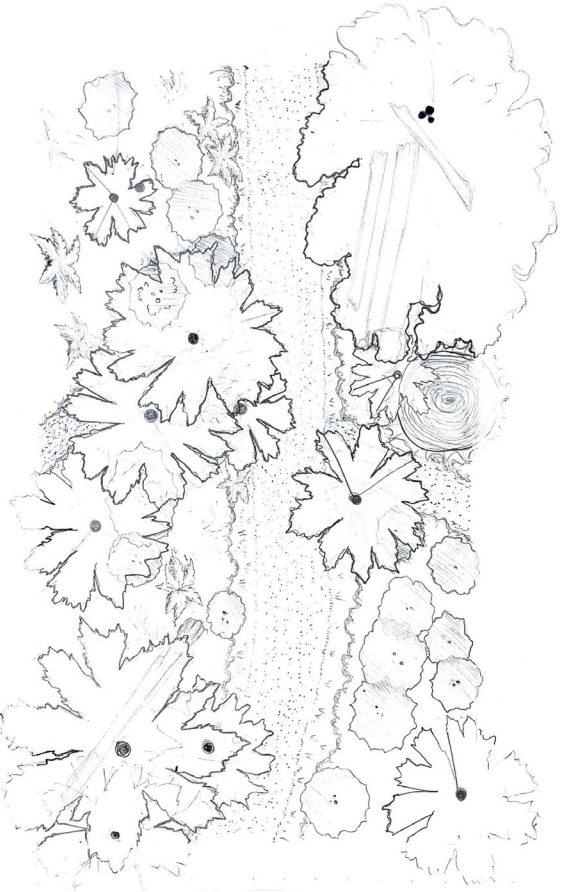
UBC SUSTAINABILITY SCHOLAR PROJECT 2024

About the Student

Katie McPartlin

BSc. Environmental and Resource Sc
M. Landscape Architecture (nearly!)



About the Project

RESEARCH TO SUPPORT A NATURAL ENVIRONMENT AND BIODIVERSITY PLAN FOR FRASER HEALTH

- ENVIRONMENTAL SCAN
- INVENTORY OF NATURAL ASSETS
- LANDSCAPE ANALYSIS

The Sites

3 Acute Care

- ✓ Delta Hospital
- ✓ Surrey Memorial Hospital
- ✓ Burnaby Hospital

3 Long-Term Care

- ✓ Cottage-Worthington Pavilion
- ✓ Heritage Village
- ✓ Mountain View Manor

ENVIRONMENTAL SCAN

RESEARCH GOALS

- Identify best practices for natural asset inventories in healthcare
- Identify ‘next steps’ for initiating biodiversity plan goals

ENVIRONMENTAL SCAN

KPI's:

BIOPHILIC DESIGN

- Patient recovery time reduction
- Staff and patient satisfaction rates

ECOLOGICAL SERVICES

- Measured improvement in air quality
- Canopy Cover
- % of landscaping area utilizing native plants

LANDSCAPING

- % reduction in water usage
- Reduction in chemical usage
- % decrease in landscaping waste produced and increase in waste recycled or composted
- Reduction in energy consumption of landscaping maintenance
- # of biodiversity-supportive projects implemented
- Number of nature-based solutions (NBS) implemented .

