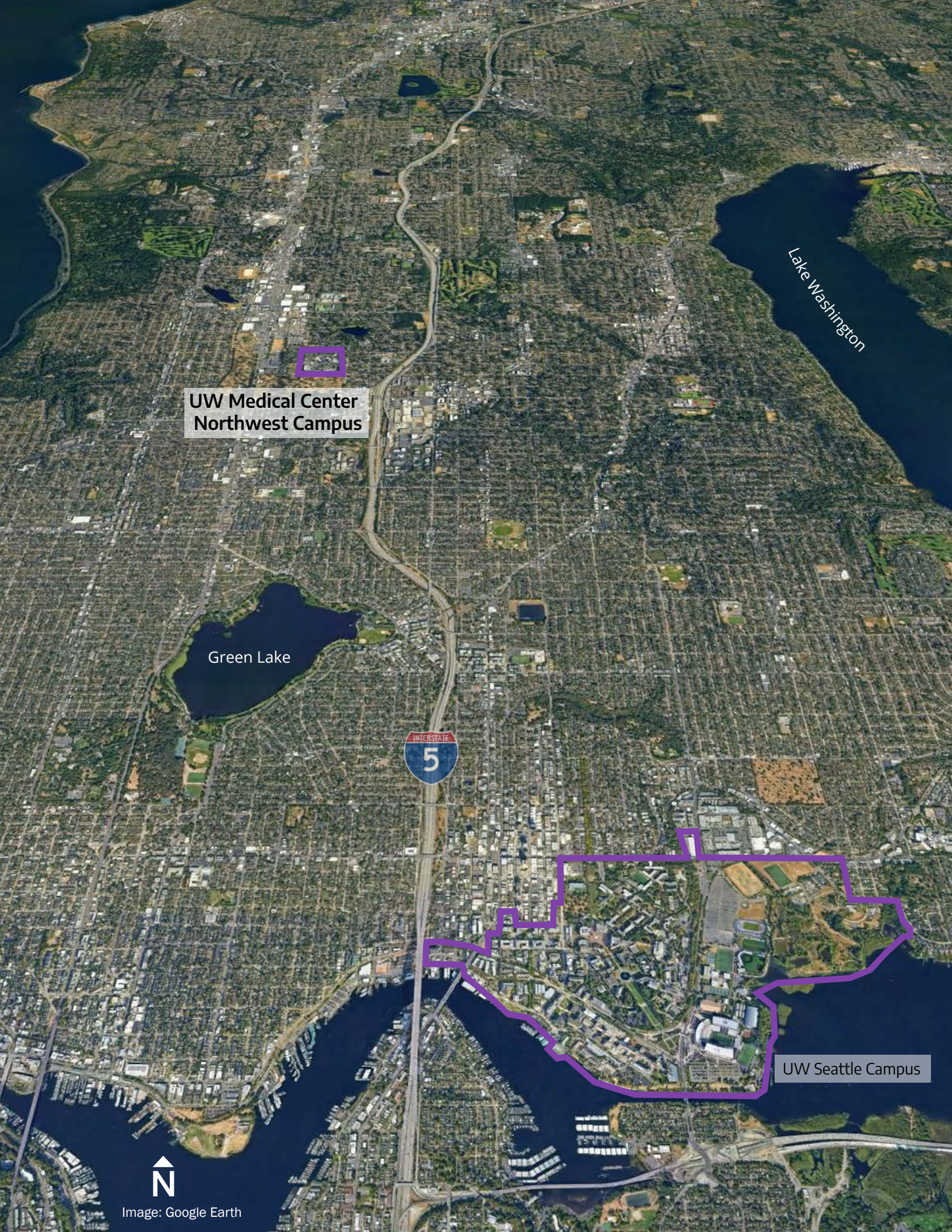
Campus Architecture & Planning / 2023

URBAN FOREST MANAGEMENT PLAN

UW MEDICAL CENTER - NORTHWEST

Seattle, Washington


UW Medical Center
Northwest Campus
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Green Lake
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UW Seattle Campus
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Image: Google Earth

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Purpose of the Plan

VISUALIZING | ANALYSIS | VISIONING | PLANNING

The University of Washington Medical Center - Northwest (UWMC - Northwest) takes pride in the quality of the natural environment of this region and at its Northwest Campus. To preserve its beauty and function, the UWMC - Northwest actively plans and develops strategies for protecting it in the face of new development. This Urban Forest Management Plan helps align planning efforts with the conservation and enhancement of the urban forest of the UWMC - Northwest. The following goals and objectives provide the framework with which strategies are developed through a thoughtful analysis of the tree canopy and resources.

Effectively **communicate the value** of the urban forest canopy relative to the well-being of patients, staff, and visitors, in addition to ecological services such as air purification, stormwater management, and wildlife habitat. Identify benefits and deficits associated with increasing or decreasing the urban forest while meeting the expanding medical facility needs.

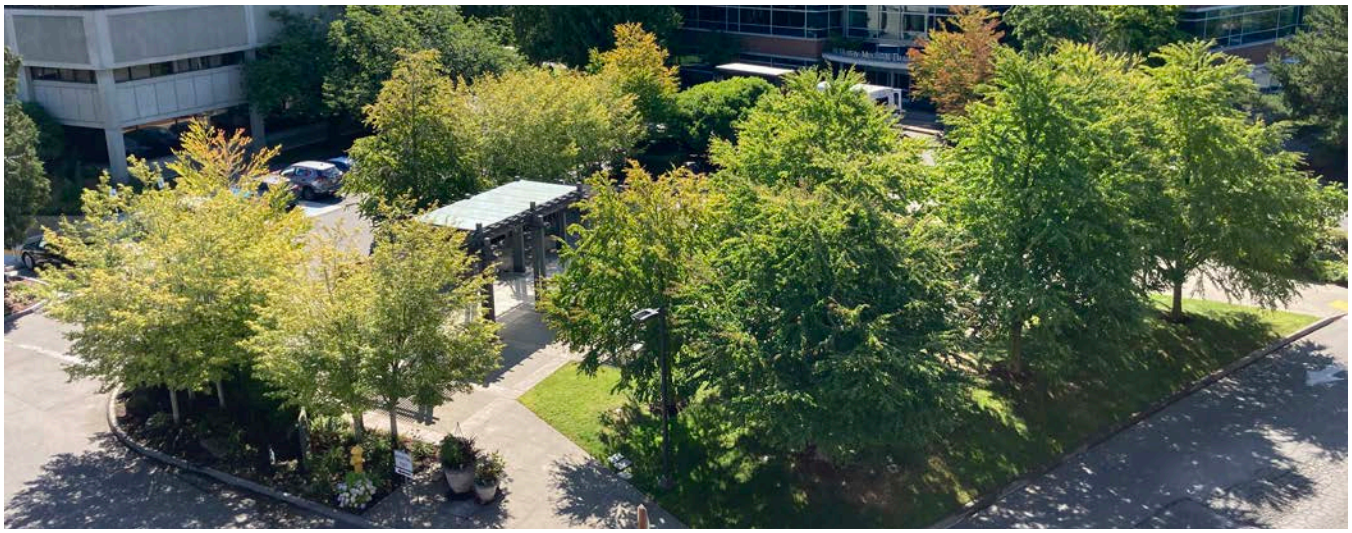
Identify **canopy coverage goals** to include percent cover and species selection criteria. Multiple approaches will be needed to meet the tree canopy goals, including planting new trees and maintaining existing ones.

Identify opportunities to **become better stewards** of the urban forest through best management practices for planting, protecting, and maintaining the trees on campus during establishment and long-term care. Provide policy recommendations for the protection of trees. Establish a tree replacement policy for tree loss due to disease or construction.

Maintain a **current and dynamic tree database** for all trees on campus with information related to tree species, size, and structural and health condition. Inform decision-making about tree species selection to increase biodiversity. Identify concerns related to trees with a high level of wind or disease susceptibility.

Implement management strategies that are acknowledged, understood, and accepted by relevant municipal departments. Coordinate with the City of Seattle to identify exceptions to the codes administered by SDCI regarding regulations around tree protection, removal, replacement and permitting to separate tree removal from building permit applications.


McMurray-Mechigel-Bartlich



Intro to Urban Forestry

...there is something in the forest to cure most anything that bothers you.

Donald Smith

The majestic views of trees in the foreground and mountains in the background give Western Washington its iconic character. The landscape's historic condition has been substantially disturbed by urbanization, leaving us with relics of its old-growth character. The history of the Pacific Northwest forest is built on narratives of different management strategies, each signifying changes in development and our understanding of ecology. Today, we are required to develop policies that support the re-establishment, enhancement, and protection of the urban forests. As the pressure of development continues in Seattle, balancing open space with buildings is pivotal for maintaining the natural experience in the city. The City of Seattle has established a standard for managing its urban forest through a sustainable framework that considers ecological, management, and stewardship goals as overlapping pillars for maintaining a healthy and vibrant urban forest. The UW Medical Center - Northwest shares similar values as the city, working towards identifying and overcoming the challenges of maintaining the tree canopy.

Washington's Forestry Past

LOGGING | MILLING | BUILDING

The woodland stands of fir, hemlock, spruce, and cedar have long been a symbol of the Puget Sound region. Historically, the canopy of trees was actively managed by Indigenous peoples for food, clothing, ceremonies, and housing. Colonization brought increased harvesting of the trees without consideration for the health of the forest. The history of local forest management can be divided into four time periods of significance, each representing a different ideology of how to sustain their production into the future.

PRE-SETTLERS : before 1848

Prior to European settlement, Native people harvested and managed the trees to meet their needs and those of the forest. They tended the forest and in return the forest species provided for them; for example, western redcedar trees were used to make ceremonial structures and dug-out canoes. Burning practices were common among Native groups as they encouraged the growth of food crops such as camas and huckleberry and increased hunting opportunities. In 1828, the Hudson's Bay Company expanded their economic efforts beyond the fur trade by building a lumber mill at Fort Vancouver, dramatically transforming how the forest of the Northwest was used and valued.

THE RISE OF THE LUMBER INDUSTRY : 1848 - 1883

The gold rush of 1848 sparked a growing demand for lumber used for steam powered engines and as structural supports in mining tunnels. In addition, lumber was increasingly harvested to build housing and shops in burgeoning mining towns and lumber camps. By the mid-1850s there were over 100 mills in the Puget Sound region, run by lumber barons who saw this region's forests as an inexhaustible resource. This period also saw an increase in illegal logging and timber theft along with high levels of corruption within the industry.

TECHNOLOGY, RAILROADS, AND CAPITAL : 1883 - 1940

The expansion of the railroad throughout this region and beyond provided greater access to harvestable land along with expanding timber markets across the country. This paired with advancements in logging technology resulted in dramatic increases in lumber production. This period also marked the beginning of government intervention through policy developed to limit the negative impact of logging activities on watersheds. The first head of the Forest Service, Gifford Pinchot felt that old-growth forests were wasteful because they grew very slowly. This encouraged the harvesting of old growth forests to be replaced by a younger faster growing stands for production purposes. Wars, along with the Great Depression, caused the lumber industry to be in constant flux during this period. From 1905 to 1930, Washington was the nation's leader in timber production until Oregon began producing more in 1931.

INTENSIVE LOGGING AND ENVIRONMENTALISM : after 1940

The lumber industry lost its dominance in Washington's economy during WWII. Most of the lumber harvested after the war went towards pulp and paper due to a change in demand. The lumber Industry continued to grow steadily, while other industries like airplanes, weapons, and other goods grew much faster. Timber prices rose substantially as the private supply of trees declined. The US Forest Service encouraged rapid logging and intensive management. They were optimistic that the high levels of production could be sustained as technology and scientific expertise would prevent depletion.

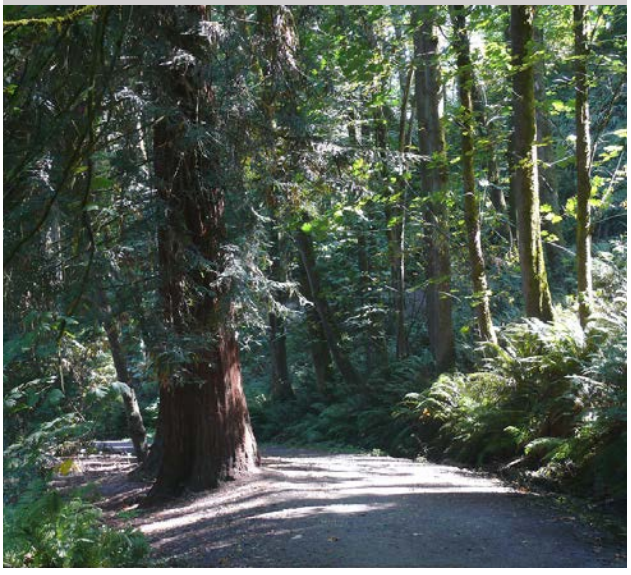
image: National Archives and Records Administration

FORESTRY TODAY: 2023

Today, the Washington State Department of Natural Resources (DNR) and the US Forest Service help manage the forest through policy and oversight of both private and public forests. One thing to note is that Western and Eastern Washington manage their forest differently due to variations in climate and forest stand species. In Western Washington, foresters practice clear-cut harvesting which allows for new seedlings to grow by reducing the competition for light. The Forest Practices Rules governed by the DNR establish laws that define what proper management of forests looks like in Washington. These laws do not impact urban forestry, which is managed and governed by local municipalities.

