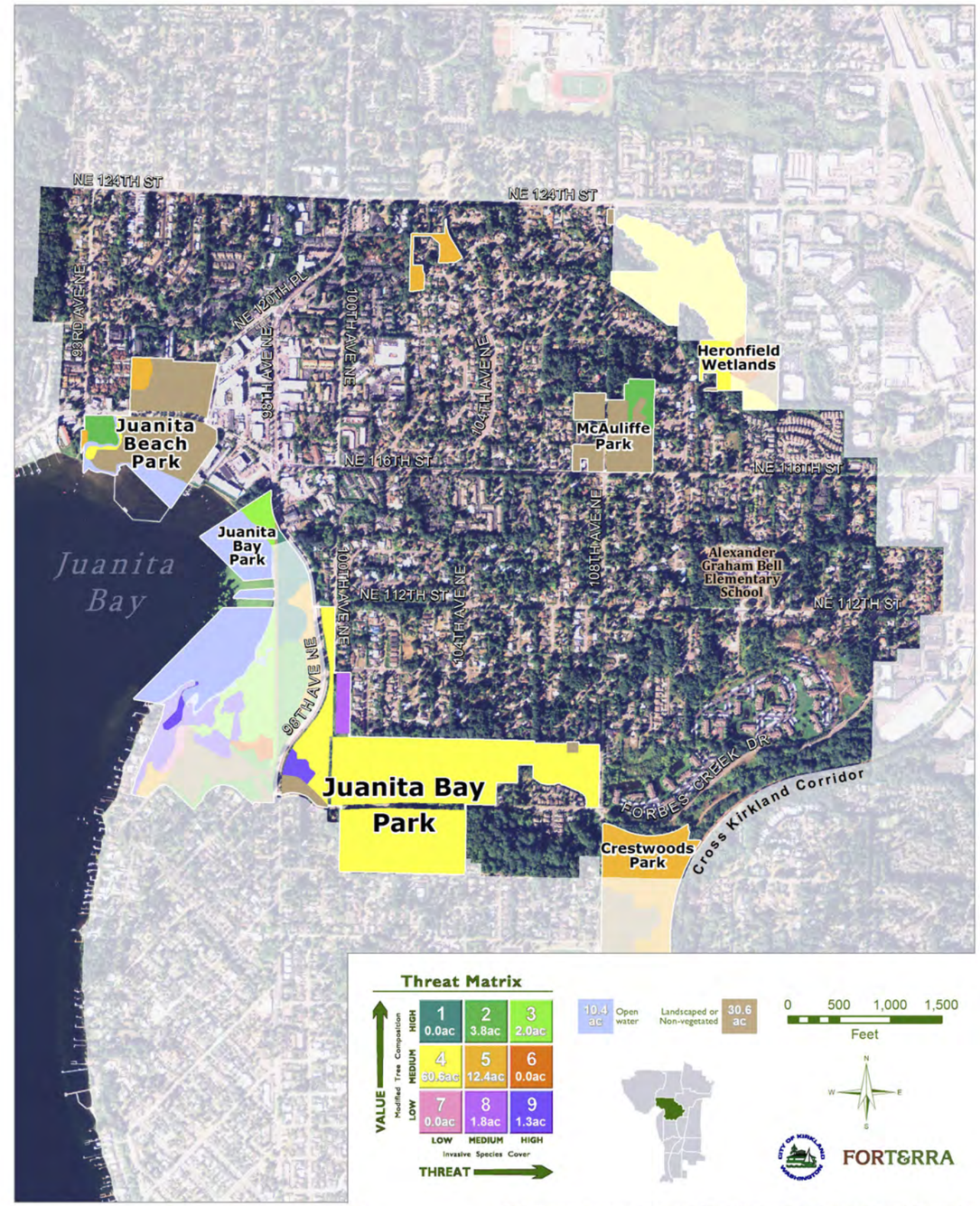
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation — South Juanita Neighborhood