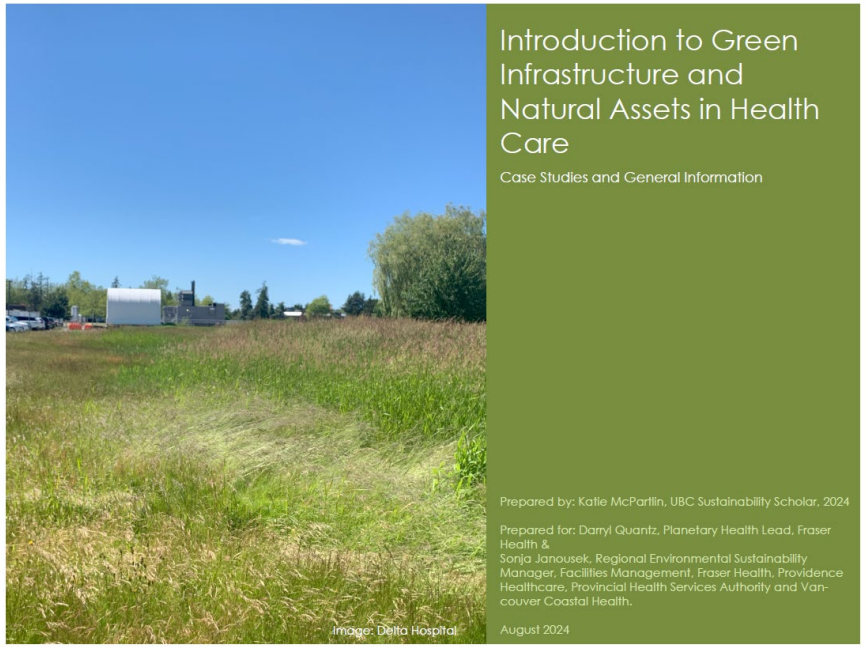
INVENTORY OF NATURAL ASSETS

RESEARCH GOALS

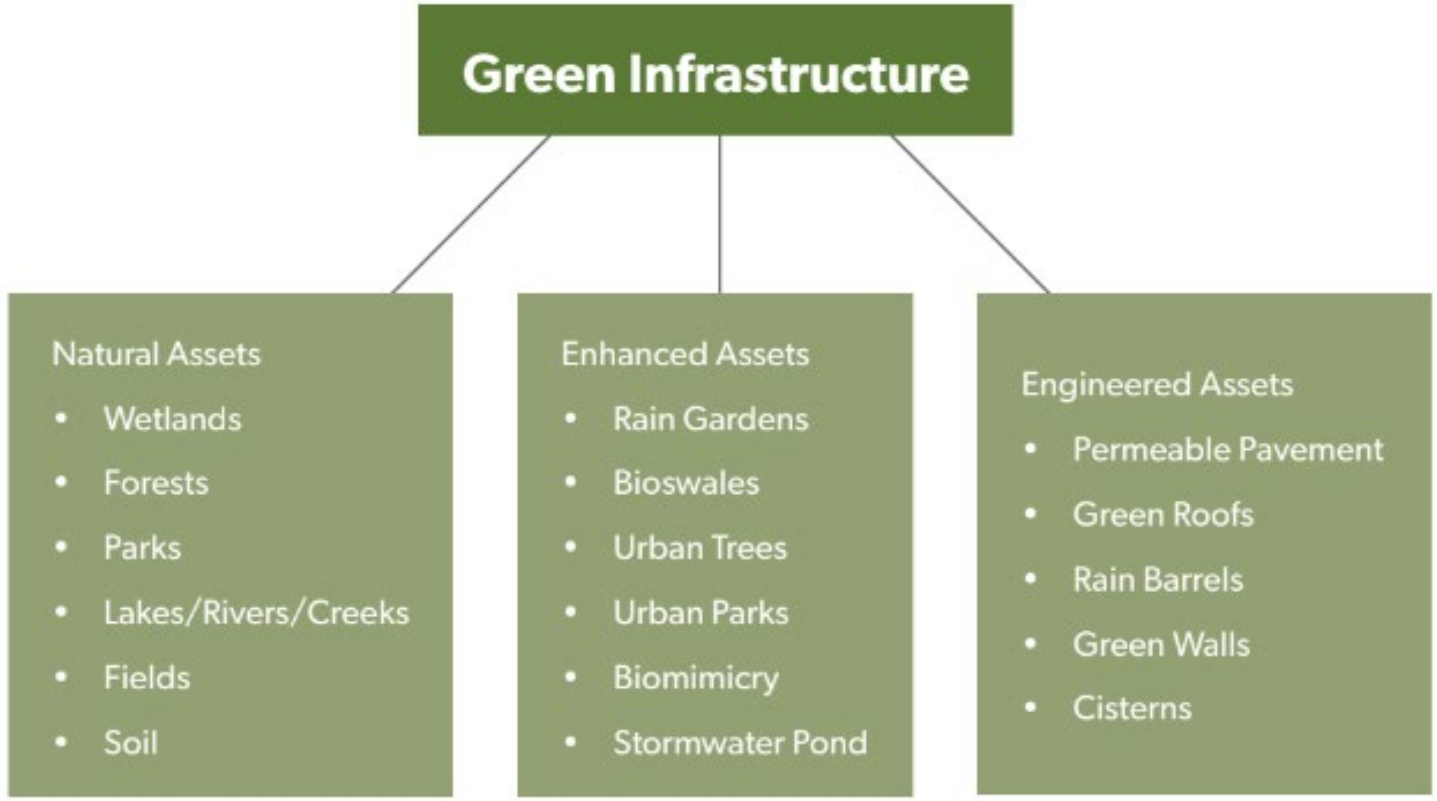
- Identify potential and current types of natural assets and green infrastructure

DELIVERABLES

- Produce a summary document describing different natural assets or green infrastructure that can be implemented at healthcare sites
- Identify the presence or absence of these at the 6 FH sites



INVENTORY OF NATURAL ASSETS



+ Native Plantings
+ Food Plants
+Indigenous Healing Gardens
+Sensory Gardens
+Healing Gardens
+Therapeutic Gardens

Categorization of green infrastructure and natural assets a described by the Municipal Natural Assets Initiative (MNA 2017).