↑ The US Army Corps of Engineers built the Lake Washington Ship Canal and the Hiram Chittenden Locks to allow passage between freshwater Lake Union and saltwater Puget Sound. Photo taken November 25, 1917

↓ Urban Forestry has become a prominent research focus of cities due to their relationship with public health, ecological processes, economic development, and livability.



WASHINGTON FORESTRY TODAY

- **18 million acres of Timberland in Washington**
- **Washington harvested 2,716,054,000 BF in 2021**
- **King county harvested 96,437,000 BF in 2021**

Seattle's Urban Forest

SUSTAINABILITY | RESEARCH | MANAGEMENT | COMMUNITY

The City of Seattle has a long history of supporting urban forestry in the region because of their awareness of the value trees provide in creating a livable and healthy city. Sited properly, trees can help extend the life of existing infrastructure by leveraging natural systems as green infrastructure. They can reduce reliance on engineered infrastructure while increasing the ecological health of an area.

The management of an urban forest differs from that of a natural setting due to the increased complexity related to development, public safety, infrastructure above and below ground, pollution, and transportation. In addressing these challenges, the City has adopted a sustainable model for managing its urban forest. The sustainable model places a higher value on the services of the forest rather than on the production of goods. The City's model identifies three primary management strategies for monitoring and improving the existing urban forest:

Tree Resources: an understanding of the trees themselves, as individuals or in stands.

Management Framework: assignment of responsibility, resources, and best practices for the care of trees.

Community Framework: the way residents are engaged in planning and caring for trees.

The management of Seattle's trees occur through multiple departments of city government: Seattle Department of Transportation manages street trees, Seattle Parks and Recreation manages park trees, Seattle City Light maintains trees around utilities, and Seattle Public Utilities manages trees along creeks. The diverse nature of the urban environment and multiple managing bodies makes a comprehensive plan important for aligning efforts across landscape types amongst different stakeholders. To establish realistic urban forest goals, the City established unique goals based on different land use types (single family, multi-family, institutional, industrial, etc.) with a citywide goal of 30% and an institutional canopy goal of 20% by 2037.

SEATTLE'S FORESTRY STRATEGIES

- **Optimize Forest Health & Environmental Benefits**
- **Increase Canopy Understanding**
- **Support Interdepartmental Efforts**
- **Proactive Management & Preservation**
- **Increase Public Awareness & Support**
- **Model Good Stewardship**

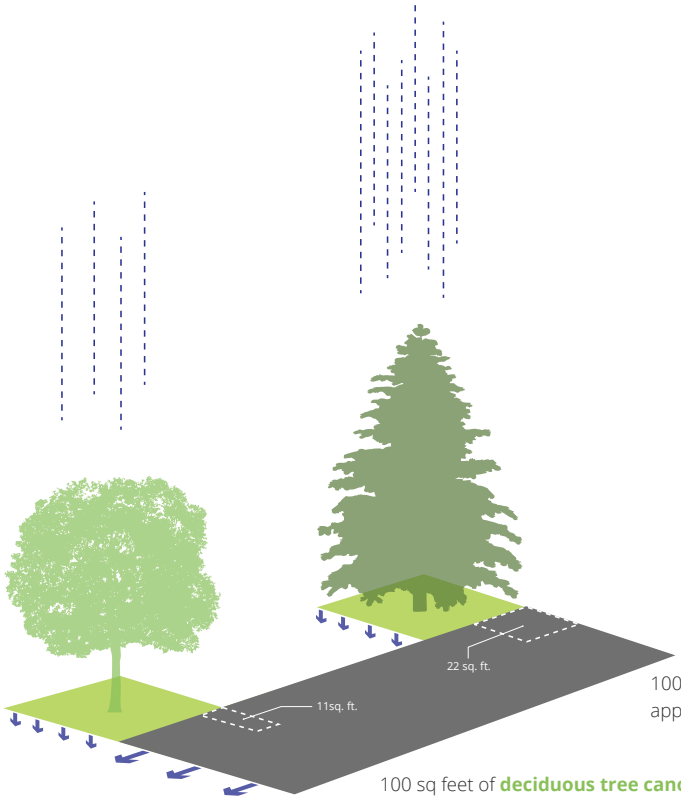
The Value of Urban Trees

ECOLOGICAL | SOCIAL | CULTURAL | VISUAL | PHYSIOLOGICAL

Urban trees provide valuable benefits to human health, ecology, and livability, especially in the face of climate change. Overall, trees help make urban environments more livable through reducing heat island effects; cleaning the air, water, and soil; providing habitat for wildlife; and contributing aesthetic beauty throughout the seasons. As trees age their benefits grow with their trunk size. Research describes a positive relationship between the presence of trees and human health, safety, creativity, social values, and decision making. To maximize their value, trees should be properly planted and maintained by the local municipality and residents based on the specific requirements of the species and the growing conditions. The following pages describe some of the many benefits trees provide that improve the living conditions in cities.

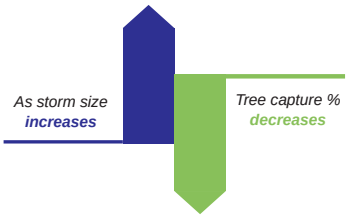
STORMWATER MANAGEMENT

Trees reduce the volume of stormwater that enters municipal infrastructure and public waterways by absorbing runoff through their roots and releasing it into the air through evapotranspiration. These processes result in improved water quality in addition to less water quantity arriving at municipal water treatment plants. Trees can manage stormwater from a surface equivalent to 10 - 20% of their canopy area. Green stormwater infrastructure should be used alongside trees to fully manage stormwater on individual sites. In the Northwest, deciduous trees are dormant during the "wet" season, which reduces their stormwater management value in comparison to evergreen trees.



100 sq feet of **deciduous tree canopy manages** runoff from approximately 11 square feet of nearby impervious surfaces

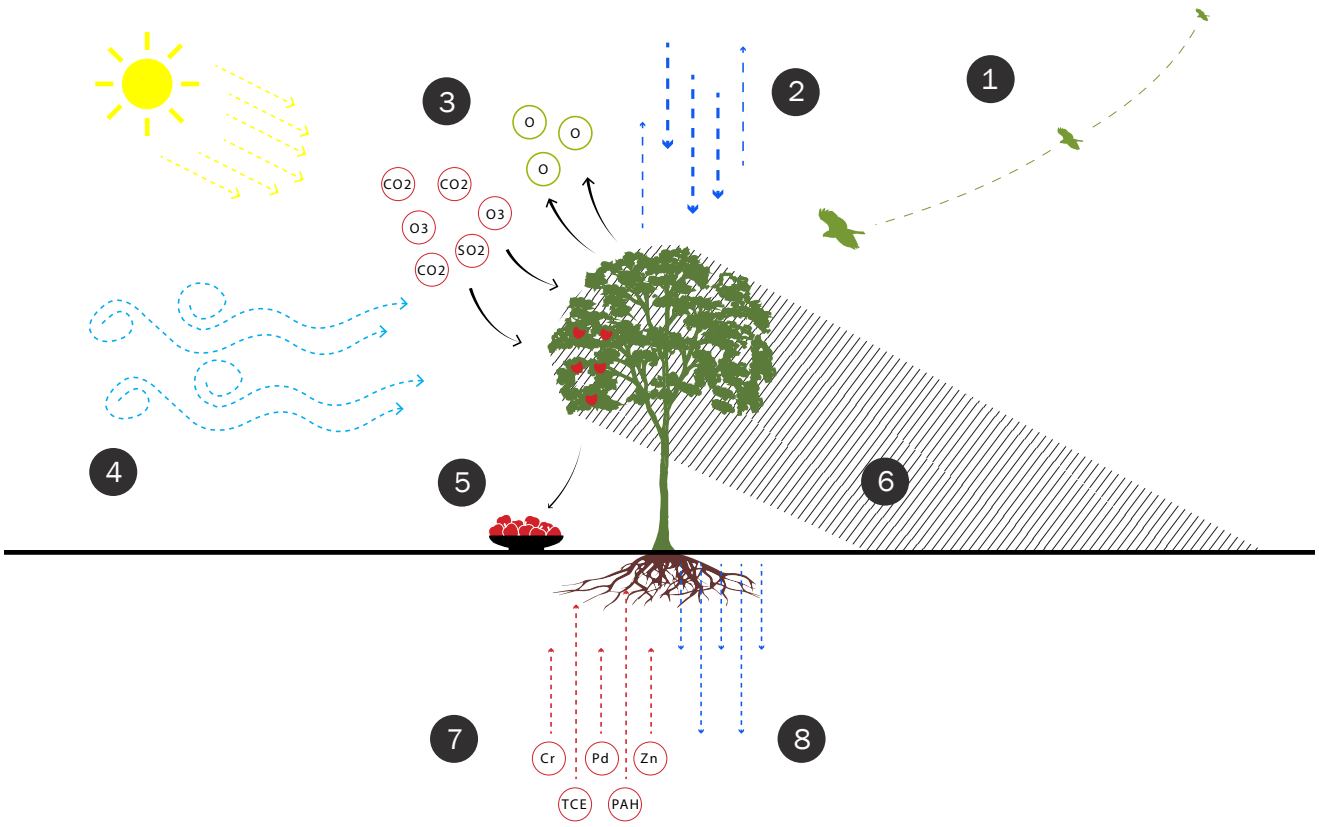
100 sq feet of **evergreen tree canopy manages** runoff from approximately 22 square feet of nearby impervious surfaces



Deciduous Trees capture 1/2 the stormwater volume as **Evergreen Trees**

The Effects of Trees on Stormwater Runoff; Herrera Environmental Consultants, Inc., February 2008

Green Stormwater Infrastructure in Seattle, 2025 Implementation Strategy; Seattle Public Utilities



ECOLOGICAL BENEFITS

1 *Habitat*

Trees provide food, shelter, and water for wildlife. Habitat benefits vary based on tree density, health, and species varieties.

2 *Stormwater*

The size and type of tree determines how much stormwater it can absorb, intercept and evapotranspirate, which are important aspects of the water-cycle.

3 *Air Quality*

Trees aid in improving air quality by absorbing greenhouse gases and other toxins while releasing oxygen back into the environment.

4 *Wind*

Siting trees perpendicular to prevailing winds helps dissipate the power of the wind and can make harsh urban environments more pleasant.

5 *Food*

Trees can provide food for both human and wildlife consumption. Tree selection defines the types of food produced and their ecological benefit.

6 *Microclimate*

The shade produced by trees creates microclimates in the city and reduces the ambient air temperature within shaded areas up to 23 degrees.

7 *Phytoremediation*

A select group of trees have the ability to uptake or stabilize contaminates within soil. Tree selection needs to be correlated with the existing soil toxin.

8 *Ground Water*

Trees promote the natural infiltration of stormwater, with their roots helping clean the water prior to it entering the ground water.

VISUAL BENEFITS

The visual presence of trees has been found to meaningfully reduce the stresses associated with living in urban areas. Trees can also help increase attention spans, improve memory, and inspire creativity in addition to other physical and emotional health benefits.

IMPROVED HOSPITAL PATIENT HEALTH OUTCOMES

The physiological benefits of trees for hospital patients were first studied in the 1970s and is now well understood. Studies have indicated that patients that are shown images or videos of nature have improved psychological well-being. Access to a window with a view of trees and nature is even more meaningful for promoting health. Patients in rooms with views to the outdoors have faster recovery times, report reduced acute pain, and have more rapid heart-rate recovery after experiencing stressful events. The cost to maintain the outdoor spaces that healthcare rooms look out onto is an important investment to make because the views improve health outcomes and lead to higher patient satisfaction.

PLANT TREES FOR SAFETY

Trees have been shown to make a place safer when they do not obstruct views at eye-level. Research has found that there is a relationship between obstructed views from first-floor windows and an increase in crime. In residential buildings, the top of first floor windows is on average 8.7 feet above grade. Recognizing this relationship can aid designers and managers in creating safe and pleasant environments across campus.

Environmental Context

TEMPERATURE | RAINFALL | SOIL | SUN

Seattle's climate is described as temperate marine or Mediterranean, characterized by cool, wet winters and warm, dry summers. On average, Seattle receives only 4 to 6 inches of rain from May to September compared to 30 inches from October to March. This condition requires plants and trees to be irrigated during summer months, especially for establishment. This condition makes rainwater harvesting for summer irrigation challenging because of the lack of rain and the scale of the system required to provide significant water for the dry months.

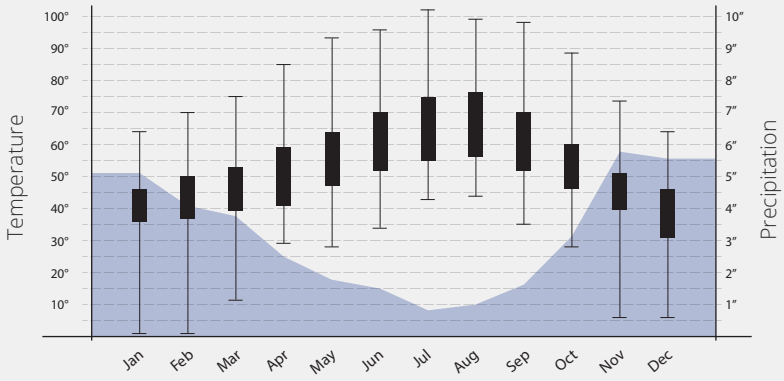
Seattle's Hardiness Zone is 8b or 15°- 20°/ 24"- 48", meaning this area has a low temperature of 15-20 degrees Fahrenheit with 24 - 48 inches of rain annually. Climate change has the potential to shift hardiness zones to the north making our climate warmer and drier which could alter the types of trees and vegetation that may thrive here in the future. Local cities are beginning to experiment by planting new varieties of trees from hardiness zones to the south as test species for the future.

