OPPORTUNITIES TO ENHANCE THE NATURAL ENVIRONMENT IN FRASER HEALTH

An Inventory of Natural Assets and Green Infrastructure at 6 Fraser Health Sites

Prepared by: Katie McPartlin, UBC Sustainability Scholar, 2024

Prepared for: Darryl Quantz, Planetary Health Lead, Fraser Health,
Sonja Janousek, Regional Environmental Sustainability Manager, Facilities Management, Fraser Health, Providence Healthcare, Provincial Health Services Authority and Vancouver Coastal Health &
Fraser Health Natural Environment Working Group.

August, 2024

Disclaimer

This report was produced as part of the UBC Sustainability Scholars Program, a partnership between the University of British Columbia and various local governments and organizations in support of providing graduate students with opportunities to do applied research on projects that advance sustainability and climate action across the region.

This project was conducted under the mentorship of Fraser Health staff. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of Fraser Health or the University of British Columbia.

Territorial Land Acknowledgements

This work was undertaken in Fraser Health. Fraser Health provides care on the traditional, ancestral and unceded lands of the Coast Salish and Nlaka'pamux Nations and is home to 32 First Nations within the Fraser Salish region. Fraser Health is dedicated to serving all Indigenous people, and honours the unique cultures of the First Nations, Métis and Inuit living within the Fraser Salish region.

Fraser Health also recognizes *that Indigenous Peoples have been stewards and care takers of the lands, waters and ice and leaders in ecosystem conservation in what is now known as Canada, since time immemorial.*

The author would like to share that they come from the lands within Treaty #3 and Treaty #4 in what is now known as Ontario; this land is the traditional territory of the Anishinaabe and Huron-Wendat Nations.

The author would like to express their deep gratitude for the opportunity to carry out this work at the six healthcare sites that are situated on numerous unceded, ancestral, and traditional territories including those of the xwməθkwəy̓əm (Musqueam), Skwxwú7mesh (Squamish), Stó:lō, Səl̓ílwətaʔ/Selilwitulh (Tsleil- Waututh), Semiahmoo, Katzie, kʷikʷəƛ̓əm (Kwikwetlem), Kwantlen, Qayqayt, scəẃaθən (Tsawwassen), Semá:th, and Mathxwí Nations as well as other həńq̓əmińəm and Sḵwx̱wú7mesh Sníchim speaking peoples.

Cover photo: Google Earth image edited by Katie McPartlin

The author would like to sincerely thank the following individuals for their contribution, feedback, and support throughout this project.

Fraser Health Natural Environment Working Group :

Darryl Quantz, [FH], Planetary Health Lead

Sonja Janousek, Regional Environmental Sustainability Manager, Facilities Management, Fraser Health, Providence Healthcare, Provincial Health Services Authority & Vancouver Coastal Health.

Carol Peters, [FH], Social Worker, Indigenous Cultural Safety

Florrie Levine, [FH], Director, Design & Construction of Burnaby Hospital

Robin Speedie [FH], Senior Consultant, Planetary Health

Erin Budd, [FH], Resident, Mental Health and Substance Use Services

Craig Dedels, [VCH], Manager of Climate Risk & Resilience, Energy & Environmental Sustainability

Kiren Hundal, [FH], Client Partner, Occupational Health Nurse

Suzanna Kaptur, [FH], Consultant, Healthy Communities, EHS, TRI-CITIES PHFN

Site Informants:

The author would like to express their thanks to the leaders and staff who facilitated our visits to the six healthcare sites. Your participation, guidance, and feedback were essential to this project and it is much appreciated.

Contents

Contents ____ iii

1.0 Introduction ____ 1

2.0 Research Approach [Methodology] ____ 2

3.0 Findings ____ 3

3.1 Environmental Scan ____ 3

3.2 Landscape Assessment of Selected FH Sites ____ 13

4.0 Summary ____ 20

5.0 Recommendations [Next Steps] ____ 21

References ____ 25

Appendices ____ 29

1.0 Introduction

The biodiversity crisis refers to the rapid decline in the variety of life on Earth, driven by factors such as habitat destruction, climate change, pollution, overexploitation, and invasive species.[1] This crisis affects ecosystem services crucial to human well-being, including pollination, air and water purification, and climate regulation.[2]

Evidence-based research of nature's contributions to human health is constantly growing. Further, it's important to acknowledge that local indigenous nations have long understood the links between human health and environmental health.[3,4]

Fraser Health (FH) is a large organization serving approximately 1.9 million people with about 110 community sites.[5] This organization can be considered an anchor institute and has massive potential to contribute to regional ecological goals while improving the healing experience of the Fraser Region population.[5]

In 2023 Fraser Health released their Planetary Health Strategy. This strategy outlines their mission, “To inspire, empower, and activate our people and partners to improve planetary health, health equity and sustainability at all levels of the healthcare system.” Goal 3.3 in this strategy, “ to leverage the natural world for health, well-being and climate adaptation,” aligns with the goals of this study, in hopes of understanding FH green spaces and identifying opportunities to improve campus landscapes for both ecological and human health. [5]

Implementing integrated nature-based interventions in healthcare facilities is a promising strategy to simultaneously serve human health and restore biodiversity. Nature-based solutions (NBS) in healthcare settings can include gardens and other natural elements that improve air quality, stimulate the senses, enhance mobility, foster social connections, and boost mental health.[6] Healthcare facilities can play a crucial role by monitoring and managing their natural environments, ensuring these spaces remain conducive to healing.

This report will summarize best practices for measuring and monitoring the natural environment in healthcare facilities as found in current institutional strategies. It will also look to local biodiversity and forest strategies as guidance including Metro Vancouver’s 2018 Ecological Health Framework and local frameworks from cities specific to each site.[7]

As the significance of NBS is identified above, this report will also include an inventory of natural assets and green infrastructure present at 6 Fraser Health sites. The sites include three long-term care and three acute-care locations. The analysis of these sites will entail observations, interviews, and a land cover assessment to both identify green infrastructure and measure metrics related to the natural environment.

2.0 Research Approach [Methodology]

There are two parts to this project, the first part is an environmental scan, seeking out best practices for healthcare authorities and anchor institutes to measure and monitor natural assets. The second part of the project was an assessment of the natural assets and green infrastructure at 6 Fraser Health sites. The sites were largely chosen due to FH staff suggestions and interest in the project.

Natural assets is a broad term and for the purposes of this project, the definition of natural assets and other types of green infrastructure are defined as described by the Municipal Natural Assets Initiative (MNAI), see their graphic below (Figure 1).[8]

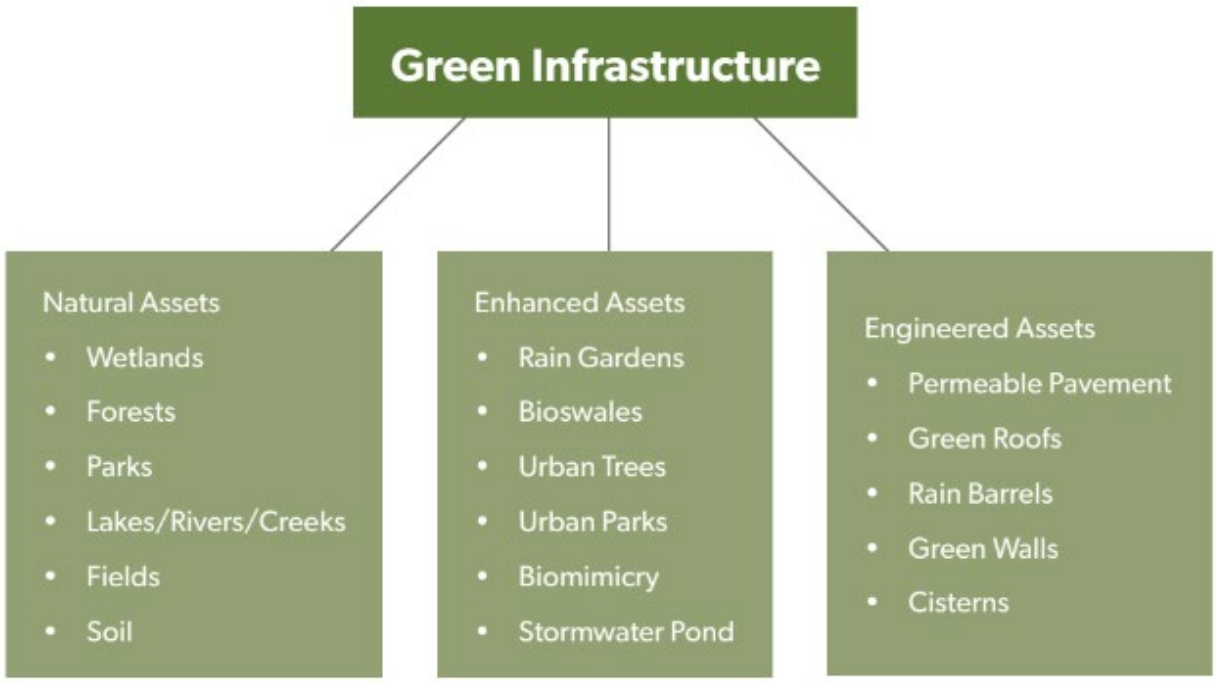


Figure 1: Categorization of green infrastructure and natural assets as described by the Municipal Natural Assets Initiative.[8]

Additional assets that are relevant to healthcare facilities were added including:

- Indigenous healing gardens,
- therapeutic gardens,
- sensory gardens,
- patient/staff/resident patio or
- terrace gardens.

An in-depth description of these various green infrastructure types was put in the report for FH made from this project entitled, “Introduction to Green Infrastructure in Health Care Settings.” General definitions of the green infrastructure found at these sites are listed in Appendix B.

This assessment was completed using site visit observations and staff interviews to apprise recommendations. This process helped identify and create an inventory of current green infrastructure. Interview questions can be seen in Appendix A. iTree Canopy is an online tool used to calculate metrics including tree canopy estimates and landcover type estimations of each site.[9] These metrics could be repeated in the future to monitor changes over time and to set new targets or key performance indicators (KPIs).