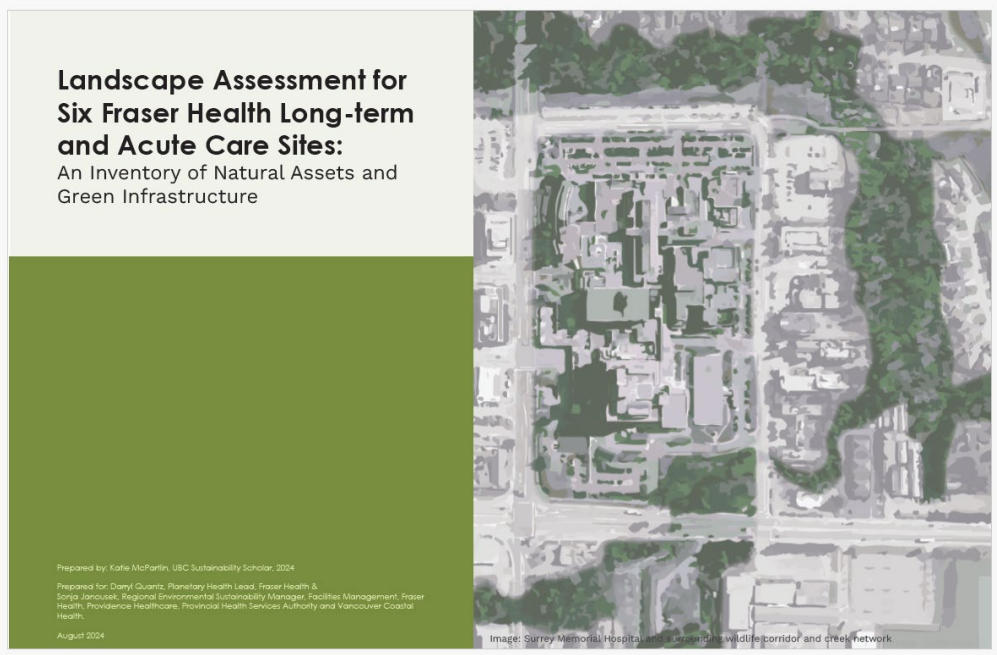
LANDSCAPE ANALYSIS

RESEARCH GOALS

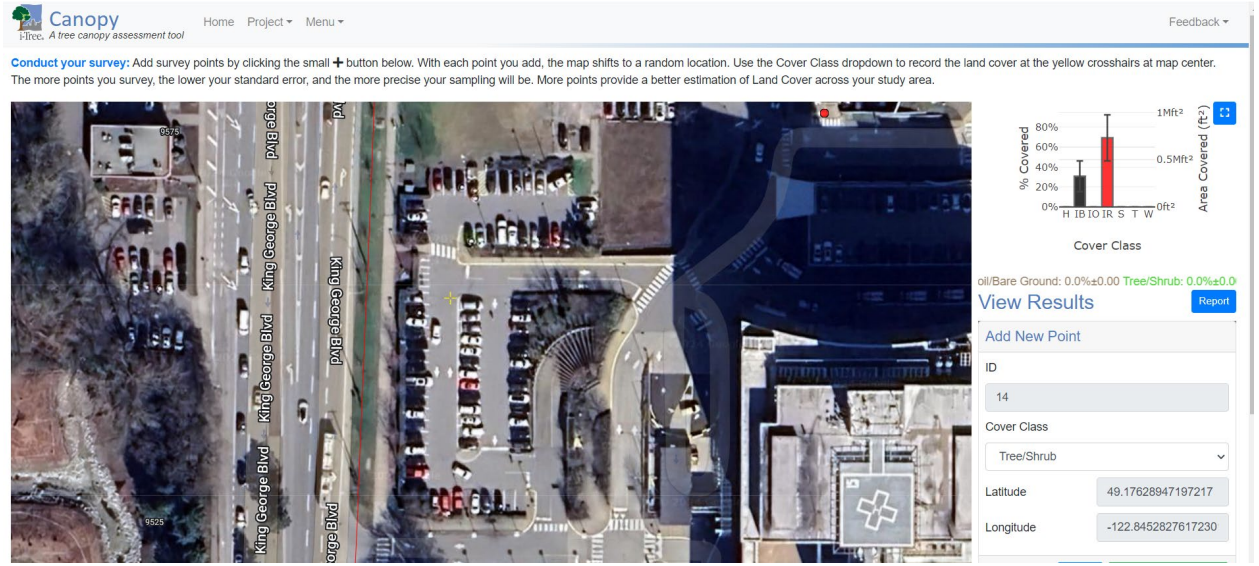
- Calculate metrics: canopy cover and % landscape types to compare 6 sites
- Tour and interview staff at 6 sites to better understand the landscape

DELIVERABLES

- Summary document with key takeaways and relevant maps/metrics comparing natural assets
- Highlight key opportunities and suggest next steps based on interviews, observations, and metrics.



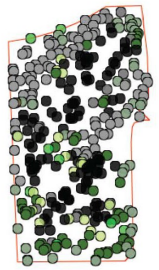
LANDSCAPE ANALYSIS

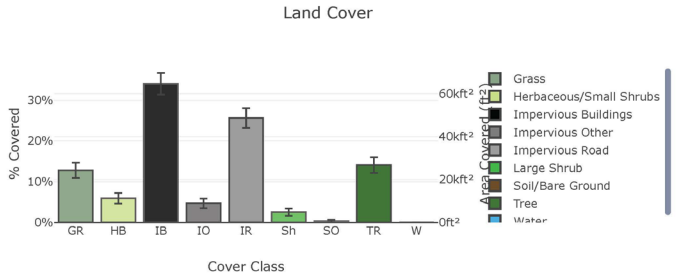


i-Tree Canopy

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 6/3/2024





Tree Benefit Estimates: Carbon (English units)