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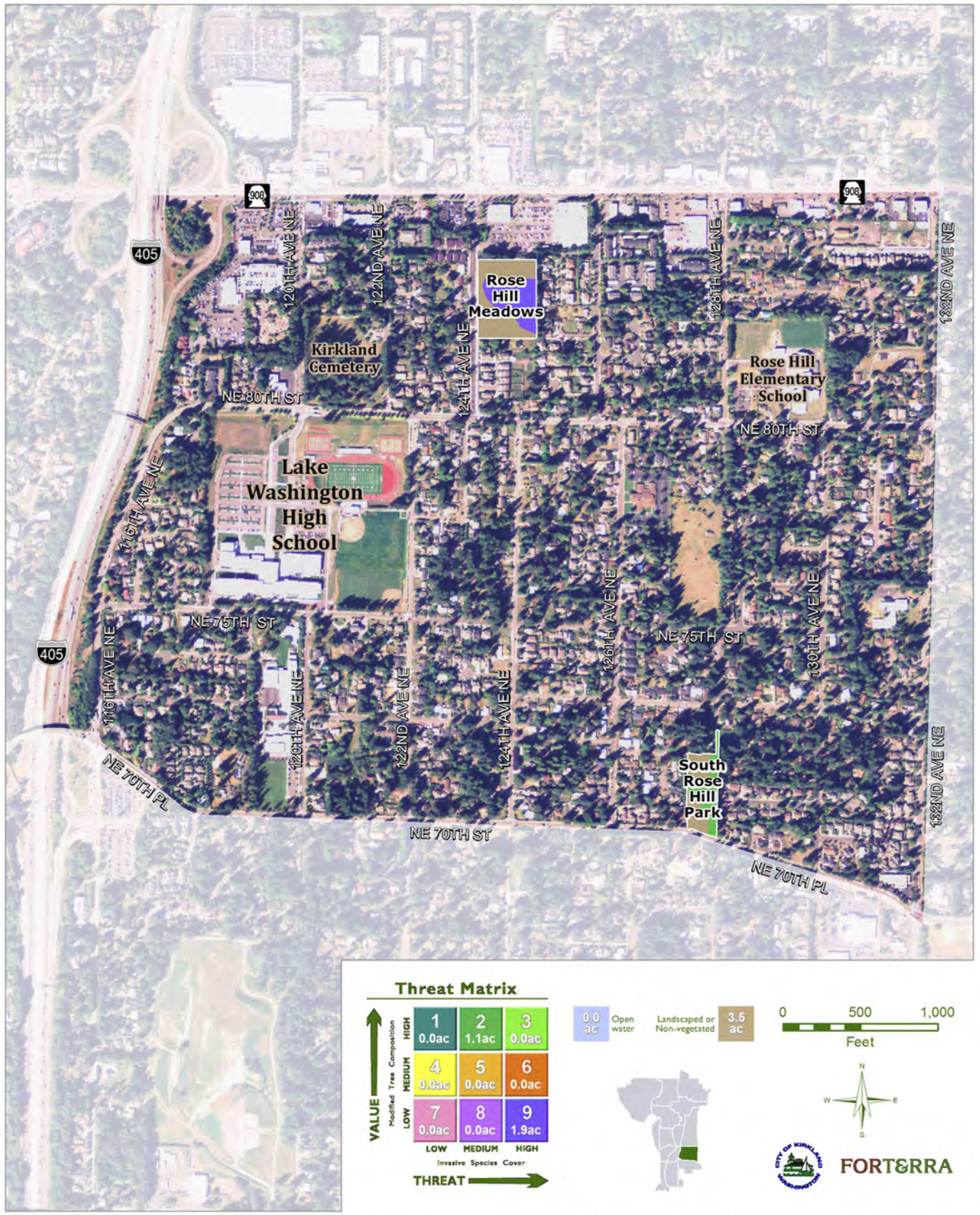
GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation South Rose Hill Neighborhood



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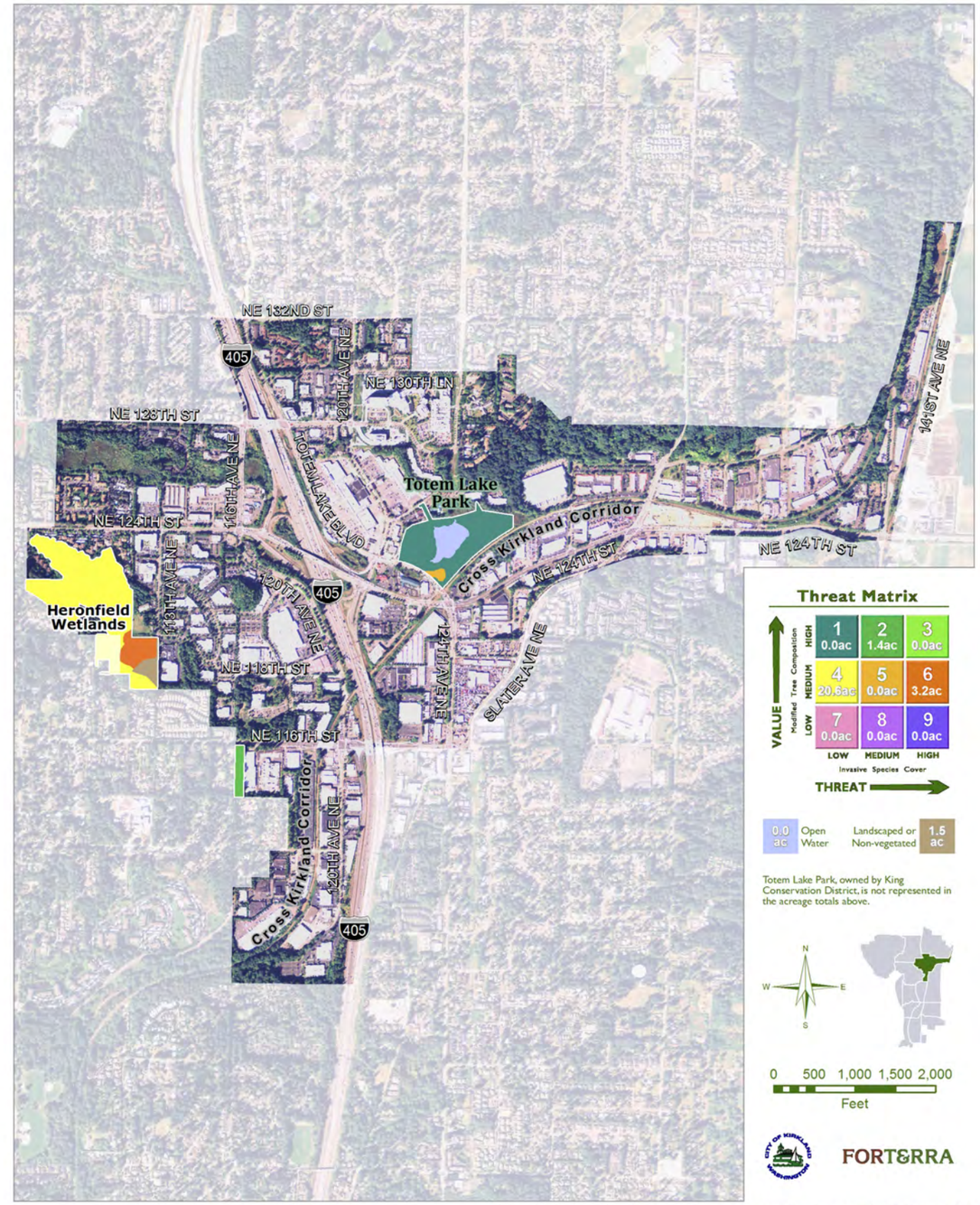
Field assessment conducted by American Forest Management, Inc., September through October 2014