3.0 Findings

3.1 Environmental Scan

3.1.1 Policy Gap

In conducting this research about greenspaces in health care it became clear that there is a lack of policy on the standards for landscapes at healthcare facilities. There were inadequate design requirements for the amount, quality, and types of greenspaces that should be present, especially in long-term care. The findings were synonymous with a study out of the University of Toronto, that reported a lack of minimum design criteria in long-term care in Ontario.[10]

The table below notes a few examples where greenspaces are mentioned.

Governing Body	Greenspace Policy	Key Takeaways
Government of BC	BC Licensing for Long-Term Care, Community Care and Assisted Living Act: Residential Care Regulation.[11] Licensing requirements Division 4: Common Areas and Work Areas. This lists minimum standards for an outdoor activity area, including: 1.5m^2 per person, a surfaced patio, comfortable seating, and if possible and reasonable shelter from sun and elements and a fenced in area. [11] Licensing requirements Part 7. Pardons facilities from adhering to the 'outside activity area' requirements if licensed prior to 2000. [11] Licensing requirements Division 2- Bedrooms. The only other mention of "outside", This requires bedrooms to have a window that makes the 'outside' visible from a seated position. [11]	None of these requirements mention the quality of these outdoor spaces or the plants, trees, or nature that should be accessible. In all the divisions where outside is mentioned, it could be a fully concrete and paved outdoor environment.
Canadian Society for Landscape Architecture (CSLA) and adopted by many urban planners.	The 3-33-300 rule is used in landscape architecture and urban planning as its related to green space accessibility. This benchmark is intended to improve health and wellbeing, access, and support urban forests.[12] The rule states that each resident must be able to see at least three trees from their home, live within 300m of a park or green space, and each neighbourhood must have a canopy index of 30%.[12]	Keep in mind this rule of thumb for urban greenspace accessibility may not be enough for our health care facilities. Long-term and short-term residents may not have the physical, mental, or logistical ability to leave the site to find a greenspace or park. Health care facilities may need to lead the way in redefining what our landscapes can provide for our health and for the health of local ecologies.

		This may be valuable to keep in mind when setting greenspace goals and targets.
Fraser Health	Service Delivery Model for Specialized Community Service Programs- Complex Medically Frail (SCSP-CMF) Day Programs for Older Adults.[13] This document states some minimum requirements for green space that relate to access, proximity, design specifications, and programming.[13]	These requirements are slightly more thorough than the BC licensing standards noted above.[11] Can we have the equivalent and or more standards in long-term care facilities for all residents? Can we develop standards for various types of acute care? Can these standards be woven not only into program standards but also new development contracts?

This gap in policy means that ensuring greenspaces at healthcare sites are performing for wildlife and people falls on FH. Their Planetary Health Strategy and Draft Green Space and Biodiversity Plan are forming goals around this.[5, 14]

Next steps to continue reducing this gap is to set specific design requirements and minimum standards internally. This may include percent area of greenspace per capita, specific design guidelines for accessibility, or ecological standards, such as species richness or canopy cover.

3.1.2 Greenspace Assessment Tools and Strategies

The cumulative takeaway from researching greenspace assessment strategies is that it is critical to select KPIs and to measure these regularly to assess progress in working towards greater ecological health outcomes.

Some KPIs that relate to biodiversity specifically include environmental surveys for species richness, plant and tree inventories, bird surveys, and amphibian egg mass surveys. Surveys that look at courser scale measures, such as land cover assessments and canopy cover don't necessarily directly indicate biodiversity, although a co-benefit of more densely vegetated greenspaces and larger canopy cover often goes hand and hand with biodiversity.[15] Canopy cover is commonly used to evaluate greenspaces including in the public health realm and NDVI (Normalized Difference Vegetation Index) is a typical method to calculate canopy cover reliably.[16, 17] In a land cover assessment, different landscape types could be given a numerical value to

estimate biodiversity even further. For example, rather than saying both a grass lawn and a rain garden are green spaces, the lawn may receive a lower score as they are typically monocultures that support few species.

Some of the tools and resources in the table below inform frameworks for initiating projects, inform other potential KPIs, as well as provide some resources for canopy cover estimates.

Tools for Initiating Sustainability Projects			
Resource	Author	Summary	
Sustainability Planner	Ontario Health	A loose template for sustainability action in healthcare settings.[18]	
Environmental Stewardship Implementation Guide For Boards, Executive Leaders, And Clinical Staff	Partnerships for Environmental Action by Communities within Health Care Systems (PEACH)	Provides a rough roadmap for initiating environmental stewardship projects in long term care and acute care.[19, 20]	
Planning for Tree Planting	Canadian Coalition for Green Health Care.	Provides a guide to initiating a Tree for Life Project including a pathway to initiate the project and potential funders. Note it is Ontario based but many potential funders are relevant to BC,[21]	
Selecting Key Performance Indicators			
Resource	Author	Summary	Key Takeaways
Sustainability Table	Partnerships for Environmental Action by Communities within Health Care Systems (PEACH)	This spreadsheet is used by other health care facilities to track environmental related KPI's.[22] PEACH website acts as a hub to share other climate and environmental initiatives in healthcare and provides many case studies.[23]	**Provides links to various plans and strategies from each health care facility** that has posted its sustainability actions. Only a select few have relevant landscape and greenspace actions, including **Hennick Bridgeport Hospital that reduced water by 50% by selecting native species** for their LEED certification.[24]
Sustainability Key Performance Indicators (KPIs)	Kevin Lewis, Association for Health Care Resource	A blog post that has an extensive list of potential KPI's. [25]	**The KPIs relevant to landscape include**: • Patient recovery time reduction through biophilic design

	& Materials Management (AHRMM).		• Satisfaction rates through biophilic design • Measured improvement in air quality through plants and greenspace • % reduction in landscaping water usage • Reduction in chemical usage including pesticides or synthetic fertilizers. • % decrease in landscaping waste produced and increase in waste composted • Reduction in energy use by landscaping equipment • Number of sustainable landscaping design features implemented or nature-based solutions. • Net reduction in carbon emissions from landscaping activities. • Number of community engagement events or programs related to sustainable landscaping. • Number of relevant environmental certifications or awards earned. The KPI's relevant to biodiversity include: • Number of biodiversity-supportive projects implemented • % of landscaping area utilizing native plants • Develop a Biodiversity impact score with applied science to understand impacts on local biodiversity[25]

Tools To Measure Canopy Cover (iTree)			
Resource	Author	Summary	Key Takeaways
iTree Canopy	iTree	i-Tree is an online application that delivers peer-reviewed tree benefits estimation science from the USDA Forest Service to all types of users. It is often used in urban forest strategies in BC.[9]	This program was used for this project and may be used to add supplementary data in future canopy calculations. Some biases of iTree Canopy include that it is a US-based interface meaning cost calculations especially will be skewed to US economies. It is also a point-based system that can have human error in categorizing spaces. This method becomes more accurate with more data points, therefore, is typically used at larger scales, such as the neighbourhood or even city scale in this case. [9] It is often used along side other spatial mapping methods to increase certainty. Regardless, **iTree interface is an accessible and easy tool for non-experts to start recording data and to get a sense of the ecological benefits that greenspaces are serving.**
iTree Best Practices.	Selim, S., Dönmez, B., & Kilçik, A	This paper is titled, Determination of the optimum number of sample points to classify land cover types and estimate the contribution of trees on ecosystem services using the I-Tree Canopy tool. The study measures the number of data points required to optimize accuracy of canopy cover and carbon sequestration estimations on iTree. [26]	They found that the optimum number of sample points for a 1 hectare of area is roughly 760±32 from the comparison of the real area and I-Tree Canopy results. Similar results for annually sequestered and stored C and carbon dioxide (CO2) amounts in trees and the reduction in air pollution were obtained as 714±16 points.[26]

There are limited precedents for healthcare authorities undertaking monitoring and management of natural assets with a publicly available strategic plan. However, due to Fraser Health's regional scale, many strategies and frameworks implemented by municipalities have a

strong relevance. Many healthcare providers use other sustainability frameworks that tend to have focus on facilities rather than the outdoors, although some of these also recognize nature-based solutions.

The table below lists tools, resources, and certifications with potential value to develop the a biodiversity plan further or to create a green space assessment tool for FH.

Sustainability Certifications and Greenspace Assessment			
Resource	Author	Summary	Key Takeaways
Leadership in Energy and Environmental Design (LEED)	Canada Green Building Council	**LEED is a certification for sustainability excellence** and green building leadership. The certification process facilitates developers in achieving high-performing, resilient buildings that reduce carbon emissions, save water, conserve energy, and reduce waste.[27]	**Focus on facilities, although there are specifications for healthcare facilities** including areas of respite and specific greenspace requirements for those, as well as specifications for quality of views.[27] The certification process has registration fees although green designs can reduce costs. It may be more beneficial for new builds rather than operations. Their scoring system could also be beneficial to inform FH sustainability goals, as they have had many healthcare facilities trial the certification, (Appendix C).
Green Hospital Score Card	Canadian Coalition for Green Health Care	**The Green Hospital Scorecard is a comprehensive benchmarking and recognition tool** for healthcare providers across Canada. It focuses on a hospital's conservation of energy, water, and their waste management, as well as pollution reduction, and leadership.[28]	**Most specific to hospitals and health care facilities, although has minimal criteria for the natural environment**. This scoring system still recognizes green infrastructure and nature-based solutions to address pollution or stormwater management or to contribute to other ecosystem services.
The Sustainable SITES Initiative (SITES)	Green Business Certification Inc.	This **green development** and operations **certification** can work in tandem with LEEDs or independently. It has a focus on landscapes and no specifications for facilities. It	This has the **most relevance to green spaces and the natural environment** and applicable to institutions such as healthcare sites It has scores for higher native plant ratios and habitat enhancement.