The sun path of this region encourages planting deciduous trees on the south and west sides of structures to reduce the amount of solar gain during the summer that reverses in the winter after they have lost their leaves. Evergreen trees provide shade and wind barriers all year long.

One of the most challenging aspects of this region's ecology is the soil. Large deposits of a thick clay layer called Vashon Till were created during the ice age as the Vashon Glacier repeatedly advanced and receded thousands of years ago. The Vashon Till layer underlies most of the city, making drainage poor, establishing vegetation difficult and installing low-impact design strategies complex. Existing environmental conditions need to be evaluated prior to tree selection to identify a species best suited for the site.

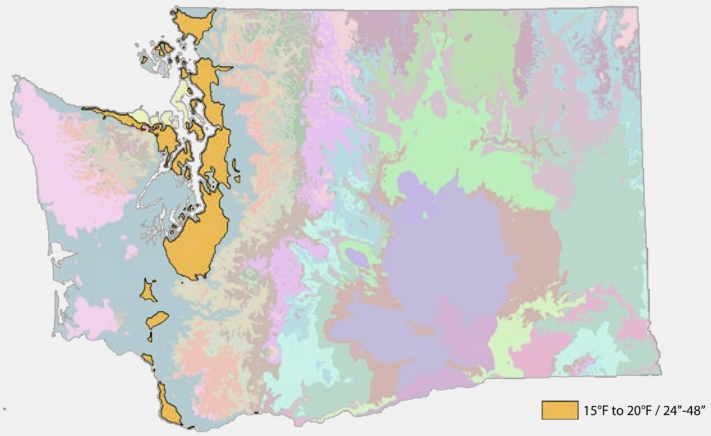
Average Annual Temperature and Rainfall

The Mediterranean climate of Seattle has warm dry summers with wet cold winters.



Hardiness Zone

Seattle is located in the 8b zone which promotes plants that are hardy down to 15 to 20 degrees.



Development & Forest Ecology

BIOTIC | ABIOTIC

Urban forests, like natural forest are constantly being impacted by biotic (living) and abiotic (non-living) factors within an ecosystem. The constantly evolving human occupation of Seattle poses the greatest threat to the city's urban forest. Construction of building and roads, infestations of disease and insects, and physical damage caused by the public and weather reshape the urban forest daily. The intensity and scale of each impact shifts a forest's state of equilibrium. Research shows that a state of non-equilibrium is favored over a static state, though a continuous reduction in canopy size, diversity, and number of trees is not preferred. Natural disturbances allow a stand to become diverse in age and type along with resilient as the interaction between impact and recovery results in a healthier forest. The UW Medical Center - Northwest recognizes the need for the landscape to change and evolve to meet the demand for new spaces where patients, staff, and visitors can work, learn, receive care, and take respite.

Managing the Urban Forest at UWMC - Northwest

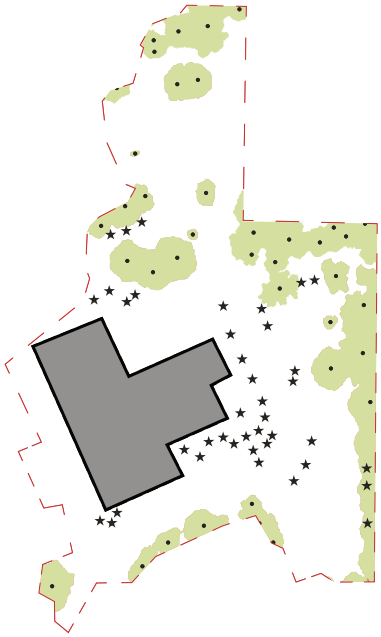
In 2022, the two-year process of creating a new Major Institution Master Plan (MIMP) was set in motion to replace the previous document established in 1991. The Behavior Health Teaching Facility is the last construction project under the 1991 document. The standards and procedures of the healthcare industry have changed significantly since the 1991 document and the new MIMP will guide the UWMC - Northwest as it seeks to bring its facilities up to the modern norms. With more development being planned, a strategy for maintaining and managing UWMC's natural environment is critical.

Behavioral Health Teaching Facility - Stewardship of the Urban Forest

During the design and implementation phases of the Behavioral Health Teaching Facility, great care was taken to preserve three western redcedar trees near the north corner of the demolished D-wing building. These mature trees provide ecological function the UWMC wanted to protect. The size of the trees helps ensure the new building does not appear out-of-scale with the surroundings. The trees in the construction site that could not coexist with the new development were replaced with two trees for each one lost. The replacement plantings are located within the construction area, in gaps in the landscape buffer along the property edge, and in suitable areas across the property. Tree varieties planted as replacements were selected based on suitability to Northwest plant communities and climate adaptability. *For more information, see the Tree Replacement Policy in the Design Guidelines section on page 50.*

2019 Canopy. The arrow points to the three western redcedars mentioned above

2022 Tree canopy in red was removed during construction of the Behavioral Health Teaching Facility



2024 Conditions after construction. Stars indicate approximate tree replacements

Demolished D-Wing with three western redcedars outlined in the background. Photo from October 2019.

Construction activity with three western redcedars outlined in the background. Photo from November 2021.

The BHTF with three western redcedars behind the building (outlined). Photo from October 2023.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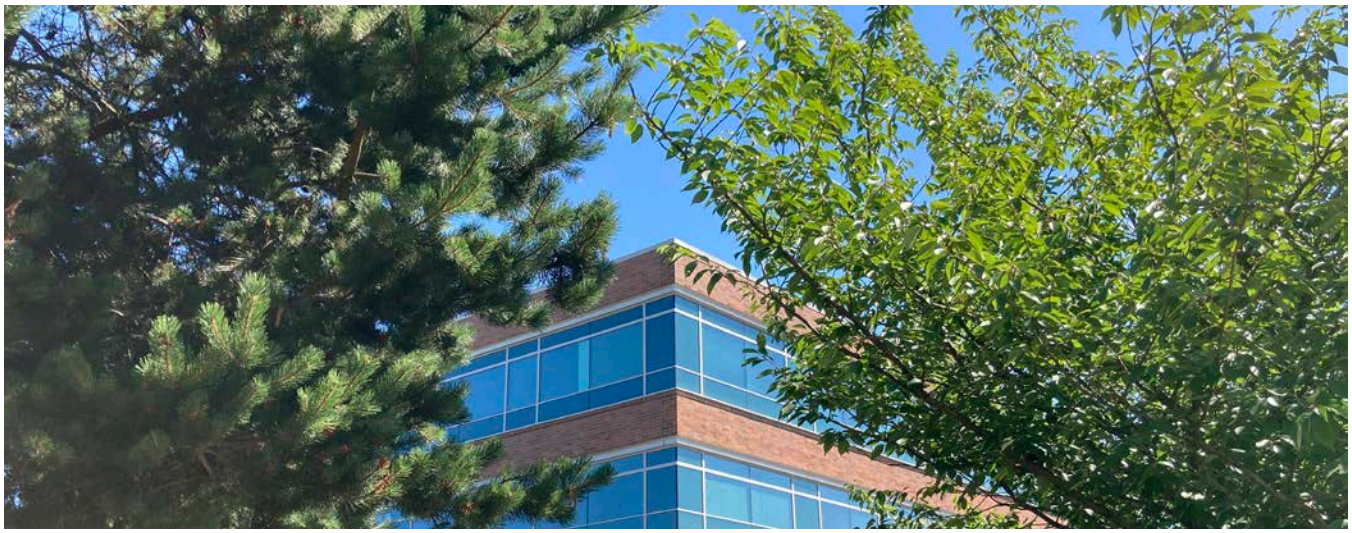


Urban Forest Planning Principles

From little seeds grow mighty trees.

Aeschylus

An analysis of the UWMC - Northwest landscape resulted in a range of insights and recommendations that address both short-term and long-term strategies for improving the urban forest and its associated value. As the medical campus evolves, data collection and tracking will be important for evaluating the UWMC's progress towards the identified urban forest goals. The use and function of trees on campus should be considered based on the landscape mosaic in which they are located to create a mutually beneficial relationship between site, nature, and architecture. These relationships will be important to consider as the UWMC - Northwest works towards maintaining the existing canopy cover through replacement of trees removed to meet the City's canopy goal set for 2037.

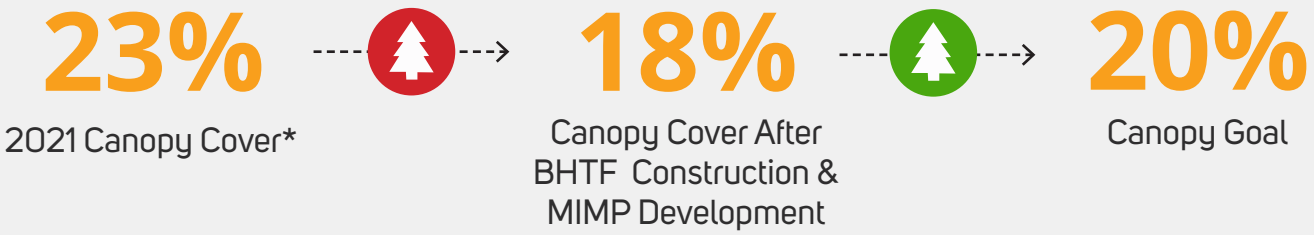
UWMC Tree Canopy Goals

UPPER CANOPY | LOWER CANOPY | UNDERSTORY

The City of Seattle has defined a tree canopy goal of 20% by 2037. This percentage is derived by dividing the total canopy area by the total area of land including buildings and the public right-of-way. Based on the canopy coverage derived from the 2021 Seattle LiDAR scan, the UWMC - Northwest currently exceedes the City's goal. However, the Major Institution Master Plan (MIMP) planned for approval in 2024, calls for renovating and updating the aging healthcare facilities. Specifically, this MIMP update suggests that UWMC - Northwest development will grow from approximately 738,000 gross square feet (GSF) up to 1.6 million GSF over the course of the MIMP. Without mitigation, the trees removed to accommodate this new development would likely reduce the existing tree canopy to about 18%.

Considering these projections, this document defines a new goal of 20% canopy coverage by 2037 which roughly equates to the estimated 2023 canopy cover, for a total of nearly 7 acres of canopy cover. The strategies and policies to achieve this goal are outlined throughout this document. Urban forestry has and will continue to be a part of the legacy of the UWMC - Northwest and it needs to be a major topic of discussion during the design process to reconcile canopy goals with implementing program needs established by the proposed MIMP.

Tree Canopy Coverage



6.6 ACRES OF CANOPY COVER BY 2037

The most recent data available from 2021 indicates that tree canopy covers 23% of the UWMC - Northwest. We estimate that in 2023 the canopy cover is about 21% due to construction-related tree removal. Per UWMC - Northwest policy, replacement trees will be planted in 2024 after the building construction is complete. Despite replacement tree plantings, additional development over the next decade could reduce the tree canopy to around 18%. Returning to 20% canopy after new development is an ambitious goal that will be achieved through the maturing of replacement trees.

**Based on the LiDAR scan of Seattle performed in 2021 by the USGS.*

2021 Tree Canopy

7.7 ACRES | 23% of Land Area

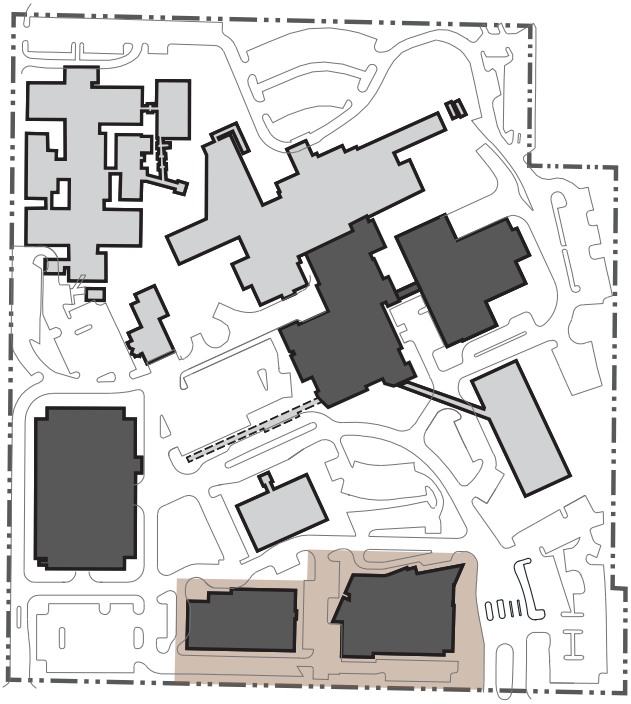
2021 City of Seattle LiDAR

Estimated 2023 Tree Canopy

7.2 ACRES | 21% of Land Area

★ = *Planned construction-related replacement trees near the BHTF building (in the red dashed circle)*

Future Development Impact on Tree Canopy



Redevelopment of the UWMC – Northwest campus will include inpatient (hospital) and outpatient clinic buildings to replace and grow existing healthcare capacity on-site. In addition, support uses such as administrative offices, daycare (for staff families), central utility plant(s), and parking structures are anticipated.

