

# UBC Social Ecological Economic Development Studies (SEEDS) Student Report

## Enhancing Green Networks and Fabric

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University of British Columbia

LARC 444/553

Themes: Biodiversity, Land

March 16, 2018

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THE UNIVERSITY OF BRITISH COLUMBIA

**School of Architecture + Landscape Architecture**

**LARC444/553 Green Network Planning (Fall 2017)**

Professor: Cynthia Girling

# **Enhancing Green Networks and Fabric**

**FINAL REPORT BOOK 1 - UBC**

## EXECUTIVE SUMMARY

This course introduced a comprehensive, landscape-based approach to long-range planning of the greenspace structure of cities to enhance both ecosystem and human purposes. Green Networks are an interconnected network of green patches and corridors incorporating parks, natural areas, remnant green spaces, street trees, and other vegetated spaces of the city. The course investigated a proactive, long-term planning approach enabling these green networks to be considered in conjunction with growth and development planning. The course was interdisciplinary and included students in the Bachelor of Urban Forestry, Bachelor of Environmental Design, Master of Landscape Architecture, Master of Architecture, and Master of Community and Regional Planning. Additionally, one professional forester from Switzerland and one student from Simon Fraser University joined the class.

The report submitted to SEEDS, entitled “Enhancing Green Networks and Fabric” represents the results from the major term project. The entire UBC campus plus an area covering the UEL and adjacent forest were divided into four study areas. Teams of four students were assigned to each study area. In this exercise the student teams de-laminated the green networks and fabric of their study area to reveal and diagnose its current order and condition. The class compiled a graphically evocative and informative spatial analysis of the UBC campus that highlights and evaluates important green systems in terms of key greenspace and livability metrics.

Maps and diagrams accompanied by photos and other illustrations “tell the urban forest story” of the study area. The analysis method included GIS-based spatial analysis with accompanying metrics derived from the mapping. Spatial mapping of each study included: green vs. grey land cover; vegetative cover (forest, shrub, trees only, herbaceous, sparse, water); all tree canopy cover (distinguish forest from urban); tree canopy categorized (deciduous/coniferous); vegetation naturalness (see Vancouver Biodiversity Strategy); habitat hotspots and habitat sites; habitat types (start with class provided legend); industrial, commercial, mixed use, high density residential, moderate density residential, civic, greenspace, public lands.

In response to their findings from this analysis, each student team then made site-wide propositions for how to make significant improvements to the green networks and fabric of their study area, specifically addressing: improving the quantity and quality of the urban forest; improving the connectivity between the green patches; improving the habitat quantity and quality and connectivity; improving rainwater management using green infrastructure. Additionally, detailed studies more clearly illustrate how the broad site-wide propositions may be implemented.



## UBC STUDY AREAS & TEAMS

Area 1 Jivan Khera, Jennifer Reid, Wilson Wang, Yifan Yuen

Area 2 Yau Ching (Norain) Chang, Ivan Brodsky, Allan Du, Jane Ho

Area 3 Colin Mbugua, Eva Snyder, Doris Sun, Tony Tse

Area 4 Leo Lee, Emily Tu, Jiahui Huang, Jake Robertson

# ACKNOWLEDGEMENTS

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We would also like to extend our special thanks to our guest lecturers to the class for sharing their expertise: Nick Page (Vancouver Park Board), Yves Kazemi, Lorien Nesbitt, Cameron Owen (City of Vancouver), Margot Long (PWL Partnership), Patrick Mooney, Bill Stephen (Vancouver Park Board), and Jeff Fitzpatrick (Metro Vancouver).

Note: This is student work based on available information. There may be some inaccuracies.



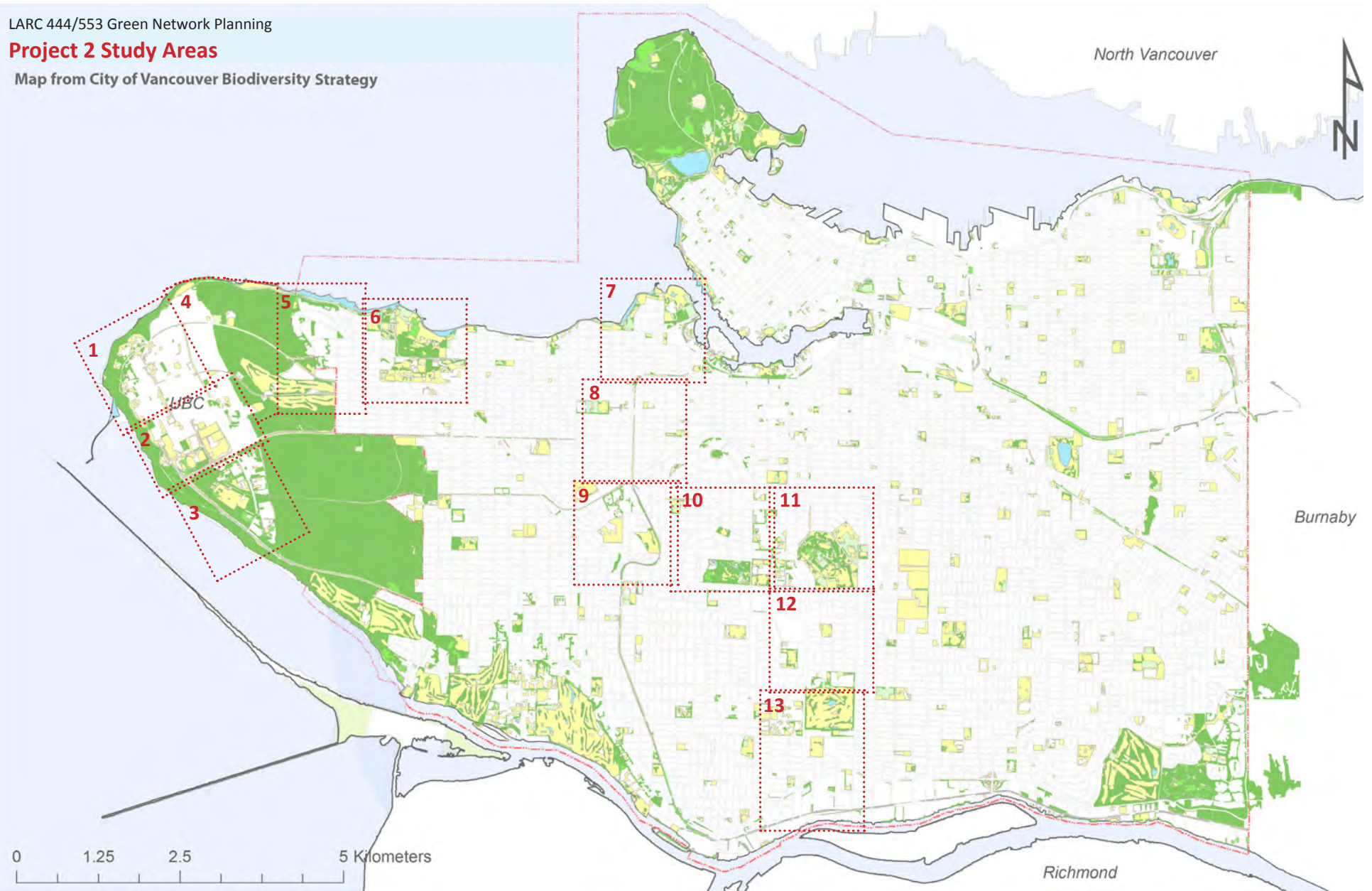
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### Project 2 Study Areas

Map from City of Vancouver Biodiversity Strategy





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LARC444/553 (Girling) Team 1

# Enhancing Green Networks and Fabric FINAL REPORT

UBC 1

Team Members:

Jivan Khera

Jennifer Reid

Wilson Wang

Yifan Yuan

December, 2017



## Zone Analysis: Green vs Grey

This focus area has a relatively high percentage of green space area, most notably within Pacific Spirit Regional Park. However, much of the green area within the campus and residential neighbourhood is composed of turf grass.



Figure 1: Map illustrating green vs grey land cover within the focus area.

### Legend

- Green area 57%
- Grey area 43%

### Green vs Grey Area - Percent

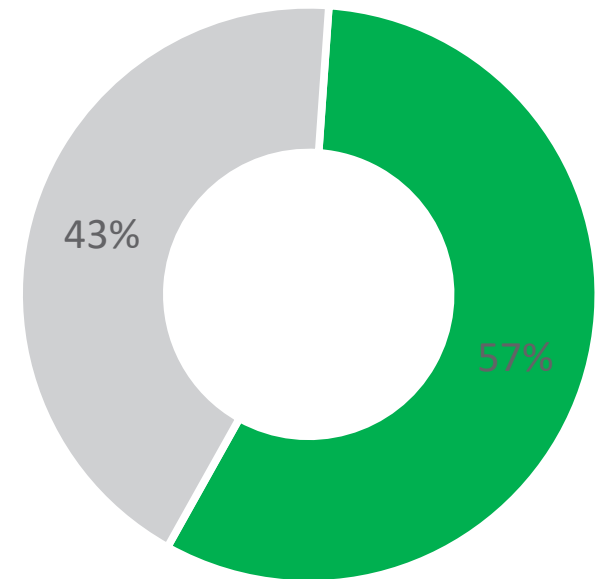


Figure 2: Percent area of green and grey land area.

## Zone Analysis: Land Cover

UBC has various land cover types , with sandy shoreline and forest of Pacific Spirit Regional Park bordering the university campus and endowment lands. The campus as residential areas are dominated by modified and semi-natural features.

### Land Cover

- Forest
- Trees
- Shrubs
- Sparse Vegetation
- Herbacious
- Shore
- Water features
- Trails

### Land Cover - Percent

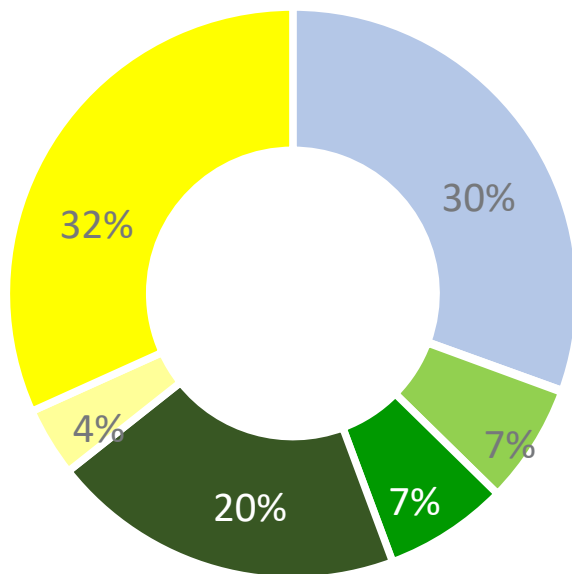


Figure 3. Percent area of land cover types.



100m

Figure 4. Map of focus area illustrating land cover types

## Zone Analysis: Vegetation Type



### Legend

- Cultural Vegetation
- Altered Vegetation
- Semi-Natural Vegetation
- Mainly Natural Vegetation
- Natural Vegetation



Figure: 5. Map illustrating natural to altered and cultural vegetation around UBC 1.



## Zone Analysis: Tree Canopy

### Legend

- Deciduous Canopy
- Evergreen Canopy
- Mixed Canopy
- Forest



Figure 6: Tree Canopy Map showing mixed, deciduous, and evergreen tree canopy in UBC 1

## Zone Analysis

### Tree Species in UBC 01

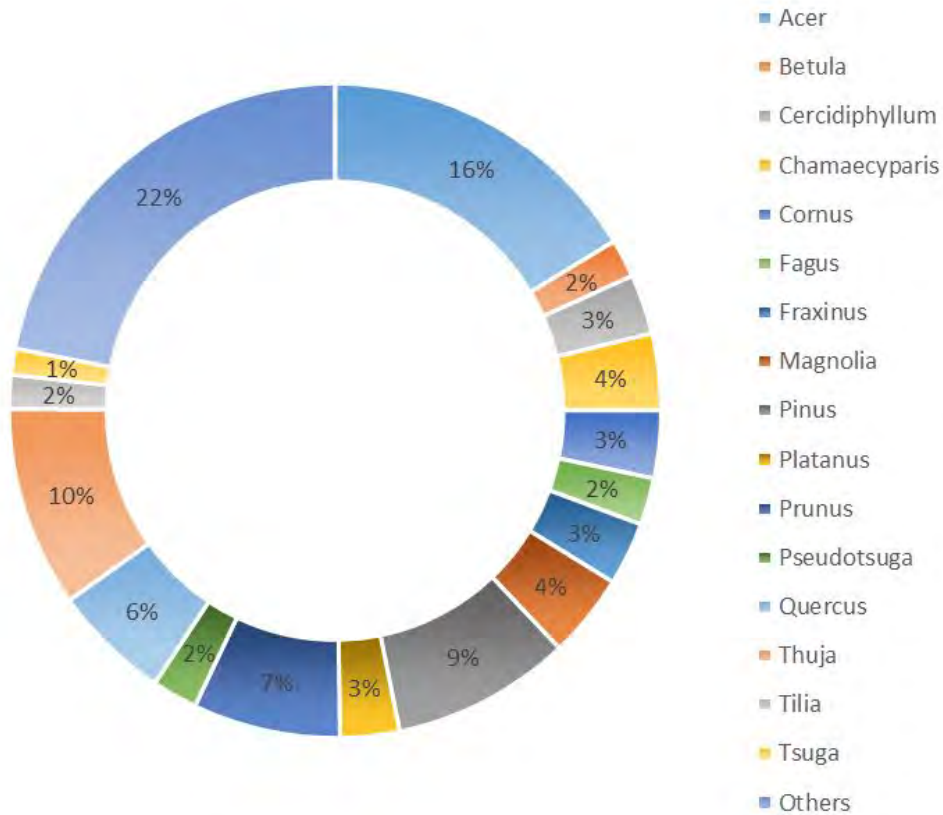


Figure 7. Diversity of Tree Species

## Tree Diversity

One of the things that we noticed was that the the percentage of deciduous tree canopy and coniferous tree canopy delivered from i-Tree seems to be equal as it contains all the tree species in our site.

The percentage recieved from GIS however only contains street trees. Meaning the forest has been ignored or uncategorized.

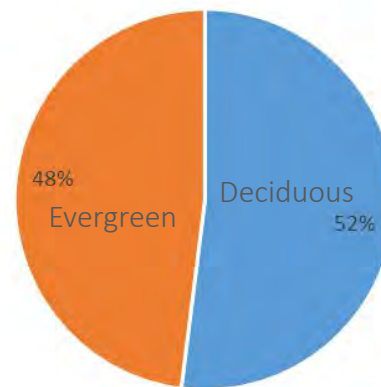


Figure 8a Overall Tree Canopy -

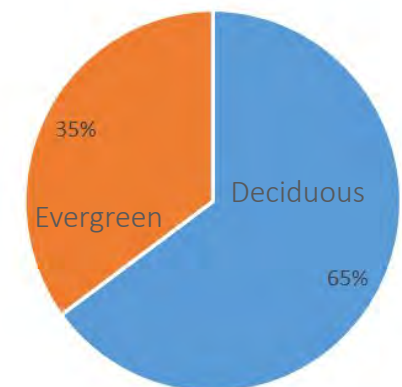


Figure 8b. Street Tree Canopy



# Zone Analysis

## Land Use

### Legend

- Attractions
- Civic Buildings
- Mixed Use
- Residential (High Density)
- Residential (Medium Density)

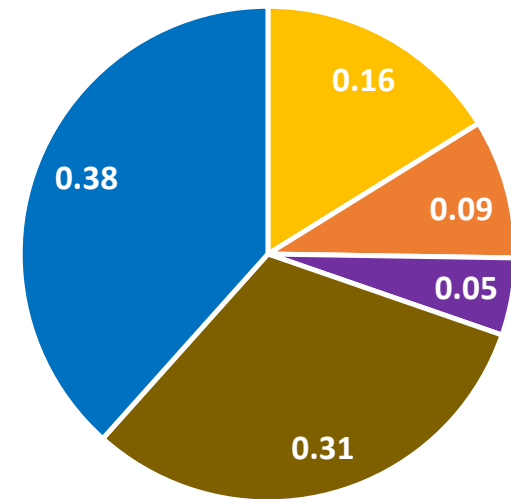
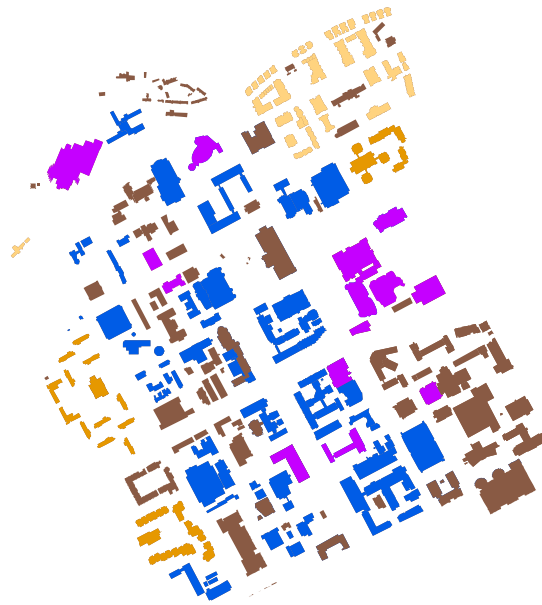


Figure 10. Percentages based on Land Use



Figure 9. Land Use Map

## Zone Analysis

### Walking Distance to the Urban Forest



#### Legend

- 100m to Nature - 78% Of UBC Zone 01
- 400m to Nature - 100% Of UBC Zone 01



Figure 11. Walking Distance Map

# Zone Analysis

## Biodiversity

### Legend

- Coniferous Forest
- Deciduous Forest
- Old Field
- Urban Old Field
- Urban Park
- Open Water
- Shore Zone
- Habitat Hot Spots



Figure 12. Biodiversity Map



## Increasing Biodiversity

One of three overarching principles identified following our analysis



Figure 13 . Potential areas for increased biodiversity

### Goals

Increasing biodiversity is one of the key goals to having a healthier and more resilient campus. We aim to improve the genetic diversity of the urban forest, replace areas with more resilient flora, and implement multifunctional interventions. These will take into account the aesthetic and spatial qualities through their implementation.