		aims to support the sustainability of landscape planning, design, and management. SITES projects aim to enhance biodiversity and mitigate climate change, while conserving resources, improving public health and protecting critical ecosystems. [29] Costly. ~$9000	It places a hierarchy on preservation then management, restoration and finally generating green spaces in order incentives the protection of natural assets. Their scoring system is similar to LEEDs in structure although much more extensive in tracking ecological KPIs, (Appendix C)
Seattle Green Factor	Seattle Department of Construction & Inspections.	This is **a green space assessment tool** used in the United States that originated in Seattle. Canada does not have an equivalent for new developments.[30]	It has a specific **focus on rainwater infrastructure although would still have impacts on biodiversity**. A variation of this score card combined with some of the others could be a positive step forward for biodiversity in healthcare. The Seattle Green Factor has detailed specification for soils and plant sizing, (Appendix C).
Natural Asset Assessments			
Resource	Author	Key Takeaways	
Technical Guidance for Science Based Targets	Science Based Targets Network (SBTN)	The SBTN helps organizations set Science-based targets (SBTs). These are measurable, actionable, and time-bound objectives, based on available science. The framework pushes alignment with ecological carrying capacities and societal sustainability goals.[31]	
Guidance on the identificati on and assessment of nature related issues: The LEAP approach	Task Force on Nature Related Financial Disclosures	TFNR is another framework that aims to direct business models to a nature positive economy. And can work in tandem with SBTN. This integrated assessment approach, LEAP, (Locate, Evaluate, Assess and Prepare) aids with how to identify, assess, manage and disclose nature related issues.[32] Both SBTN and TFND strategies would be beneficial to look into when assessing FH wide nature-based solutions, natural assets, and the capital of these.	
How to include natural assets in	Natural Assets Initiatives (NAI)	This is a guidebook for municipalities to begin managing assets. This is a very easy to use and comprehensive resource and certainly has applicability to inform natural asset management at FH.[33]	

asset management plans. Natural Assets Initiative		The definitions and methods laid out by the NAI, previously Municipal Natural Assets Initiatives (MNAI), are used throughout this project and used by local governments such as the Ecological Health Framework noted below.[7]	
Examples of Municipal Natural Asset Management Plans			
Resource	Author	Summary	Key Takeaways
Ecological Health Framework	metrovancouver	This framework for Metro Vancouver acts as a regional biodiversity plan although has an expanded scope to encompass other elements of ecological health.[7]	Part four describes **how Metro Vancouver will monitor and report on the state of the regional environment.** Some indicators that use that have applicability to FH include: • % Tree canopy cover • % Impervious surfaces • Green space connectivity index • Water quality index (for creeks on site) • Number of newly introduced or newly established invasive non-native species.[7]
Markham	City of Markham	The City of Markham has inventoried their natural assets for an asset management plan.[34]	The City of Markam also uses frameworks from the Natural Assets Initiatives (NAI).[33] In this document **they show in depth methods including their database information on their tools, resources**, and framework.
Example of a Healthcare Facility Biodiversity Plan			
Resource	Author	Summary	Key Takeaways
Biodiversity Management Plan	North Bristol NHS Trust (NBT)	A guide to management of NBT green space and includes plans for enhancement of biodiversity. Ecological surveys were conducted by contractors to establish habitat types and species presence on site. This plan further highlighted opportunities to protect and enhance greenspaces for human and non-human users. [35]	**A site-specific biodiversity plan allows for a more thorough and finer scale analysis as well as tailored targets**. This plan helps to prioritize various landscape types on the site and although does not have applicable plant species and habitat types due to its context in the UK, it does have applicable larger themes to environmental management in a health care setting.[35]

Next steps would be to establish desired KPI's and hire the appropriate experts to measure them and start to record the data. Once a baseline is established it will enable setting specific and achievable greenspace targets. There are opportunities for engagement especially with indigenous partners to set some of these indicators and targets. Some green spaces or biodiversity targets can be referenced against local policy including local biodiversity plans and forest strategies as FH has a role to play in the communities in which it is embedded.

3.1.3 Local Biodiversity and Urban Forest Strategies

Local Urban Forest Strategies		
Resource	Author	Canopy Goals
Urban Forest Strategy	City of Burnaby	Still developing a forest strategy. Although, a current goal is to increase canopy cover from 32 % in 2022 to metro Vancouver's goal of 40%.[36]
Urban Forest Management Strategy	City of Surrey	Goal of 30% urban tree canopy by 2038.[37]
Delta Urban Forest Strategy	City of Delta	City of Delta aims for 40% canopy cover in urban areas.[38]
Urban Forest Strategy	City of Abbotsford	Abbotsford aims for 40% canopy cover in urban areas.[39]
Tree Inventory	City of Chilliwack	No forest strategy although the tree inventory report aims to increase canopy cover from the 2021 estimate of 27%.[40]
Local Biodiversity Plans		
Resource	Author	Key Takeaways
Delta's Birds & Biodiversity Conservation Strategy	City of Delta	Delta is a significant area for bird conservation as its various ecosystem types, including agricultural lands are used extensively by migrating birds.[41] Delta hospital is only about 100 meters from large expanses of agricultural land and has adjacent greenspaces. Considering this context in designs at FH sites in Delta could greatly benefit local biodiversity.
Biodiversity Conservation Strategy	City of Surrey	Diamond Head developed a biodiversity strategy for Surrey. It has useful habitat type maps among other city-wide data that can help inform ecological connectivity opportunities for the Surrey Memorial Hospital or other FH sites in Surrey. [42]

		Recommended that the city work with adjacent landowners to naturalize near the Quibble Creek riparian area and remove barriers to movement. It is also **recommended that they work with adjacent landowners** of the field corridor created under the Hydro right of way to naturalize this area and remove barriers to movement. Create wetlands in lowland areas and install traffic calming and signage for road crossings.[42]
Biodiversity Design Guidelines	City of Surrey	This is a comprehensive list of biodiversity minded landscape design decisions. Their section about habitat features and structures provides great recommendation for incorporating more habitat elements on sites. Zoetica Environmental Consulting Services and Lees and Associates worked on these guidelines with the City of Surrey. [43]

3.2 Landscape Assessment of Selected FH Sites

The landscape assessment took place at 5 different sites that hosted 6 different Fraser Health facilities. Interviews and observations during site visits helped to surface common challenges in landscape management at acute care and long-term care facilities. The iTree canopy assessment is a starting point to track the amount of green space and its distribution at the sites. Supplementary research for each location helped inform of nearby natural spaces, parks, or ecosystems that may benefit from green infrastructure at FH sites.

3.2.1 Interviews / Observations

Site informants who delivered a site tour were able to provide some information about the quality of landscapes, how they are used, the capacity to manage them, and any visions they had about possible improvements. A list of the informal interview questions that were asked are in Appendix A.

The major findings from these interviews and site visit observations revealed common challenges and some common opportunities.

There were numerous challenges that arose related to landscape design and maintenance:

- **Maintaining plant health** especially as it relates to drought or urban conditions. These appeared amplified by plant selection, plant placement, and soil health.

- Limited species diversity for tree and shrub selection. Many sites were dominated by typical non-native street trees such as London planes, maple (*Acer*) species, and cherries (*Prunus*) species. The understories often included monocultures of evergreen shrubs and groundcovers such as laurels, boxwoods, Japanese spurge or rhododendrons.
- Limited native plantings. Native plants were only sparsely observed apart from naturalized areas such as forests and meadows.
- Limited access to greenspace is another common theme. Physical barriers to access greenspace that were identified by informants or observed include insufficient paths, damaged pathways, minimal seating and rest areas, as well as active construction.

Recommendations for many of these challenges include selecting drought-tolerant native plant species that will be climate-adapted. Upgrading irrigation systems or re-grading to take advantage of surface runoff are strategies that increase planting success in harsh conditions.

The physical access to green space would have to be addressed in new designs and upgrades. Ideally, communication of concerns, such as these will have a quick response time. The Draft Green Space and Biodiversity Strategy in Health Care for Fraser Health provides some good recommendations for streamlining a path from site-specific concerns to action items. [14] Furthering the draft strategy and focusing on engagement plans at each site could greatly benefit issues related to access and use of greenspaces. A thorough greenspace engagement plan could also present opportunities to connect and collaborate with internal and external Indigenous partners.

These same challenges and others were noted in a different context as it is related more to budget and capacity rather than landscape design and maintenance:

- Maintaining plant health. 4 out of the 5 locations noted unsatisfactory landscaping as it is limited by budget. All sites noted that plant care and landscape maintenance become deprioritized in a healthcare setting due to the many other facilities and maintenance requirements onsite.
- Limited species diversity. Planting diverse gardens and removing lawns can seemingly require greater maintenance. Sometimes native species and highly diverse plantings require alternative maintenance strategies compared to lawns or non-native evergreen groundcovers. For example, perennial bulbs may require cutback in the spring or fall or weeding may require more plant identification skills when they are amongst a wide variety of other herbaceous species.

- Limited access to greenspace. Access was also limited by the capacity of staff to supervise residents at long-term care sites. Unless greenspaces were enclosed and secured as well as attached to common spaces in the care home residents likely need a family member or staff to assist them in experiencing the entire site's green space.

Budget challenges for landscape improvement projects and sufficient maintenance would benefit from an additional study. Nature-based solutions often have cost benefits long-term in energy savings or through ecosystem services. These benefits could be calculated to leverage greenspace enhancement projects.

Perceived capacity challenges as it relates to the maintenance of naturalized spaces compared to more formal manicured spaces. Some of this perceived capacity could be addressed through education on nature-based solutions and developed management plans for naturalized areas. Any greenspace improvement project would also greatly benefit from communication and collaboration with Facilities and Maintenance of Operations staff at each site.

Access to greenspace as it relates to capacity challenges could be addressed by incentivizing more outdoor programming at long-term care sites. All long-term care sites recognized certain staff that may act as a potential avenue to introduce horticulture or outdoor programs including through, ambassador staff, rec teams, and volunteers.

3.2.2 iTree Canopy Findings and Green Infrastructure

Green infrastructure on the site was identified through site visits and observations. It was categorized into natural assets, enhanced assets, and engineered assets as described in the methods section in Figure 1. Additional enhanced assets that related specifically to health care and appeared on sites were therapeutic gardens, healing gardens, enclosed patio space, and terrace rooftop gardens. Case studies and descriptions of all of these and other green infrastructures that may affect biodiversity are noted in another document developed for FH during this project called, An Introduction to Green Infrastructure in Healthcare Settings.

Below is the green infrastructure found at the various sites.