These changes will have an impact on the tree canopy of the site. This document should be referenced during each new project to ensure proper measures are taken to maintain the value of the urban forest on the site.

Landleases

Potential Replacement of Program Elsewhere

Buildings to Maintain / Renovate

Achieving Canopy Goals

Proper and strategic tree selection is vital when working towards a specific canopy goal. Each tree has its own dimensions that reflect the overall shape of the tree from pyramidal to columnar. Choosing trees that have a wide mature canopy width can greatly reduce the number of trees needed to achieve canopy goals. By comparing this generic canopy analysis (below) with the available land for new plantings, we can determine the types of trees that will fit in landscaped areas and assist in reaching the canopy goals for the UWMC - Northwest. Integrating this type of thinking into design projects could help grow the UWMC - Northwest urban forest for years to come.

GENERIC TREE ANALYSIS

Canopy Width (ft)	Area per tree (sq ft)	# of trees per acre
5	*20*	*2,218*
10	*79*	*555*
15	*177*	*246*
20	*314*	*139*
25	*491*	*89*
30	*707*	*62*
35	*962*	*45*
40	*1,257*	*35*
45	*1,590*	*27*
50	*1,963*	*22*
55	*2,376*	*18*
60	*2,827*	*15*
65	*3,318*	*13*
70	*3,848*	*11*
75	*4,418*	*10*
80	*5,027*	*9*
90	*6,362*	*7*
100	*7,854*	*6*

Metasequoia glyptostrobodies **20'**

Circidiphyllum japonicum **40'**

Paulownia tomentosa **50'**

Juglans nigra **70'**

Metrics and Reporting

CANOPY GOALS | TREE HEALTH

The UWMC strives to better understand the urban forest resources it inherited when it purchased the Northwest campus in 2020. With the goal of being good stewards of the trees, the UWMC will track several metrics including, diversity of trees, canopy cover change, tree structural condition, and tree health condition. The diversity of trees should include a mix of ages, species, and genus to overcome disturbance and ensure the longevity of the forest resource. The canopy cover change will be measured against the canopy cover goal set by this document. Periodic updates to this document may be made as we approach the goal deadline. Tree condition data will be gathered by a third-party arborist in association with major construction projects and will be retained internally. The metrics of these categories will be used to inform and guide management decisions in the future.

The health of the trees is as important as the quantity of canopy cover on campus. The UWMC hires skilled third-party arborists to update the tree inventory, consult on health conditions, perform holistic pruning, and inoculate trees against pests and diseases.

The UWMC will gather its own data through the UWMC Groundskeepers or a third-party arborist to track growth. The UWMC depends on outside data such as tree canopy change data from the City of Seattle. Although the UWMC may not control the schedule for when data is gathered by other entities or reported publicly, it can use this periodic data to compare to its own record keeping for a comparison of different scales of information.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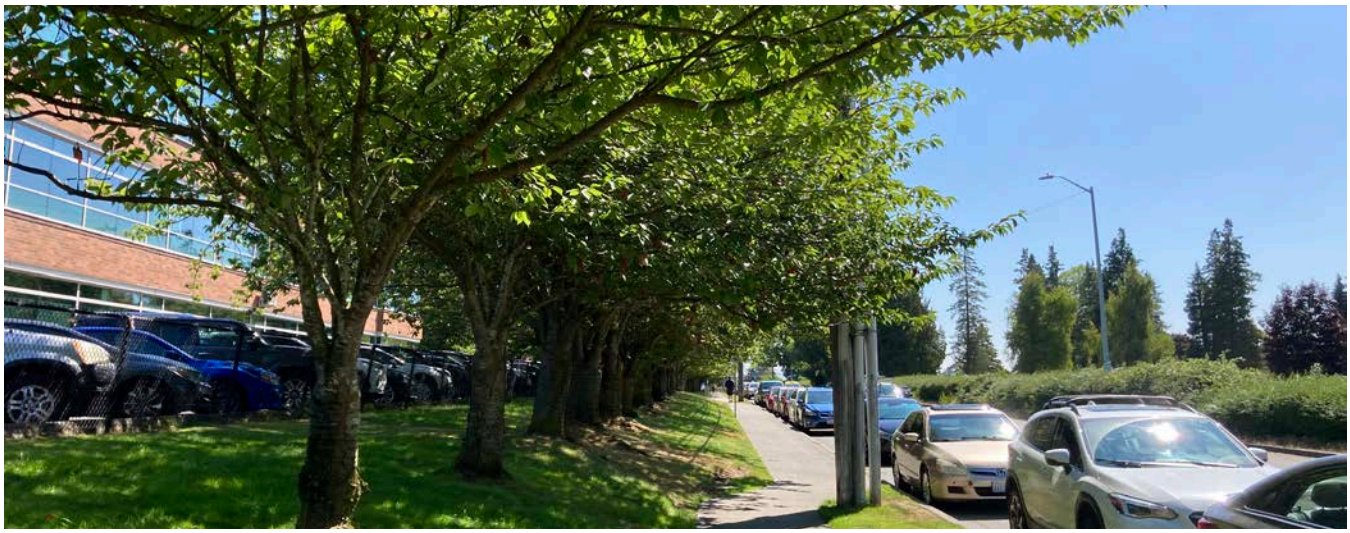


UWMC's Urban Forest

Man is nature as much as the trees.

Daniel Urban Kiley

The UWMC - Northwest was carved out of a forest of trees, where reminisce of its grandeur still exist today at the campus edges. The UWMC consists of a mosaic of landscape types, each providing important environmental services that comprise a small example of Northwest Ecotones: conifer forest, deciduous groves, and grasslands. The urban forest not only comprises trees but is experienced as the juxtaposition of all the vegetated layers, lawns, planter beds, groves, and shrubs against the architecture and surrounding context. It is the organization and relationship between these multiple pieces that give the UWMC - Northwest its identity. Preserving and enhancing these attributes throughout the campus can impact both inpatient and outpatient health outcomes as well as employee and visitor experiences. To establish goals and strategies related to the urban forest, a baseline needs to be defined for which all future changes will be compared with to understand the progress and value of subsequent efforts. The hospital was integrated into the UW Medical Center system in 2009 and officially became the UWMC - Northwest in January 2020. This document is the first Urban Forest Management Plan under UWMC ownership. As such, it seeks to establish that baseline and new goals for the tree canopy and management.

Land Cover

33 ACRES | LANDSCAPING | BUILDINGS | INFRASTRUCTURE

The UWMC owns and manages the land within the Major Institution Overlay (MIO) to standards set by the UWMC and the City of Seattle; this includes all hardscape, softscape, buildings, vegetation, and utilities that fall within the MIO. To establish a baseline for analyzing the UWMC's urban forest, the existing ground conditions have been quantified.

Land Cover

Total Area :	**33 acres**
Canopy Area	**21% (7 acres)**
Building Gross Square Feet :	**780,000**
Parking Stalls:	**1,633**
Landscaped Areas:	**24% (8 acres)**

Building Coverage

# Buildings :	**13**
Total Area :	**27% of Land Area (9 acres)**

Landscape Character

The UWMC - Northwest has many landscape types associated with different uses of space. These include woodland groves, buffer plantings, parking lots, open lawns, building entry terraces, walkways, and a gathering square with a fountain. Each type of space has a function and a character. By identifying and describing each element, the urban forest management plan can consider the needs of each use type when establishing tree canopy goals. Each element should be addressed on its own terms, considering adjacent relationships. Urban forestry practices can help emphasize the character of each type of space while enhancing ecological and social function across the UWMC - Northwest.

With more development planned, simplifying the landscape types into three broad categories: landscape buffer, entry & wayfinding, and landscape amenities, can help envision the character of the landscape. The proposed 2024 Major Institution Master Plan for UWMC - Northwest provides new opportunities and standards for bringing the healthcare facilities up to modern protocols. During each building design process there must be a discussion about how the landscapes associated with new buildings will relate to the three landscape categories.

LANDSCAPE BUFFER

The groves along the property edges are the recognizable Pacific Northwest frame for the UWMC - Northwest, with tall evergreen and deciduous trees and a robust canopy. The continuity of the woodland grove at the edges of the property is key to its character and provides screening to the neighboring properties.

ENTRY & WAYFINDING

The entryways and streets provide clear way finding and are welcoming and beautiful. These areas receive the highest level of care and maintenance as they are highly trafficked by cars and emergency vehicles. Strategic tree planting locations can make entrances clear and assist with conveying people to the healthcare facilities.

LANDSCAPE AMENITIES

Amenities are the landscaped areas that provide beauty and moments of respite and reflection throughout the property. These include ornamental plantings, special trees, gardens, vistas across the property, outdoor dining spaces, and terraces for sitting and gathering.

Tree Database

GIS | GPS | ISA ARBORIST

The following analysis of the UWMC - Northwest urban forest was completed using ArcGIS 10.8, Illustrator, InDesign, AutoCAD, and Microsoft Excel. The tree inventory was conducted in May of 2023 by Tree Solutions Inc. With the property officially becoming UWMC - Northwest in January 2020 and the 2024 Major Institution Master Plan coming into effect, this analysis represents a snapshot in time that establishes a baseline for the UWMC's management of its urban forest.

The Arborist assessed the health of approximately 606 trees on the property with specific attention to 203 trees with high visibility along wayfinding routes. Each surveyed tree is tagged with a unique number, measured for diameter at standard height (DSH), identified, classified, measured at the drip line, and rated for health condition.

The data used for the canopy analysis was derived from a LiDAR scan completed by the City of Seattle in 2021 and made public in 2023. The other data used to create all the maps that follow were acquired from the City of Seattle GeoData website. This includes building outlines, parcels, and right-of-way. All additional map data is approximated by georeferencing hardcopy maps using know points and then tracing the features into a new feature class.

Tree Health Categories

Excellent - Perfect specimen with excellent form and vigor, well-balanced crown. Normal to exceeding shoot length on new growth. Leaf size and color normal. Root zone undisturbed. No apparent pest problems. Long safe useful life expectancy for the species.

Good - Imperfect canopy density in a few parts of the tree, up to 10% of the canopy. Few pest issues or damage, and if they exist, they are controllable or tree reacts appropriately. Safe useful life expectancy typical for the species.

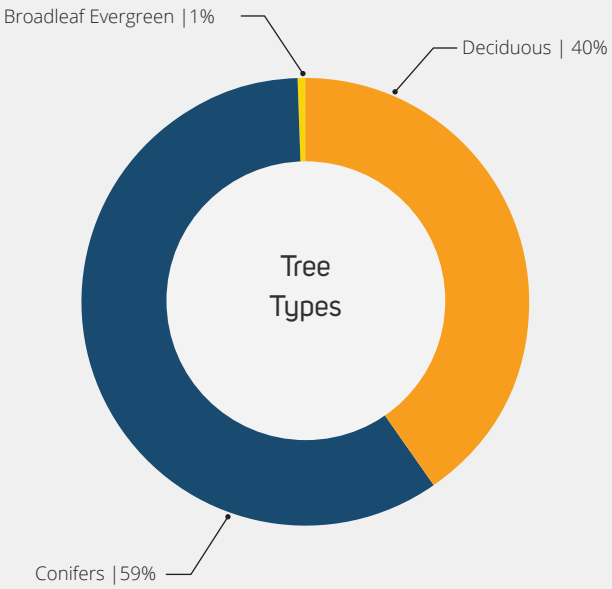
Fair - Crown decline and dieback up to 30% of the canopy. Leaf color is somewhat chlorotic/necrotic with smaller leaves and "off" coloration. Shoot extensions indicate some stunting and stressed growing conditions. Obvious signs of pest problems contributing to lesser condition, control might be possible. Below average safe useful life expectancy.

Poor - Lacking full crown, more than 50% decline and dieback, especially affecting larger branches. Leaf size and color reveals overall stress in the plant. Insect or disease infestation may be severe and uncontrollable. Extensive decay or hollows in branches and trunk. Short safe useful life expectancy.

All Trees

606 TREES | 55 SPECIES

The UWMC - Northwest has 606 trees planted spanning 55 different species with each providing value to the character and quality of the landscape. Although the diversity of the property's trees speaks to the previous owner's management, the ongoing health of the trees is the responsibility of the UWMC - Northwest. Through strategic care and management, the UWMC strives to provide a diversity of trees and distinct landscapes as amenities for its patients, employees, and visitors. Continuing to enhance biodiversity while improving the overall health of the urban forest is paramount for minimizing potential tree loss due to pests and severe weather. Growing this resource by increasing the number of species and trees on the property will help build the UWMC - Northwest's legacy of being good stewards.