Description	Carbon (lb)	±SE	CO_2 Equiv. (lb)	±SE	Value (CAD)	±SE
Sequestered annually in trees	1,410.77	±194.96	5,172.82	±714.85	164 Can$	±23
Stored in trees (Note: this benefit is not an annual rate)	42,021.26	±5,807.03	154,077.94	±21,292.45	4,887 Can$	±675

Currency is in CAD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Amount sequestered is based on 0.053 lb of Carbon, or 0.194 lb of CO_2, per ft²/yr and rounded. Amount stored is based on 1.574 lb of Carbon, or 5.771 lb of CO_2, per ft² and rounded. Value (CAD) is based on 0.12 Can$/lb of Carbon, or 0.03 Can$/lb of CO_2 and rounded. (English units: lb = pounds, ft² = square feet)

Tree Benefit Estimates: Air Pollution (English units)

Abbr.	Description	Amount (oz)	±SE	Value (CAD)	±SE
CO	Carbon Monoxide removed annually	15.45	±2.14	1 Can$	±0
NO2	Nitrogen Dioxide removed annually	69.29	±9.58	0 Can$	±0
O3	Ozone removed annually	404.45	±55.89	42 Can$	±6
SO2	Sulfur Dioxide removed annually	24.77	±3.42	0 Can$	±0
PM2.5	Particulate Matter less than 2.5 microns removed annually	43.27	±5.98	153 Can$	±21
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	99.01	±13.68	26 Can$	±4
Total		**656.25**	**±90.69**	**223 Can$**	**±31**

Currency is in CAD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Air Pollution Estimates are based on these values in oz/ft²/yr @ Can$/oz/yr and rounded:
CO 0.001 @ 0.06 Can$ | NO2 0.003 @ 0.01 Can$ | O3 0.015 @ 0.10 Can$ | SO2 0.001 @ 0.00 Can$ | PM2.5 0.002 @ 3.55 Can$ | PM10* 0.004 @ 0.27 Can$ (English units: oz = ounces, ft² = square feet)

Tree Benefit Estimates: Hydrological (English units)

Abbr.	Benefit	Amount (Kgal)	±SE	Value (CAD)	±SE
AVRO	Avoided Runoff	17.79	±2.46	217 Can$	±30
E	Evaporation	88.49	±12.23	N/A	N/A
I	Interception	88.92	±12.29	N/A	N/A
T	Transpiration	36.84	±5.09	N/A	N/A
PE	Potential Evaporation	223.48	±30.88	N/A	N/A
PET	Potential Evapotranspiration	179.97	±24.87	N/A	N/A