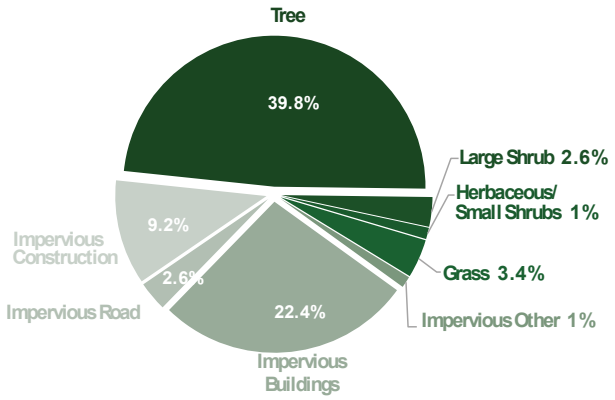
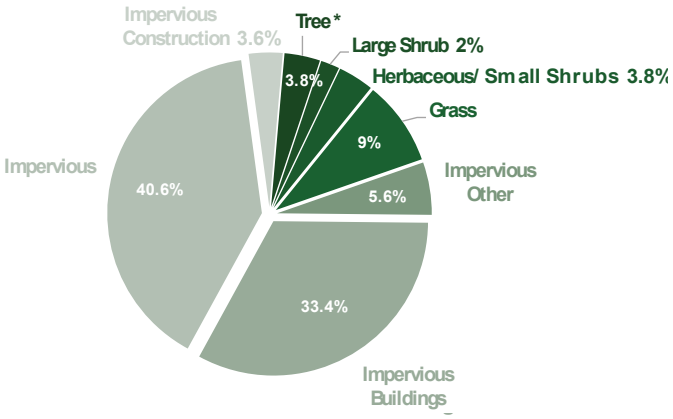
FH Site	Natural Assets	Enhanced Assets
Burnaby Hospital		
Surrey Memorial Hospital		
Delta Hospital and Mountain View Manor		
Cottage-Worthington Pavilion		
Heritage Village		

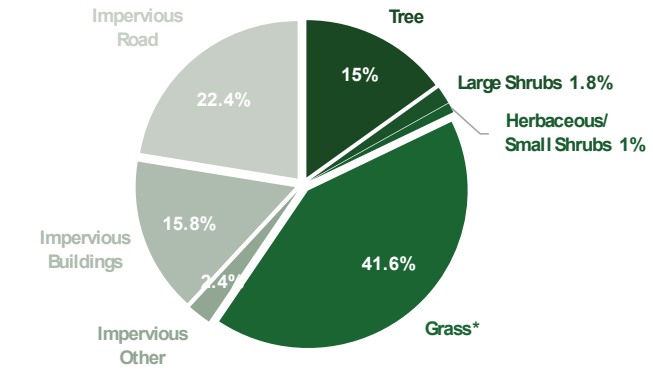
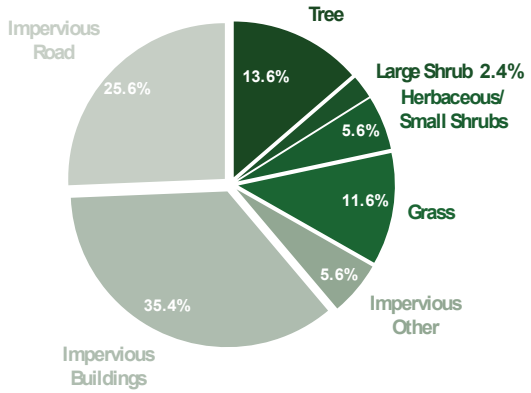
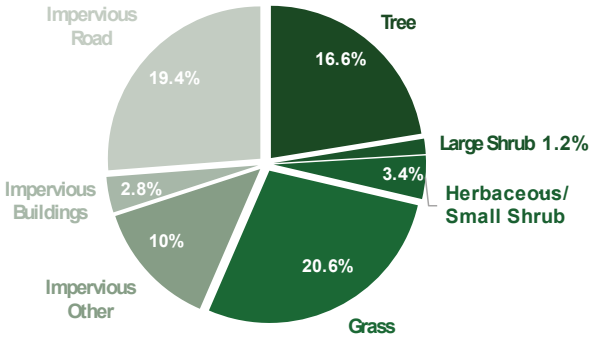
This inventory identifies the natural assets at all three acute care sites, ranging from sensitive natural ecosystems to naturalized field or meadow spaces. These present a unique opportunity for habitat enhancement projects that benefit site users as well as the larger ecological systems that these sites often fall adjacent to.

Enclosed patios don't necessarily imply planting areas and often are the only location for long-term care residents to access. There are opportunities to expand the number of nature-based solutions at both acute care and long-term care homes.

The iTree Canopy assessment revealed a wide array of green to grey proportions on site. Green implying any planted area and grey implying an impermeable and hardscaped development including roads, paths, or buildings.

The table below shows the landcover assessment results from a 500 pt iTree Canopy survey at each site.

FH Site	iTree Canopy Land Cover Assessment
Burnaby Hospital	
Surrey Memorial Hospital	 *Note, satellite imagery is from the winter, therefore canopy is less visible and the estimation may be skewed lower than actual.

Delta Hospital and Mountain View Manor	 *Note approx half of 'Grass' space is un-mowed meadow and half a lawn monoculture
Cottage-Worthington Pavilion	
Heritage Village	

iTree Canopy assessments are biased in numerous ways and this data would benefit from supplementary assessment methods.[9] Numerous methods with ArcGIS or other geographic programs would complement this study and could be done for sites in future.[35] An in-person tree inventory is often used along side canopy studies and again would add more precision to this green space analysis. Next steps to further this work would add these other data sources and have the appropriate experts such as environmental consultants to do so.

Despite potential inexactitudes this landcover assessment combined with observations of the site, revealed that there was minimal tree coverage aside from the forest plot and that grass lawns were a dominating landscape type. The lawns according to site informants were often under-utilized spaces. This finding highlights opportunities to trial no-mow, meadows, or other green space types in these areas, that will better serve people, biodiversity, and climate resiliency.[44]

The green infrastructure identified at the sites is a high-level overview. The finer scale natural elements on these sites could be assessed. Selecting what to assess, could benefit from more engagement with indigenous partners and with staff from each site. It was recommended by a FH Health Staff member that recording indigenous medicinal plants would be a beneficial KPI. Continuing to refine these measures and add to a database will further inform future landscape design opportunities.

3.2.3 Contextual Research

The acute care sites all have a presence of a natural asset, including forests, creeks, and fields/meadows. Through site visits and additional research, it was found that all the sites have neighbouring properties with ecological value. This context means there is greater potential to support local biodiversity or to enhance ecological or habitat connectivity locally.

Burnaby Hospital has a non-developable forest plot and creek onsite that with a forest management plan could benefit local biodiversity even more and allow for educational, cultural, and health related uses of the space. Across the street is a conservation area with a similar young forest ecosystem.

Surrey Memorial Hospital is adjacent to Quibble Creek, a small tributary and some of the property overlaps with a BC Hydro right of way.[42] The landscape below the BC Hydro line is an under-utilized field/meadow space. There are opportunities for habitat enhancement projects here that may benefit community members, hospital users and staff, as well as contribute to the biodiversity within this ecological corridor.

Delta Hospital and Mountain View Manor also host a naturalized field. In the near future, this area will become developed. As of now it seemingly is supporting birds, as barn swallows and other unidentified swallow species were seen using this space to forage. According to the site informant the swallows also will utilize the space under the eavestroughs of one of the buildings. This habitat may be significant to consider as development progresses. The site is near agricultural and park lands and Delta is a major stopover point for migrating birds.[43] This context heightens the significance of considering bird habitat in future designs. Delta Hospital has strong

community support and numerous partnerships to maintain landscapes. There is potentially capacity to introduce nature-based solutions due to this support as well as a large community to benefit from new projects.

Context is significant for sites without natural systems present as Heritage Village also falls adjacent to a creek and greenway. Any nature-based solutions and green infrastructure at these sites could contribute to the function and health of these adjacent naturalized areas.

These opportunities are ones that arose from one site visit, informal interviews, and some additional greenspace research, although there are many more opportunities to be uncovered through engagement with staff, patients, residents, indigenous partners, and other stakeholders.

4.0 Summary

Summary of major findings include:

- The proportion of greenspaces greatly shifts across different acute care and long-term care facilities.
- Acute care facilities generally hosted a greater number of natural assets and green infrastructure.
- Delta Hospital and Mountain View Manor found success in external volunteer programs and partnership with other entities including the City of Delta to fulfill some garden maintenance needs.
- There are opportunities to contribute to the habitat and ecological connectivity locally at many sites.

Summary of common sentiments shared by site informants during visits include:

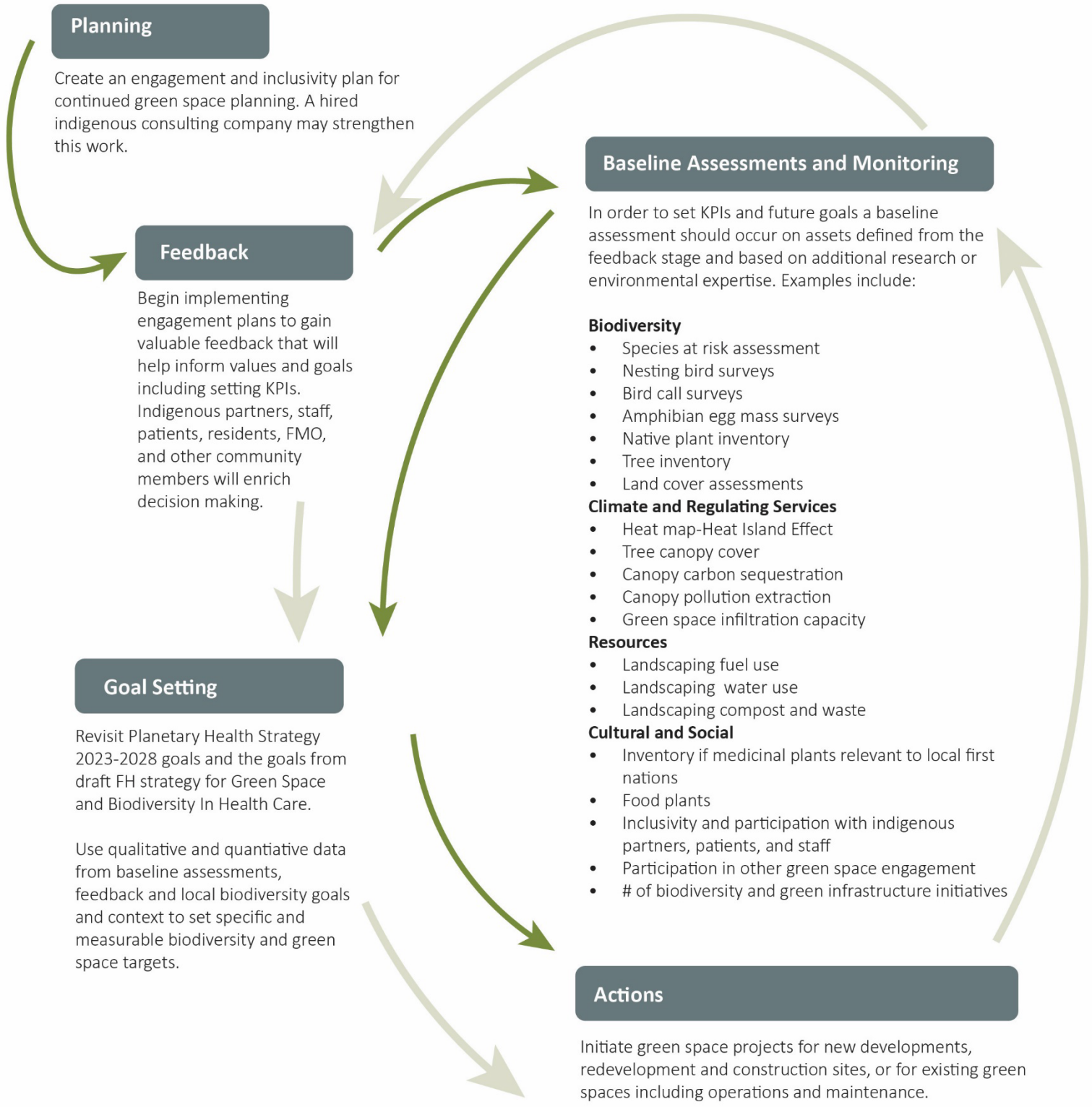
- Deprioritizing landscape is a reality due to other Facilities and Maintenance of Operations requirements on site especially as it relates to clinical demands.
- Feeling limited by budget for landscaping contracts
- Challenges sustaining plant health and gardens success.
- Accessibility to green space limitations both in capacity or physical barriers
- Desire for stronger communication avenues and a clear chain of command to address landscaping and green space concerns.
- Desires for clarity and reassurance of greenspace type, function, and quality for developments as facilities are frequently expanding.

5.0 Recommendations [Next Steps]

Addressing concerns, challenges, and opportunities that arose during various stages of this project will likely require a mixed approach with both long-term and short-term interventions.

Short-term actions to address biodiversity and improve green spaces could be through small scale design interventions established through further site and staff engagement. Some suggestions are noted in part 3.2.1 Interviews and Observations section of this document and more thoroughly noted in the report to FH entitled, “Landscape Assessment for Six Fraser Health Long-term and Acute Care Sites: An Inventory of Natural Assets and Green Infrastructure”. These are more site-specific recommendations although may have applicability at other sites that face similar landscape challenges.

Long-term actions may include more thorough planning stages to address biodiversity and greenspaces across all FH sites. This project started to track some of the noted KPI’s in the below diagram and started to build feedback from FH staff at the project study areas. The next page is one variation of a road map to further inform future FH Biodiversity Plans in tandem with strategies laid out in the Draft FH Strategy for Green Space and Biodiversity in Health Care.[14]


Planning
Create an engagement and inclusivity plan for continued green space planning. A hired indigenous consulting company may strengthen this work.
Feedback
Begin implementing engagement plans to gain valuable feedback that will help inform values and goals including setting KPIs. Indigenous partners, staff, patients, residents, FMO, and other community members will enrich decision making.
Goal Setting
Revisit Planetary Health Strategy 2023-2028 goals and the goals from draft FH strategy for Green Space and Biodiversity In Health Care.
Use qualitative and quantiative data from baseline assessments, feedback and local biodiversity goals and context to set specific and measurable biodiversity and green space targets.
Baseline Assessments and Monitoring
In order to set KPIs and future goals a baseline assessment should occur on assets defined from the feedback stage and based on additional research or environmental expertise. Examples include:
Biodiversity
• Species at risk assessment
• Nesting bird surveys
• Bird call surveys
• Amphibian egg mass surveys
• Native plant inventory
• Tree inventory
• Land cover assessments
Climate and Regulating Services
• Heat map-Heat Island Effect
• Tree canopy cover
• Canopy carbon sequestration
• Canopy pollution extraction
• Green space infiltration capacity
Resources
• Landscaping fuel use
• Landscaping water use
• Landscaping compost and waste
Cultural and Social
• Inventory if medicinal plants relevant to local first nations
• Food plants
• Inclusivity and participation with indigenous partners, patients, and staff
• Participation in other green space engagement
• # of biodiversity and green infrastructure initiatives
Actions
Initiate green space projects for new developments, redevelopment and construction sites, or for existing green spaces including operations and maintenance.

Central to this work moving forward should be the collaboration with the FH Indigenous Design Team, and other internal and external indigenous partners. As aligns with FH planetary health goals to centralize indigenous ways of knowing. Incorporating indigenous voices throughout this process and allowing them to meaningfully shape FH greenspaces will invaluably enrich this work.

Some additional ideas that arose as potential solutions to capacity, access, and funding limitations include the following.

Financial and capacity building

Limited budget for landscapes	De-prioritizing landscapes	Limited capacity for access
• **Evaluate landscape contract satisfaction** at sites and increase the budget at those who require it or reallocate • **Conduct a cost benefit analysis of nature-based solutions** to justify new upfront landscape costs that may make return in future through ecosystem services like resource conservation. Resources and strategies for natural assets inventory as capitol include SBTN & TFSA.[31,32,33]	• **Seek ways to integrate landscape into job descriptions and new roles.** Ex. Heritage Village has no onsite FMO and may benefit from another position here. • **Seek collaborations for reduced demand on internal staff.** Ex: The City of Delta Collaboration at Delta Hospital, or community volunteers	• **Seek ways to integrate green space programming into job descriptions and new roles** Ex. Cottage Worthington Pavilion suggested internal staff or site users that may have space for new engagement or programs if said program is planned and established: The Rec Team or the Rehab Team Ambassador Team Volunteer Coordinator Volunteers Families of residents

Any of the above and more could be explored in potential future projects. Some project focus areas that may benefit this research include the following:

- Expanding on landscape assessments and green infrastructure inventories
- Engagement and inclusivity strategies and implementation
  .
- Financial and capacity building through internal avenues at FH
- External grants, partnerships, and collaborations
- Greenspace plans and respite areas during active construction and redevelopment
- Setting specific green space standards for new developments: minimum standards for green space in acute and long-term care.

References

1. UNEP United Nations Environment Program (2024). Facts about the nature crisis https://www.unep.org/facts-about-nature-crisis?gad_source=1&gclid=CjwKCAjwmYCzBhA6EiwAxFwfgBsCXUNMd6E3AwZB276YQuKfejBOkO-2v_6jfru3W31jeN1byQvPAxoCGBEQAvD_BwE
2. Sterckx, A., Delbaere, B., De Blust, G., Spacova, I., Samson, R., Remmen, R., & Keune, H. (2024). Quality criteria of nature-based interventions in healthcare facilities: a scoping review. Frontiers in Public Health, 11, 1327108. https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2023.1327108/full
3. Redvers, N., Celidwen, Y., Schultz, C., Horn, O., Githaiga, C., Vera, M., ... & Rojas, J. N. (2022). The determinants of planetary health: an Indigenous consensus perspective. *The Lancet Planetary Health*, *6*(2), e156-e163.
4. UBC Faculty of Medicine. (2023). Future Proofing Health in Changin Climate. Retrieved from: https://www.med.ubc.ca/news/future-proofing-health-in-a-changing-climate/
5. Fraser Health (2023). Planetary Health Strategy 2023-2028 https://www.fraserhealth.ca/-/media/Project/FraserHealth/FraserHealth/Health-Topics/Climate-and-environment/Planetary-Health-Strategy-Report-Final-2023-09-19.pdf
6. Marselle, M. R., Hartig, T., Cox, D. T., De Bell, S., Knapp, S., Lindley, S., ... & Bonn, A. (2021). Pathways linking biodiversity to human health: A conceptual framework. Environment international, 150, 106420. https://www.sciencedirect.com/science/article/pii/S0160412021000441
7. metrovancouver. (2018). Ecological health framework. https://metrovancouver.org/services/regional-planning/Documents/ecological-health-framework.pdf
8. Municipal Natural Assets Initiative. (2017). Primer on Natural Asset Management. https://mnai.ca/media/2019/06/MNAI-Org-Charts.pdf
9. i-Tree Canopy. i-Tree Software Suite v5.x. (n.d.). Web. Accessed June 2024. https://canopy.itreetools.org/ https://www.itreetools.org/
10. Verderber, S. (2022). Reimagining long-term care architecture in post-pandemic Ontario—and beyond [White paper]. *Center for Design þ Health Innovation, University of Toronto*.
11. Government of BC. (2022). Community Care and Assisted Living Act: Residential Care Regulation [Last amended October 24, 2022 by B.C. Reg.208/2022] https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96_2009
12. Konijnendijk van den Bosch C. Promoting health and wellbeing through urban forests – Introducing the 3-30-300 rule: International Union for Conservation of Nature- Urban

Alliance; 2021 [consulted July 7, 2022]. Link: https://iucnurbanalliance.org/promoting-health-and-wellbeingthrough-urban-forests-introducing-the-3-30-300-rule/