Improving genetic diversity can be achieved by ensuring that we grow from seed and have both varied and appropriate plant species for the interventions proposed. Replacing lawn areas with more resilient species, such as micro-clover, would require less maintenance. Finally, the multifunctional landscape interventions could take the shape of raingardens, bioswales, water retention ponds, and basins. These would provide stormwater management, new habitat areas, and increased aesthetic appeal of the landscape.



Figure 14 . Example of lawns

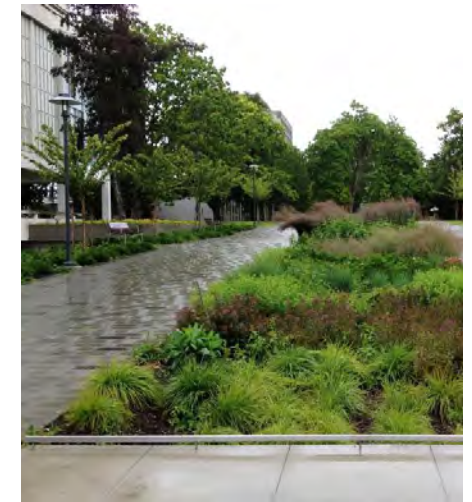


Figure 15 . On campus rain garden



## Increasing Green Land Cover

One of three overarching principles identified following our analysis



Figure 16. Replaceable existing hardscape

### Goals

The campus has achieved over 50% green land cover, this however can be improved further and for greater environmental gain. Looking at the present as well as the future allows us to establish long-term and short-term goals. Our current estimates have 13% of the site area being “workable” grey surface. We propose that roughly 5% of the total site area be replaced.

Requiring green roofs for new construction would take advantage of the many environmental benefits within that assembly. We also propose removing many surface level parking lots and consolidating them into centralized parkades on campus. This would remove inefficient hardscape throughout the campus. We also propose to increase the volume of the green land cover by replacing less vibrant areas, such as lawns, with denser and richer vegetation.



Figure 17. Unnecessary hardscape



Figure 18. CIRS UBC- Green Roof



## Improving Storm-water Management

One of three overarching principles identified following our analysis



Figure 19. Caption, Scale

### Goals

Improving storm-water management throughout the campus would improve the overall pedestrian experience and reduce the amount of maintenance required. This results in saving labor hours, fuel, and money over time.

Identifying problem areas to fix would be the first step. An example of this is the courtyard of the Macmillan Building. This courtyard is impermeable hard surface and accumulates rainwater easily. Granted this isn't the only area on campus with this occurs, but it is

We propose to redirect storm-water into basins, swales, and rain-gardens while also replacing impervious surfaces with permeable alternatives.



Figure 20. Macmillian Courtyard

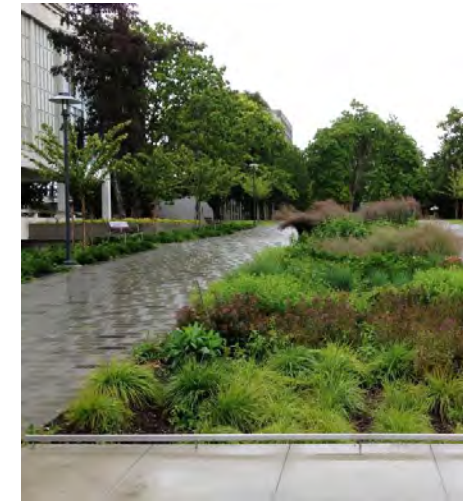


Figure 21. Rain garden on campus

## Policy Context

These are policies that we looked at when establishing our goals and propositions.

### Details

The policy that exists at our site was used as a sort of guideline in establishing our goals. The policies largely come from the UBC Vancouver’s campus plan (Figure 1). Some strategies in that plan include: 1) creating a sustainable campus by having more greener buildings and infrastructure, 2) providing a campus for globally significant teaching, learning and research, and 3) rediscovering UBC’s sense of place and natural west coast beauty. We also looked at the UBC Land Use Plan (Figure 2) and also Metro Vancouver’s regional growth strategy (Figure 3) to get a wider scope of what Vancouver is doing so that there wouldn’t be a disconnect between UBC and the city of Vancouver. A major goal that the city of Vancouver sets out to achieve is to protect the environment and responding to climate change impacts. Therefore, we took that into consideration as well and integrated their strategies into our goals.



Figure 22. Vancouver Campus Plan

Figure 23. UBC Land Use Plan

Figure 24. Metro Vancouver’s regional growth strategy.



## Implementation

This map shows where major interventions will be implemented.

### Intervention Types

- Zones for improved biodiversity
- Zones for increased green space
- Zones for storm water management

Proposed changes would occur at intervals on a small scale, with areas due for renewal to undergo treatment first. A period of monitoring and review will follow these changes to ensure that they are functioning appropriately; interventions may undergo revision if required.

Biodiversity will be enhanced by increasing genetic-diversity through the planting of seeds rather than propagules, and replacement will occur as stands decline. Turf-grass to be maintained only in a few select areas and areas which receive less attention year-round will be planted with the low-maintenance drought-resistant species. Porous paving will be installed as some roads or parking lots are replaced. Reduction of effective impervious area will be met by redirecting storm-water run-off to rain gardens, bioswales, and storm water detention basins.

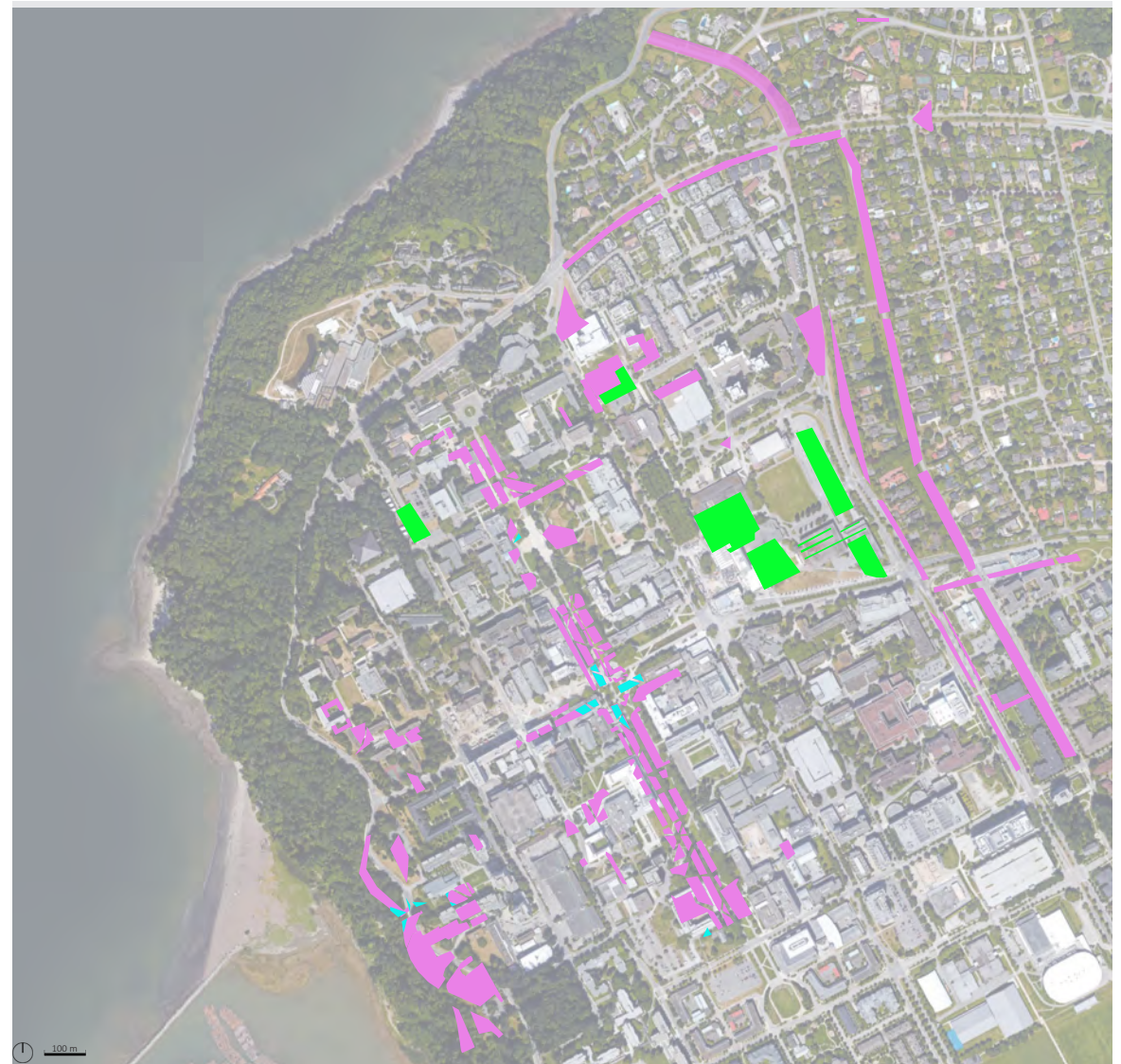


Figure 25 Map of UBC showing areas for intervention. Basemap modified from Google Earth



## Zoom Study – The Oaks of Main Mall (Wilson Wang)

Design proposition for a section of Main Mall



Figure 26: Location of zoom study in red at UBC.  
Image retrieved from: <https://www.google.ca/maps/>



Figure 27: Section of Main Mall.



Figure 28. Barrier planting design around trees and shrubs.  
Retrieved from: <https://i.pinimg.com/736x/0b/d4/7a/0bd47a219121df084b6567c5601ebe2a--privacy-landscaping-landscaping-ideas.jpg>

### Details:

Along Main Mall, a monoculture of *Quercus rubra* is planted and this is a concern for biodiversity and therefore resilience. If a disturbance such as an insect infestation were to occur, it will travel along Main Mall and therefore will likely kill all the *Quercus* spp. Furthermore, *Quercus rubra* is one of listed trees that is discouraged from the UBC's Vancouver Campus Plan. Therefore, for my zoom study I would like to propose a planting design that is in compliance to the design guidelines set out by the UBC Vancouver Campus Plan. This is a long-term goal and will require time. Some species we recommend would be: *Ulmus americana* 'Princeton' (Figure 29), *Acer x freeman* 'Morgan' and *Platanus x hispanica* (Figure 30). The trees will have a repeating pattern and will serve to look like a gradient along main mall. A barrier (using *Taxus* spp.) will surround each tree to aid in their protection from foot traffic and yard maintenance (Figure 28).



Figure 29. *Ulmus americana* 'Princeton' Figure 26. *Platanus x hispanica*  
Images retrieved from: [https://www.google.ca/search?q=tree+images&rlz=1C5CHFA\\_enCA-557CA557&oq=tree+images&aqs=chrome..69i57j0l5.3959j0j4&sourceid=chrome&ie=UTF-8](https://www.google.ca/search?q=tree+images&rlz=1C5CHFA_enCA-557CA557&oq=tree+images&aqs=chrome..69i57j0l5.3959j0j4&sourceid=chrome&ie=UTF-8)

## Zoom Study – The Oaks of Main Mall (Wilson Wang)

### Design proposition for a section of Main Mall

#### Details:

In the end, a nice connected tree corridor should result along Main Mall (an example is shown in Figure 5). The precedent that I have chosen comes from Low Costa Mill Cottages in England (Figure 6). The tree corridor at the Low Costa Mill Cottages offers a linear and uniform space while aiding in shade. Although this design won't be exactly replicated on my zoom study, it inspired the general idea. The monoculture that is currently at Main Mall will be replaced by a more diverse canopy in order to increase resilience and biodiversity. The canopy is almost connected to create a sort of enclosed space which will help to shade the surface from the sun and also provide some shelter from the rain. The ecosystem service that is provided in my zoom study falls under the regulating services category (Figure 7). The trees at this site will provide carbon sequestration as well as to help with climate regulation.



Figure 32. Example of a tree corridor

Retrieved from: <https://thumbs.dreamstime.com/z/landscape-corridor-trees-taken-th-july-east-ren-frewshire-56886386.jpg>



Figure 33. Diverse tree planting design at Low Costa Mill Cottages, England

Retrieved from: <https://media-cdn.tripadvisor.com/media/photo-s/09/6c/4e/12/low-costa-mill-cottages.jpg>



Figure 31. Ecosystem services categories.

Retrieved from: <https://www.earthwiseaware.org/wp-content/uploads/2017/07/Ecosystem-services.png>



## Zoom Study: A More Sustainable Right-of-Way (Jennifer Reid)

Lawns continue to be desired by homeowners as it signals a sense of care and pride in one's neighbourhood, but they come with great ecological costs.



Figure 34. Location of zoom study indicated in red - Wesbrook Cres at S.W Marine Drive. Basemap modified from Arc Map.



Figure 35. View looking southward up Wesbrook Cres; drought ridden turf grass is a common occurrence in this area.

This study focuses on the northern tip of Wesbrook Crescent, a quiet residential street with very little traffic or pedestrian activity. The road verges are planted with turf grass, which has become increasingly difficult to manage due to factors such as chaffer beetle damage and summer water restrictions, and is costly to replace. Furthermore, as lawns require frequent mowing by fossil-fuel powered equipment, they are costly to the environment through the release of carbon emissions into the atmosphere, and also provides few ecological benefits. Replacing turf grass with micro-clover based turf could reduce the need for costly maintenance and also increase ecosystem services such as pollination and nitrogen fixation<sup>1</sup>.

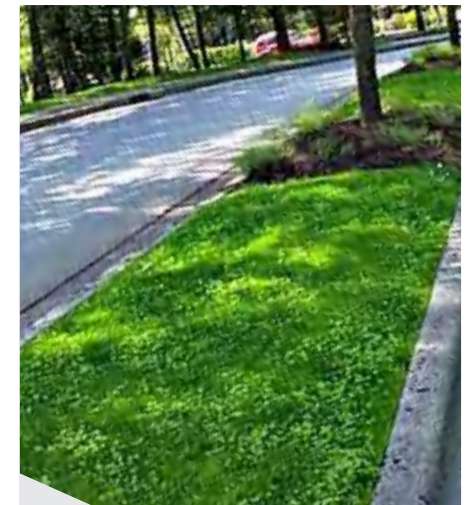


Figure 36a & 36b. Before and after photos showing the improved green quality following replacement with micro-clover based seeding in Port Moody. Images from: <http://www.portmoody.ca/index.aspx?page=1426>



## Zoom Study: A More Sustainable Right-of-Way

A design proposition for to create a more sustainable right-of-way in a residential neighbourhood in the University Endowment Lands

### Looking Forward

Beyond simply increasing biodiversity and sustainability of vegetation in the area, values such as walkability and storm water infiltration can also be improved. Porous pavement has been successfully used in residential neighbourhoods and allows storm water to infiltrate through, thus reducing pressure on our drainage systems and local streams, which face the grunt of excess water flow, especially during the winter. Wider sidewalks are a simple amendment which will increase pedestrian friendliness in the area, and encourage residents to walk through their neighbourhood.

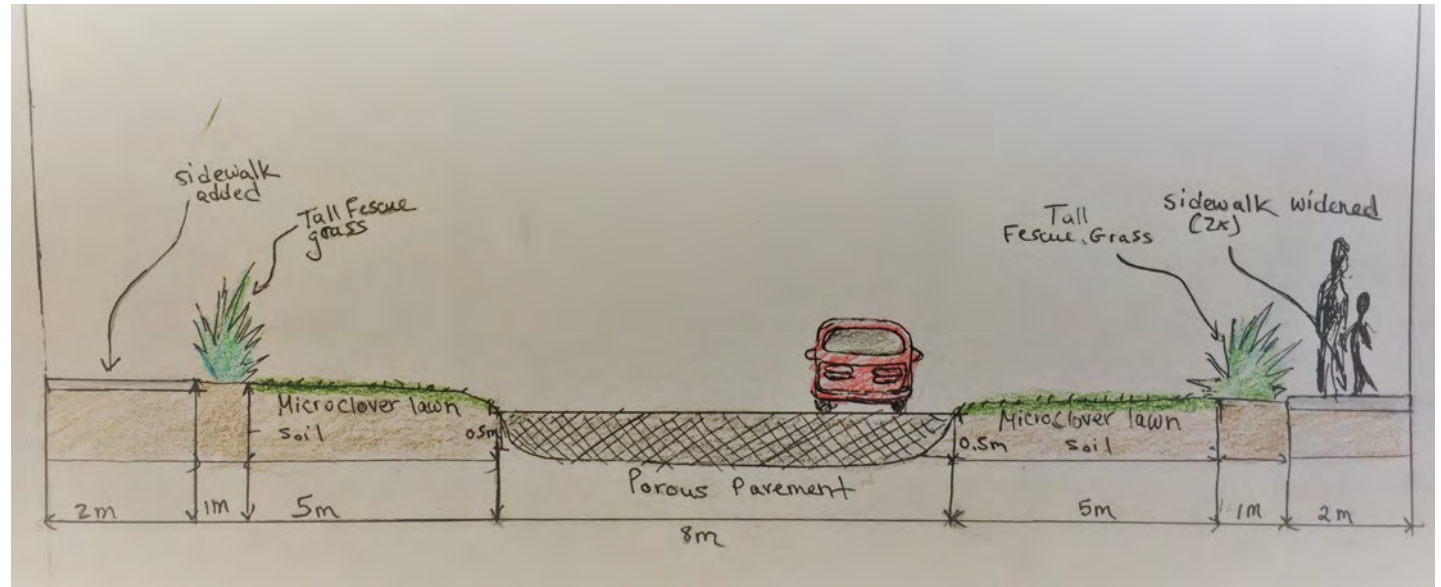


Figure 37. Cross section of proposed interventions. Porous pavement would increase storm water infiltration while, and widened sidewalks would increase pedestrian friendliness in the neighbourhood. Micro-clover would largely replace turf grass, reducing maintenance and increasing ecological benefits. *Festuca glauca* would increase species diversity, as well as provide additional habitat to pollinating insects.