LANDSCAPE ANALYSIS: Themes

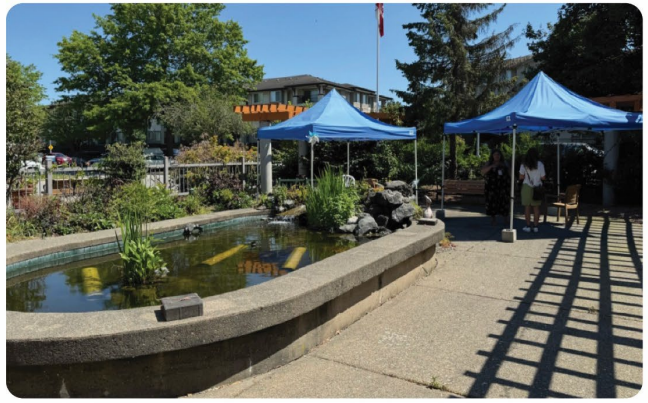
ACCESS

Naturalized Spaces

Accessibility

During Construction

Shade or Rest Areas



LANDSCAPE ANALYSIS: Themes

PLANT HEALTH

Limited Irrigation

Harsh Conditions

Invasives and Competition

Limited Landscape Budget / Time / Priority

LANDSCAPE ANALYSIS: Themes

SPECIES DIVERSITY

Ground Covers

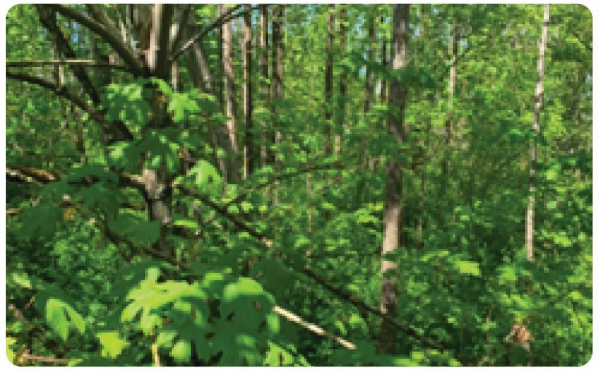
Lawn Monocultures

Shrubs and Urban Trees

LANDSCAPE ANALYSIS: Themes

MANAGMENT OF NATURALIZED SPACES

Forest Management



Meadow Management

Public Safety in Naturalized Areas

Development and Greenspace

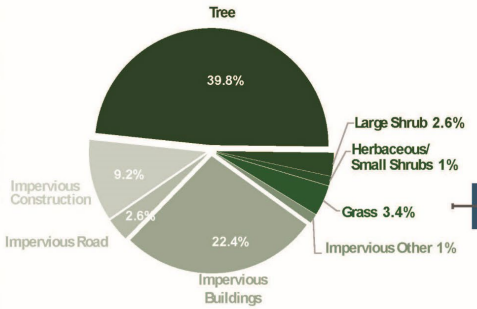
LANDSCAPE ANALYSIS : Burnaby Hospital

Legend

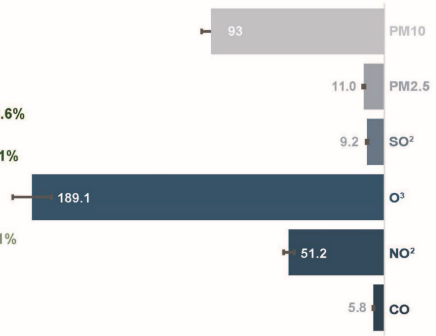
- Property Line / Study Area
- Creek
- Greenway / Bikeway
- Trees removed

1. Forest Plot
2. Creek
3. Rooptop Terrace in Palliative Care
4. Urban Trees

Land Cover Assessment
(% of Total Area)



Air Pollutants Removed
Annually By Tree Canopy (lbs)



Existing Green Infrastructure

Natural Assets

Creek

Forest

Enhanced Assets

Terrace Garden

Urban Trees

Site Observations

Native and Invasive Plant Presence

Gardens and grounds:
Limited to no presence of native plant species.
Limited presence of invasive plant species.

The naturalized forest plot:
Abundant presence of both native and invasive species.

LANDSCAPE ANALYSIS : Burnaby Hospital

	Challenge	Recommendation
	**Access to Naturalized Spaces** Due to the steep slope and setback regulations there are limited entry or viewing points to the forest.	Boardwalks and viewing platforms around the forest edge is a simple intervention to encourage positive human - nature connections. Interpretive signage for education about local flora and fauna is another short term intervention. Increasing the quality and amount of green space throughout the hospital grounds will maximize health benefits of being in green spaces, while minimizing disturbance to the sensitive forest habitat.
	**Access During Construction** The site will be under construction for next 5 years. It is loud and dusty and much of the current green space will be developed or is used as part of the construction site.	Consider temporary or modular green spaces to be phased simultaneously with the redevelopment phasing. This will ensure there is always a place for staff, patients, and visitors to have access to plants and nature. A temporary green space may include movable planter boxes and seating.
	**Garden and Street Tree Diversity** Planted areas typically had a mono-culture ground cover or shrub layer. Street trees mostly consisted of non-native Acer (maple) species.	Planting more native species in foundation plantings and planting a greater variety of street trees is a simple way to increase biodiversity in a urban setting.[3][4]
	**Forest Management** The forest is currently unmaintained with a visible presence of invasive species. The report by Diamond Head Consulting confirms the presence of invasive species here.[2]	A longer-term solution is required for this challenge. A forest management plan could be developed with the help of community partners and a consulting company. Monitoring of this space will require expertise from biologists and environmental consultants. Developing community support and a volunteer base could be beneficial to take on some of the work to maintain a riparian forest plot.

INVENTORY OF NATURAL ASSETS : Example

MANAGMENT OF NATURALIZED SPACES

Case Study: Forests in Healthcare Settings

Blarbuie Woodland, Scotland

Argyll and Bute Hospital underwent a forest enhancement project in 2002, for patients, staff and visitors.

They created pathways, added signage, developed management plans and offered educational opportunities. [3]

Partnerships

A joint project with:
Reforesting Scotland,
Argyll Green Woodworkers Association,
National Health Services (NHS),
Scottish Association for Mental Health,
Lochgilphead Community Council.