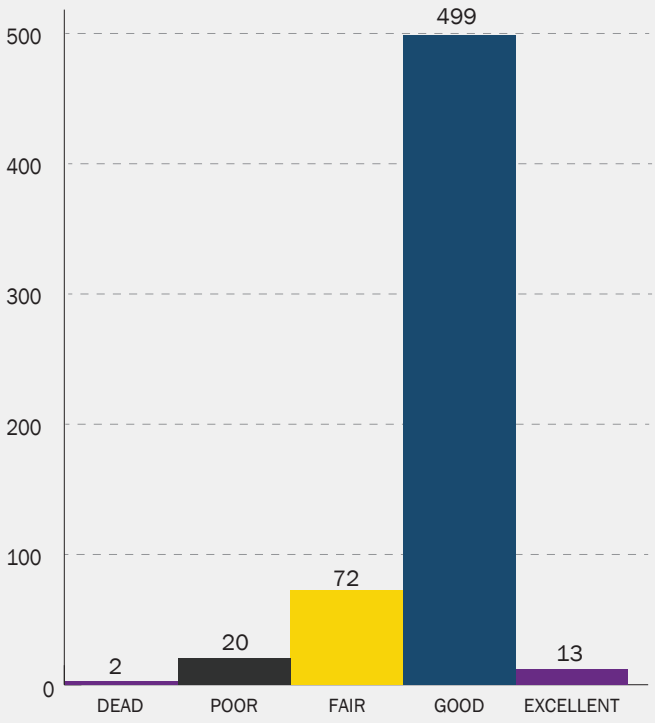


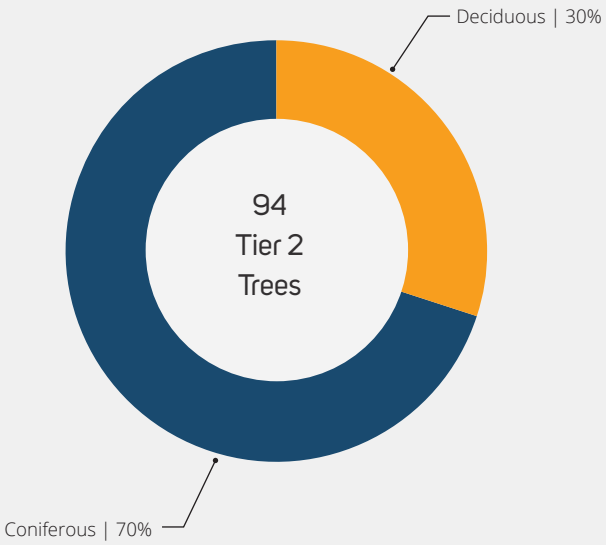
Most Common Species

Tree Species	# of Trees
Thuja plicata	177
Pseudotsuga menziesii	98
Prunus serrulata	78
Calocedrus decurrens	54
Cercidiphyllum japonicum	33
Pinus sylvestris	26
Betula pendula	20
Pinus contorta var. contorta	14
Tilia cordata	13
Fraxinus pennsylvanica	11
Acer rubrum	11

All Trees

TREE CONDITION

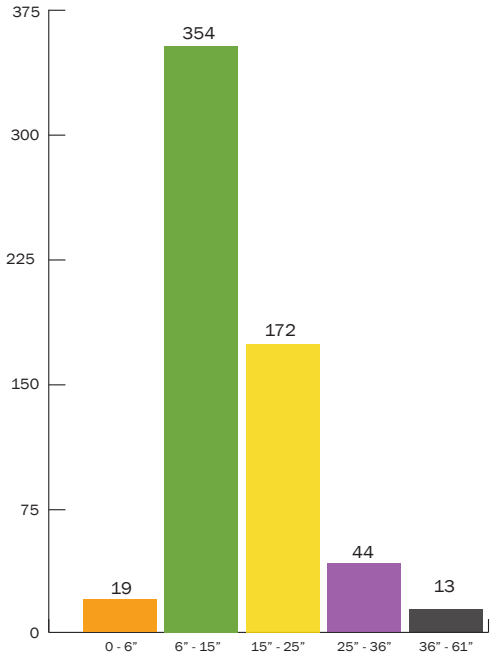




Diameter at Standard Height

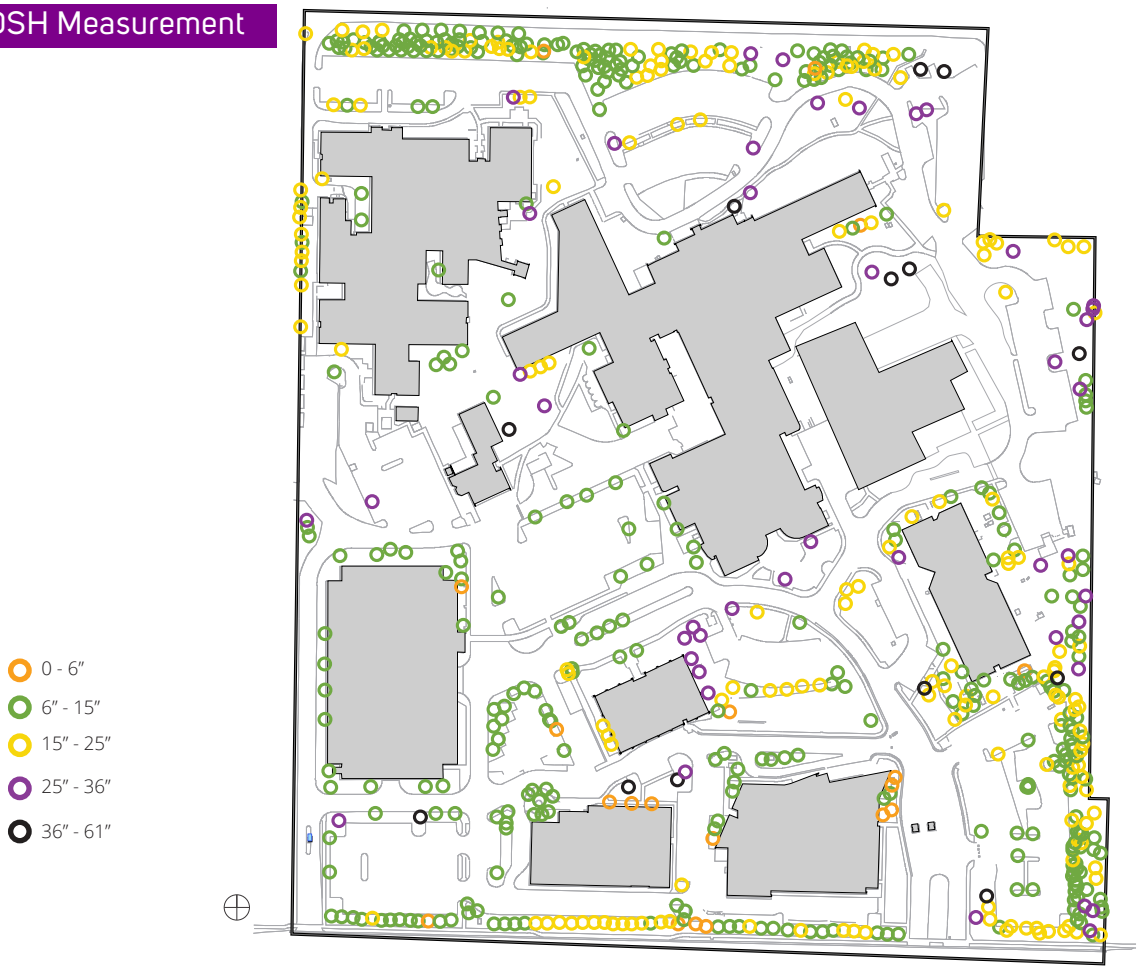
EXCEPTIONAL | CALIPER

The Diameter at Standard Height measurement or DSH is a standard dimension taken at 4.5 feet above the base of the tree. The DSH measurement can be used to extrapolate other dimensions of a tree, tree height, crown volume, and age. The City of Seattle uses this measurement to define which trees are and are not exceptional. The majority of trees on the campus have a DSH less than 15 inches with only 34 trees above 30". It is important for UWMC to have a range of trees with varying DSH's to provide a diverse urban forest that consists of a range of species at different sizes and ages.



Quantity per DSH Range

DSH Measurement



Estimated Tree Age

MATURE | ESTABLISHING

A healthy forest is composed of trees of varying ages to help reduce the possibility of simultaneous tree loss. The estimated age of trees at UWMC - Northwest has been determined by reviewing historic aerial photos and by using a standard formula where age equals DSH multiplied by species growth factor (a number published by researchers). This method yields results with an accuracy of plus or minus 10%. An alternative method would be comparing existing height to potential max height to determine a life stage category, though this method requires tree height data. Age analysis revealed that over half of the existing trees at UWMC - Northwest are 50+ years old, which means there is a need to diversify the ages of trees on campus. The current strategy for accomplishing this is to add new trees during new construction projects following the *Tree Replacement Policy (page 50).*

Trees 70+ years old

161 TREES | 27%

Trees 0-20 years old

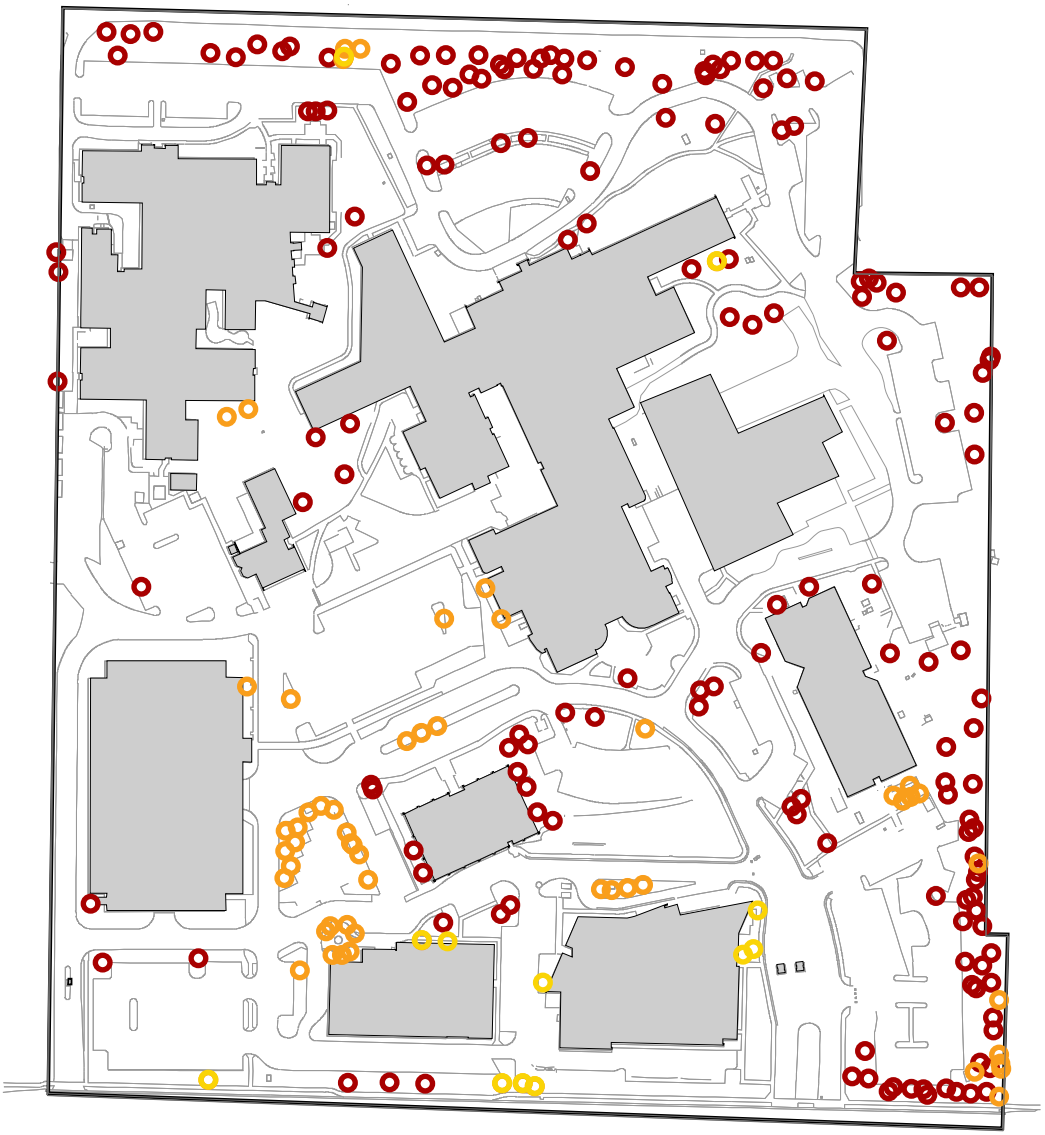
11 TREES | 2%

Under 6" DSH Trees

12 TREES | 2%

Unknown Age

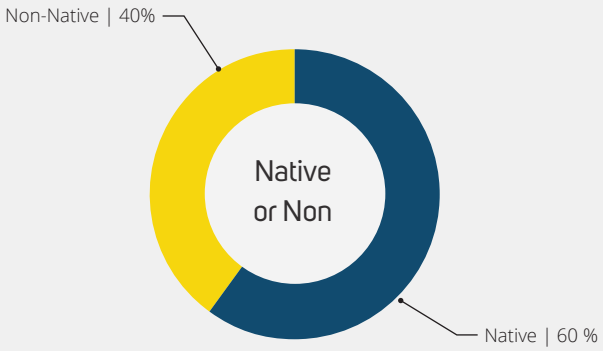
48 TREES | 8%

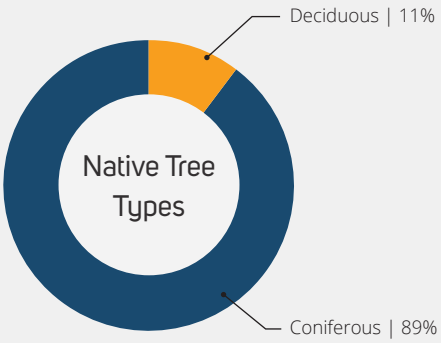


Native Trees

366 TREES | 20 SPECIES

Trees that are native to Northwest Washington are assets to the campus because of their natural acclimation to the Northwest climate and their benefit to wildlife habitat. Native trees have naturally aligned their watering and nutrient needs with the local climate which reduces irrigation requirements, reduces disease risk, enhances the local ecology, and helps limit the introduction of potential invasive species into the landscape. UWMC - Northwest has more native trees than non-native trees. The campus has a significantly greater percentage of native conifers than native deciduous trees, with *Thuja plicata* and *Pseudotsuga menziesii* representing 65% of native trees on campus. Given the dominance of these two native species on campus, the UWMC can enhance biodiversity by introducing more native species. The UWMC recognizes the benefits of native trees but also feels that a healthy urban forest needs to respond to the existing conditions which are greatly altered from what was present historically, making natives not always the most ideal choice. Planting non-native trees could help identify which species may thrive here in the climate-changed future.