Figure 38 Pervious paving used in Pringle Creek allows water to percolate through. Image from <http://www.ewashtenaw.org>



Figure 39. *Festuca glauca*. Image from <https://i.ebayimg.com/images>



Figure 40: Aerial photo of proposed changes



## Zoom Study: Rain Gardens Along Main Mall (Jlvan Khera)



Figure 41. Potential areas for rain garden interventions

### Goals

Rain-gardens along main mall address all three goals that we have established. They provide denser and richer habitat areas, provide opportunity for varied and resilient plant species, utilize the potential of lawn areas, manage storm-water, and provide aesthetic beauty.

There are several areas on the campus that have such interventions, but main mall would pose a few challenges. Mainly, tree roots from the mature trees. This can be avoided however as over time these trees are projected to be replaced. By using a long-term approach to implement rain-gardens as sections of trees are replaced, this issue can be avoided.

It is important to note that we do not propose to replace all lawns as students utilize them during fairer weather.



Figure 42. Lawns along Main Mall



Figure 43. Rain Garden, Agronomy Rd.



## Zoom Study: Rain Gardens Along Main Mall (Jivan Khera)

### Ecosystem Services

#### Summary

Biodiversity is aided by additional terrestrial habitat and plant density.

Climate and atmosphere would be affected by reduced urban heat island effect. This would be due to water retention in these interventions as well as the small amount of carbon sequestration that would occur.

Pollination can be affected depending on the types of plants used within the rain-garden interventions.

Cultural services would benefit via social cohesion, mental wellbeing, aesthetic, and inspirational spaces being produced. Creating beautiful nature filled places on the campus for people to gather and mingle would be beneficial.



Figure 44. Raingarden, Buchanan



Figure 45. Buchanan Courtyard



Figure 46. Rain Garden, University Boulevard



## Zoom Study: Green bus loop (Yifan Yuan)

A design proposition for the short term in UBC bus loop

### Challenges and solution

Area: bus loop that is surrounded by aquatic center and war memorial gym as well as construction sites which are designed as residence buildings (Figure 1)

The bus loop consists of concrete. In other words, this area doesn't look nice and may increase the level of contaminants and storm water run-off due to the lack of green space. To solve this problem, green roof on bus shelter, street trees and shrub hedges can be introduced to UBC bus loop. Green roof will be applied on the bus shelter. Due to the hot, dry summer in Vancouver, plant that are used on green roof must have high drought tolerant and looks nice. As a result, Sedum plant can be a good choice for the green roof on bus shelter. Also, the intensive green roof will be the choice on bus shelter because intensive green roof requires less maintenance and does not need very strong structure to support.

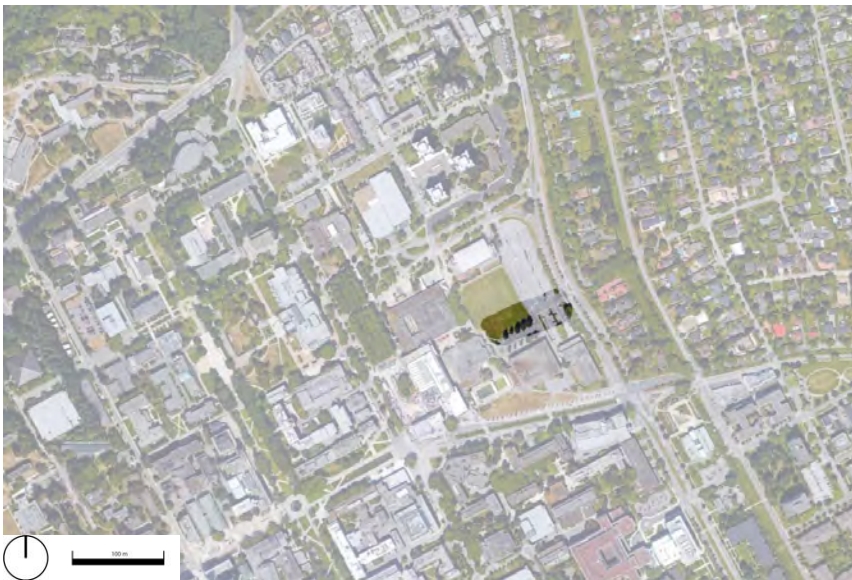


Figure 1

Image retrieved from <https://www.google.ca/maps/@49.2675661,-123.2274987,6781m/data=!3m1!1e3>

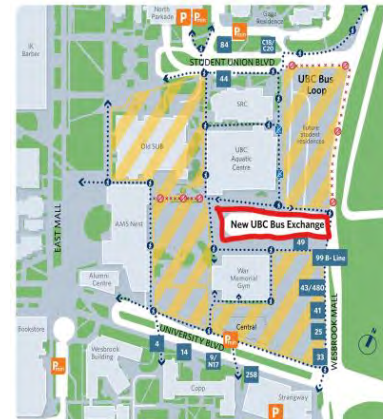


Figure 2

Image retrieved from <https://planning.ubc.ca/vancouver/transportation>

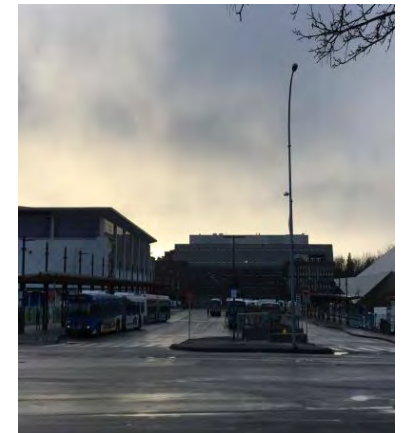


Figure 3

## Zoom Study: Green bus loop (Yifan Yuan)

A design proposition for the short term in UBC bus loop

### Ecosystem service and Precedents

The green roof can provide the shade in hot summer and the light color in cold, rainy winter. The green roof, street trees as well as hedge shrubs can help to decrease the level of contaminants as well. As a result, the green space in bus loop can provide regulating service and cultural service. Also, green roof can help people have a better understanding of green roof. One of precedents in Manchester was built in 2016. The green roof on bus shelter make whole place look nice and achieve a better storm water management. Sedum plant on the bus shelter requires less maintenance which save cost.



Figure 4



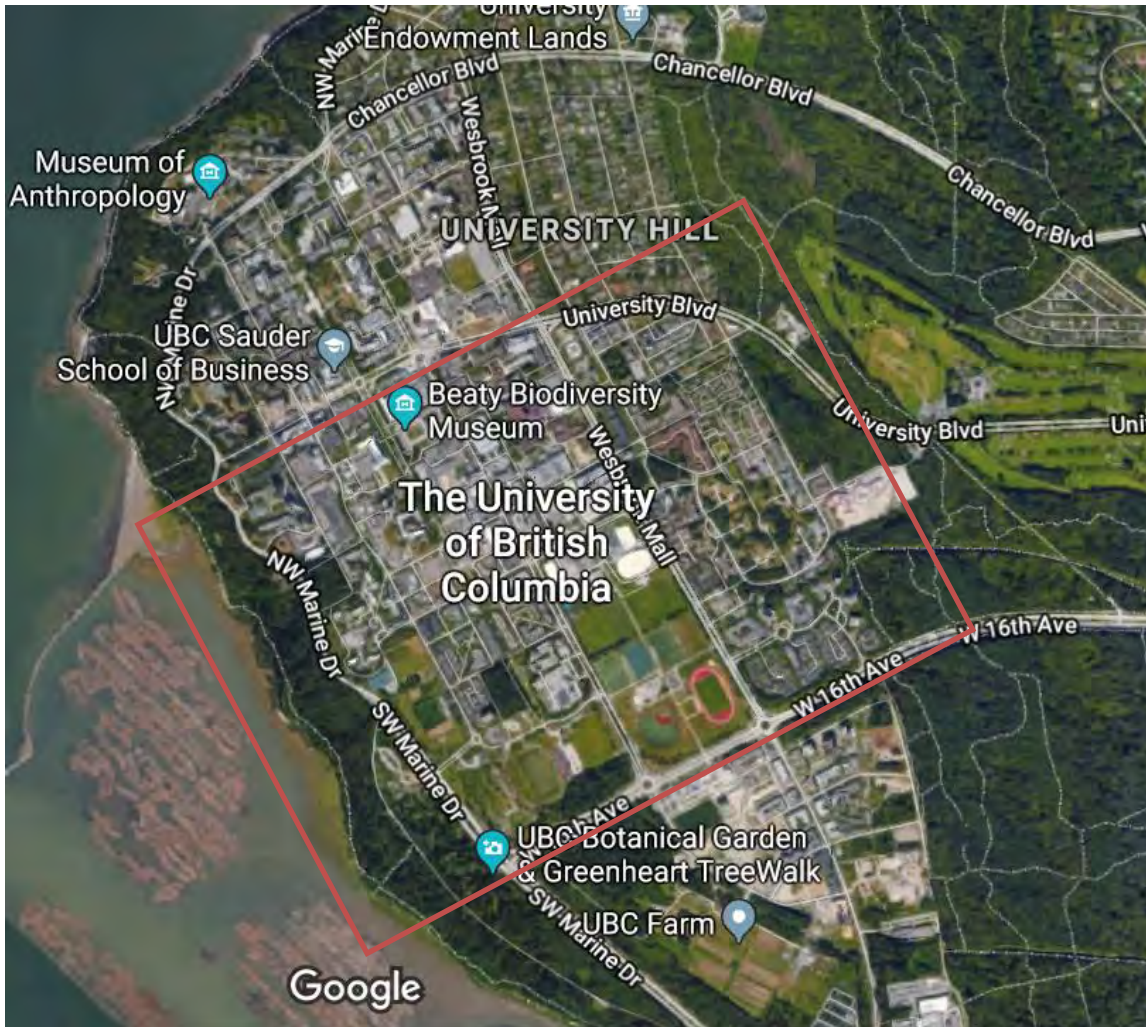
Figure 5

Image retrieved from <http://www.manchestereveningnews.co.uk/news/greater-manchester-news/300k-bus-shelter-free-wifi-11929732>





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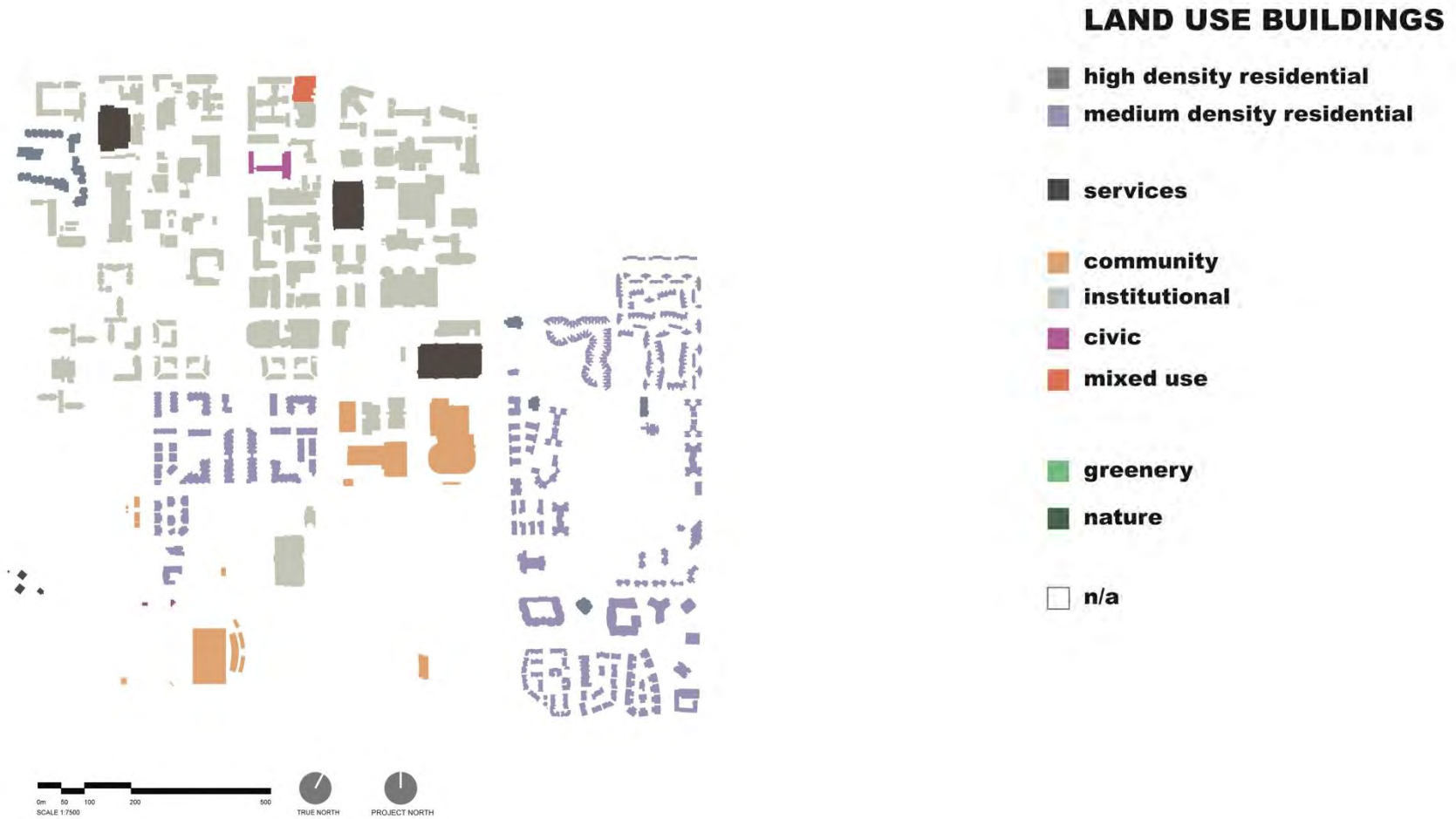
## Enhancing Green Networks and Fabric FINAL REPORT

Site: UBC 2

Team Members: Norain Chang, Ivan  
Brodsky, Allan Du, Jane Ho

## Land Use - Buildings

Identifying and categorizing building programs by typology



Land Use Map, Scale 1-7500

# Land Use - Fabric

Identifying and categorizing fabric by uses

## LAND USE

- high density residential**
- medium density residential**
  
- services**
  
- community**
- institutional**
- civic**
- mixed use**
  
- greenery**
- nature**
  
- n/a**



Land Use Map, Scale 1:7500



## Urban Forest

Analyzing urban forest by vegetation type



### URBAN FOREST

- cultural vegetation**
- altered vegetation**
- semo-natural vegetation**
- mainly natural vegetation**
- vegetation**

Different vegetation types, Scale 1:7500

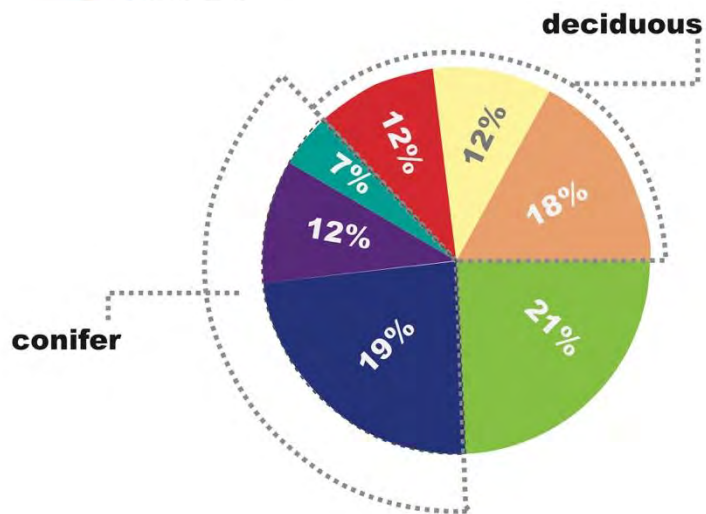
# Canopy Cover

Identifying diversity in tree canopy

- tall deciduous canopy 15m+
- medium deciduous canopy 7-14m
- small deciduous canopy 6m or less

- tall conifer canopy 15m+
- medium conifer canopy 7-14m
- small conifer canopy 6m or less