GREEN KIRKLAND PARTNERSHIP

Forest and Natural Areas Tree-iage Evaluation Totem Lake Neighborhood



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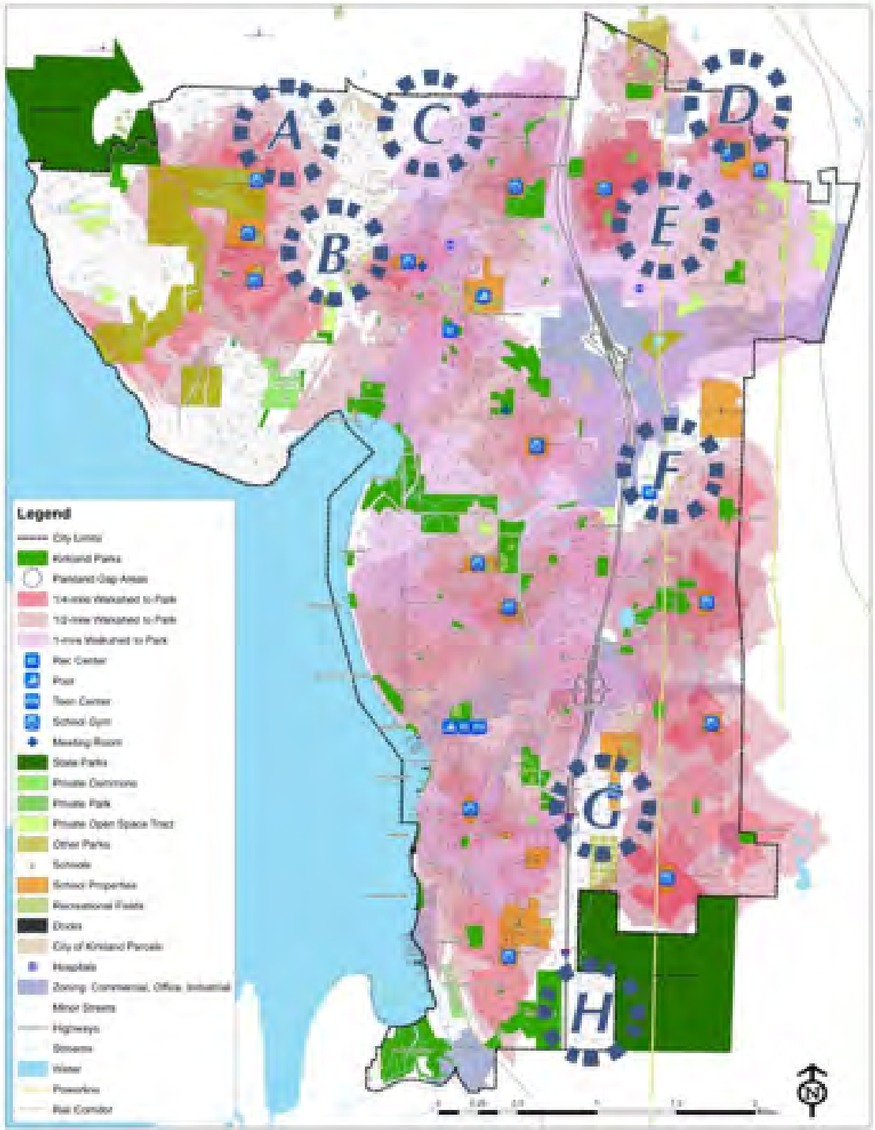
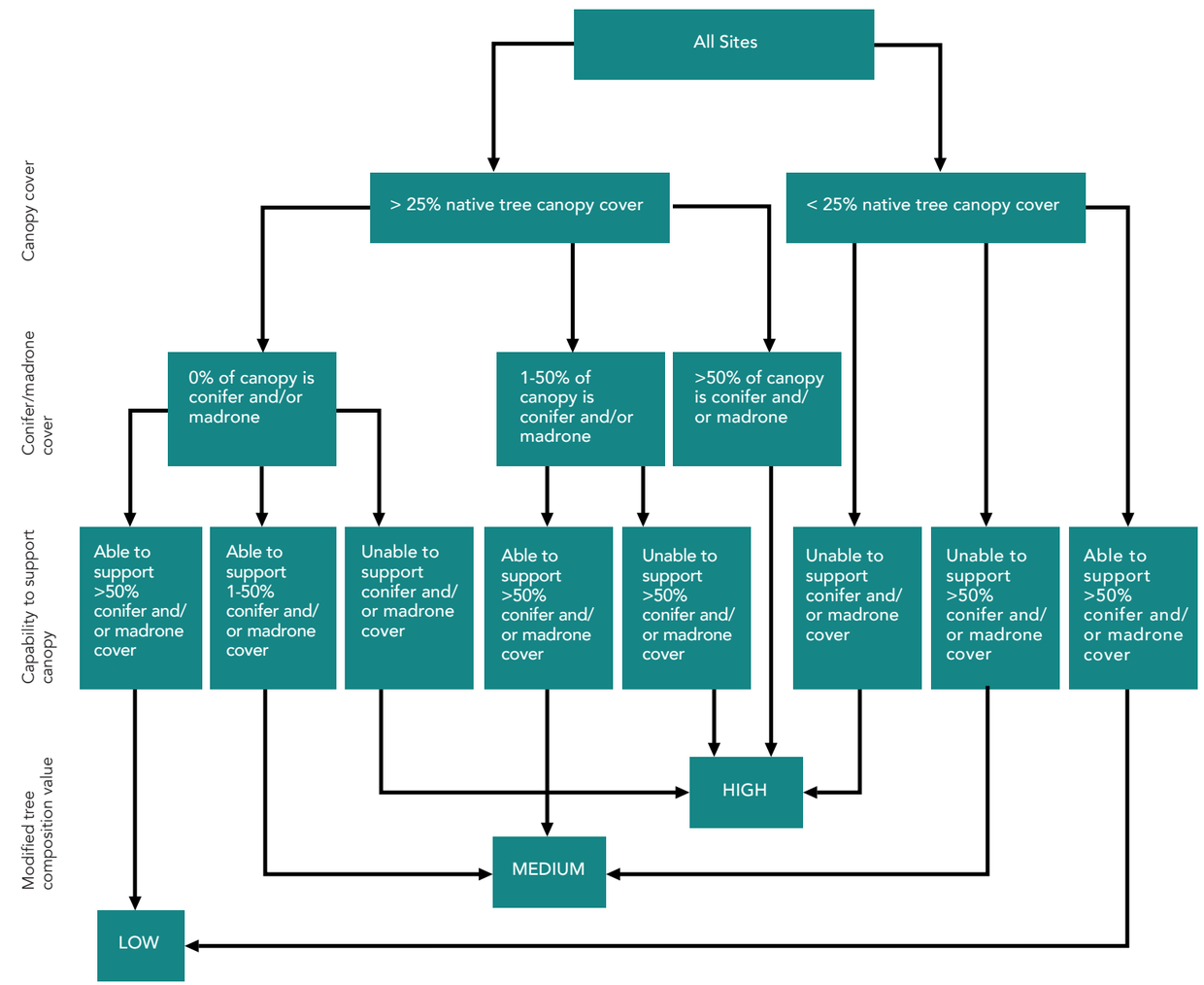
Appendix B: Map of Gap Analysis for Land Acquisition