13. Fraser Health (2022). (FHA Share point File) Service Delivery Model for Specialized Community Service Programs- Complex Medically Frail (SCSP-CMF) Day Programs for Older Adults
14. Green, M., Guerra, C., Holt, M., and Ivanova, B. (2023). Green Space and Biodiversity In Health Care: A Draft Strategy for Fraser Health. https://bcgreencare.ca/resource/green-space-and-biodiversity-in-health-care-a-draft-strategy-for-fraser-health/
15. Brunbjerg, A. K., Hale, J. D., Bates, A. J., Fowler, R. E., Rosenfeld, E. J., & Sadler, J. P. (2018). Can patterns of urban biodiversity be predicted using simple measures of green infrastructure?. *Urban Forestry & Urban Greening*, *32*, 143-153.
16. Yañez, D. V., Barboza, E. P., Cirach, M., Daher, C., Nieuwenhuijsen, M., & Mueller, N. (2023). An urban green space intervention with benefits for mental health: A health impact assessment of the Barcelona "Eixos Verds" Plan. Environment international, 174, 107880.https://www.sciencedirect.com/science/article/pii/S0160412023001538?via%3Dihub
17. Urban green spaces and health. Copenhagen: WHO Regional Office for Europe, 2016.https://blogs.ubc.ca/2017wufor200/files/2017/01/Urban-Green-Spaces-and-Health-WHO-2016.pdf
18. Ontario Health, (2024). Sustainability Planner – Instruction Sheet and Tool. Sustainability Planner – Instruction Sheet and Tool (hqontario.ca)
19. Peach Health Ontario. Environmental Stewardship: An Implementation Guide For Boards, Executive Leaders, And Clinical Staff: Meeting Hospital Standards And Beyond. Working Copy of Sustainable Healthcare Leaders Guidebook for Canadian Health Care (mcmaster.ca)
20. Peach Health Ontario. Environmental Stewardship: An Implementation Guide For Boards, Executive Leaders, And Clinical Staff: Meeting Long Term Care Standards And Beyond Sustainable Healthcare Leaders Guidebook for Canadian Long Term Care (mcmaster.ca)
21. Canadian Coalition for Green Health Care. Final_Anatomy of Tree Planting_Trees for Health-Canada (greenhealthcare.ca)
22. C, Brenna. Sustainability Strategies Table for PEACH. Retrieved from : Copy of Sustainability Strategies Table- Connor Brenna- Google Sheets
23. PEACH (2024). Partnerships for Environmental Action by Communities within Health Care Systems (PEACH). Retrieved from : https://peach.healthsci.mcmaster.ca/
24. Hennick Bridgepoint Hospital. (2024) Green Design and Features. Retrieved from: https://www.hennickbridgepointhospital.ca/en/who-we-are/green-design-and-features.asp

25. Lewis, K., (2023) Improving Sustainability Performance in Healthcare: Sustainability Key Performance Indicators (KPIs). Association for Health Care Resource & Materials Management (AHRMM). Online Article Retrieved from: https://www.linkedin.com/pulse/improving-sustainability-performance-healthcare-key-indicators-lewis-8c0mc/?trackingId=ArOp31L4QbeRnuaF0qRlxg%3D%3D
26. Selim, S., Dönmez, B., & Kilçik, A. (2023). Determination of the optimum number of sample points to classify land cover types and estimate the contribution of trees on ecosystem services using the I-Tree Canopy tool. Integrated Environmental Assessment and Management, 19(3), 726-734.
27. Canada Green Building Council. LEED Campus Guidance For Projects on a Shared Site Applicable to LEED 2009 and LEED v4 Design and Construction, and Operations and Maintenance Rating Systems. Updated 2014. Retrieved from: https://support.usgbc.org/hc/en-us/articles/12126333712659-Applying-LEED-to-healthcare-projects
28. Canadian Coalition for Green Health Care (2019). Green Hospital Scorecard 2019 Report JULY 2021. Retrieved from: 2019-Green-Hospital-Scorecard-Report.pdf (greenhealthcare.ca)
29. Green Business Certification Inc (GBCI) SITES Developing Sustainable Landscapes. Last updated: 2024 Retrieved from: SITES | Developing Sustainable Landscapes (sustainablesites.org)
30. Seattle Department of Construction & Inspections. Seattle Green Factor. Last updated 2024. Retrieved from: Seattle Green Factor- SDCI | seattle.gov
31. Science Based Targets Network (2023). Technical Guidance: Step 1: Assess. https://sciencebasedtargetsnetwork.org/wp-content/uploads/2023/05/Technical-Guidance-2023-Step1-Assess-v1.pdf
32. Task Force on Nature Related Financial Disclosures (2023). Guidance on the identification and assessment of nature related issues: The LEAP approach Version 1.1 2023. https://tnfd.global/wp-content/uploads/2023/08/Guidance_on_the_identification_and_assessment_of_nature-related_Issues_The_TNFD_LEAP_approach_V1.1_October2023.pdf?v=1698403116
33. NAI (2024). Nature is infrastructure: How to include natural assets in asset management plans. Natural Assets Initiative. naturalassetsinitiative.ca
34. Municipal Natural Assets Initiative (MNAI). (2021). Toward natural asset management in the City of Markham, Ontario. Summary of inventory results and implications. https://mnai.ca/media/2021/05/MNAI-Inventory-Cluster-Markham-report-101.pdf

35. North Bristol NHS Trust. (2019). Biodiversity Management Plan. https://www.nbt.nhs.uk/sites/default/files/sites/default/files/190802%20Biodiversity%20Mgt%20Plan%20v7%20%28ECS%29.pdf
36. City of Burnaby. Urban Forest Management Strategy. Last updated 2024. Retrieved from: https://www.burnaby.ca/our-city/strategies-and-plans/climate-action/healthy-eco-systems/urban-forest-strategy
37. City of Surrey. (2023). Urban Forest Management Strategy. Retrieved from: 2ea93347818dbb21188b3bcc08db20ae_2023-01-13_SurreyUFMS-screen.pdf (ehq-production-canada.s3.ca-central-1.amazonaws.com)
38. City of Delta. (2020) Urban Forest Strategy Retrieved from: https://delta.ca/sites/default/files/2021-06/Urban%20Forest%20Strategy%20CAE.pdf
39. City of Abbotsford. (2021). Urban Forest Strategy. Retrieved from: abbotsford.ca/sites/default/files/2022-05/2021-22 Urban Forestry Strategy.pdf
40. City of Chilliwack. Urban Forests. Last updated 2024. Retrieved from: https://www.chilliwack.com/main/page.cfm?id=2958
41. City of Delta. (2018). Delta's Birds & Biodiversity Conservation Strategy, Retrieved from: https://www.delta.ca/sites/default/files/2021-06/Delta%27s%20Birds%20and%20Biodiversity%20Conservation%20Strategy%20CAE.pdf
42. City of Surrey. (2014). Biodiversity Conservation Strategy Biodiversity Conservation | City of Surrey
43. City of Surrey (2021). Biodiversity Design Guidelines. https://www.surrey.ca/sites/default/files/media/documents/BiodiversityDesignGuidelines_Introduction.pdf
44. City of Vancouver. Vancouver, Canada: Transforming Mown Turf Lawns to Urban Pollinator Meadows https://aiph.org/green-city-case-studies/vancouver-canada-merit/

Appendices

Appendix A Informal Interview Questions

Interview Questions to Site Informants. Note not all questions were relevant or answered by informants.

UNDERSTANDING SITE

1. What is the site like (surface description/landscape analysis, different types of areas, different types of plants/trees)?
2. Environment: Is there enough shade, enough sun?
3. What are opportunities to make the site more climate resilient and sequestering carbon? (Note main ecosystem type/main biomass, and #/age/species of trees.)

UNDERSTANDING CAPACITY

1. Who are the managers?
2. What is the landscape contract/what does it entail?
3. How often is it maintained? Are these practices disruptive? (loud, produce dust and particulate matter, etc.)
5. Are there other stakeholders involved in maintaining site elements?

(Ie community garden groups, non-profits, volunteers, patients/residents, multiple maintenance companies, city, parks board)

6. Do you think staff, patients, or the community would be interested in the maintenance or stewardship of new ecosystems or garden space?
7. What capacity and interest do staff and managers have to evaluate landscapes and/or run engagement for identifying nature-based design opportunities/needs?

UNDERSTANDING USE

1. How is it used by people: Are there places to sit/rest/play/walk/other programs?
2. Who uses the outdoor space most often: Do staff, patients, other community members or commuters use this space more often?
3. How is it used by non-human life: Have you noticed any wildlife or interesting plants?
4. What are some values you see in improving the landscape here?
5. What are we doing well and what are the opportunities for improvement? What do you like about the landscape? What don't you like about the landscape?
6. Is there any food grown? What are the opportunities for that?
7. Are there medicinal plants grown?

Appendix B Green Infrastructure Definitions

Green Infrastructure

Natural and constructed features in urban environments that can provide ecosystem services.

Natural Assets

Are a subset of green infrastructure and refers to natural stores of resources or naturally occurring ecosystems. The 'asset' component implies that they provide ecosystem services or benefits to people in some capacity.

Enhanced Assets

Are generally those that have been designed to mimic natural assets and often still include natural elements and processes. For example, a rain garden in a sense mimics a wetland in both design and function and is mostly natural elements, it may even have some of the species planted.

Engineered Assets

These differ from enhanced assets in that they typically only mimic the function of natural assets but isn't something found in nature. For example, a rain barrel mimics the function of a wetland in that it stores rainwater, but it is an entirely man-made structure.

Therapeutic Garden

Refers to one that is accessible and used by patients, staff, or residents in healthcare in order to benefit from actively gardening.

Healing Garden

Refers to a garden designed for restorative purposes and may include a water feature or other calming elements.

Enclosed Patio

Refers to an outdoor space that is enclosed by a structure or fence. It may or may not have planters or gardens within, but allows patients and especially long-term care patients to access the outside with minimal or no supervision.