■ mixed



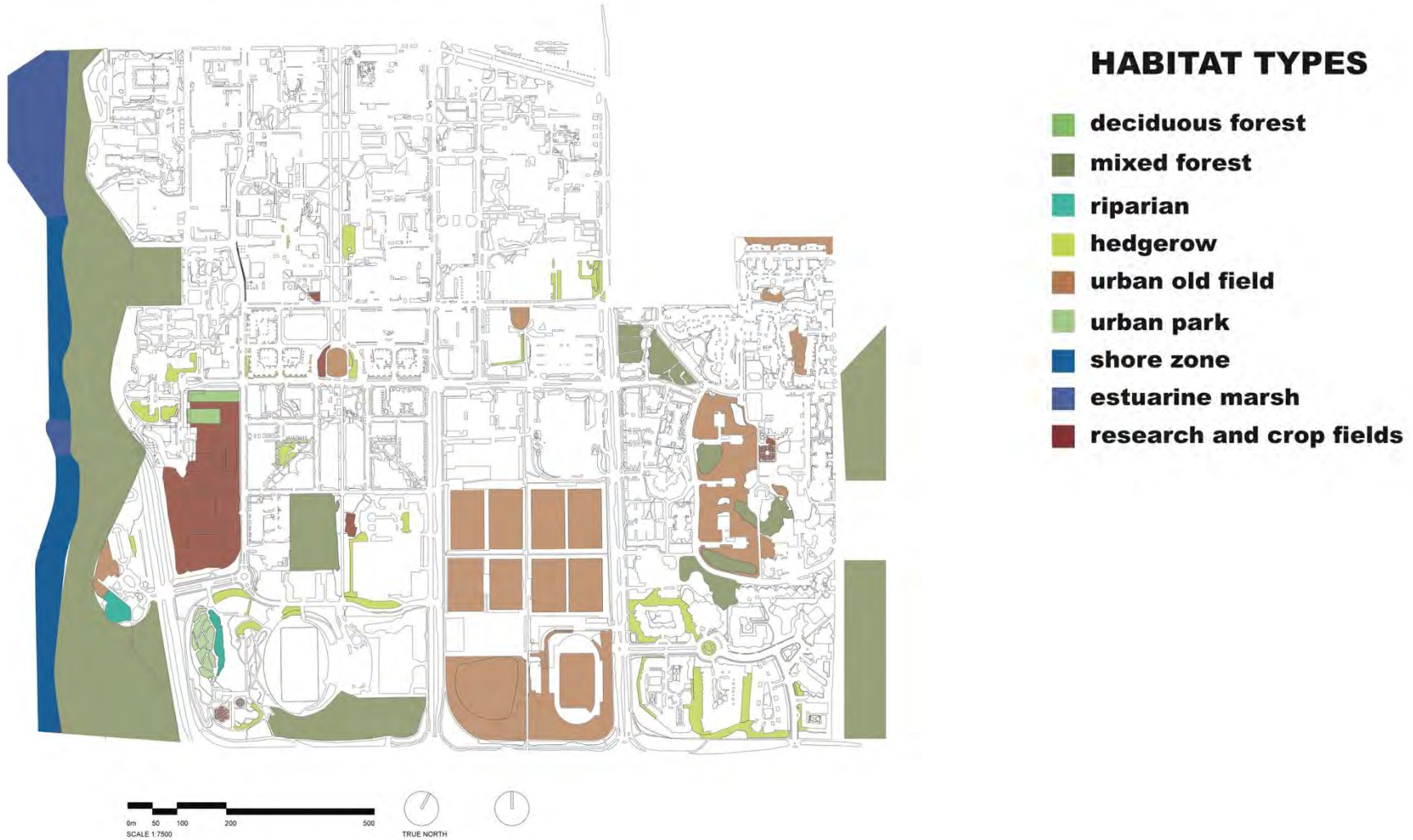
Pie chart of tree breakdown, NTS



Canopy layers, Scale 1:7500

# Habitat Types

Identifying habitat types






Habitat types, Scale 1:7500



# Biodiversity

Analyzing biodiversity and connective patterns

## BIODIVERSITY HOT SPOTS AND CONNECTIVITY

-  habitat hot spot
-  habitat site
-  habitat connections



Biodiversity hotspots and connections, Scale 1:7500

# Land Cover Type

Coding types of land cover by density



## LAND COVER TYPE

- dense / forested
- moderate / shrub
- low / grass



Land cover types, Scale 1:7500

Land Cover Distribution, NTS



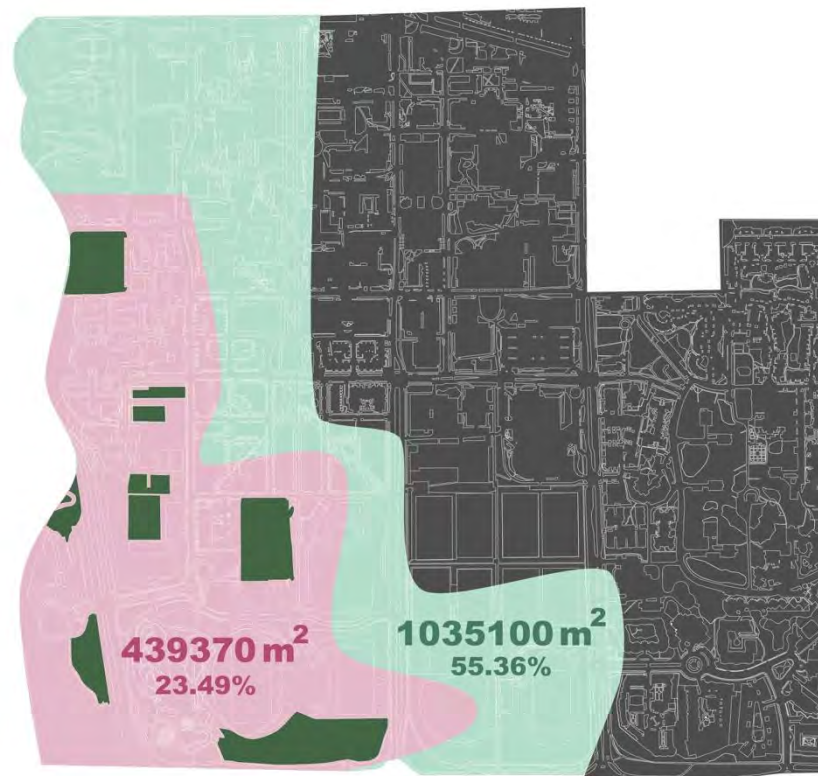
# Distance to Nature

Mapping proximity to nature

## distance to nature

- 100m
- 400m
- <400m
- nature

if its greater than 300m desire to interact with nature drops



Access to large green spaces by distance, Scale 1:7500

## Big Idea

Given our analysis of our site through different metrics and the observation that it is arguably one of the busier zones of UBC, we wanted to address the ecosystem services of the site, and more specifically the cultural side to it. So through green interventions, we wanted to consider how we can encourage a healthy, green and sustainable lifestyle comprehensively from the moment a person interacts with the zone from the outside and the inside.

**Through **green** interventions starting from the exterior to the interior, we can encourage a **healthy, green and sustainable** lifestyle for the students and staff that interact with this zone.**



## City Goals

We based our interventions on three city goals. Although it can be argued that the second goal is already met, we wanted to enhance pedestrian and biker experience.

- 1 Addition 22% tree cover – currently at 19%**
- 2 Make the majority (over 50%) of trips by foot, bicycle, and public transit**
- 3 Reduce energy use and GHG emissions in existing buildings by 20% over 2007 levels**

## Interventions

Based on our identified places of dwelling and paths of connections, we decided that each area has particular aspects that could be improved or enhanced. Thus, we examined each area into greater detail and proposed interventions that would work towards meeting our big idea and city goals.



The aspects that could be improved in our site are biker and pedestrian experience, multifunctional spaces, improving the sustainable operations of buildings, and increase in tree canopy.

## Location of Zoom Studies



Scale 1:/500



## Zoom Study 1 : Bike Lanes (Norain Chang)

### Main Mall

Being one of the major arteries on campus, this section of main mall receives a ton of traffic especially at peak hours. We noticed that pedestrian traffic and their circulatory paths are governed but the landscape design that exists on the main mall, however what is lacking and a potential hazard if users increase is the potential collision that can happen between pedestrians and cyclists. Remembering one the city goals being to increase trips by foot, cycling, and public traffic, an effective and non-invasive strategy should be implemented. Using the currently pedestrian movement patterns governed by landscape design, we intend to parallel cyclist's traffic with the existing pattern on the inside of the existing pathway adjacent to green fabrics running down the center of main mall.



..... pedestrian traffic

— bike traffic

Existing and proposed circulation paths,  
Scale 1:1500



This is a quick collage of what the intervention could allow. By using non-invasive strategies such as painting the existing pathway, and placing planters to distinctly separate the two different functions, this can ensure safety and clear definition of the two means of getting across campus. By having strategic breaks in the planning of planters, this can allow for an “AAA cycling” an all ages and abilities cycling paths across the Main Mall as well as allow for safe crossroads.

Enhancing Green Networks and Fabric FINAL REPORT - Site 02  
Zoom Study 2: Land Use Change (Ivan Brosky)



I chose this area for my zoom study as this area is currently a  $\sim 400\text{m}^2$  concrete slab of pavement. This is unnecessary gray land cover and is a great opportunity to increase green land cover and work towards Vancouver's 22% canopy cover goal. I would leave area on the sides as a reliable walkway and redo area outlined in green as small park with picnic tables surrounded by coniferous trees leaving a view of the reconciliation totem pole. The brown rectangles represent the three picnic tables made of wood or recycled plastic. The six green circles represent native coniferous trees along each side of the picnic tables. Some considerations when implementing this design would be making sure the trees have enough space to grow as to not encroach on the walkways by planting them appropriately and selecting the proper species. An appropriate species could be a set of six western red cedar, and a possible management option would be removing the middle two in 30 years to make room for the other four. This will add about  $210\text{m}^2$  of green land cover that will help increase infiltration and create a more complete green corridor down main mall.





## Zoom Study 3: Green Buildings (Jane Ho)

### Chan Gunn Sports Medicine Pavilion

Currently, this area is one of the places within our site that has lowest tree canopy. If more vegetation could be incorporated into the new building design, this could create additional benefits such as cooling and providing wildlife habitat. This would be ideal because it builds habitat connections and corridors for which animals can move through. The new building is also east of a biodiversity hotspot located in Pacific Spirit Park as well as other existing habitat sites. This is a design proposal that can serve as reference for future buildings. The figure below shows the design propositions that could be taken into consideration to make the future Chan Gunn Medicine Pavilion a sustainable operating building.



Figure Caption, Scale  
Future location of the Chan Gunn Sports Medicine Pavilion, Scale 1:16.5





## Zoom Study 4: Tree Canopy Cover (Allan Du)

### UBC Baseball Turf

For our fourth zoom study we focused on increasing canopy cover. The sports field has a lot of empty space where appropriately planted trees could be placed to increase the areas canopy cover. Given the location and the area of the sport field, the field has the potential to strengthen greenway corridors which serve as travel ways between the two ends of Pacific Spirit Park, as well as habitat for wildlife. Increasing canopy cover will increase ecosystem benefits such as wildlife habitat and connectivity between habitats, as well as enhancing the experience of being in the sport field by providing shade in the summer, and connecting people further with nature. As well, by planting a diverse canopy, with different species, we can support greater biodiversity.



Southarm Park Richmond BC,



Scale 1:1333

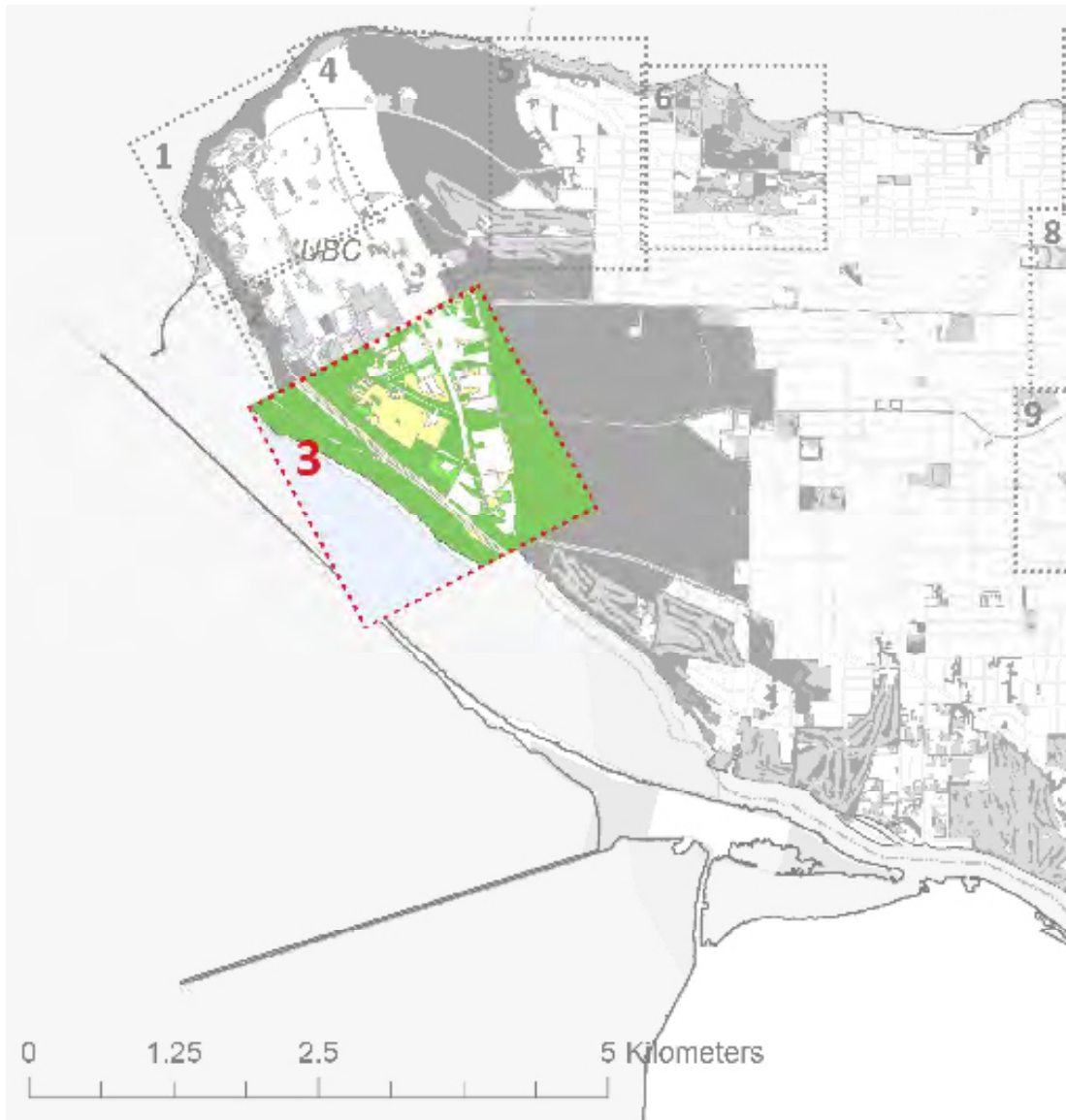




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THE UNIVERSITY OF BRITISH COLUMBIA

School of Architecture + Landscape Architecture



LARC444/553 (Girling) Team 03

## Enhancing Green Networks and Fabric

Wesbrook Village - Site 03

Team Members:

Colin Mbugua

Eva Snyder

Doris Sun

Tony Tse



## GREY versus GREEN

The majority of the site is green.

Around 72% of the site is composed of greenways (i.e. Scholar's Greenway), greenspaces (i.e. Mundell Park) and green edges (i.e. the buffer between Pacific Spirit Park and the residential zones). 28% of the site are grey areas including buildings, parking space, and roads (Figures 1 & 2).

Note. Grey lines represent the centre of roads. Roads are wider in reality than on map.

### Percent area of grey versus green area

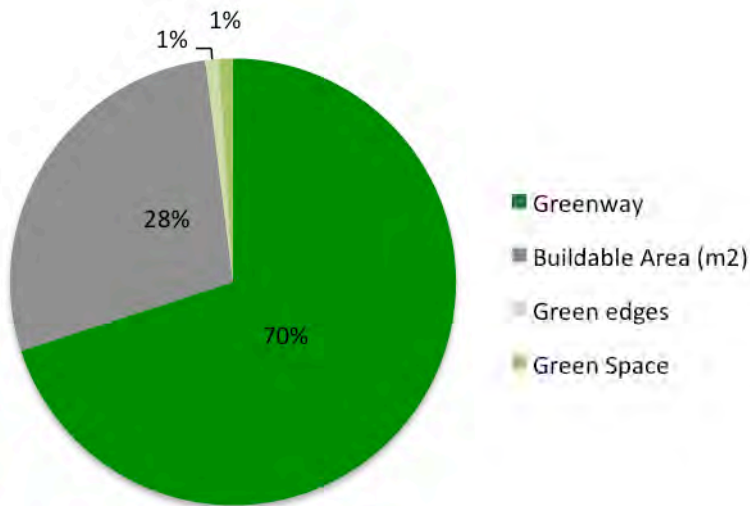


Figure 1. Map of grey versus green area of the study site.



Figure 2. Map of grey versus green area of the study site.

## LAND COVER

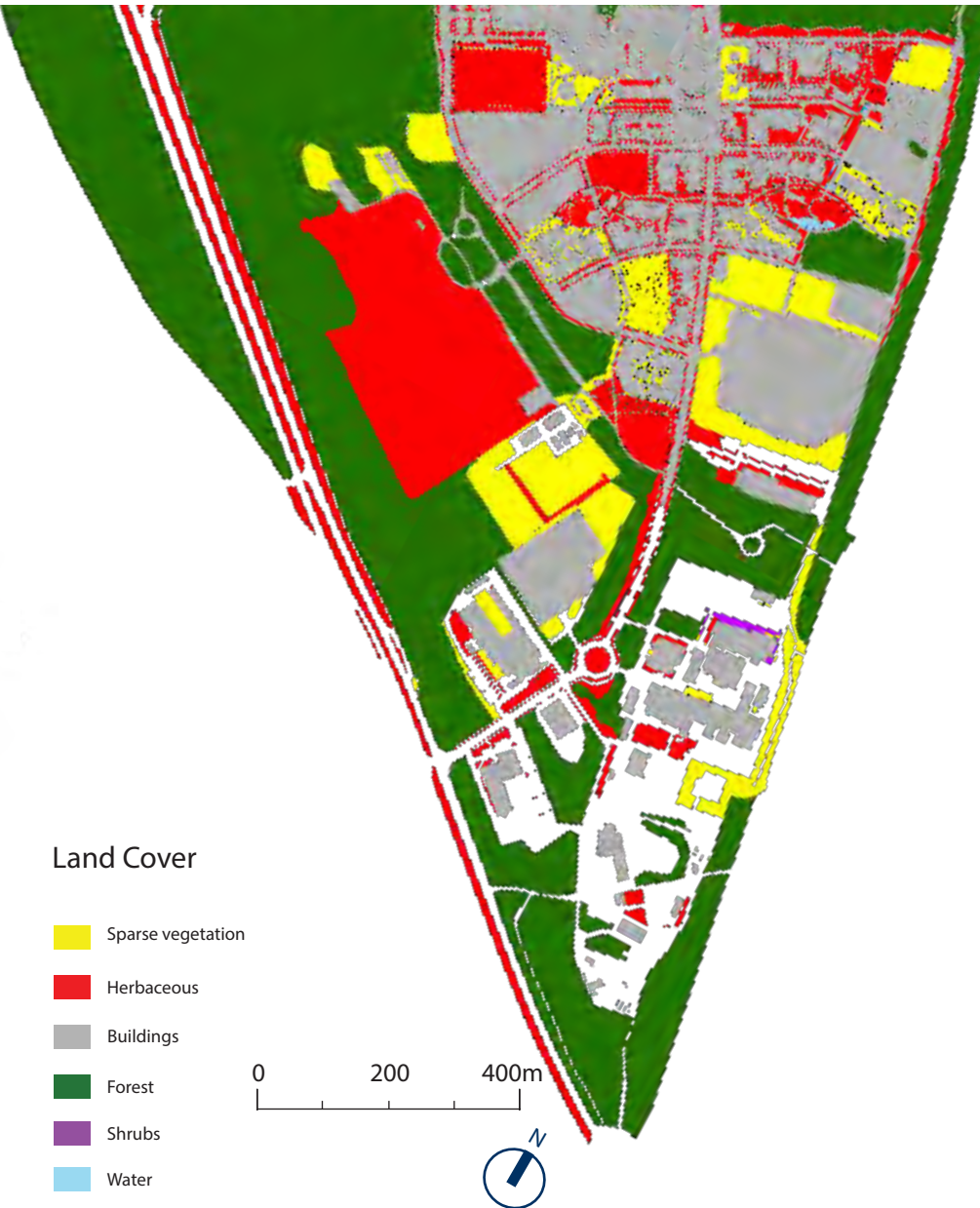


Figure 3. Map of the land covers of the study site.