Eight potential acquisition areas for neighborhood parks were identified:

Northeastern portion of the Finn Hill neighborhood (Gap Area 'A')
Southwestern portion of the North Juanita neighborhood (Gap Area 'B')
Northeastern portion of the North Juanita neighborhood (Gap Area 'C')
Northeastern portion of the Kingsgate neighborhood (Gap Area 'D')
Central portion of the Kingsgate neighborhood (Gap Area 'E')
Northern portion of the North Rose Hill neighborhood (Gap Area 'F')
Western portion of the South Rose Hill neighborhood (Gap Area 'G')
Southern portion of the Bridle Trails neighborhood (Gap Area 'H')

Appendix C: Forest Landscape Assessment Tool (FLAT) Flow Chart for Habitat Composition



Appendix D: Management Unit Acres per Tree-iage Acre per Park

PARK NAME	TREE-IAGE CATEGORY 1	2	3	4	5	6	7	8	9	ACRES PER PARK
Brookhaven Park				0.46						0.46
Carillon Woods					9.25					9.25
Cotton Hill Park		0.57			0.88	1.46			1.55	4.46
Crestwoods Park					19.27	19.2				19.27
Edith Moulton Park	1.47			1.84	13.09	3.92			4.77	25.09
Everest Park	0.25			8.31	0.95	4.11				13.62
Finn Hill Open Space			1.59	8.24		3.59			1.01	14.43
Forbes Lake Park	4.21	0.84	2.58		2.52	1.20			0.50	11.85
Heritage Park			1.73							1.73
Heronfield Wetlands				24.74		3.20				27.94
Highlands Natural Area				1.52						1.52
Juanita Bay Park	5.14	8.50	10.72	55.87	4.75	1.24	0.95	1.83	9.27	98.27
Juanita Beach Park		1.77		0.59	1.50					3.86
Juanita Heights Park					5.79		0.23			6.02
Kingsgate Open Space						1.11				1.11
Kingsgate Park			7.23							7.23
Kiwanis Park					1.75					1.75
Lake Avenue W. Street End Park						0.18				0.18
Mark Twain Park				1.04		1.06				2.10
McAuliffe Park		2.07								2.07
North Juanita Open Space			1.66					0.07		1.73
North Juanita Open Space Park				0.79						0.79
North Rose Hill Open Space	1.15			0.29		1.25	0.78		1.08	4.55
North Rose Hill Woodlands Park	3.51			4.20	3.48	3.44	6.34	1.04		22.01
Ohde Avenue Pea Patch								0.55		0.55
O. O. Denny Park	7.44	28.73								36.17
Rose Hill Meadows									1.89	1.89
South Juanita Open Space					1.94					1.94
South Norway Hill Park		9.77								9.77
South Rose Hill Park		1.09								1.09
Totem Lake Open Space		1.45								1.45
Watershed Park	13.20	10.20		7.60	31.09	0.82	4.07		10.18	77.16
Waverly Beach Park		0.47								0.47
Windsor Vista Park						4.93				4.93
Yarrow Bay Wetlands	47.63			20.88			2.06			70.57
ACRES PER TREE-IAGE CATEGORY*	84	65	26	136	96	32	14	2	32	487