Urban Trees

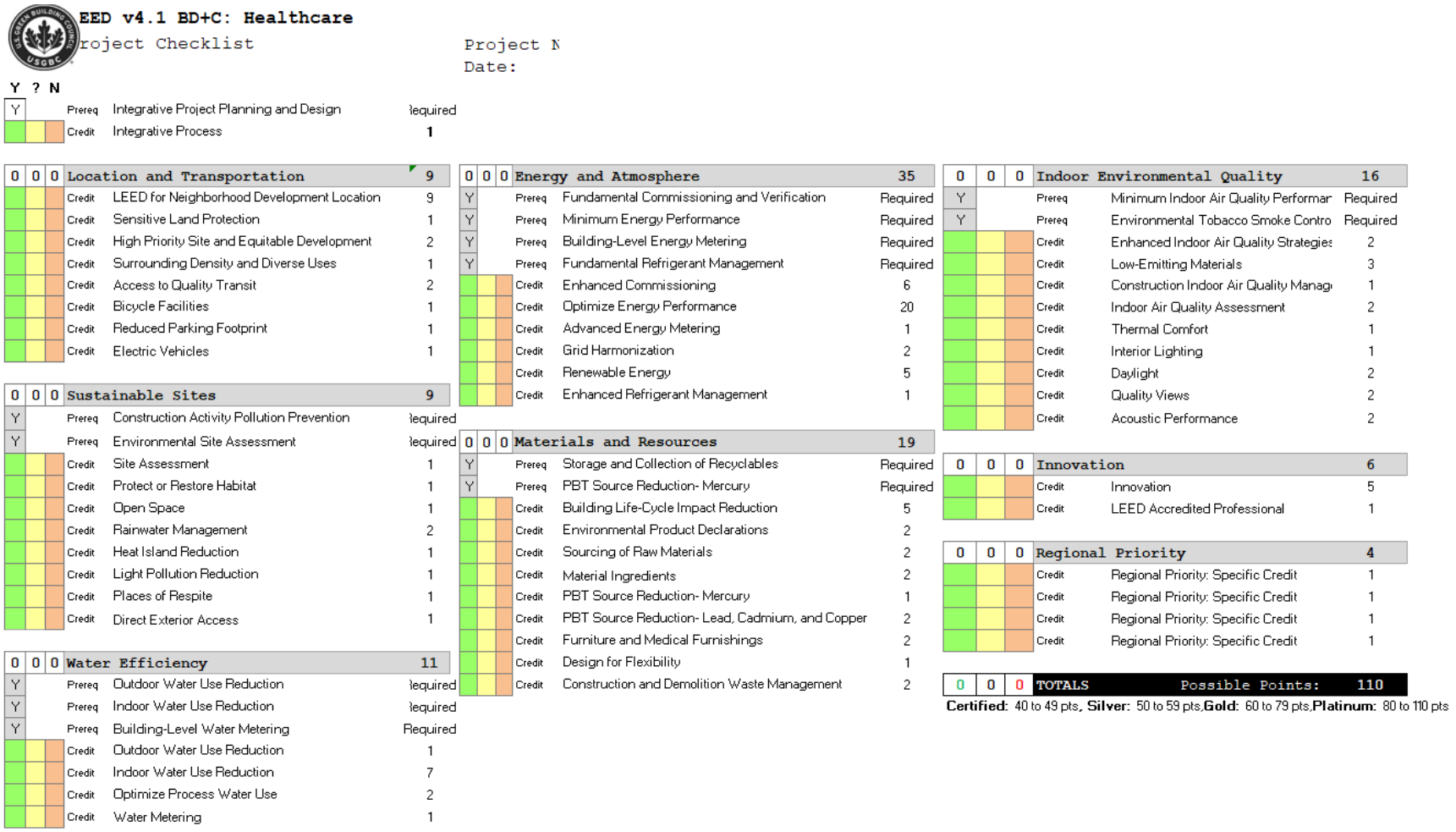
These are any tree planted that becomes part of our urban forest, but don't necessarily form a native forest ecosystem.

Terraced Garden

A terrace garden here implies the presence of a rooftop garden or rooftop patio with planter beds.

Appendix C Sustainability Certification Scorecards and Measures

LEED Certification Scorecard. Retrieved from: https://www.usgbc.org/leed-tools/scorecard



EED v4.1 BD+C: Healthcare
roject Checklist

Project N
Date:

Y	?	N			
Y			Prereq	Integrative Project Planning and Design	equired
			Credit	Integrative Process	1

0	0	0	Location and Transportation		9
			Credit	LEED for Neighborhood Development Location	9
			Credit	Sensitive Land Protection	1
			Credit	High Priority Site and Equitable Development	2
			Credit	Surrounding Density and Diverse Uses	1
			Credit	Access to Quality Transit	2
			Credit	Bicycle Facilities	1
			Credit	Reduced Parking Footprint	1
			Credit	Electric Vehicles	1

0	0	0	Sustainable Sites		9
Y			Prereq	Construction Activity Pollution Prevention	equired
Y			Prereq	Environmental Site Assessment	equired
			Credit	Site Assessment	1
			Credit	Protect or Restore Habitat	1
			Credit	Open Space	1
			Credit	Rainwater Management	2
			Credit	Heat Island Reduction	1
			Credit	Light Pollution Reduction	1
			Credit	Places of Respite	1
			Credit	Direct Exterior Access	1

0	0	0	Water Efficiency		11
Y			Prereq	Outdoor Water Use Reduction	equired
Y			Prereq	Indoor Water Use Reduction	equired
Y			Prereq	Building-Level Water Metering	Required
			Credit	Outdoor Water Use Reduction	1
			Credit	Indoor Water Use Reduction	7
			Credit	Optimize Process Water Use	2
			Credit	Water Metering	1

0	0	0	Energy and Atmosphere		35
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
			Credit	Enhanced Commissioning	6
			Credit	Optimize Energy Performance	20
			Credit	Advanced Energy Metering	1
			Credit	Grid Harmonization	2
			Credit	Renewable Energy	5
			Credit	Enhanced Refrigerant Management	1

0	0	0	Materials and Resources		19
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	PBT Source Reduction- Mercury	Required
			Credit	Building Life-Cycle Impact Reduction	5
			Credit	Environmental Product Declarations	2
			Credit	Sourcing of Raw Materials	2
			Credit	Material Ingredients	2
			Credit	PBT Source Reduction- Mercury	1
			Credit	PBT Source Reduction- Lead, Cadmium, and Copper	2
			Credit	Furniture and Medical Furnishings	2
			Credit	Design for Flexibility	1
			Credit	Construction and Demolition Waste Management	2

0	0	0	Indoor Environmental Quality		16
Y			Prereq	Minimum Indoor Air Quality Performar	Required
Y			Prereq	Environmental Tobacco Smoke Contro	Required
			Credit	Enhanced Indoor Air Quality Strategies	2
			Credit	Low-Emitting Materials	3
			Credit	Construction Indoor Air Quality Manag	1
			Credit	Indoor Air Quality Assessment	2
			Credit	Thermal Comfort	1
			Credit	Interior Lighting	1
			Credit	Daylight	2
			Credit	Quality Views	2
			Credit	Acoustic Performance	2

0	0	0	Innovation		6
			Credit	Innovation	5
			Credit	LEED Accredited Professional	1

0	0	0	Regional Priority		4
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1

0	0	0	TOTALS	Possible Points:	110

Certified: 40 to 49 pts, **Silver:** 50 to 59 pts, **Gold:** 60 to 79 pts, **Platinum:** 80 to 110 pts

SITES Certification Scorecard. Retrieved from: SITES Rating System and Scorecard | U.S. Green Building Council (usgbc.org)