A melange of different land types.

Wesbrook Village has a mix of different lands types (figure 3). The west side of the Village is dominated by residential buildings, transitioning into a more commercial setting, and transitioning residential and institutional buildings in the east.



Figure 4. The forest and sparse vegetation land cover above, and the water and buildings land cover below.



## VEGETATION NATURALNESS

Most of the vegetation is ornamental.

The majority of species in Wesbrook Village are ornamental alien species. The native species in our site (including *Thuja plicata*, and *Pseudotsuga menziesii*, two prominent native species) are in the minority at 2% and 4% respectively (Figure 4). While tree species diversity is high, the West coast native species presence is weak (Figure 5). Patches of native trees exist but they are not well connected to their surroundings and the trees are in declining health.

### Tree species proportions

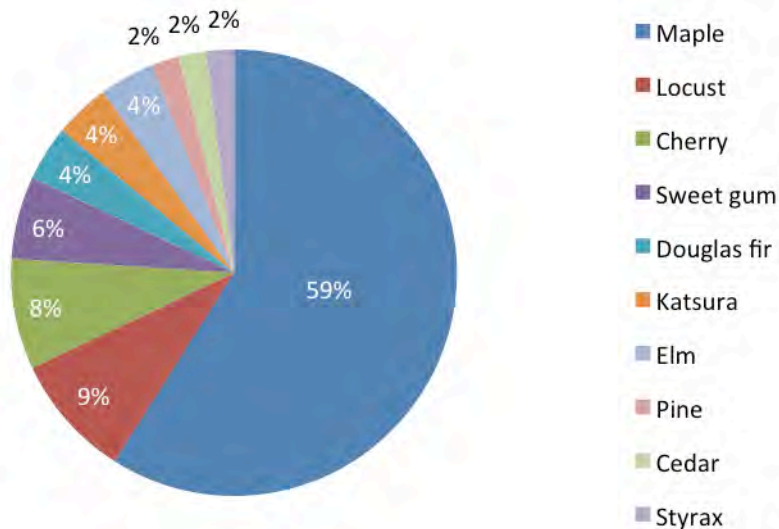


Figure 4. Maple, Locust, and Cherry are the dominant species while Douglas-fir and Cedar are few.

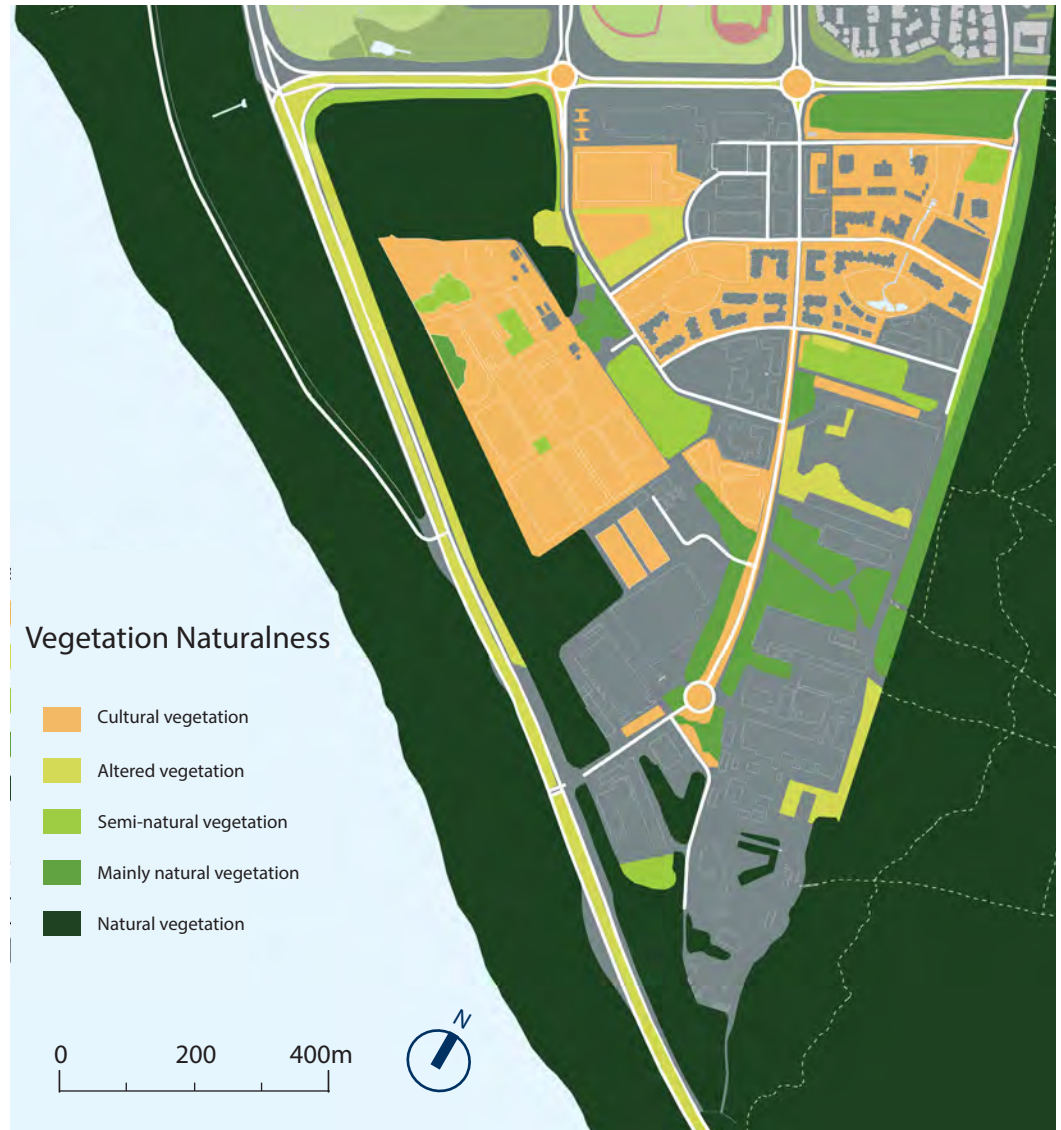


Figure 5. Map of natural and cultural vegetation of the study site.



## TREE CANOPY COVER

### Discontinuous canopy cover

Wesbrook Village has a mix of different lands types and their associated canopy covers (Figure 6). The west side of the Village is dominated by residential buildings, transitioning into a more commercial setting, and transitioning residential and institutional buildings in the east. Most of the sites trees are younger and so have smaller canopies, additionally, several large green areas are open to the sky, without trees. This accounts for the low overall canopy cover recorded (Figure 7).

### Tree canopy coverage

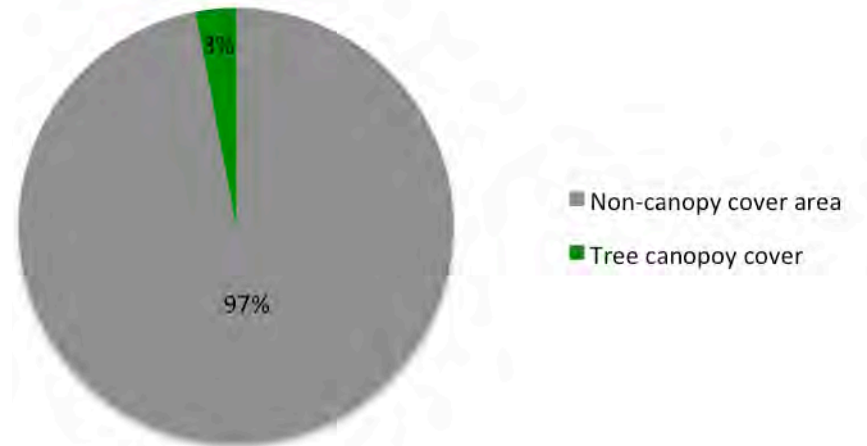


Figure 6. Map of tree canopy cover of the study site.

Figure 7. Tree canopy cover in the Village is very low.

### One scene, many land uses



Figure 8. Multiple land uses like homes, stores, schools, and greenspaces can be found in a 5 minute walk.

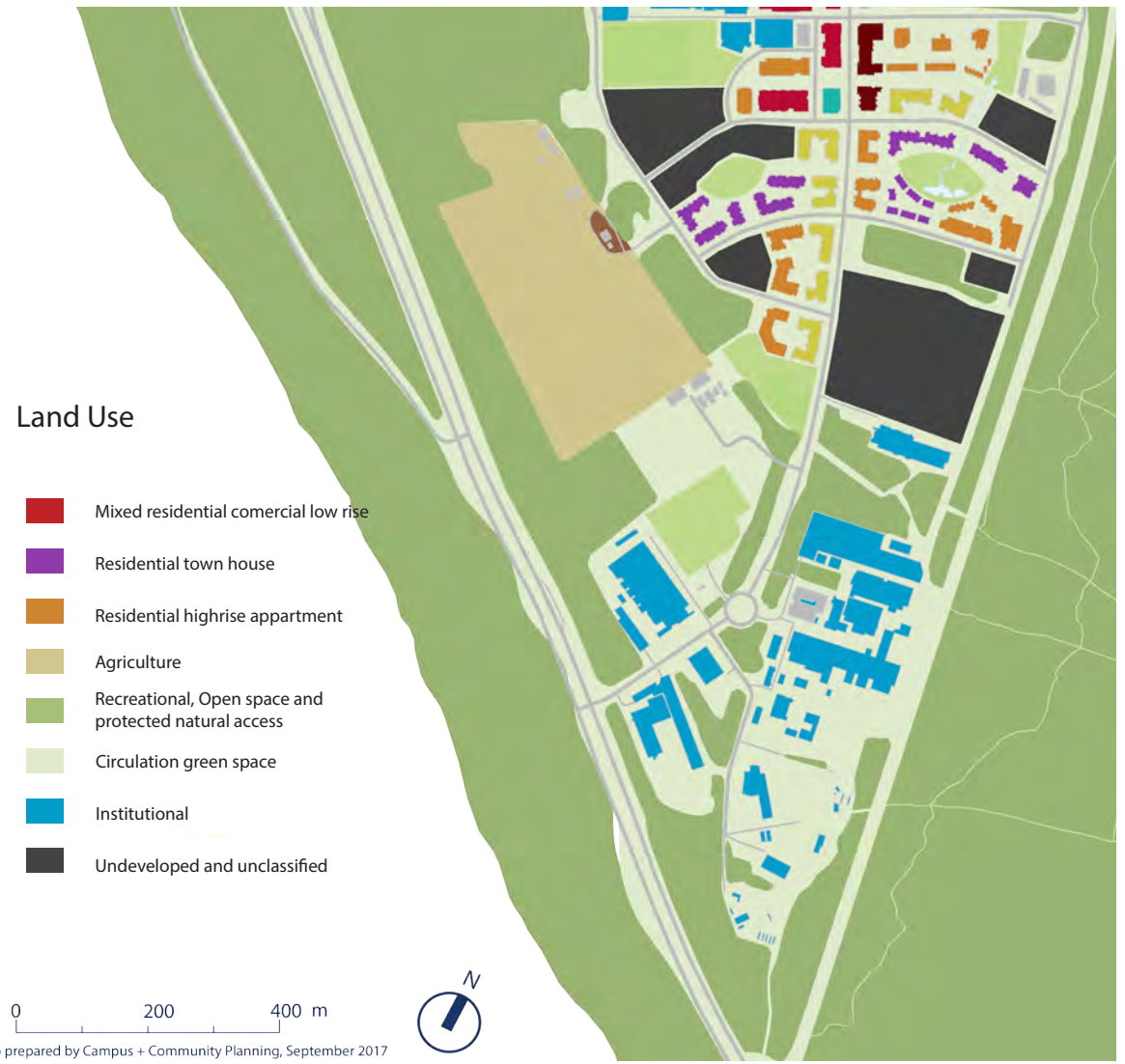


Figure 9. Map of land use of the study site.

## WALKING DISTANCE TO URBAN FOREST



Figure 10. Map of 100m and 400m walking distances in the study site.

Walking from home to the urban forest is quick and convenient.



Figure 11. Multi-story buildings dominate the site and increase overall walkability



## BIODIVERSITY



Figure 12. Map of habitat types and habitat connectivity of the study site.

### Conventional urban planting

Biodiversity of the site is dominated by non-native species (see vegetation naturalness section). The variety and selection of these terrestrial vegetation species is typical for urban areas in Vancouver, and far more reflective of anthropogenic forces than the nearby PCP which reflects biogeoclimatic conditions. This is a point of interest.

### Diagram Title / Sub-Title

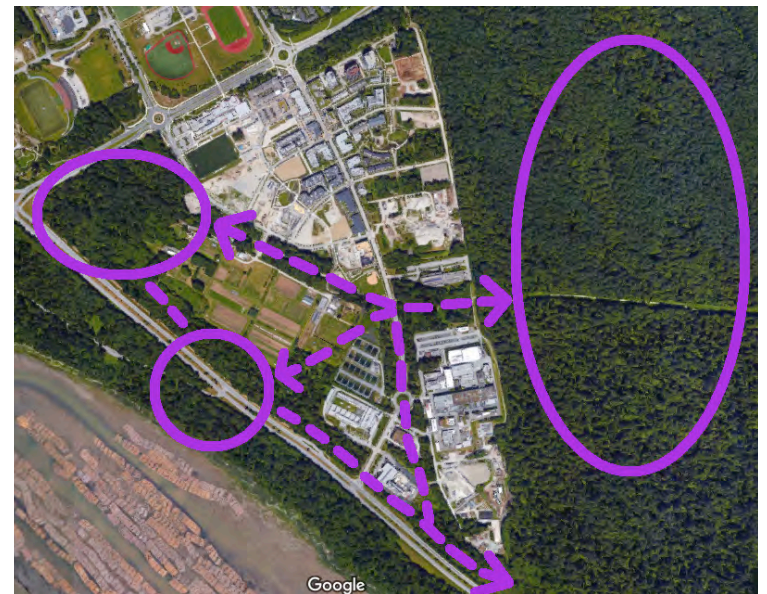


Figure 13. Map of habitat types and habitat connectivity of the study site.

## POLICY CONTEXT

The Vancouver Campus Plan (2010)

Wesbrook Place Neighbourhood Plan (2016)

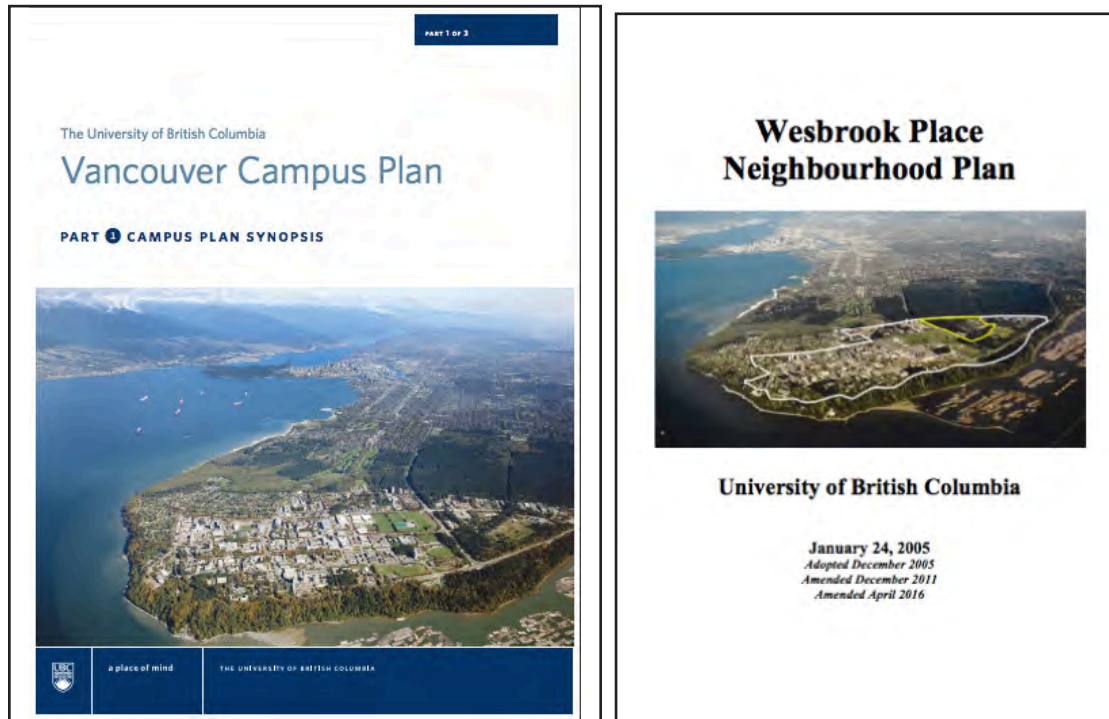


Figure 14. Two plans examined in context of this study.

Project goals:

1. Reintroduce native vegetation into Wesbrook Village
2. Strengthen connections to the neighbouring Pacific Spirit Park and internal greenways
3. Strengthen flora and fauna connections between Wesbrook and the surrounding forest

### Native plants, green connections, flora/ fauna

Due to the spatial proximity and strong connections of Wesbrook Village to UBC Vancouver, we also considered the Vancouver Campus Plan (2010) with the Wesbrook Place Neighbourhood Plan (WPNP, 2016).

Firstly, we considered the Vancouver Campus Plan, Section 3, Campus Plan Strategy to “rediscover UBC’s sense of place and natural west coast beauty” and Wesbrook Place Neighbourhood Plan (WPNP) Section 3.5.10. However, both plans do not go into detail about the plant specifics and only WPNP briefly touches on plant requirements.