Appendix E: Dominant Overstory Species by MU Acres

SCIENTIFIC NAME	COMMON NAME	PRIMARY SPECIES BY MU ACRES	SECONDARY SPECIES BY MU ACRES	TERTIARY SPECIES BY MU ACRES
Acer macrophyllum	Bigleaf Maple	164.4	55.3	79.7
Alnus rubra	Red Alder		178.3	41.0
Arbutus menziesii	Pacific Madrone	69.2	0.82	3.77
*Betula pendula**	European White Birch		3.04	1.9
Fraxinus latifolia	Oregon Ash		3.04	0.38
Populus balsamifera	Black Cottonwood	78.1	53.5	21.2
*Populus nigra**	Lombardy Poplar	0.9	1.8	4.8
Prunus emarginata	Bitter Cherry	0.6	7.0	95.0
Pseudotsuga	Douglas Fir	83.2	30.4	
menziesii Salix lucida	Pacific Willow	67.0	37.2	19.3
Salix sitchensis	Sitka Willow	6.1	1.5	
Thuja plicata Tsuga	Western Redcedar	8.7	98.4	34.1
heterophylla	Western Hemlock		1.76	25.15

Appendix F: Primary and Secondary Understory Species by MU Acres

SCIENTIFIC NAME	COMMON NAME	PRIMARY	SECONDARY
Rubus spectabilis	Salmonberry	139.50	78.42
Grass species	Grass	96.68	7.44
Polystichum munitum	Sword Fern	95.29	90.23
Oemleria cerasiformis	Indian Plum	56.96	62.69
Salix scouleriana	Scouler's Willow	46.31	17.15
Rubus ursinus	Trailing Blackberry	15.84	22.87
Gaultheria shallon	Salal	11.76	28.34
Corylus cornuta	Beaked Hazelnut	6.49	23.87
*Rubus armeniacus**	Himalayan Blackberry	5.99	9.72
Rosa nutkana	Nootka Rose	5.48	0.83
Typha latifolia	Cattail	3.78	14.08
Acer circinatum	Vine Maple	1.46	12.98
Cornus sericea	Red-Osier Dogwood	1.65	13.07
Mahonia nervosa	Dull Oregon Grape	0.79	4.09
Equisetum fluviatile	Swamp Horsetail	0.73	
Salix sitchensis	Sitka Willow		18.73
Scirpus acutus	Hardstem Bulrush		0.50
Symphoricarpos albus	Snowberry		50.75
Rubus parviflorus	Thimbleberry		2.06
Holodiscus discolor	Oceanspray		3.87
*Phalaris arundinacea**	Reed Canary Grass		4.93

Appendix G: Invasive Species Occurrences by MU Acres

SCIENTIFIC NAME	COMMON NAME	MU ACRES	% OF PROJECT AREA
Rubus armeniacus	Himalayan blackberry	389.87	80.1%
Hedera helix	English ivy	256.48	52.7%
Ilex aquifolium	English holly	227.58	46.7%
Phalaris arundinacea	reed canary grass	161.05	33.1%
Geranium robertianum	herb Robert	156.01	32.0%
Rubus laciniatus	evergreen blackberry	142.02	29.2%
Polygonum × bohemicum	Bohemian knotweed	104.66	21.5%
Prunus laurocerasus	cherry laurel	100.07	20.5%
Calystegia sepium	hedge bindweed	74.56	15.3%
Solanum dulcamara	bittersweet nightshade	45.60	9.4%
Cytisus scoparius	Scotch broom	29.01	6.0%
Lamiastrum galeobdolon	yellow archangel	11.22	2.3%
Crataegus monogyna	English hawthorn	8.15	1.7%

Appendix H: Public Input

The following is a summary of the discussion and activities from the Green Kirkland Partnership's open house and public input meeting, held at Heritage Hall on March 24, 2015, with 35 people in attendance. The open house included a presentation reporting on the Partnership's accomplishments as well as the preliminary findings from the 2014 habitat assessment. Data was collected regarding where participants live and work and which parks they visit most frequently.

Participants gathered for small-group discussions in which questions were posed regarding community outreach, volunteerism, and the criteria by which the Partnership should prioritize parklands for restoration. The public input process also included an online survey that ran from January through March 2015; it received 28 participants and asked similar questions to those at the open house. The Green Kirkland Partnership deeply values this public input: we have used it as a guide in the development of this new 20-Year Restoration Plan, and it will continue to be a resource during plan implementation.

Public Use and Value Questions

What is your zip code? (Survey)

ZIP CODE	RESPONSES	ZIP CODE	RESPONSES
98033	16	98052	1
98034	10	98105	1

Neighborhoods Represented (Open House)

NEIGHBORHOOD	LIVE	WORK	NEIGHBORHOOD	LIVE	WORK
Central Houghton	2	1	North Juanita	1	
Everest		1	North Rose Hill	1	
Highlands	1		South Juanita	1	
Kingsgate	1		South Rose Hill	2	1
Market		1	Totem Lake		1
Moss Bay	1	1	Other (Redmond,		
Norkirk	2		Seattle, Woodinville)	3	3

Parks most frequently visited (Open House and Survey)

OWNED/MAINTAINED BY CITY OF KIRKLAND	RESPONSES
Juanita Bay Park	14
Juanita Beach Park	11
Crestwoods Park	9
Marina Park	9
Watershed Park	9
Heritage Park	8
North Juanita Open Space	7
Peter Kirk Park	6
North Rose Hill Woodlands Park	5
OO Denny Park	5
A	5
132nd Square Park	4
Cotton Hill Park	4
Forbes Creek Park	4
Houghton Beach Park	4
Carillon Woods	3