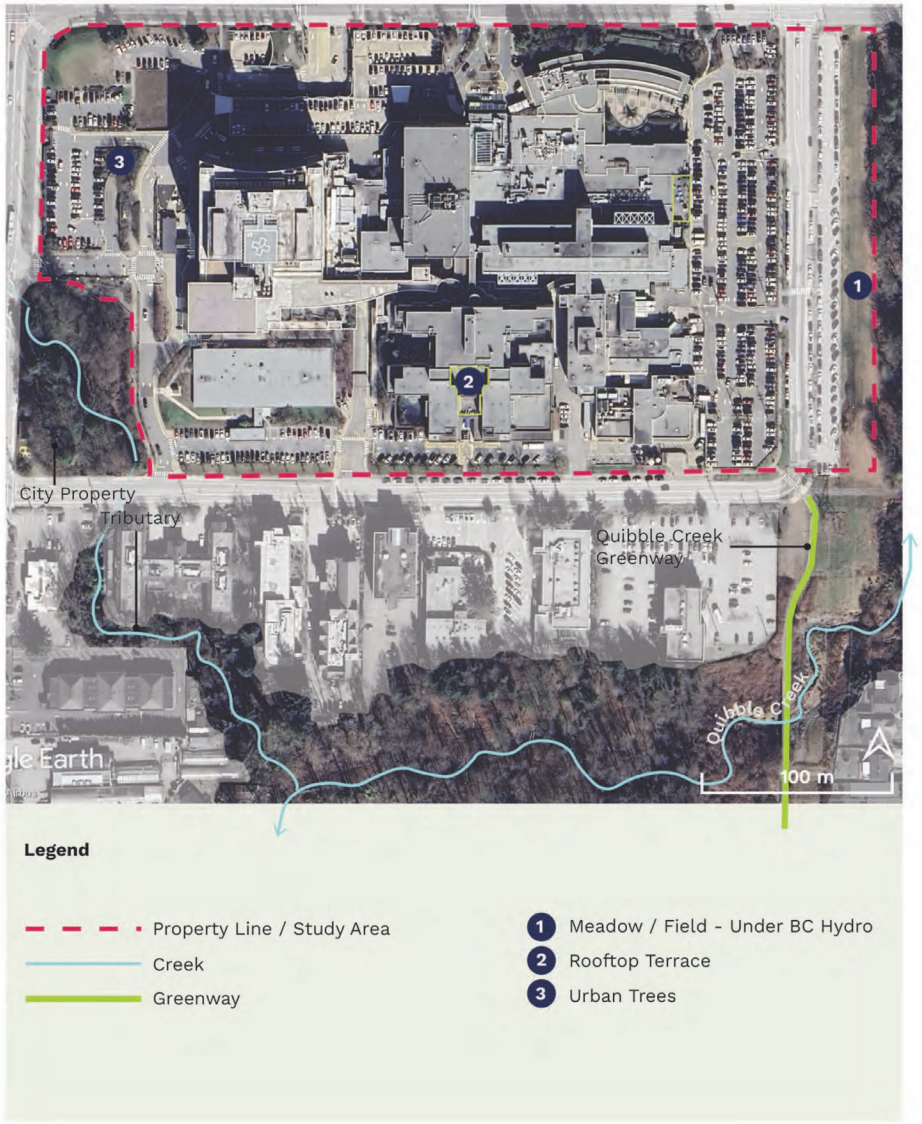
Having community partners was essential to carrying out a project such as this.
Research, consultation, and appraisal was completed with the help of partners. Followed by detailed planning and fundraising.[3]

Stewardship

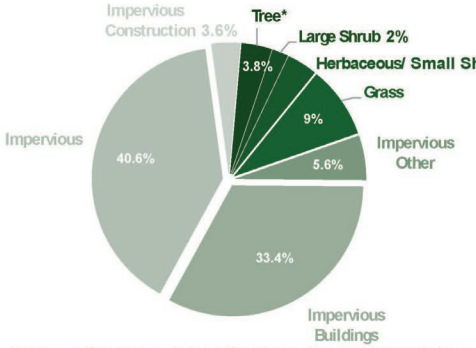
Ongoing monitoring and management of the woods would be required. According to their project page, community participation was key to protecting the woods long term and making them accessible to everyone.[3]

Typical Requirements for Small Scale Forest Maintenance

LANDSCAPE ANALYSIS: Surrey Memorial Hospital

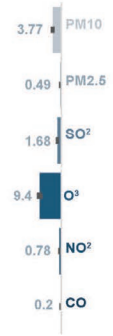


Land Cover Assessment
(% of Total Area)



*Note, satellite imagery is from the winter, therefore canopy is less visible and the estimation may be skewed lower than actual.

Air Pollutants Removed
Annually By Tree Canopy (lbs)



Existing Green Infrastructure

Natural Assets

Meadow

Enhanced Assets

Urban Trees

Terrace Garden

Site Observations

Native and Invasive Plant Presence

Gardens and grounds:
Limited to no presence of native plant species.
Presence of invasive species.

The naturalized field plot:
Presence of native and invasive species.

INVENTORY OF NATURAL ASSETS

PLANT HEALTH

Case Study: Pollinator Gardens

Groves Memorial Community Hospital
Elora, Ontario

A local agricultural society funds environmental projects in the community. The new pollinator gardens constructed in 2021 are connected to an existing healing garden and a community trail.

The design is intended to support insect diversity which in turn will support the gardens and local crops.[11]

Case Study: Green roofs

Sharp Memorial Hospital, California, US

A 5000 square foot green roof was completed in 2010 at the Sharp Memorial Hospital. Patients mostly enjoy this view from above and are often pleased if they discover it represents the first few bars of Beethoven's "Ode to Joy".

The planting is a mix of raised planters, trees, and ground covers. The roofing assembly was built up and planted with mostly sedum tiles and other drought tolerant plant plugs.