Secondly, WPNP Sections 1.4.2 and 3.3.6 states to have streets and lanes considered as extension of park and greenway systems. In the present state, greener streets can be achieved, especially in the commercial sectors of Wesbrook Village.

Lastly, in the Vancouver Campus Plan, habitat is not considered. In the WPNP, bird habitats are emphasized with various strategies to increase habitats in trees and with nest boxes for certain species. We aim to further improve the quality of terrestrial habitats, and we hope that our zoom studies can increase the usability of greenspaces for not only birds, but other fauna and people as well.



GOAL 1 -

Reintroduce native vegetation into Wesbrook Village



Figure 15. A grove of *Thuja plicata* and some ferns near UHILL Secondary. More native trees can be planted and managed to better achieve a west coast atmosphere.

An example of the different understories



Image taken from Google Earth

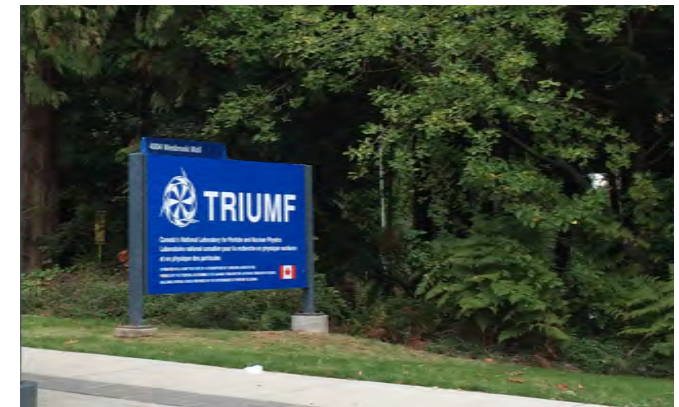


Figure 16. An example of poor and rich understory plants along the east forest buffer and along Wesbrook Mall.

The west coast characteristics of Wesbrook Village has been described in the plans via architecture and landscape views. This shaping with plants, and moreover native plants, is lacking in the policies. In the site, the few patches of native vegetation are disconnected and unhealthy (Figure 15).



## GOAL 2 -

Strengthen connections between neighbouring Pacific Spirit Park and internal greenways

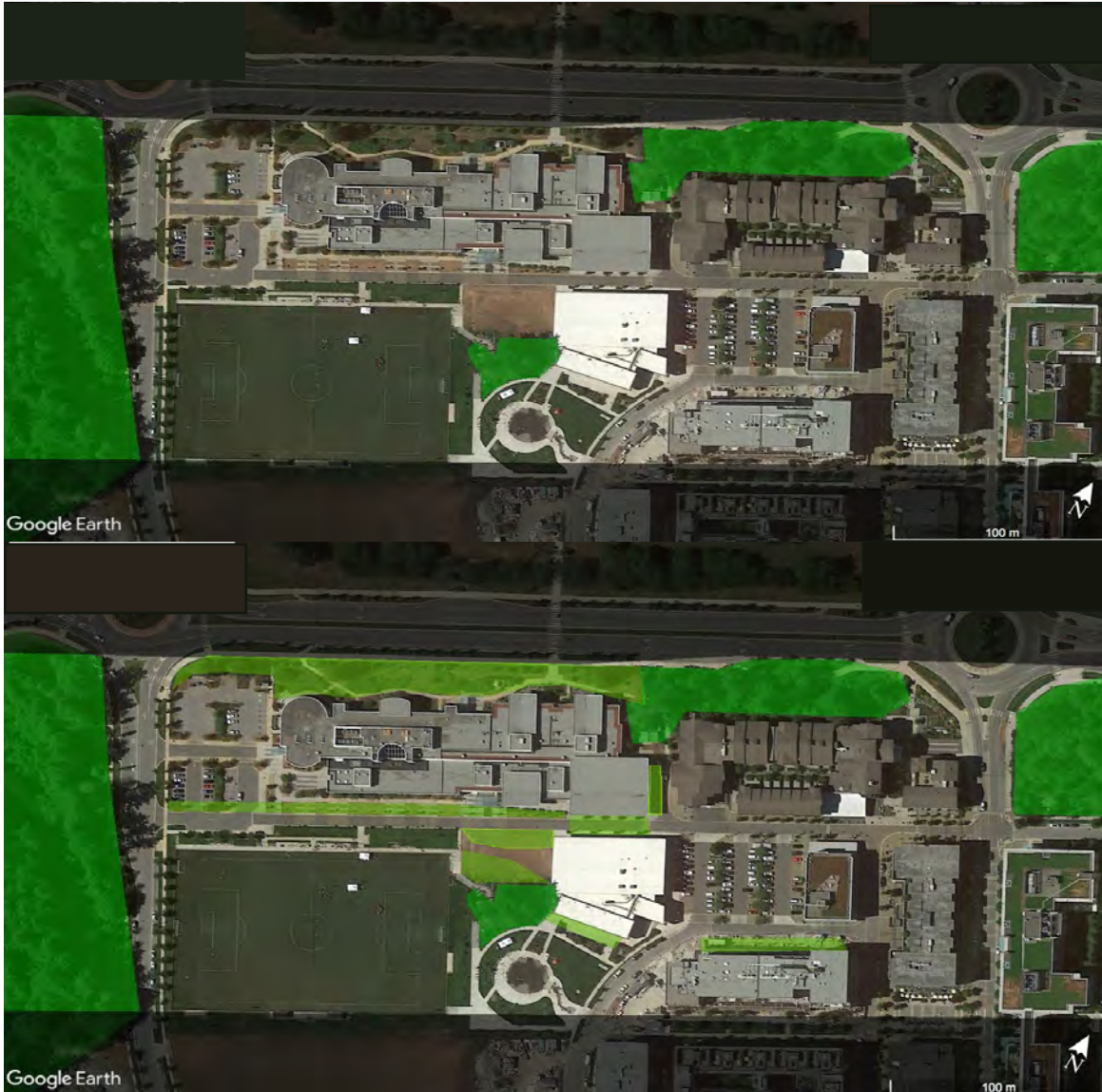


Figure 17. Google Earth images of current (dark green) and potential (light green) greenspaces.

Strong potential for additional greenery



Figure 18. Along Berton Ave, there is potential to increase canopy cover and vertical stratification.

The Vancouver Campus Plan and the WPNP layout maps for green networks open space context map. In both maps, the greenspaces of the lanes are not mentioned. In addition to networks, grey or “dead” spaces are also potential sites for increasing the canopy and vegetation cover. In the Wesbook Village context, the commercial zone has the most traffic but the least amount of greenspaces, as seen in Figure 17. There is strong potential to increase canopy cover with native trees and shrubs (Figure 18).

## GOAL 3 -

Strengthening flora and fauna connections between Wesbrook Village and the surrounding forest



Figure 19. Dense thickets attract birds and other wildlife as shelter and safe corridors.

The WPNP has a focus on terrestrial habitat that we wish to work with. Wesbrook Village already has examples of pre-existing habitats sites, especially along the south of Wesbrook Mall near TRIUMPH and the Centre for Comparative Medicine.

Within the residential and school areas however, we would like to see an increase in habitat sites and habitat connections along roads adjacent to the homes. These sites will aim to encourage wildlife and human engagement at an educational level.



Figure 20. Dead space outside the local community centre and the miniature school field can be revitalised with vegetation and thus wildlife.



## IMPLEMENTING GOALS

### Wesbrook Village Zoom sites



Figure 21. Areas which we plan to conduct zoom studies to carry out the goals listed.

### Project goals

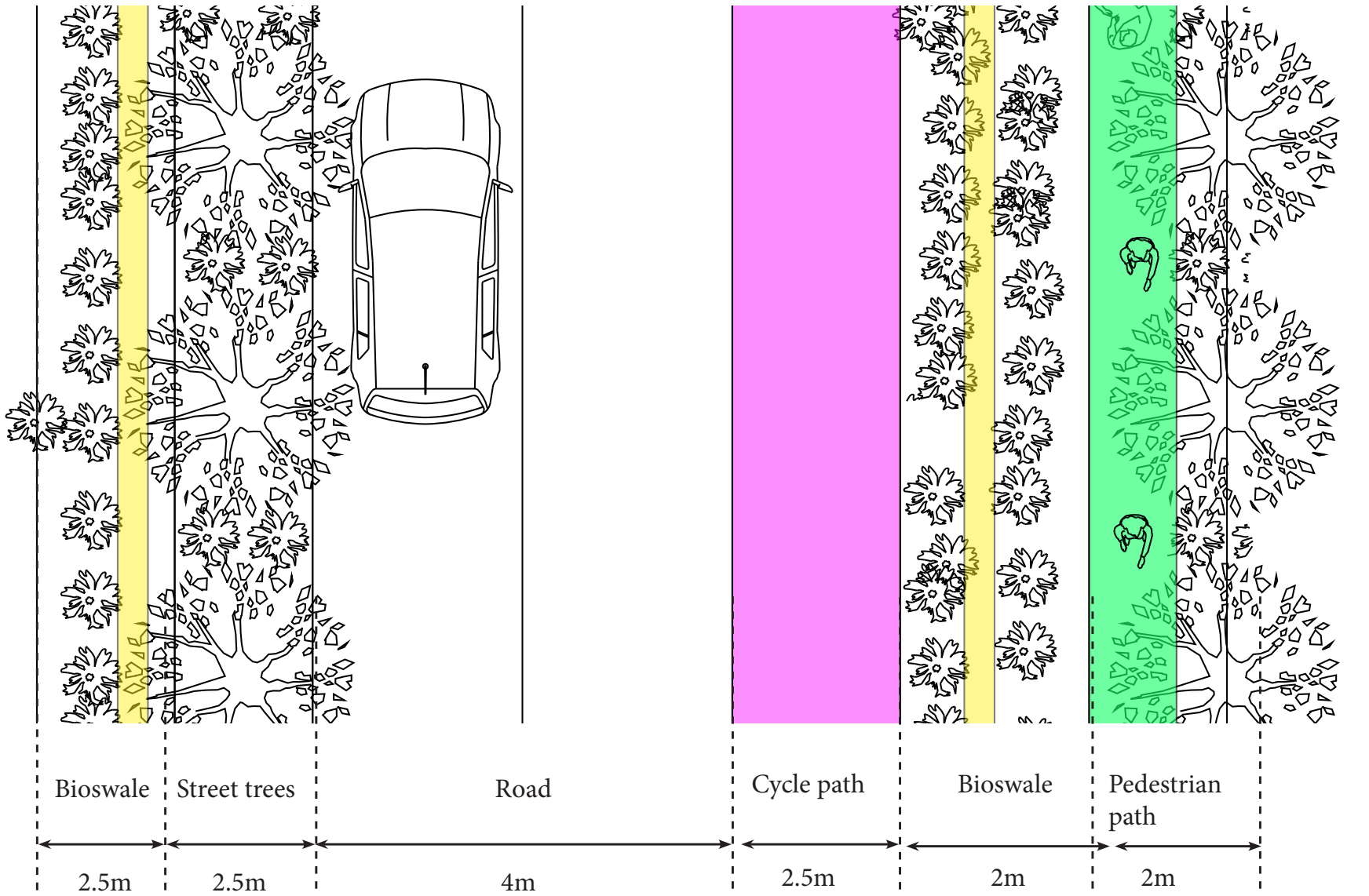
1. Reintroduce native vegetation into Wesbrook Village
2. Strengthen connections to the neighbouring Pacific Spirit Park and internal greenways
3. Strengthen flora and fauna connections between Wesbrook and the surrounding forest

### Implementing and monitoring

Actions presented in the zoom studies within Wesbrook Village (2 to 4) will be implemented at a smaller scale for convenience of implementation, monitoring, and management. Regarding monitoring and management, the local residents and in particular the students from UHILL secondary and UBC can be invited as volunteers or interns to help manage and look after the pilot plots. This arrangement will also allow for more community engagement, student interactions with the community, and stronger connections and knowledge with their surrounding environment.

# ZOOM 1 - W 16th and SW Marine Drive rainwater filtration / habitat connectivity (Colin Mbugua)

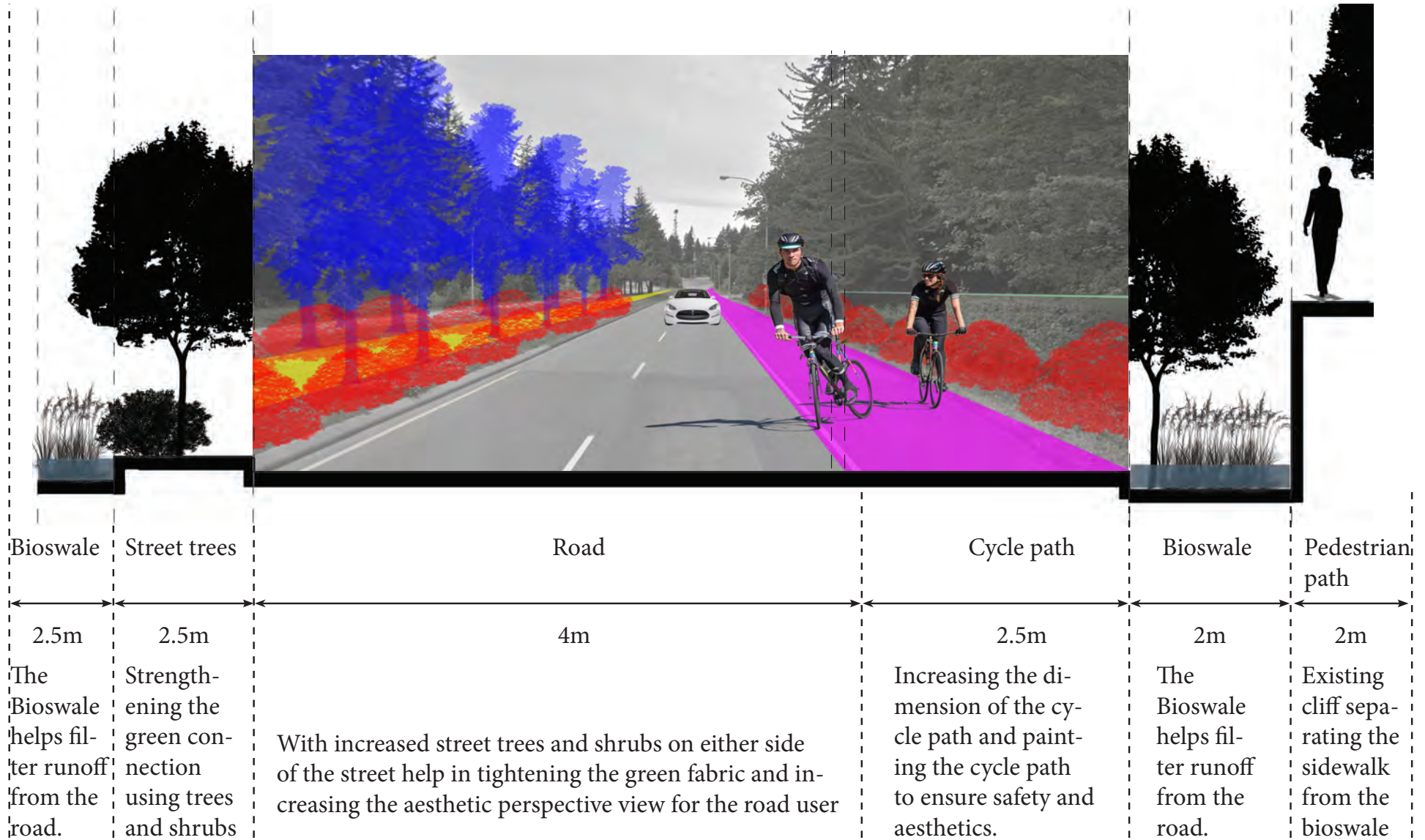
Strategy 1. West 16th Plan 1:100





ZOOM 1 - W 16th and SW Marine Drive rainwater filtration / habitat connectivity (Colin Mbugua)

West 16th Half road section 1:100



## ZOOM 2 - Climate resiliency in the urban landscape (Eva Snyder)

### Overview

Forest ecosystems are naturally adapted to drought and flood, stresses predicted to intensify due to climate change, through their mycorrhizal associations. These associations allow plants to access otherwise inaccessible nutrients in the soil as well as transfer carbon, water and defense signals belowground, strengthening the plant community as a whole. These principles could be applied to an urban landscape in order to understand urban ecosystems and resiliency.

Wesbrook Village is a leader in sustainable design, both on the community planning and infrastructure level. However, plantings are discontinuous with Pacific Spirit Park, within which the Wesbrook is nested. This is not an issue per se, it may however be an opportunity for improvement: urban plantings are known to face a range of challenges, particularly as climate change threatens their future resiliency.

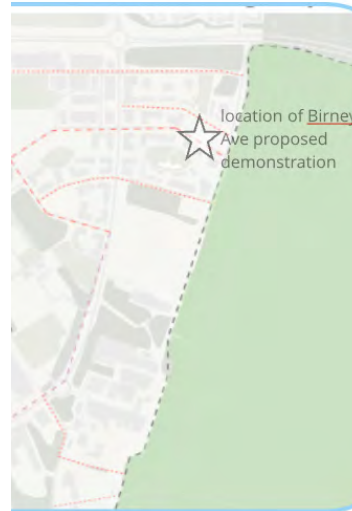


Figure 22. Location of proposed trial

### Proposed

Wesbrook village could be the site of an 'enhanced urban ecosystem' demonstration, wherein restoration of belowground symbiotic fungal associations in urban areas is studied and used to understand resilience to climate change. The design concept is based on idea of succession—a mosaic of native plantings, within which some parts will thrive, and other parts will change as plants adapt or succumb. The composition and dynamics of the native Pacific Spirit Park (PCP) can be used as a guide. For this study, comprehensive vegetation surveys were conducted in three locations in PCP near Wesbrook.

The field of belowground ecology is relatively young, and there is much to learn about applications of this science for urban areas.