OWNED/MAINTAINED BY CITY OF KIRKLAND	RESPONSES
Edith Moulton Park	3
Everest Park	3
Spinney Homestead Park	3
Juanita Heights Park	3
Kiwanis Park	2
North Kirkland Community Center & Park	2
Highlands Park	2
Mark Twain Park	1
Yarrow Bay Wetlands	1
OTHER PARKS OR PROPERTIES	
Big Finn Hill Park (King County)	4
Bridle Trails State Park (Washington State)	4
Saint Edward State Park (Washington State)	3
Cross Kirkland Corridor (Kirkland Transportation Plan)	2
Totem Lake Park (King Conservation District	1

What activities do you participate in when visiting Kirkland's forested and natural area parks? (Survey)

ACTIVITY	% OF RESPONSES
Hiking and walking	89%
Restoration activities	50%
Picnicking or other passive recreation	43%
Dog walking	29%
Other*	29%
Birding	25%

**Other included geocaching, biking, scooters with kids, swimming, photography, flying kites, and community events.*

What do you value most about Kirkland's forested and natural area parks? (Survey)

- Large natural areas that are not groomed sports fields.
- The canopy and the animal habitat, plus it is nice to be somewhere away from traffic.
- The passiveness, the quiet, the beauty, the native plants, the birds
- That they are peaceful and beautiful
- Green space to enjoy nature and have kids play outdoors.
- Cleanliness, safety, dedication to restoration
- Fresh air and nature. Native plants!
- Habitat preservation for native birds, plants, wildlife
- They give people of all ages easy access to natural areas.
- The ability to feel like we're still connected to nature even though we're in a city/suburb.
- Their location and abundance.
- The sight of the parks.
- Place to recreate, wildlife, fresh air, no cars, quiet
- Walking trails, views, wildlife habitat, environmental services (water and air quality, noise buffer, etc.)
- Beauty, wilderness, fresh air
- Easy access, connections between them via the connector, unmanicured spaces, trails, play spaces for kids (not just the structures)
- The opportunity to enjoy nature in a quiet, clean, and peaceful environment.
- Being in nature, exercising, seeing wildlife.
- Seeing nature and the restoration that is occurring in the parks.
- Trees, solitude, nature
- That they are there to enjoy and not overcrowded.
- That they are there!
- Peace and quiet

Volunteerism Questions

Have you volunteered with the Green Kirkland Partnership before?

Of the 28 responses to the online survey, about 60% had volunteered with the Green Kirkland Partnership at least once in the past and just over 30% had volunteered more than five times. One participant reported volunteering extensively with King County Parks at Big Finn Hill Park as well as Green Kirkland Partnership. About 50% of participants at the open house had previously volunteered.

If you are a current volunteer or Steward, what additional resources do you need to further support your volunteer efforts? (Survey)

- Combine resources between Green Kirkland Partnership and King County Parks
- Green Kirkland does a great job in supporting volunteers. It's difficult to find a calendar of volunteer events/information through the Facebook page. The emailed sign-up link is great, but locating the events isn't so easy.
- Need more volunteers—steady ones.
- Buckets and a pitchfork in our Job Box.
- Receiving treat donations for future events.
- I've been a volunteer with street cleaning. Maybe there's a way to link people interested in clean streets and healthy land.
- Need more variety of times events are held; weekend mornings aren't good, would prefer weekday events
- Garbage cans and dog waste bags at all woodland park entrances, please!!!
- Free mulch

Why do you or would you participate in a Green Kirkland volunteer event? (Survey)

ACTIVITY	% OF RESPONSES
To give back to my community	88%
To improve my parks and natural resources	88%
Personal enrichment and responsibility	50%
Outdoor exercise	50%
Educational opportunity for children	29%
Student service learning hours	21%
Photography	4%

Think about a time you have volunteered for Green Kirkland Partnership or elsewhere — what made that a successful event, and what made you want to come back? (Open House Discussion)

Major themes included:

- Seeing a difference
- Experience of being a part of the community and making connections; social interactions
- Being part of something bigger, i.e., Regional Effort
- Having a well-organized event
- Good leadership; positive, enthusiastic attitudes
- Events are better when not too big — don't like big groups
- Feeling appreciated is important
- Collaborative
- Good group with good energy — builds community
- History/background — understanding why
- Getting outside, physical activity
- Incentives help get me there — food, service hours
- Treat all volunteers with respect — don't talk down to them
- Variety of tasks, the whole restoration process
- Leaders able to adapt to volunteer groups' specific needs
- Getting a good workout
- Learning something; understanding ecological context
- Being outside and getting fresh air
- Fun! Fun! Fun!

Outreach and Engagement Questions

What sources of information do you use to look for volunteer opportunities? (Survey and Open House)

SOURCES OF INFORMATION	% OF SURVEY RESPONSES
Internet and websites	74%
Email	70%
Newsletters or e-newsletters from other organizations	44%
Community bulletin boards (e.g., library, community centers)	22%
Other*	9%

**Other included "all of the above" and newspapers*

During the open house, discussion groups specifically mentioned reading:

- Green Kirkland emails
- EarthCorps emails
- City volunteer listserv
- Snail mail from the city

Participants suggested:

- Create a Parks Blog where Green Kirkland Stewards could contribute and share information
- Develop a to-do list for the website that lists other volunteer activities such as data entry
- Put the Green Kirkland event calendar on the web
- Make signing up for events more streamlined

What is the most effective way to reach out to people in your neighborhood? (Open House and Survey)