It has reduced stormwater runoff, provided pollinator and bird habitat, as well as aided in the climate control of the building and exterior environment. [19]

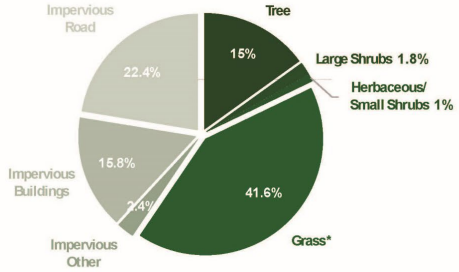
Select native climate-adapted sp., (sedums, grasses, alliums), Upgrade irrigation systems, Consider grading in large scale projects

LANDSCAPE ANALYSIS: Delta Hospital and Mountain View Manor

Legend

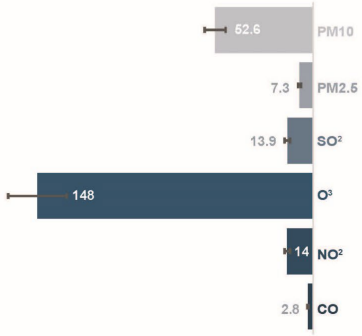
- Property Line / Study Area
- 1 Meadow / Field -To Be Developed
- 2 Therapeutic Gardens - Raised Beds
- 3 Enclosed Patio
- 4 Healing Garden
- 5 Urban Trees

Land Cover Assessment
(% of Total Area)



*Note approx half of 'Grass' space is un-mowed meadow and half a lawn monoculture

Air Pollutants Removed
Annually By Tree Canopy (lbs)



Existing Green Infrastructure

Natural Assets

Meadow

Enhanced Assets

Urban Trees | Healing Garden | Enclosed Patio | Therapeutic Garden

Site Observations

Native and Invasive Plant Presence

Gardens and grounds:
Limited presence of native plant species.
Limited presence of invasive plant species.

The naturalized meadow / field plot:
Presence of native and invasive species.

INVENTORY OF NATURAL ASSETS : Example

MANAGMENT OF NATURALIZED SPACES

Case Study: Meadows in Healthcare Settings

Ysbyty Gwynedd Hospital, Bangor, Wales

Meadows Health and Wellbeing Route is a 1.7 km signed walking route developed from Ysbyty Gwynedd, a hospital in Bangor, to nearby meadows at Eithinog Nature Reserve. (4)

Partnerships

This project is in partnership with Plantlife and is part of Magnificent Meadows Cymru, a government funded program that is working to restore over 500 hectares of wildflower meadows and grassland in Wales. These environments connect communities to natural spaces for health and well being. (4)

Photo: NHS Signage

Stewardship

On going monitoring and management of the meadows would be required. This particular site is connected to a nature reserve that takes on the bulk of the work.(4)

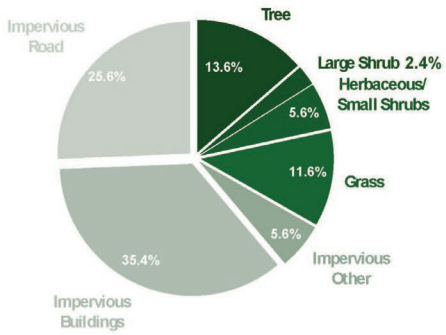
LANDSCAPE ANALYSIS : Cottage Worthington Pavilion

Legend

- Property Line / Study Area

1. Enclosed Patio- At The Entrance
2. Enclosed Patio -For Residence
3. Enclosed Patio -Not Used Widely
4. Enclosed Patio - For Staff
5. Urban Trees

Land Cover Assessment
(% of Total Area)



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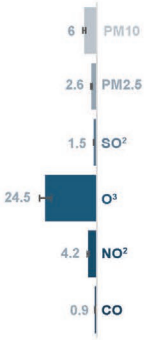


Existing Green Infrastructure

Natural Assets

Enhanced Assets

Urban Trees

Enclosed Patio

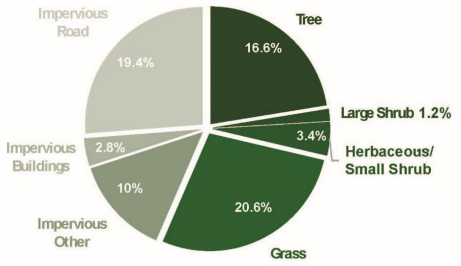
Site Observations

Native and Invasive Plant Presence

Limited presence of native plant species.
Presence of invasive plant species.

LANDSCAPE ANALYSIS: Heritage Village

Land Cover Assessment
(% of Total Area)



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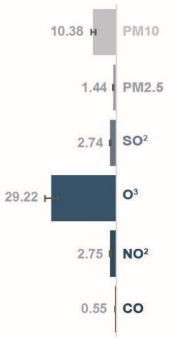


Existing Green Infrastructure

Natural Assets

Enhanced Assets

Site Observations

Native and Invasive Plant Presence

Gardens and grounds:
Presence of native plant species.
Limited presence of invasive plant species.

INVENTORY OF NATURAL ASSETS

ACCESS

Case Study: Sensory Gardens

Aldeburgh Hospital, London, UK

A sensory garden was created at a hospital with the focus of stimulating the senses especially for dementia patients. These gardens have elements that allow users to engage with sight, smell, touch, and especially, sound. Featuring musical instruments all throughout the space.