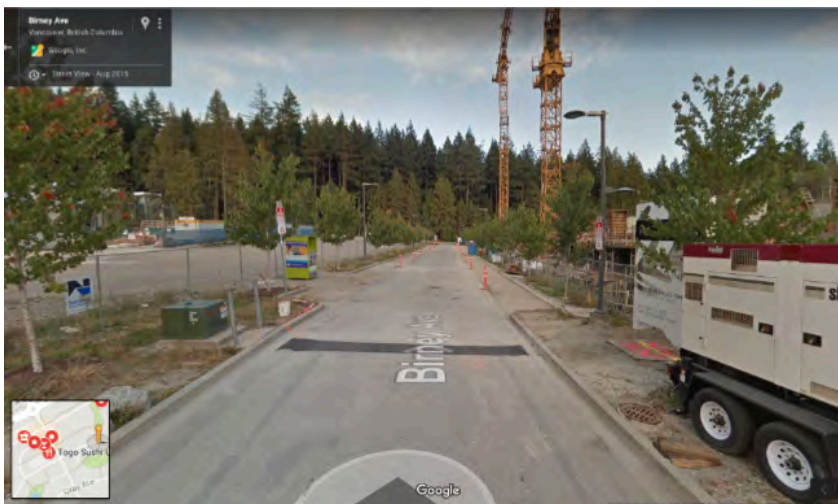


Figure 23. Birney ave. currently



59 Figure 24. Birney ave. trial visualization



## ZOOM 2 - Climate resiliency in the urban landscape (Eva Snyder)

### Plantings

Species indicated on plan (Figure 25) with abbreviations indicated in this list.

sources: personal reconnaissance; Native plant alliance, 1997

All sites:

Fd - *Pseudotsuga menziesii*(Douglas-fir)

Ts - *Tsuga heterophylla*(hemlock)

Tp - *Thuja plicata*(cedar)

Sa - *Symphoricarpos albus*(snowberry)

Aa - *Amelanchier alnifolia*(saskatoon)

Au - *Arctostaphylos uva-ursi*(kinnikinnick)

Pm - *Polystichum munitum*(sword fern)

South facing sites additionally:

Sc - *Shepherdia canadensis*(soopolallie)

Gs - *Gaultheria shallon*(salal)

Pm - *Paxistima myrsinites*(falsebox)

Ma - *Mahonia aquifolium*(oregon grape)

North facing sites additionally:

Rs - *Ribes sanguineum*(red currant)

Cc - *Cornus canadensis*(bunchberry)

Lb - *Linnaea borealis*(twinflower)

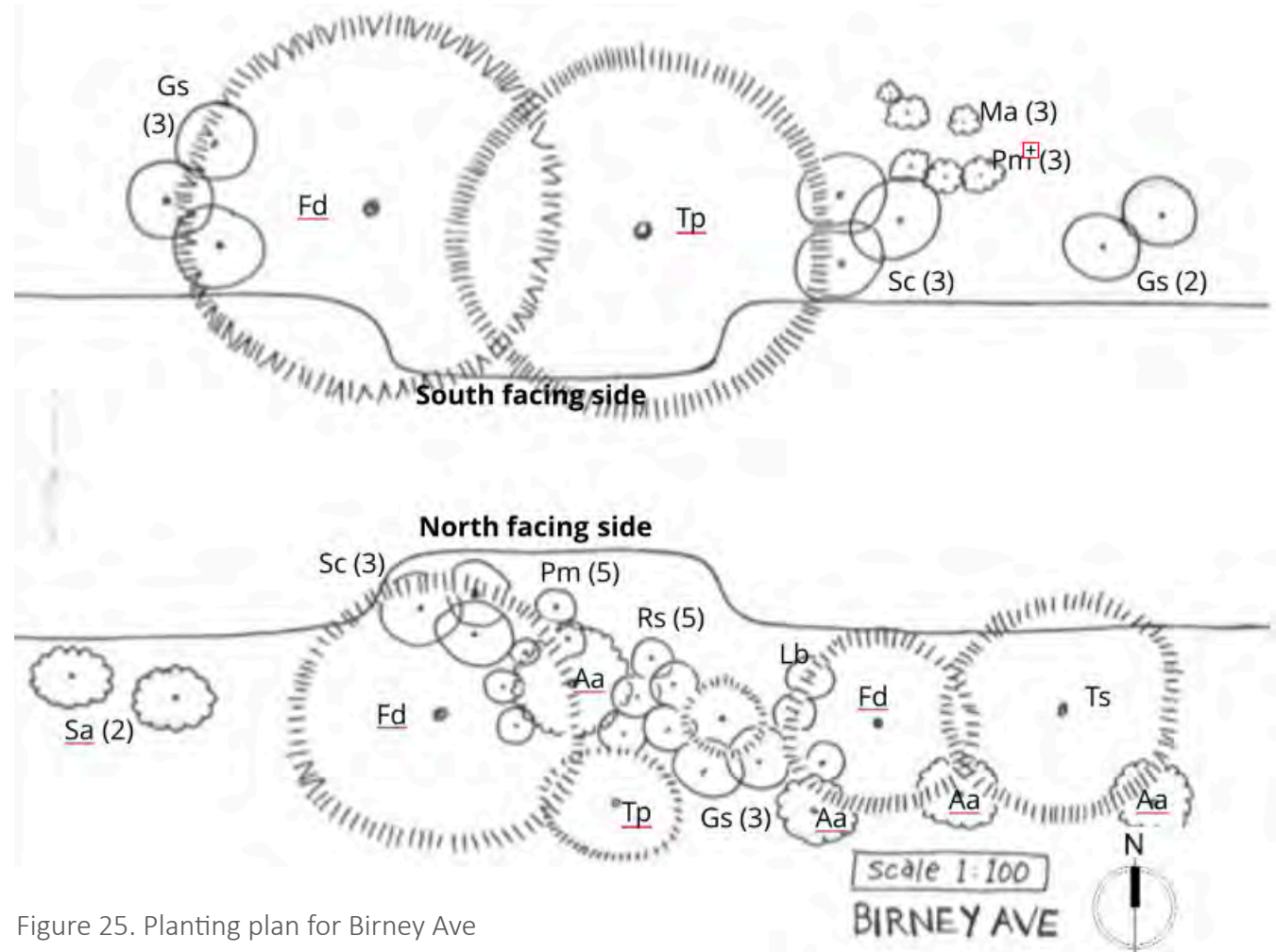


Figure 25. Planting plan for Birney Ave

Native Plant Alliance (1997). A manual of native plants for urban areas of the Pacific Northwest. Retrieved online from: [http://www.wnps.org/landscaping/herbarium/native\\_alliance\\_urban\\_complete.pdf](http://www.wnps.org/landscaping/herbarium/native_alliance_urban_complete.pdf)

## ZOOM 3 - Strengthening internal greenways and connections to neighbouring PSP (Doris Sun)



Fig 26. Berton Ave in Wesbrook Village.

### Current conditions

While the dramatic transition can be a pleasant walking experience, the amount of the West coast forest declines significantly as one heads west. In fact, if the avenue is split into East and West halves, around 48% of the East is forested while around 8.5% of the West is forested. With this large gap in mind, we seek to achieve two goals with Berton Ave:

1. To increase canopy cover in the west
2. To better link east and west buffer

There is strong potential to introduce native trees in the East half as well as the ability to convert gray landscapes into green ones by reduce parking space to the Village periphery (UBC Vancouver Campus Plan, 2010).

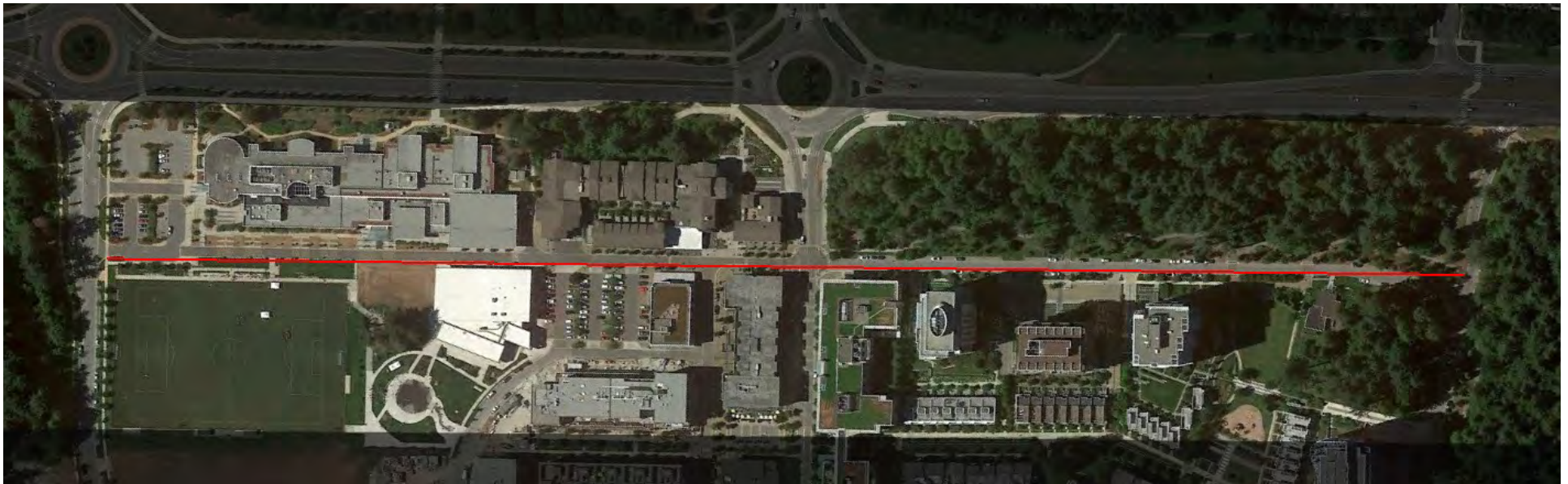


Fig 27. The marked difference in canopy cover in the east and west of Berton Ave. The native forest can be extended from east to west.



## ZOOM 3 - Strengthening internal greenways and connections to neighbouring PSP (Doris Sun)

### Proposed conditions

1. Using Google Earth to map polygons of potential new greenspaces, it is possible to double the current canopy cover to around 17% by increasing the amount of soft surfaces and planting vegetation. In the field in front of UHILL secondary, a bioswale can be added on the field along with extending the existing patch of native plants. This not only provides an educational feature at hand, but also adds interest to the otherwise underused field.

2. Regarding Berton Ave, two design options are possible on the grey network: a boxed parklet or a garden patch directly on the ground. Parklets have built-in pots or tree trenches with adequate soil volume to sustain tree growth. Shrubs can be grown on the ground level spaces or in pots.

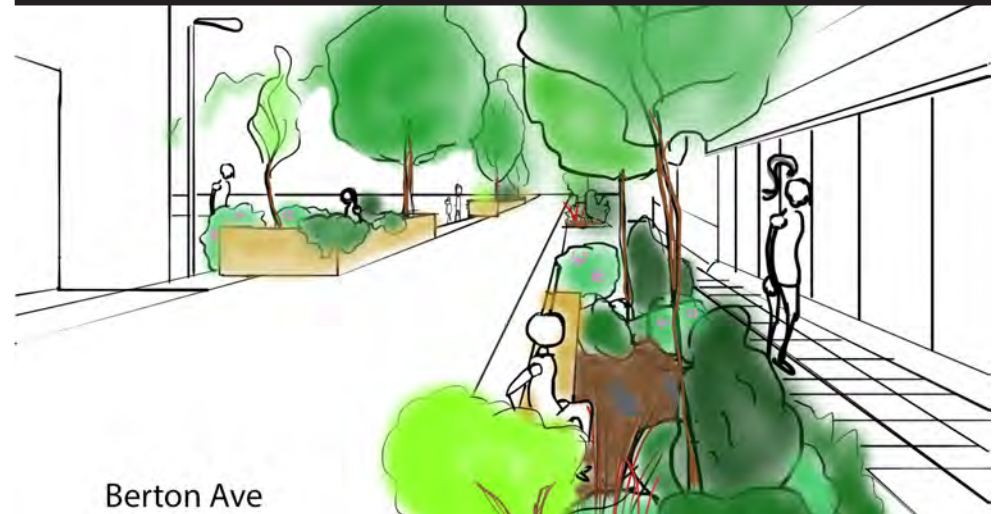
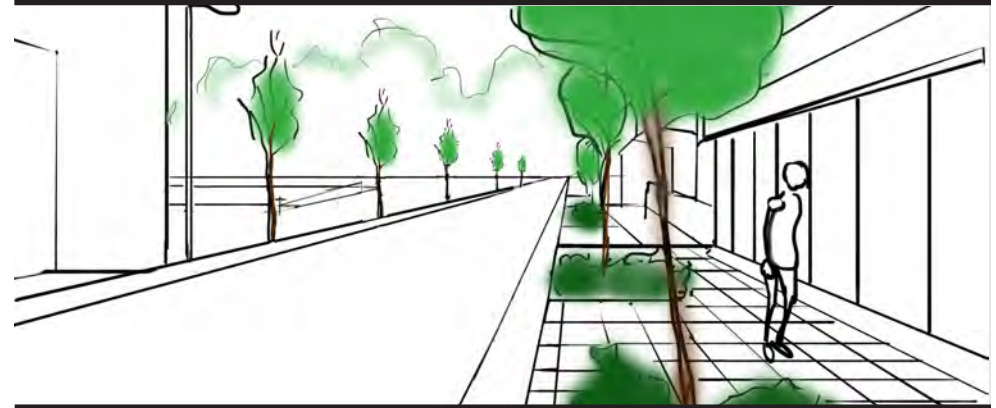
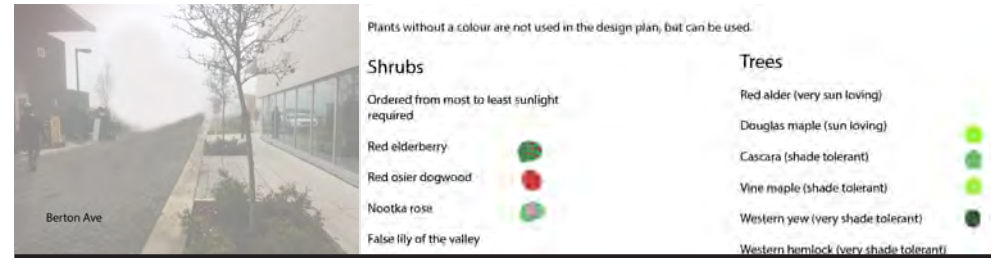


Fig 28a. Berton Ave before proposal. Dark green is existing vegetation.

Fig 28b. Berton Ave after proposal. Light green is new vegetation.

Berton Ave

Fig 29. Berton Ave after adding native shrubs and trees. Two designs are possible: raised parklet or a ground-level garden. Plant list above.

## ZOOM 4 - Tunnelling between Wesbrook Village & Pacific Spirit Park (Tony Tse)

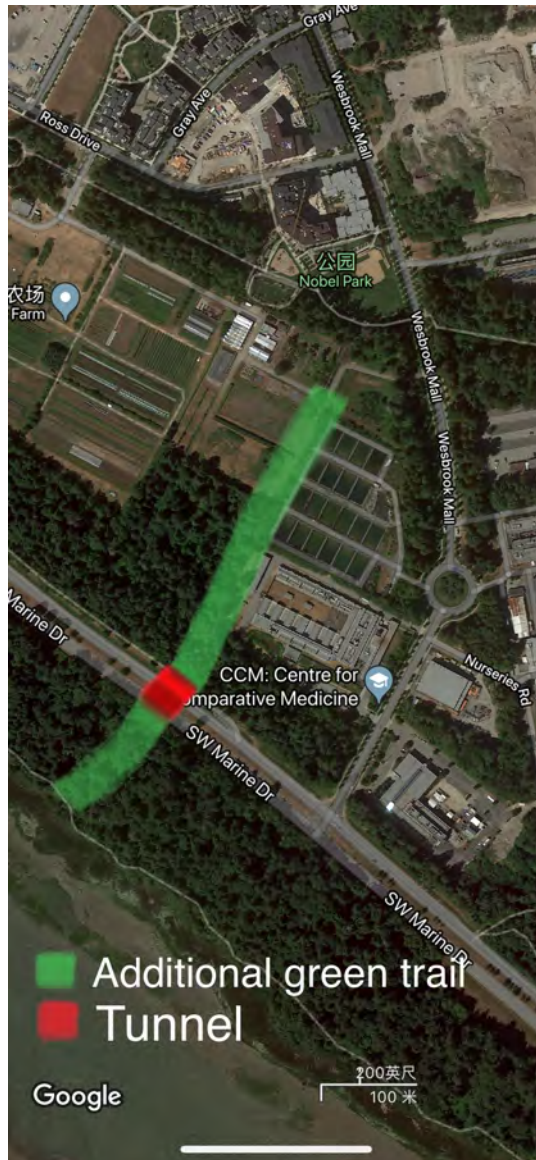


Figure 30. The new trail connects the Wesbrook Mall all the way to the trail near the ocean.

Connect the power line trail all the way to west side of the SW Marine Dr

In order to maximize the community's accessibility to nature and to allow them to access various type of nature, we want to expend the power line trail across the south side of Wesbrook to the other side of Marine Drive. It is key for us to ensure the safety of the community when crossing the highway. Hence, we decide to build a tunnel for pedestrian and cyclists to get across.

This trail/tunnel will extend the trail for walkers, joggers, and bikers.



Figure 31. The sky bridge will be better for the wildlife to get across.

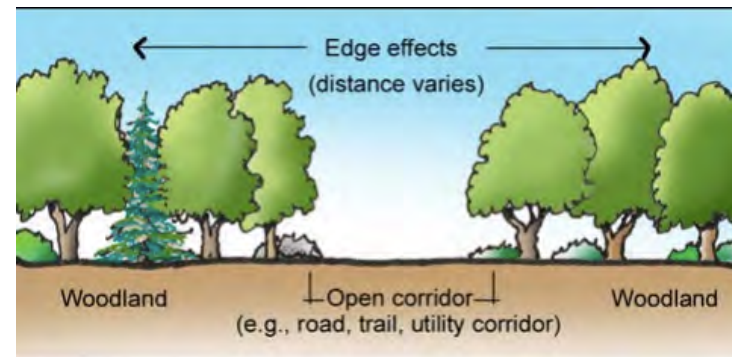


Figure 32. Animals living in the habitats separate by a man made open corridor could lead to a possible



## ZOOM 4 - Tunnelling between Wesbrook Village & Pacific Spirit Park (Tony Tse)

### Benefits on Wildlife

We should also focus on the design to make residents more comfortable going through the tunnel.