- Finn Hill: Finn Hill Neighborhood Association website and meetings, email, flyers
- Flyers delivered to the door.
- Internet, including email, and social media such as Facebook and Nextdoor.com
- Create Facebook group just for Green Kirkland Stewards and volunteers
- Kirkland Parks and Recreation brochure
- Come to Home Owners' meetings at the condo.
- PTAs at schools in all new neighborhoods
- In Kirkland Heights, it's best to send a note to every apartment.
- Kirkland Reporter
- I live in Finn Hill in a diverse neighborhood, where few people talk to each other. I'm not sure why that is, but community events or block parties may help bring people together.
- Market Neighborhood: e-mail newsletter and temporary signs
- Kingsgate/Evergreen Hill: Fliers in mailboxes
- I live on Goat Hill, so I think that would be the Inglewood–Finn Hill area: Nextdoor.com
- Neighborhood electronic bulletin boards
- South Rose Hill/Bridle Trails: Probably fliers on doors but also announcements at the neighborhood meetings

Across the City, what organizations or community groups do you recommend the Green Kirkland Partnership reach out to? (Open House and Survey)

- High Schools and Middle Schools have many students that are looking to fulfill volunteer hours. Some have clubs and others have Honor Societies.
- Neighborhood associations
- Local technology companies
- Northshore Community Church. They were in Bothell before the annexation but now they're in Kirkland. They are a big part of the annual cleanup event of North Shore School District which involves a lot of groundskeeping.
- Seattle Tilth — Seattle Tilth is actively engaged in Green Seattle Partnership at Rainier Beach Urban Farm and Wetlands and even have their own wetland stewards working alongside the farm! Great opportunity for GKP to harness the existing connection Tilth has to the Green Cities at their new Kirkland location to restore the forest adjacent to Tilth demonstration at McAuliffe Park. If not developed, this would be a lost opportunity, given the number of people and volunteers this could also harness for the Partnership.
- Targeted scouting event? Work directly with Girl Scouts, campfire girls, Boy Scouts to plan a special event just for them — working with Western Washington coordinators. Have special themed day for them?

- Young people at KTUB and local schools
- Boys and Girls Clubs, Knights Of Columbus, St. John Vianny Parish
- Finn Hill Neighborhood Association
- Mountains to Sound Greenway Trust
- Chamber of Commerce luncheons
- Heidi Hawkins [publisher] Kirkland Living magazine for an informational article
- Kirkland views, Kirkland weblog
- Contacting neighborhood associations
- Develop comprehensive school outreach plan: Do targeted event in each neighborhood just for the schools. Do special outreach campaign to the kids and families via PTSA's, build relationship with principles or the district's science director.
- Kirkland women's group?
- Washington Trails Association (WTA) New partnership? Find out if they do urban work — Potential Forterra/ GKP/ WTA collaboration?
- Intergenerational outreach or event that includes the senior center and the YMCA teen center?
- PCC member event — making connections between healthy lands, sustainable farming etc.
- 4H — any active in Kirkland or Eastside? Untapped resource? Do they ever do conservation work? Goat connection?
- High School Honor Society
- Future Business Leaders of America
- Need more outreach to private landowners
- Hold workshops: "How to be a good neighbor to parks." Big issues — control invasives, no dumping; Ties in water conservation, stormwater, and protecting natural resources.

20-Year Plan Content Questions

What topics or questions would you like to see addressed in the Green Kirkland Partnership's Forest and Natural Areas 20-Year Restoration Plan? (Survey)

- I would like to see ALL Kirkland natural areas included in the restoration plan, this includes Big Finn Hill Park, Juanita Woodlands and greenbelts that not officially designated as parks. The ivy and holly in some of the green belts makes driving the roads like playing Russian roulette, and is sad for the healthy future of the green zones.
- I know it's a very difficult topic, but it would be good to know how the city would look if private owners kept removing their trees without replanting. In our Juanita neighborhood, the trees are mature, and some must be removed for safety; however, they are not replaced. I estimate (roughly) that we have 50% of the canopy that existed even 10 years ago, not counting the park. Of course, development has contributed with much bigger houses and smaller yards.
- Various ways to attract volunteers...need more steady volunteers (and Stewards)
- Community outreach
- Habitat preservation for native birds, plants, wildlife
- Affordable housing near natural areas.
- More walking groups that encourage people to get out into the parks and natural areas.
- More programs to include young people.
- Ways to link young and old people. The young could assist the old and learn a lot. The old could get some exercise and learn something about the interests of the young.
- Involvement of a variety of ethnic groups in the planning and maintenance of natural areas.
- We want more trails.
- Continued restoration and the importance of these natural areas as Kirkland's population experiences a boom.
- How to get rid of ivy. Can the sale of it be banned in WA State as it is in Oregon?
- Ways to improve connectivity for people and wildlife between the parks, opportunities to mingle more wild habitat into sports-oriented parks and vice versa.
- Keeping our parks clean — possibility of a dog park at St. Edwards, Finn Hill with no leashes, allowing some acreage to be fenced off on the trails — similar to White Center's dog park trail area. We would be willing to pay an annual fee for this...
- What is the plan to expand spaces? How will connections between parks grow?
- Invasive species removal
- Expansion of city park lands and public spaces
- Overcrowding at Juanita Beach Park and disruption of sensitive environments in Juanita Beach Park
- Enforcement of dog leashing and dog waste pick-up
- Better assistance to park users who speak English as a second language or not at all (Kirkland Parks and Community Services serves an extremely diverse clientele, yet all signage and information is provided in English only. What about the Russian population? Or the Indian?)
- How do we provide access to natural beauty without over-developing our park spaces?
- Dogs running off leash all the time when they are supposed to be on leash and under control.
- More education for homeowners about the problems of planting invasive plant species that spread to green spaces.
- Making sure Peter Kirk Park does not get surrounded by tall buildings.