Appendix D

SITES v2 Scorecard Summary

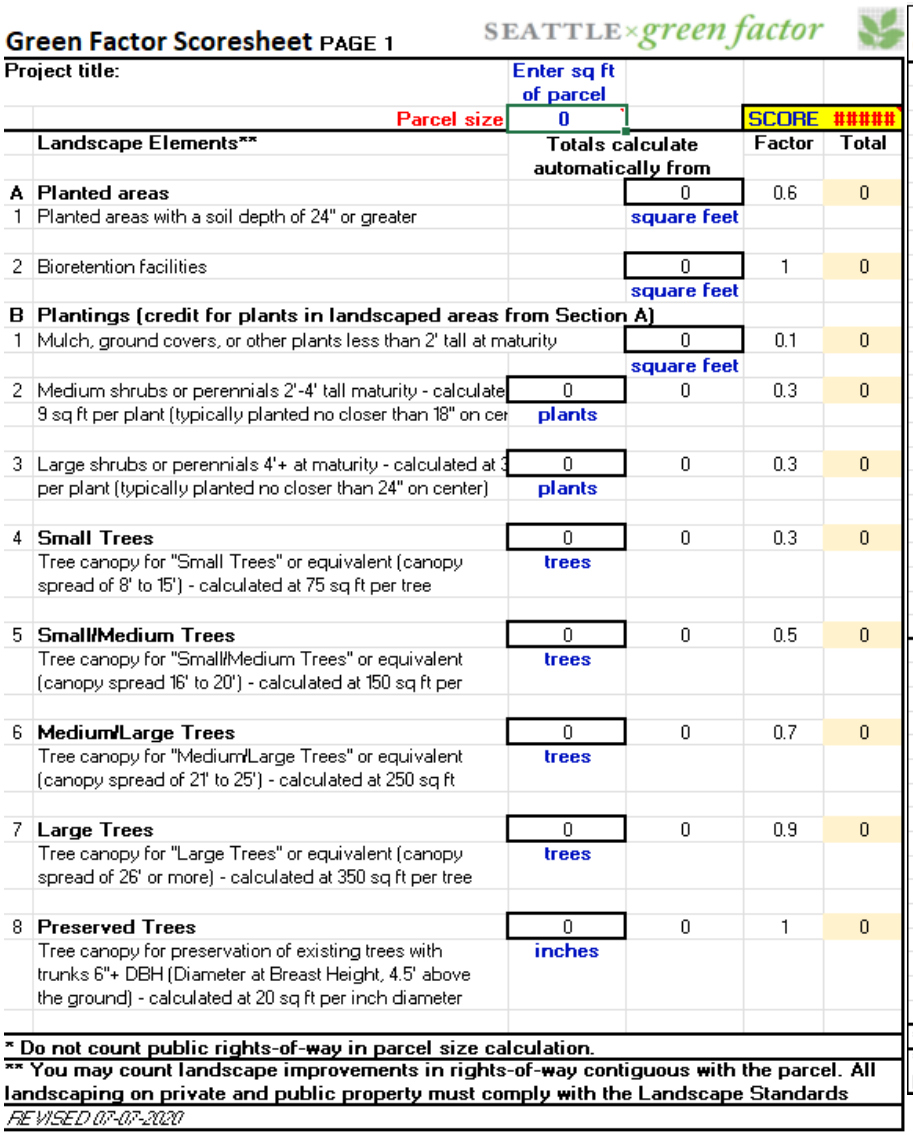
YES	?	NO			
0	0	0	**1: SITE CONTEXT**	**Possible Points:**	**13**
Y			CONTEXT P1.1	Limit development on farmland	
Y			CONTEXT P1.2	Protect floodplain functions	
Y			CONTEXT P1.3	Conserve aquatic ecosystems	
Y			CONTEXT P1.4	Conserve habitats for threatened and endangered species	
			CONTEXT C1.5	Redevelop degraded sites	3 to 6
			CONTEXT C1.6	Locate projects within existing developed areas	4
			CONTEXT C1.7	Connect to multi-modal transit networks	2 to 3
0	0	0	**2: PRE-DESIGN ASSESSMENT + PLANNING**	**Possible Points:**	**3**
Y			PRE-DESIGN P2.1	Use an integrative design process	
Y			PRE-DESIGN P2.2	Conduct a pre-design site assessment	
Y			PRE-DESIGN P2.3	Designate and communicate VSPZs	
			PRE-DESIGN C2.4	Engage users and stakeholders	3
0	0	0	**3: SITE DESIGN – WATER**	**Possible Points:**	**23**
Y			WATER P3.1	Manage precipitation on site	
Y			WATER P3.2	Reduce water use for landscape irrigation	
			WATER C3.3	Manage precipitation beyond baseline	4 to 6
			WATER C3.4	Reduce outdoor water use	4 to 6
			WATER C3.5	Design functional stormwater features as amenities	4 to 5
			WATER C3.6	Restore aquatic ecosystems	4 to 6
0	0	0	**4: SITE DESIGN – SOIL + VEGETATION**	**Possible Points:**	**40**
Y			SOIL+VEG P4.1	Create and communicate a soil management plan	
Y			SOIL+VEG P4.2	Control and manage invasive plants	
Y			SOIL+VEG P4.3	Use appropriate plants	
			SOIL+VEG C4.4	Conserve healthy soils and appropriate vegetation	4 to 6
			SOIL+VEG C4.5	Conserve special status vegetation	4
			SOIL+VEG C4.6	Conserve and use native plants	3 to 6
			SOIL+VEG C4.7	Conserve and restore native plant communities	4 to 6
			SOIL+VEG C4.8	Optimize biomass	1 to 6
			SOIL+VEG C4.9	Reduce urban heat island effects	4
			SOIL+VEG C4.10	Use vegetation to minimize building energy use	1 to 4
			SOIL+VEG C4.11	Reduce the risk of catastrophic wildfire	4
0	0	0	**5: SITE DESIGN – MATERIALS SELECTION**	**Possible Points:**	**41**
Y			MATERIALS P5.1	Eliminate the use of wood from threatened tree species	
			MATERIALS C5.2	Maintain on-site structures and paving	2 to 4
			MATERIALS C5.3	Design for adaptability and disassembly	3 to 4
			MATERIALS C5.4	Use salvaged materials and plants	3 to 4
			MATERIALS C5.5	Use recycled content materials	3 to 4
			MATERIALS C5.6	Use regional materials	3 to 5
			MATERIALS C5.7	Support responsible extraction of raw materials	1 to 5
			MATERIALS C5.8	Support transparency and safer chemistry	1 to 5
			MATERIALS C5.9	Support sustainability in materials manufacturing	5
			MATERIALS C5.10	Support sustainability in plant production	1 to 5

YES	?	NO			
0	0	0	**6: SITE DESIGN – HUMAN HEALTH + WELL-BEING**	**Possible Points:**	**30**
			HHWB C6.1	Protect and maintain cultural and historic places	2 to 3
			HHWB C6.2	Provide optimum site accessibility, safety, and wayfinding	2
			HHWB C6.3	Promote equitable site use	2
			HHWB C6.4	Support mental restoration	2
			HHWB C6.5	Support physical activity	2
			HHWB C6.6	Support social connection	2
			HHWB C6.7	Provide on-site food production	3 to 4
			HHWB C6.8	Reduce light pollution	4
			HHWB C6.9	Encourage fuel efficient and multi-modal transportation	4
			HHWB C6.10	Minimize exposure to environmental tobacco smoke	1 to 2
			HHWB C6.11	Support local economy	3
0	0	0	**7: CONSTRUCTION**	**Possible Points:**	**17**
Y			CONSTRUCTION P7	Communicate and verify sustainable construction practices	
Y			CONSTRUCTION P7	Control and retain construction pollutants	
Y			CONSTRUCTION P7	Restore soils disturbed during construction	
			CONSTRUCTION C7.4	Restore soils disturbed by previous development	3 to 5
			CONSTRUCTION C7.5	Divert construction and demolition materials from disposal	3 to 4
			CONSTRUCTION C7.6	Divert reusable vegetation, rocks, and soil from disposal	3 to 4
			CONSTRUCTION C7.7	Protect air quality during construction	2 to 4
0	0	0	**8. OPERATIONS + MAINTENANCE**	**Possible Points:**	**22**
Y			O+M P8.1	Plan for sustainable site maintenance	
Y			O+M P8.2	Provide for storage and collection of recyclables	
			O+M C8.3	Recycle organic matter	3 to 5
			O+M C8.4	Minimize pesticide and fertilizer use	4 to 5
			O+M C8.5	Reduce outdoor energy consumption	2 to 4
			O+M C8.6	Use renewable sources for landscape electricity needs	3 to 4
			O+M C8.7	Protect air quality during landscape maintenance	2 to 4
0	0	0	**9. EDUCATION + PERFORMANCE MONITORING**	**Possible Points:**	**11**
			EDUCATION C9.1	Promote sustainability awareness and education	3 to 4
			EDUCATION C9.2	Develop and communicate a case study	3
			EDUCATION C9.3	Plan to monitor and report site performance	4
0	0	0	**10. INNOVATION OR EXEMPLARY PERFORMANCE**	**Bonus Points:**	**9**
			INNOVATION C10.1	Innovation or exemplary performance	3 to 9

YES	?	NO		
0	0	0	**TOTAL ESTIMATED POINTS**	**Total Possible Points: 200**

		SITES Certification level Points
YES	Project confident points are achievable	**CERTIFIED** 70
?	Project striving to achieve points, not 100% confident	**SILVER** 85
NO	Project is unable to achieve these credit points	**GOLD** 100
		PLATINUM 135

Seattle Green Factor. Retrieved from: https://SeattleGreenFactorScoresheet.xlsx



Green Factor Scoresheet PAGE 1 — SEATTLE×green factor

Project title:		Enter sq ft of parcel			
	Parcel size	0		SCORE	#####
	Landscape Elements**	Totals calculate automatically from		Factor	Total
A	**Planted areas**		0	0.6	0
1	Planted areas with a soil depth of 24" or greater		square feet		
2	Bioretention facilities		0	1	0
			square feet		
B	**Plantings (credit for plants in landscaped areas from Section A)**				
1	Mulch, ground covers, or other plants less than 2' tall at maturity		0	0.1	0
			square feet		
2	Medium shrubs or perennials 2'-4' tall maturity - calculate	0	0	0.3	0
	9 sq ft per plant (typically planted no closer than 18" on cer	plants			
3	Large shrubs or perennials 4'+ at maturity - calculated at 3	0	0	0.3	0
	per plant (typically planted no closer than 24" on center)	plants			
4	**Small Trees**	0	0	0.3	0
	Tree canopy for "Small Trees" or equivalent (canopy spread of 8' to 15') - calculated at 75 sq ft per tree	trees			
5	**Small/Medium Trees**	0	0	0.5	0
	Tree canopy for "Small/Medium Trees" or equivalent (canopy spread 16' to 20') - calculated at 150 sq ft per	trees			
6	**Medium/Large Trees**	0	0	0.7	0
	Tree canopy for "Medium/Large Trees" or equivalent (canopy spread of 21' to 25') - calculated at 250 sq ft	trees			
7	**Large Trees**	0	0	0.9	0
	Tree canopy for "Large Trees" or equivalent (canopy spread of 26' or more) - calculated at 350 sq ft per tree	trees			
8	**Preserved Trees**	0	0	1	0
	Tree canopy for preservation of existing trees with trunks 6"+ DBH (Diameter at Breast Height, 4.5' above the ground) - calculated at 20 sq ft per inch diameter	inches			

* Do not count public rights-of-way in parcel size calculation.
** You may count landscape improvements in rights-of-way contiguous with the parcel. All landscaping on private and public property must comply with the Landscape Standards

REVISED 07-07-2020

Green Factor Scoresheet PAGE 2 — SEATTLE×green factor

C	**Green roofs**			
1	Green roofs over at least 2" and less than 4" of growth medium	0	0.4	0
		square feet		
2	Green roofs 4" - 8" of growth medium	0	0.6	0
		square feet		
3	Green roofs 8"+ of growth medium	0	0.8	0
		square feet		
D	**Vegetated walls**	0	0.4	0
	NC, C, SM, and South Downtown zones only	square feet		
E	**Permeable paving**			
1	Permeable paving over at least 6" and less than 24" of soil or gravel	0	0.2	0
		square feet		
2	Permeable paving over at least 24" of soil or gravel	0	0.5	0
		square feet		
F	**Structural soil systems**	0	0.5	0
		square feet		
	sub-total of sq ft =	0		
G	**Bonuses**			
1	Landscaping that consists of drought-tolerant and/or native plant species	0	0.1	0
		square feet		
2	Landscaped areas where at least 50% of annual irrigation needs are met	0	0.2	0
	through the use of harvested rainwater or collected greywater	square feet		
3	Vegetation visible to passersby from adjacent public right of way	0	0.2	0
	or public open spaces	square feet		
4	Landscaping in food cultivation	0	0.1	0
		square feet		
		een Factor numerator =		0

* Do not count public rights-of-way in parcel size calculation.
** You may count landscape improvements in rights-of-way contiguous with the parcel. All landscaping on private and public property must comply with the Landscape Standards