In addition to the health benefits of this space, plantings provide pollinator habitat and refuge for birds and other wildlife.[13]

Case Study: Indigenous Healing Gardens

Ajax Pickering Hospital, Ontario

An Indigenous Community & Healing Garden was designed and installed in 2022 at the Ajax and Pickering Hospital. The design and plant selection integrated components of indigenous history and learnings.

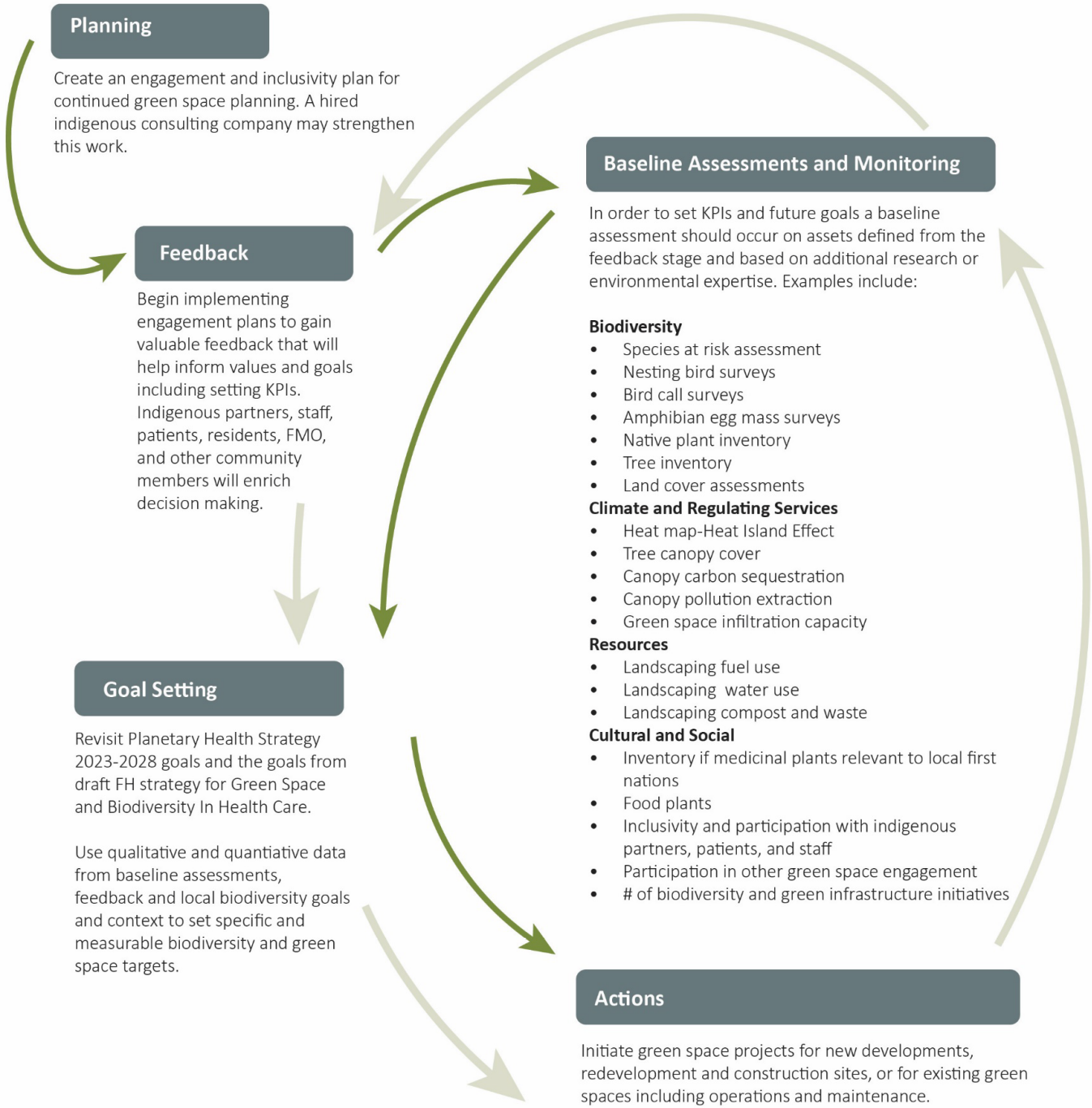
"The garden provides a space of relief and recreation for hospital staff, patients, volunteers and community members as well as enhance our connection to the indigenous peoples of the Mississaugas of Scugog Island."- Ajax Pickering Hospital

Takeaways

- Many common challenges and sentiments were expressed across all sites.
- 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 partnerships with other entities, including the City of Delta, to fulfill some garden maintenance needs.
- There are opportunities to significantly contribute to the habitat and ecological connectivity locally at many sites.

Next Steps

Continue engaging with site staff, measuring KPI's and recording green infrastructure



Next Steps

Continue research and engagement to find capacity building solutions

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

Next Steps

Continue research and engagement for the following project areas that arose

- 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.

Discussion

Image: Surrey Memorial Hospital and surrounding wildlife corridor and creek network


DBLAZE DBLAZ