If money were no object, where should the partnership grow next? OR, which new parks would you like to see the Partnership focus on in the next 1–5 years? (Open House)

- Cross Kirkland Corridor! [raised in all four discussion groups at open house] Also include the NE section of the Eastside Rail Corridor within city limits that currently is not part of the CKC.
- Totem Lake Park: New density/development areas like Totem Lake Park and Juanita Bay Park east of Market Street
- Connection between the South Kirkland Park and Ride and Watershed Park; would like to see work completed and connections from Watershed park to Cochran Creek to Yarrow Bay Wetlands area [raised in three of four discussion groups]
- Juanita Bay Park next to new Jack-in-the Box and Fire Station site
- Habitat connections next to new community near Crestwoods Park
- OO Denny Park
- Edith Moulton Park
- Any parts of the City that do not currently have parks where Green Kirkland is currently active close by (within a half-mile radius?) If there are no currently active volunteers in those areas, target those areas in outreach. If there are no parks there already, make it a priority to acquire land for park use in those areas.
- Focus on annexation (new neighborhood) area parks.

What should the criteria be for prioritizing restoration at a GKP site? (Open House)

- Sites that provide salmon-spawning areas
- Proximity to schools or vulnerable communities and accessibility to bus lines
- Go after #9 tree-iage first
- Neighborhood parks with the highest density of people — quality-of-life issue for those neighborhoods
- Low-income neighborhoods and underserved communities
- Habitat — focus on areas that are quickly getting worse
- High-visibility projects along trails and popular walking paths in new density/redeveloped areas like Totem Lake Park

Appendix I: Glossary

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 Kirkland Partnership utilizes an adaptive management strategy to inform its administrative and restoration practices over time.

Balanced Scorecard

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

Butt Rot

Fungi that affect native trees, usually caused by root rot spreading up the trunk or resulting from a wound at the "buttress" (the trunk's broadened base, where it meets the soil). Ganoderma applanatum affects bigleaf maple and other native deciduous trees, while Phaeolus schweinitzii affects many native conifer species. When extensive decay is found, butt rot reduces the trunk's structural integrity.

Canopy Cover

The percent of a forest floor or specific geographic area covered by tree crowns. Assessed using aerial orthophotographs as well as 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.

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 Kirkland's urban forest include Douglas-fir, western redcedar, and western hemlock.

Cross Kirkland Corridor (CKC)

The Cross Kirkland Corridor is a City-owned, 5.75-mile-long former rail corridor developed into a multi-model transportation trail. It has the potential to be a model of transportation sustainability and livability, as shown in the Cross Kirkland Corridor Master Plan adopted by the City Council in June 2014. The City's larger transportation planning process guides CKC development and maintenance.

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.

Eco-charrette

The City of Kirkland will host a collaborative community workshop or "eco-charrette" in late spring 2015 to build upon the Cross Kirkland Corridor (CKC) Master Plan, further defining the Master Plan Goal 3 to "Foster a Green Kirkland." The interactive workshop will:

- Engage experts from a variety of disciplines to explore opportunities towards the "greenest" corridor.
- Identify green strategies and environmental themes for the corridor as a whole, as well as specific corridor segments where applicable.
- Develop concepts to inform future design guidelines, projects, and potential eco-certifications.

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 environment. This includes 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 other human activity.

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.

Gap Analysis (for parkland)

An analysis to review the locations and types of existing facilities, land use classifications, transportation/access barriers, and other factors in a given area, e.g., the City of Kirkland park system, to determine underserved areas, including identifying preliminary targets for new natural areas parkland acquisition.

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 tree canopy. 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 includes Seattle, Kirkland, Tacoma, Redmond, Kent, Everett, and Puyallup. 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 between 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.

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 likely to cause economic and/or environmental harm.

Laminated Root Rot

A serious disease caused by Phellinus weirii, a fungus that can thrive in both living and dead roots of some conifers for extended periods of time. Douglas-fir is susceptible to this pathogen, along with true firs such as grand fir. Western red cedar is resistant to infection, and deciduous species are immune. Symptoms include reduced terminal growth, followed by yellowing and thinning of the tree crown.

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 Kirkland parks 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-iage 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 redcedar, 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.

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. When 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.

Seep

A place where water (usually groundwater) reaches the earth's surface, forming moist areas or puddles. Seeps are important habitat for small mammals, birds, and butterflies.

Stormwater Runoff — see *Runoff.*

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 one to nine. One represents high quality habitat and low invasive species threat and nine represents low quality habitat and high invasive species threat.

Tree Canopy

The uppermost layer of the forest, formed by 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.

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

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 gasses 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.*

Woody Shrub

A woody, multistemmed plant that grows to less than 26 feet tall and is found in the forest understory.

Common plants referenced in this plan

INVASIVE PLANTS		NATIVE PLANTS	
	Himalayan blackberry *Rubus armeniacus*		Douglas Fir *Pseudotsuga menziesi*
	English holly *Ilex aquifolium*		Red Alder *Alnus rubra*
	Reed canary grass *Phalaris arundinacea*		Bigleaf Maple *Acer macrophyllum*
	English ivy *Hedera helix*		Black Cottonwood *Populus balsamifera*
	Bindweed *Convolvulus arvensis*		Western Redcedar *Thuja plicata Tsuga*