Most Common Native Species

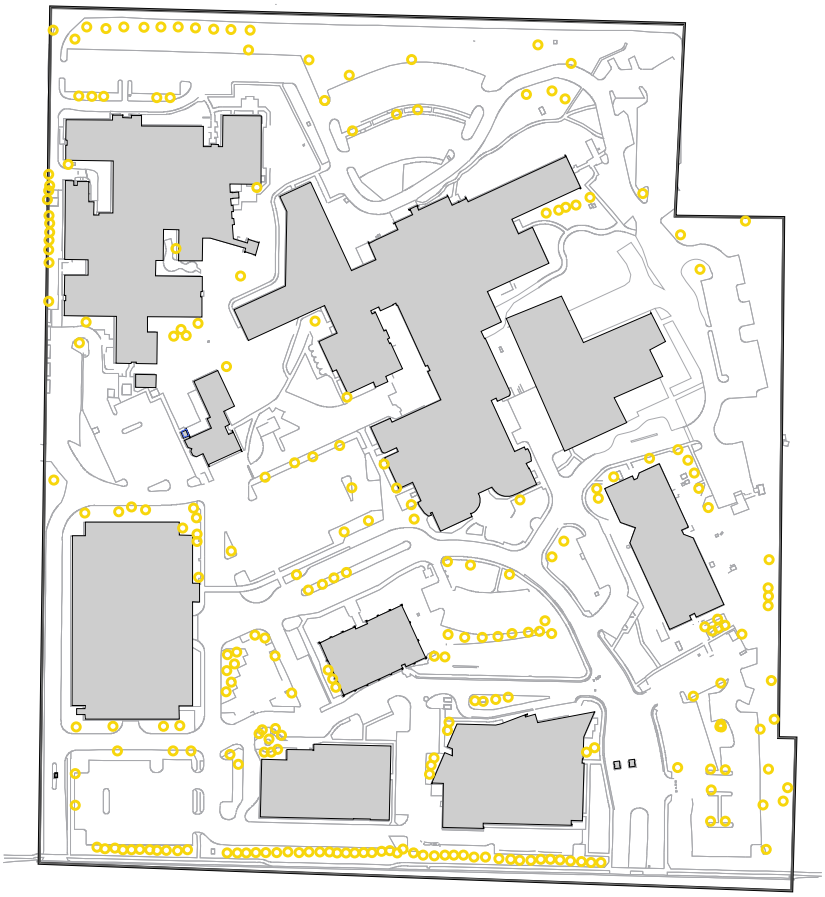
Tree Species	# of Trees
Thuja plicata	*143*
Pseudotsuga menziesii	*96*
Calocedrus decurrens	*54*
Pinus contorta var. contorta	*14*
Betula payrifera	*9*
Acer circinatum	*8*
Callitropsis Nootkatensis	*6*
Robinia pseudoacacia	*5*

Native Trees

366 TREES | 60%

Non-Native Trees

240 TREES | 40%



Invasive Species

17 TREES | 4 SPECIES

Unlike non-native species, which can contribute positively to the urban forest, invasive trees may cause negative impacts on other plants and human health. The UWMC has 17 trees on campus that have been identified by the King County Noxious Weed Division or the USDA as invasive species or weeds of concern. These species have the potential to out-compete diverse plantings, turning areas into unwanted vegetation. Removal of weeds of concern following Seattle municipal code is recommended. For other species, ceasing new plantings is a sufficient remedy. The following species have been identified as invasive and are growing at UWMC - Northwest:

Weed of Concern: Black locust – Robinia pseudoacacia (5)

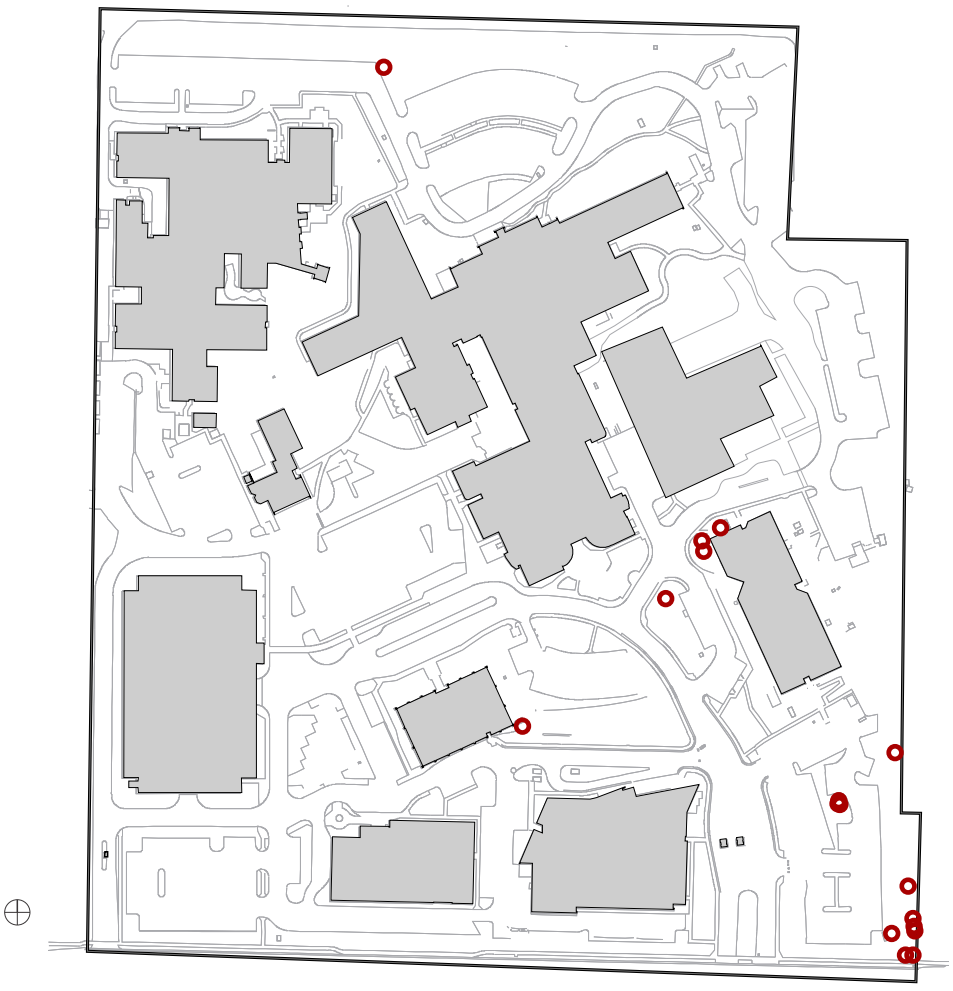
Weed of Concern: Wild Cherry – Prunus avium (1)

European birch – Betula pendula (10)

English Hawthorne – Crataegus laevigata (1)

Invasive Species

2% of Total Trees



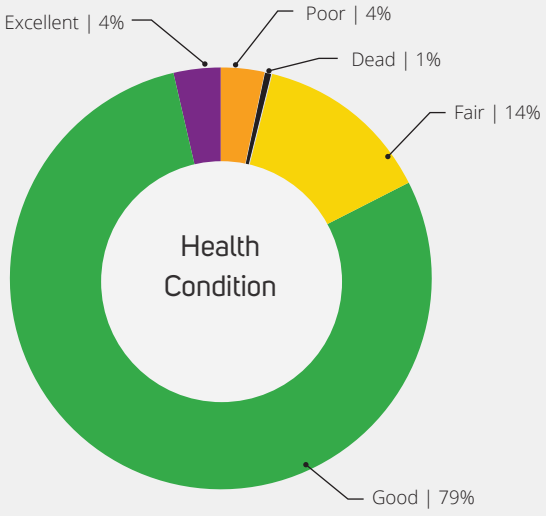
Coniferous Trees

359 TREES | 19 SPECIES

Historically, Washington was dominated by conifer forests that were logged extensively over the past 150 years. Only scattered patches of mature forests remain across Western Washington. This has impacted the natural succession of Washington's forest that are now dominated by deciduous trees. Five of the top ten most abundant species on campus are conifers with the highest densities of conifers being along the edges of central campus. Conifers are unique in that they provide environmental services all year long. They improve air quality, provide wind and noise barriers, provide shade, and help retain stormwater runoff from impervious surfaces. Leveraging the environmental services offered by conifers could help UWMC protect areas from prevailing winds, shade buildings to reduce energy costs, and help manage stormwater on-site.

79%

of Conifers on Campus are in Good or Excellent Health



59%

of Trees on Campus are Conifers

Most Common Coniferous Species

Tree Species	# of Trees
Thuja plicata	*143*
Pseudotsuga menziesii	*96*
Calocedrus decurrens	*54*
Pinus sylvestris	*18*
Pinus contorta var. contorta	*14*
Callitropsis Nootkatensis	*6*
Sequoia sempervirens	*4*
Cedrus deodara	*4*
Juniperus scopulorum	*4*

Conifer Trees

359 TREES | 60%

Deciduous Trees

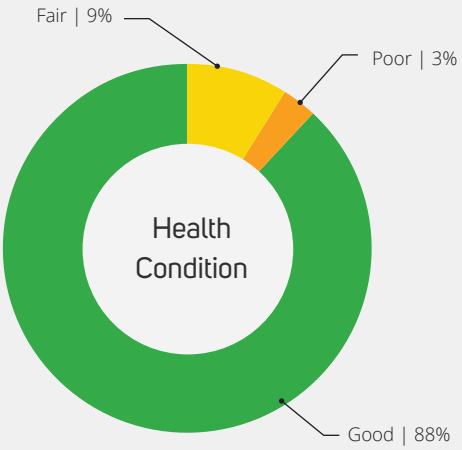
245 TREES | 40%

Deciduous Trees

245 TREES | 56 SPECIES

The amazing autumn color that is offered by Northwest deciduous trees is a cultural legacy of the Pacific Northwest that is celebrated by residents and visitors alike. Most of this region's historic old-growth forest has been cleared by development and its place are greater quantities of deciduous trees. Deciduous species differ in their ability to produce food, flowers, and other resources. They provide half the stormwater management value that conifers offer because deciduous trees are dormant during the winter, with the exception of *Populus tremuloides* (Quacking Aspen). However, planting deciduous trees on the south and west sides of buildings can help create micro-climates to reduce energy costs. The UWMC values access to sunlight both indoors and outdoors for their patients, visitors, and staff. Deciduous trees planted around open areas, entrances, and walkways allow for a bright experience of the campus, even in the winter. With 56 different deciduous species, the UWMC canopy is a vast living resource that reflects the robust and diverse communities that work, live, and play within the campus.

88%
of Deciduous Trees on Campus are in Good Health



40%
of Trees on Campus are Deciduous

Most Common Deciduous Species

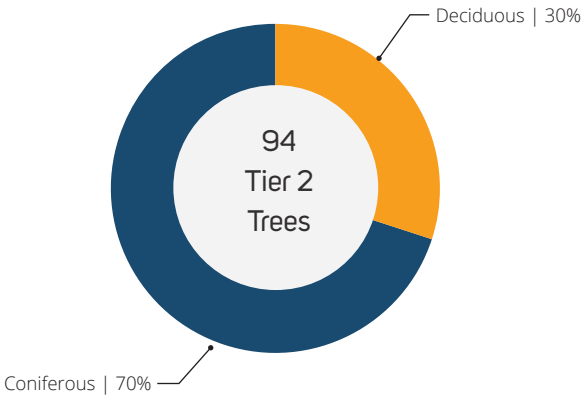
Tree Species	# of Trees
Prunus serrulata	77
Cercidiphyllum japonicum	32
Acer rubrum	11
Fraxinus pennsylvanica	11
Betula nigra	10
Betula pendula	10
Betula papyrifera	9
Pyrus calleryana	8
Acer circinatum	8

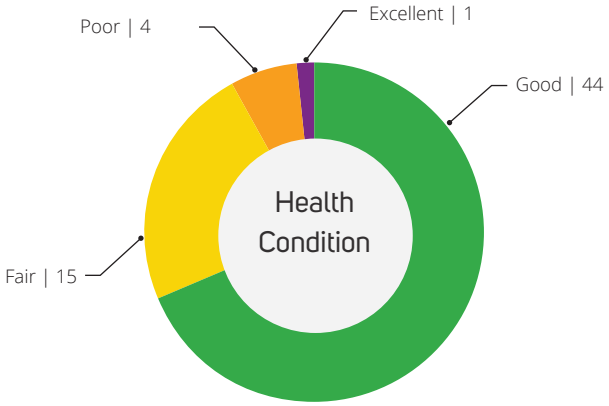
Tier 1 and 2 Trees

94 TIER 2 TREES | 26 SPECIES

Exceptional Trees provide the UWMC - Northwest with culturally significant specimens that offer habitat benefits and enhance the overall quality of the campus. These trees have been identified based on the City of Seattle's SDCI Director's Rule 7-2023. Tier 1 trees are heritage trees (defined in Seattle Municipal code, Title 15), none of which are on the UWMC - Northwest campus.

Tier 2 trees are any tree with a DSH of 24" or greater or meets or exceeds the threshold diameters specified by the Director's rule for specific tree species with a threshold below 24". The new rule classifies an additional 30 trees as exceptional trees (Tier 2).





Most Common Tier 2 Trees

Tree Species	# of Trees
Thuja plicata	33
Pseudotsuga menziesii	18
Pinus contorta var. contorta	8
Amelanchier alnifolia	4
Pinus sylvestris	4
Picea sitchensis	3
Quercus rubra	3
Quercus frainetto	3

Disease Susceptibility

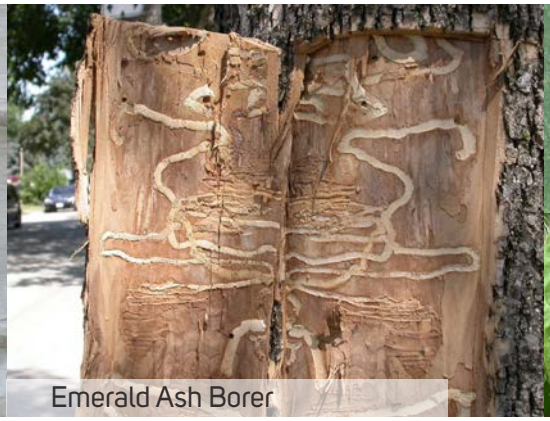
INTEGRATED PEST MANAGEMENT | INOCULATION

All trees are susceptible to disease or insects, it's the fatal nature of their susceptibility that varies. The best way to protect a tree from harmful agents is to plant them in an ideal condition and maintain them to optimal health. Though not all diseases or insects only attack unhealthy trees, for instance, the Emerald Ash Borer attacks trees of all conditions. Planting a diverse stand that is not limited to natives is ideal because many diseases and insects affect native plants. A ratio of no more than 10% of one species or 20% of one genus or 30% of one family is recommended to minimize the risk of massive disease infestation resulting in extensive tree death. Currently, the campus is above these thresholds with three species—*Thuja plicata, Pseudotsuga menzieseii, and Prunus serrulata*—each exceeding 10% of trees on campus.

With the number of outbreaks growing, a diversity of trees needs to be maintained in the urban environment to better protect the forest from a single vector destroying the canopy. Urban areas that have a concentration of individual species are more susceptible to massive infestation. When establishing a tree palette for an area, it is not recommended to limit tree types to ones that are not associated with a major disease or insect risk, unless there have been high volumes of outbreaks. Restricting tree choices will put areas at risk of potential future outbreaks caused by unknown pests.

When a tree has been identified as potentially infected or diseased the UWMC - Northwest Groundskeepers or a hired arborist conducts an evaluation of the tree. This helps the UWMC determine the necessary means for resolving the hazard. A tree is removed when pruning, cabling, spraying, or injecting are not viable options for resolving the concern. The UWMC takes advantage of integrated pest management to minimize its use of insecticides, fungicides, and pesticides because of their potential negative effects on soil biology, pollinators, water quality, and human health.


Bronze Birch Borer


Emerald Ash Borer

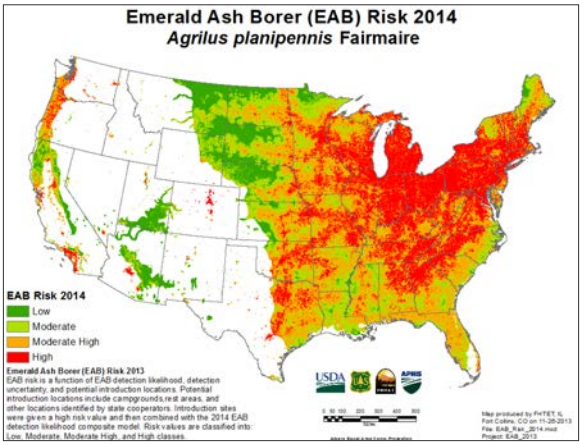

Spider Mite


Aphids

Emerald Ash Borer

FRAXINUS | NO REPORTED CASES

Emerald Ash Borer is an invasive beetle that has yet to be detected in Washington State. However, an infestation was reported in Oregon in 2022. The Emerald Ash Borer is a beetle associated with trees in the *Fraxinus* genus that feeds on foliage. Its larvae feed on the inner bark of ash trees which impacts the tree's ability to transport water and nutrients. The beetle is native to Asia and is assumed to have arrived in the U.S. on solid wood packing materials. The areas where this beetle is being reported have implemented quarantines to restrict its movement. The Puget Sound Region has been identified by the USDA and US Forest Service as a high-risk area for potential outbreaks because of the robust forest and associated industries that are in this region. Establishing an early detection rapid response strategy to help educate staff on properly identifying this disease will aid in reducing the impact of any outbreak that may occur.



Verticillium Wilt

ACER | NOT A CURRENT PROBLEM

Verticillium is a soil-borne fungi that attacks woody ornamental trees in the United States. Verticillium slowly spreads inside the tree causing a slow and long death. This infection is often confused with other tree impacts: herbicide damage, adverse environmental conditions, or mechanical damage. Nurseries using land that was previously growing infected plants are more susceptible to this disease. Certain trees are more susceptible to this disease while others are immune to it, such as Beech, Birch, Pine, and Poplar trees. This disease may have infected trees on campus in the past and prior to UWMC ownership, though any trees of concern were removed. Big Leaf Maple trees are highly susceptible to this disease, though UWMC only has 4 individuals of this species on campus. If verticillium wilt becomes an issue, the best course of action is to remove the infected tree and replace it with a different or immune species.

Bronze Birch Borer

BETULA | CURRENT PROBLEM

The Bronze Birch Borer is a current problem in many birch trees on the UWMC - Northwest property. The problem is ongoing because once infestation has started in a tree it is difficult to eradicate it without the use of pesticides. The beetles are most attracted to unhealthy trees so by planting new birch trees in their ideal habitat; cool areas with moist soil and partial sun exposure and minimal foot traffic will help minimize the risk of infestation. When ideal soil conditions are not met, new and established birch trees should be irrigated sufficiently to keep the trees healthy and prevent infestation. Also, selecting varieties that have greater resistance is also a good strategy for minimizing risk. Once trees have been diagnosed with this parasite, a third-party arborist is hired to treat select trees that can be saved. Those that do not overcome the infestation are recommended for removal.

High Susceptibility

Betula pendula (10 individuals)

Moderate Susceptibility

Betula papyrifera (9 individuals)

Minimal Susceptibility

Betula nigra (10 individuals)

Betula Health

29 trees


4
NATIONAL

Stewardship Practices & Standards

The death of the forest is the end of our life

Dorothy Stang

The UWMC takes great pride in their ability to maintain and enhance the urban forest. Through the oversight of the UWMC Groundskeepers and with tree management being conducted by a licensed arborist, each tree is carefully managed to minimize tree loss and improve tree health while enhancing the overall aesthetic of the property. These processes along with management guidelines are outlined in this chapter to provide designers and builders with the UWMC's tree planting standards and processes.

UWMC-NW Grounds Management

The character of the landscape is a product of the careful management by the UWMC - Northwest Groundskeepers. The Groundskeepers conduct the maintenance of all trees, lawns, planting beds, and hardscape along sidewalks, and in vegetated areas, and parking lots within the Major Institutional Overlay. All trees within the Major Institution Overlay are managed as a whole by the UWMC - Northwest Groundskeepers with support from third-party arborists.

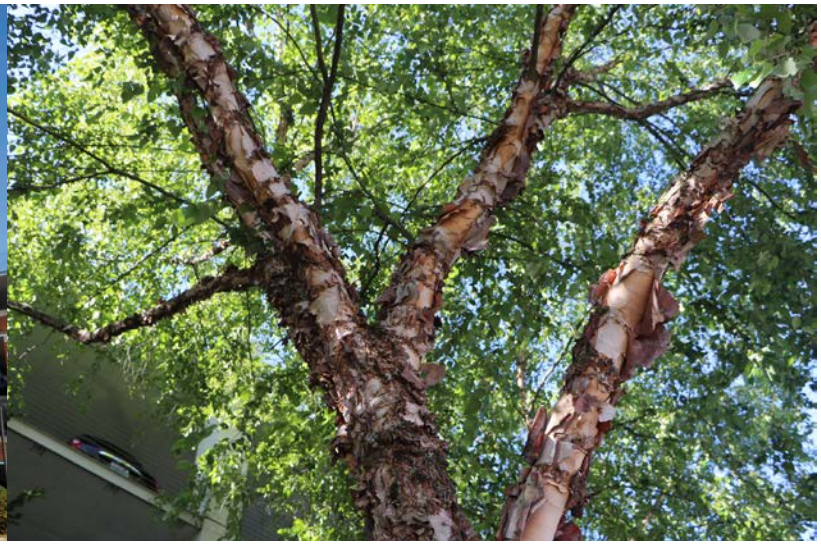
GROUNDSKEEPERS

The Groundskeepers complete work on a regular schedule to ensure a pleasant experience for all patients, visitors, and staff members. The UWMC - Northwest has three full-time groundskeepers on staff, each with decades of experience with landscape maintenance. The team contracts outside landscape vendors for monthly assistance with irrigation and low-visibility landscaping during the busiest times of the year. The groundskeepers perform routine tree pruning of lower branches that can be reached from the ground with hand tools and pole pruners.

URBAN FOREST SPECIALIST

Thorough tree pruning and maintenance is carried out by a third-party arborist. The Arborist works on a yearly contract to provide proactive tree care including thinning, deadwood removal, pruning over rights-of-way and away from buildings, and other safety measures, as well as inoculation and treatment of diseases and pests. The Arborist predicts that a holistic treatment of every tree in 2023-2024 will reduce the routine maintenance costs over the next five to ten years.

The UW Campus Architecture & Planning group works closely with the UWMC - Northwest during new building design and planning to maintain the vibrancy of the urban forest. During building project implementation, the UWMC - Northwest uses a third-party arborist to conduct a tree inventory and analysis for trees on the construction site. The Arborist provides on-site recommendations for existing trees to ensure they remain healthy during construction.



Management Recommendations

Maintain the diversity of trees on campus

In establishing a resilient urban forest, a diversity of trees in age, type, and size should be intermixed throughout campus. This will help protect the campus urban forest from infestations and tree death.

TASKS

1. Work with grounds staff to identify locations on campus where new trees can be planted.
2. Create a planting palette for campus.
3. Create a Replacement Plan for invasive, aging, and unhealthy trees on campus.

BENEFITS

1. Helps build a resilient urban landscape.
2. Strengthens the cultural value that the forest adds to the campus.
3. Enhances wildlife habitat on campus.
4. Different tree types can be leveraged for their environmental services resulting in cost savings.

Improve the health of trees on campus

Having a strategy for improving the health of existing trees can help minimize costs associated with tree removal, damage caused by unmaintained trees, and maintenance.

TASKS

1. Maintain an inventory of all the trees on campus that are currently in fair, poor, and very poor health.
2. Create a series of BMP's that define steps towards improving tree condition.
3. Develop a means for conducting additional tree maintenance on unhealthy trees.
4. Monitor new tree plantings on campus to identify issues with specific sites and conditions.
5. Prescribe a strategy for protecting trees from deadly bugs and disease.

BENEFITS

1. Provides the public with Northwest specimen trees.
2. Helps protect the cultural value of trees on campus.
3. Helps to minimize maintenance and operation costs.

Maintain an up-to-date GIS Tree Database

The UWMC - Northwest engaged a third-party arborist to complete an exhaustive tree inventory of the Major Institution Overlay. A methodology to keep the database up to date should be developed to allow the UWMC to monitor changes to the urban forest on a tree-by-tree basis.

TASKS

1. Identify the cost for completing a periodic tree survey.
2. Define a methodology for updating the tree database when projects occur.
3. Identify different funding sources for completing these tasks.

BENEFITS

1. Used to identify existing trees located within the limit of work of construction sites.
2. Allows the UWMC to track the changing diversity, age, and health of trees on campus.
3. Environmental value can be quantified.

City Relations

The urban forest is constantly changing and evolving, making accurate monitoring critical for understanding how the urban forest is changing. The UWMC can engage with the City of Seattle in understanding urban forestry best practices for the property.

Standardize LiDAR scan schedule

The UWMC needs access to periodic LiDAR scans to accurately track the evolution of its tree canopy. LiDAR imagery helps us monitor the impact of development on the tree canopy and the effectiveness of the tree replacement policy over time.

TASKS

1. Establish a methodology for obtaining Lidar Scans of UWMC - Northwest from the City of Seattle.

BENEFITS

1. Track tree canopy goals.
2. Can be used for campus development needs.

Increase awareness of UWMC's urban forestry activities & resources

The urban forestry program has implemented numerous activities to strengthen the value of the urban forest to the public that could benefit from greater awareness.

TASKS

1. Generate and standardize outreach materials for forestry activities appropriate for healthcare settings.

BENEFITS

1. Eases access to Urban Forestry Information.
2. Expands the locations where information can be acquired and shared.

Design Process

CONCEPT | SCHEMATIC | DETAILS | CONSTRUCTION

The UWMC - Northwest has established a robust design review process from a project's inception to completion that promotes an open dialogue between designers, the UWMC community, and project stakeholders. The goal of this process is to align every project with UWMC goals for preserving significant vegetated conditions, maximizing a building's function and capacity while enhancing the overall experience of the campus. Every major project must go through this process, so the campus is developed and designed with buy-in from all stakeholders and considered as part of a integrated whole.

PRE-CONSTRUCTION

At the start of every project, trees potentially impacted by the project are assessed. Capital projects require the UWMC to hire a third-party arborist to assess all trees within the construction area. An assessment of current conditions and an appraisal of each tree is prepared. Tree protection is a high priority, and the UWMC uses every measure to protect the root system and canopy of these trees. For more details, see the "Design Guidelines" section at the end of this chapter.

DESIGN REVIEW

All major projects are required to present to the University of Washington Architectural Commission for review and comment during all phases of the design process.

University of Washington Architectural Commission (UWAC)

UWAC was established in 1957 to advise the University President and Board on issues related to design, function, performance, and environmental integrity associated with new construction and planning on campus. The commission provides project review for development that affects the aesthetic character and composition of the university's campuses. The UWAC plays a key role in helping to preserve and enhance the unique character of outdoor spaces and attain high quality campus environments through reviewing and providing comments on construction projects on campus. The committee is made up of a diverse mix of members that have specific interest and expertise in topics directly related to landscape architecture, botany, urban design, campus planning, public health, and architecture.

DURING CONSTRUCTION

Once construction begins, the UWMC Groundskeepers, University Landscape Architect, and consulting Landscape Architect conduct site visits, nursery visits, and observe the installation of vegetation for each project. The collaboration within this group makes sure that the design intent is being fully realized while taking into consideration the maintenance requirements and the long-term vision of the landscape.

POST CONSTRUCTION

After construction has been completed, the UWMC Groundskeepers or a hired arborist conducts all tree management work during the warranty period of the contract.

Design Guidelines & Standards

The preservation and enhancement of a healthy UWMC – Northwest landscape and urban forest begins with defining project goals and guidelines through the design and construction process. In order to establish a standard for landscape implementation, the UWMC has defined critical design guidelines for consultants to use for creating landscapes that will thrive on the property and for groundskeepers to maintain and replace as necessary. These guidelines provide support from initial site planning to final acceptance. Within the following pages, details are provided to support specific guidelines or standards to be used by designers in the creation of construction documents. They include site planning, tree and plant protection, tree removal, and tree replacement.

For additional standards and specifications, UWMC requires use of the UW Facilities Design Standards including, but not limited to:

Plants standard specifications – including quality assurance; delivery, storage and handling; site conditions; sequencing; warranty; site preparation; installation; maintenance; cleaning; protection.

Trees standard specifications – including contractor responsibility; preconstruction conference; quality assurance; tree protection; soil and compaction protection; site examination and coordination; pruning; tree and stump removal; fertilizing and irrigation during construction and maintenance period; damage or loss mitigation.

Irrigation design standards – including design evaluation; submittals; products, materials and equipment; installation, fabrication and construction; drawings specifications.

Each specification is updated and maintained on the UW Facilities website: facilities.uw.edu/planning/design-standard

SITE PLANNING

- Meetings with the University Landscape Architect are encouraged prior to starting the design process.
- An evaluation of the existing trees on a site is required prior to design. This evaluation will be conducted by a third-party Arborist for all projects.
- All Tier 2 trees, trees to remain on site and trees for removal will be denoted on the site plan, demolition plan, and tree protection plan.
- A site survey is required for all new projects on campus, conducted by a licensed surveyor. An electronic AutoCAD version of the survey is to be provided to Campus Engineering when completed.

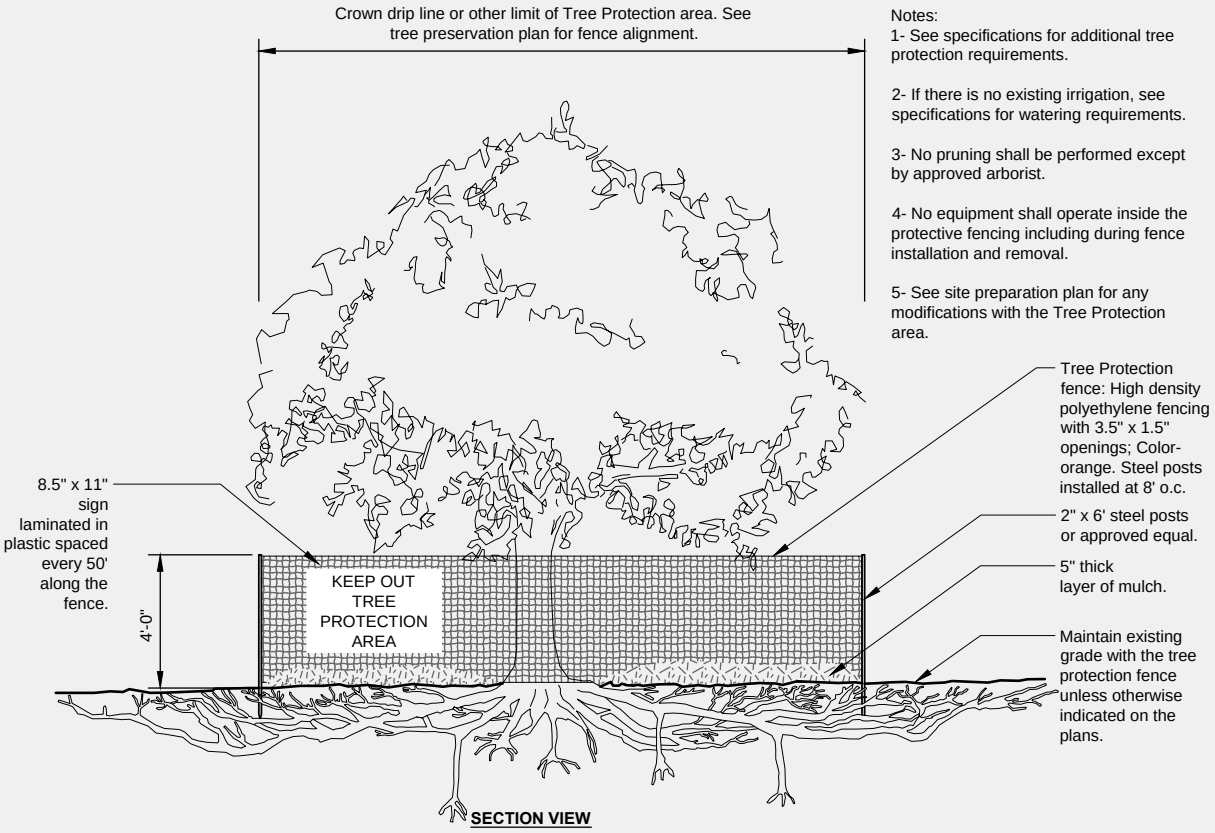
TREE PROTECTION PRODUCTS

- Tree Protection shall be reviewed and approved by the project Arborist or the University Landscape Architect prior to installation.
    - PROTECTION FENCING shall be equal to the following:
        - CHAIN LINK FENCE: 6 feet tall Galvanized, 11 gauge, 2 inch mesh chain link fencing with nominal 2 1/2 inch diameter galvanized steel posts set in metal frame panels on movable core drilled concrete blocks of sufficient size to hold the fence erect in areas of existing paving to remain.
        - GATES: For each fence type and in each separate fenced area, provide a minimum of one 3 foot wide gate. Gates shall be lockable. The location of the gates shall be approved by the University Landscape Architect.
        - Submit suppliers product data that product meets the requirements for approval.
    - MATTING shall be equal to the following:
        - Matting for vehicle and work protection shall be heavy duty matting designed for vehicle loading over tree roots.
        - Submit suppliers product data that product meets the requirements for approval.
    - GEOGRID shall be equal to the following:
        - Geogrid shall be woven polyester fabric with PVC coating, Uni-axial or biaxial geogrid, inert to biological degradation, resistant to naturally occurring chemicals, alkalis, acids.
        - Submit suppliers product data that product meets the requirements for approval.
    - FILTER FABRIC shall be equal to the following:
        - Filter Fabric shall be non-woven polypropylene fibers, inert to biological degradation and resistant of naturally occurring chemicals, alkalis and acids.
        - Submit suppliers product data that product meets the requirements for approval.
    - PROTECTIVE SIGNAGE shall be equal to the following:
        - Contractor shall post weather-resistant 8.5”x11” fluorescent green or yellow signage on protection fencing at 20 foot intervals warning construction personnel to keep out of tree protection zones.

TREE AND PLANT PROTECTION AREA

- The Tree and Plant Protection Area is defined as all areas indicated on the tree protection plan. Where no limit of the Tree and Plant Protection area is defined on the drawings, the limit shall be the drip line (outer edge of the branch crown) of each tree.
- The Contractor shall not engage in any construction activity, traverse the area to access adjacent areas of the project, or use the Tree Protection area for lunch or any other work breaks without the approval of the University Landscape Architect.

- All tree management activities within the Tree Protection Area will be performed or observed by a Certified Arborist.
- Potentially harmful materials to tree roots can not be stored within twenty (20) feet of protection fencing. Potentially harmful materials include, but are not limited to, petroleum products, cement and concrete materials, cement additives, lime, paints and coatings, waterproofing products, concrete forms coatings, detergents, acids, and cleaning agents.
- Flag all trees and shrubs to be removed by wrapping orange plastic ribbon around the trunk and obtain the University Landscape Architect's approval of all trees and shrubs to be removed prior to the start of tree and shrub removal. After approval, mark all trees and shrubs to be removed with orange paint in a band completely around the base of the tree or shrub 4.5 feet above the ground.
- Flag all trees and shrubs to remain with white plastic ribbon tied completely around the trunk or each tree and on a prominent branch for each shrub. Obtain the University Landscape Architect's approval of all trees and shrubs to be remain prior to the start of tree and shrub removal.
- Prior to any construction activity at the site including utility work, grading, storage of materials, or installation of temporary construction facilities, install all tree protection fencing, Filter Fabric, silt fence, tree protection signs, Geogrid, Mulch and or Wood Chip.



S-X TREE PROTECTION

TREE AND PLANT PROTECTION AREA CONT.

- All trees and landscape requiring protection shall be fertilized and watered by the Contractor until Substantial Completion.
- In the event that construction activity is unavoidable within the Tree and Plant Protection Area, notify the University Landscape Architect and submit a detailed written plan of action for approval. The plan shall include: a statement detailing the reason for the activity including why other areas are not suited; a description of the proposed activity; the time period for the activity, and a list of remedial actions that will reduce the impact on the Tree and Plant Protection Area from the activity. Remedial actions shall include but shall not be limited to the following:
    - When excavation for new construction is required within the Tree Protection Area, hand clear and excavate in a matter that will not cause damage to the tree, roots or soil.
    - Tree branches that interfere with the construction may be tied back or pruned to clear only to the point necessary to complete the work. Other branches shall only be removed when specifically indicated by the University Landscape Architect.

TREE REMOVAL

- Trees are to not be dropped with a single cut unless the tree will fall in an area not included in the Tree and Plant Protection Area. No tree to be removed within 50 feet of the Tree and Plant Protection Area shall be pushed over or up-rooted using a piece of grading equipment.
- Protect adjacent paving, soil, trees, shrubs, ground cover plantings and understory plants to remain from damage during all tree removal operations, and from construction operations. Protection shall include the root system, trunk, limbs, and crown from breakage or scarring, and the soil from compaction.
- Grind stumps to ground level, unless there are roots from other trees or vegetation that may be negatively impacted by the practice.
- Prior to tree removal, work with the University Landscape Architect on potentially salvaging the lumber produced from the removed tree.

TREE REPLACEMENT

- The requirement for Tier 2 tree replacement is a 2:1 ratio of trees lost to trees required. All other trees are required to be raplaced at a ratio of 1:1. New trees shall be 2″ in caliper minimum. **Trees shall have a replacement value of $1,000/tree.**
- When the project cannot replace all trees that were identified for preservation on-site or if damaged by construction, the equivalent value of these trees will be charged to the project. The cost to the contractor is based upon the square inches of cross sectional area of trunk measured at 4 ft. above grade, in accordance with the following criteria:
    - $75.00/square inch for trees less than or equal to 6 inch diameter
    - $50.00/square inch for trees greater than 6 inch and less than 18 inch diameter
    - $40.00/square inch for trees greater than or equal to 18 inch diameter

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Mount Rainier seen from the top level of the parking garage