Not only to benefit the residents but also to enhance the ecological cycle. Forest fragmentation by the separation of highway could cause edge effect in ecosystems, which may fasten the elimination of some species. The tunnel allows animals to get across which weakens the of edge effect and reduce roadkill of animal.

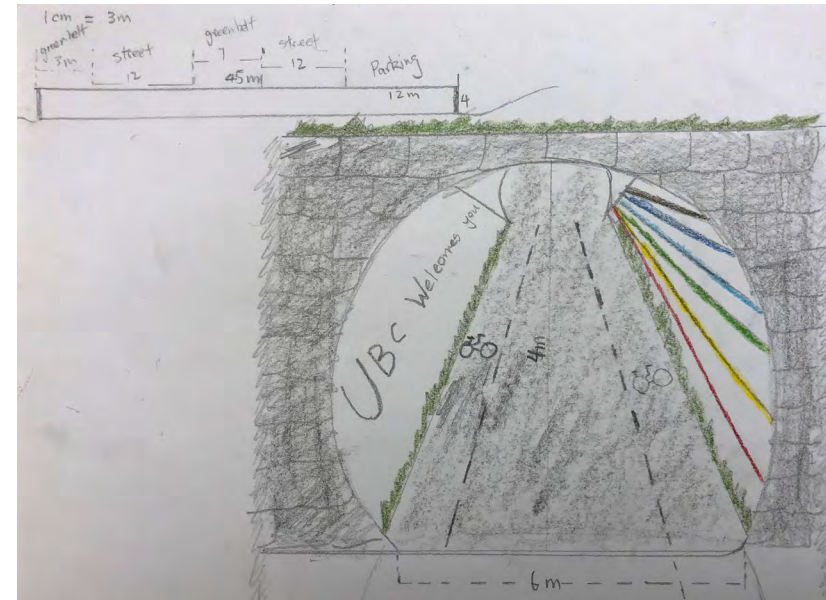


Figure 34. A cross section of the tunnel and its proportions.



Figure 33. Animals living in the habitats separate by a man made open corridor could lead to a possible limitation of certain spe-



Figure 35. This is an existing tunnel in the UBC botanical garden.







a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

School of Architecture + Landscape Architecture



Site 4 Orthophoto  
November, 2017

LARC444/553 (Girling) Team 4

## Enhancing Green Networks and Fabric FINAL REPORT

Site 04

Team Members:

Peiyang (Leo) Li

Emily Tu

Jiahui Huang

Jake Robertson

## Site Analysis

Site 4 is a part of the University Endowment Land and the highly forested Pacific Spirit Park takes about 2/3 of the site.

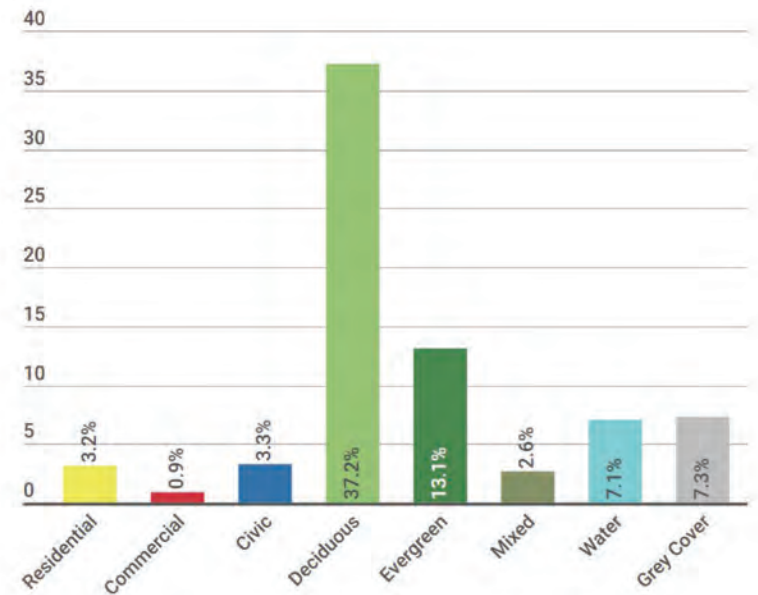


Analysis Map

### Legend

- Deciduous Canopy
- Residentail (Low Density)
- Evergreen Canopy
- Residentail (Medium Density)
- Mixed Canopy
- Residentail (High Density)
- Herbaceous
- Mixed Use
- Water
- Grey Cover

### Land Use and Canopy Types Percentage
















# Master Plan

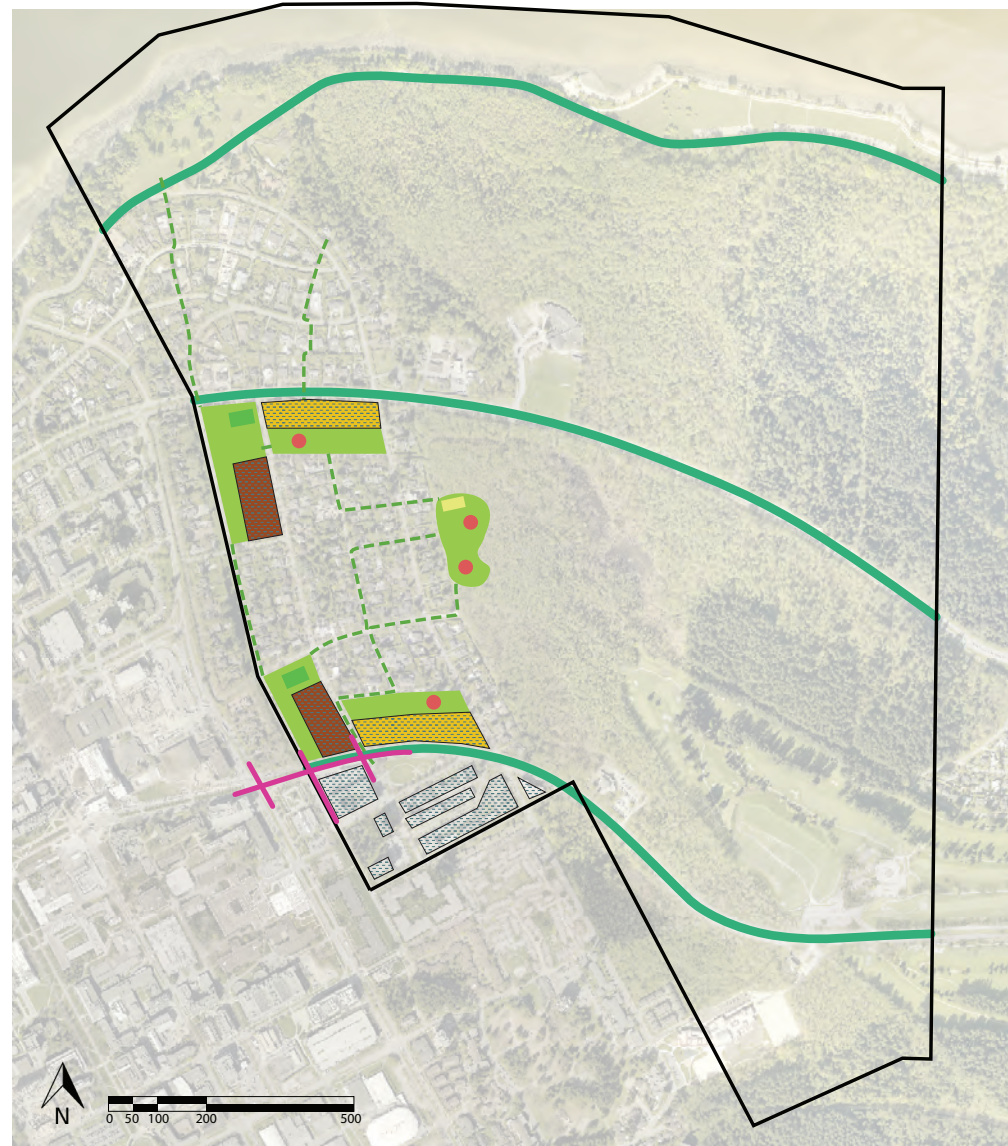
Though the site is highly forested, there are still many problems we identified and tried to improve the quality of green space on the site by this proposal.

## Legend

-  Trail
-  Bridge
-  Rain Garden
-  Roof Garden
-  Playground
-  Community Center
-  Community Garden
-  Green Space
-  Public Park
-  Residential (Medium Density)
-  Mixed Use

## Goals

- Make the streets pedestrian and biker friendly
- Improve storm water management
- Create denser housing for more green space
- Improve the connection and accessibility of green space
- Restore the forest
- Mke our city more beautiful
- Improve the green infrastructure



Master plan with 2016 otho photo as base map

## Forest Restoration

Historical clearings happened in 1900s damaged the forest in the Pacific Spirit Park a lot. Invasive plants from residential areas are also threatening the health of the forest.



Current Canopy Types, main restoration area is circled

### Legend

- Deciduous Canopy
- Evergreen Canopy
- Mixed Canopy
- Herbaceous

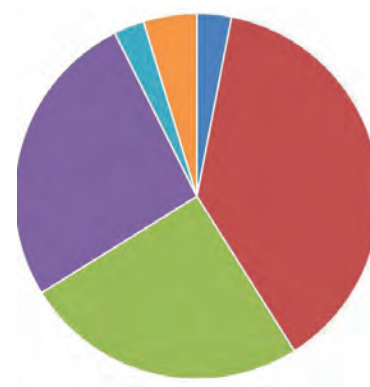
### Forest Restoration Methods

For invasive plants:

- Plant for competition
- Education
- Contain and restrict
- Mechanical, manual and cultural control

For deciduous trees:

- Plant conifer trees to replace unhealthy and dying deciduous trees



- Common Periwinkle
- English Holly
- English Ivy
- Himalayan Blackberry
- Yellow Lamnium
- Other

Invasive Plant Species



## Forest Restoration

Dying deciduous trees should be replaced by coniferous trees to create a healthier forest. Mixed forest will increase largely after restoration.

### Legend

- Deciduous Canopy
- Evergreen Canopy
- Mixed Canopy
- Herbaceous

### City Goals

“The Biodiversity action plan will restore or enhance an additional 25 hectares of natural areas by 2020.”

### Our Accomplishment

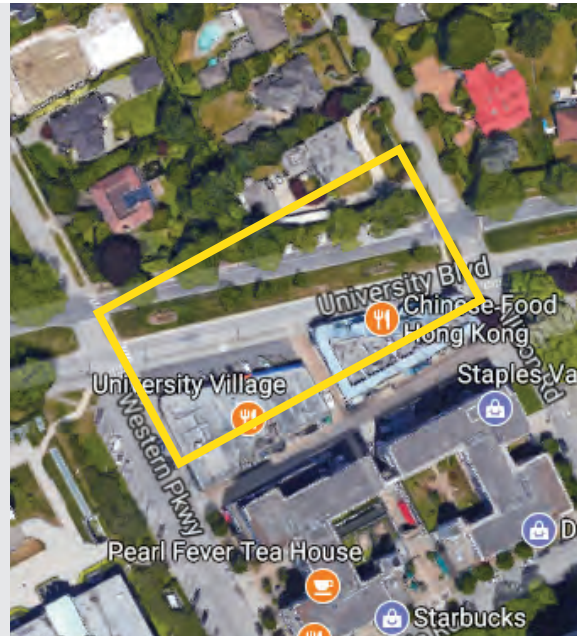
Unhealthy deciduous trees are moved  
35.3% (995 square meters) increase in mixed forest



Proposed Canopy Types

## Zoom Study - University Village (Jiahui Huang)

University Village is near the main entrance of UBC, and University Boulevard in front of it is always busy with cars, bikers and pedestrians. Something has to be done to improve the walkability and aesthetic value of it.

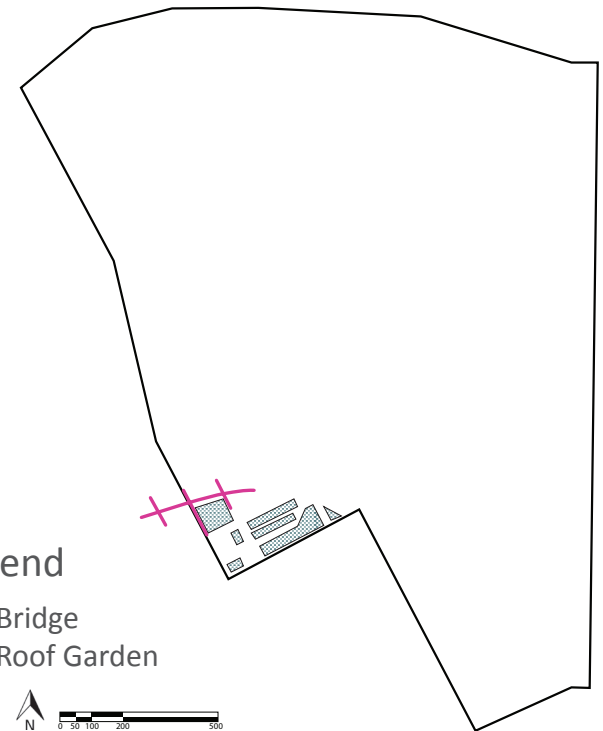


Site Location and Condition photos, Not to Scale

### Goals

- Improve walkability:
  - Move storefront to the second floor, build a bridge next to the storefront for pedestrians and bikers
  - Ground floor for buses, parking and good delivery
- Make the city more beautiful:
  - More space for vegetation on and under the bridge
  - Create roof and rain gardens to reduce greenhouse effect and manage storm water

### Proposed Area





## Zoom Study - University Village Proposal (Jiahui Huang)

Improve regulating services: more vegetation to reduce heat island effect in city and improve air quality.

Improve cultural services: pedestrian path and street are decorated with plants for better landscape.

### Concept Images



Storefront with vegetation

Umbria, Italy  
<http://www.icanholidays.com/wp-content/uploads/2016/11/Spello-Umbria-Italy-copy-700x460.jpg>

Bridge, stores and street

plan for prime River North parcel  
<https://chicago.curbed.com/2017/6/28/15887538/river-north-chicago-development-north-bridge-mall-expansion>

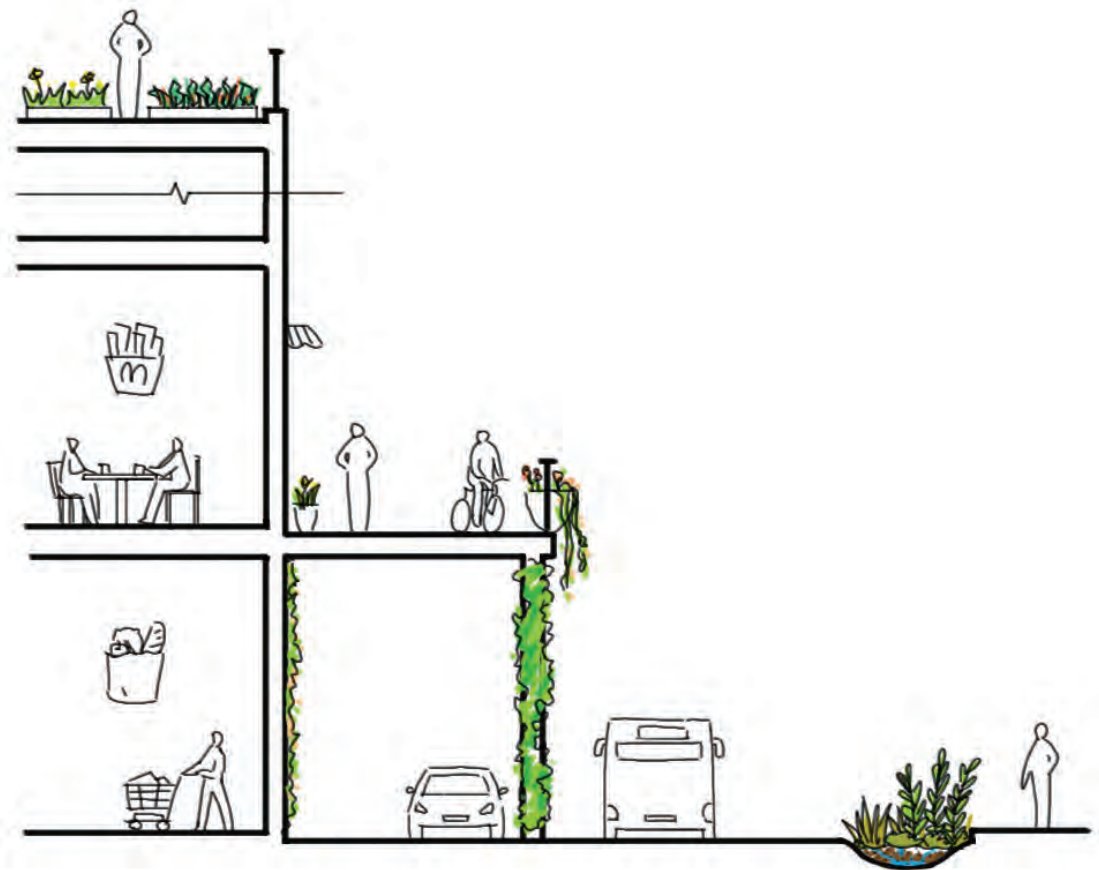


Green wall

San Francisco Museum of Modern Art  
[http://www.habitathorticulture.com/system/photos/sf-moma/large/sfmoma\\_living\\_wall\\_overhead.jpg?14659165475](http://www.habitathorticulture.com/system/photos/sf-moma/large/sfmoma_living_wall_overhead.jpg?14659165475)

Green bridge columns

Green bridge in Chengdu  
<http://www.ecns.cn/visual/hd/2017/07-11/135384.shtm>



Section Drawing, Not to Scale

## Proposition: Increase Density (Jake Robertson)

Location: Along Chancellor Blvd., between Allison and Acadia Rd.



- The area is currently low density, single family home suburban sprawl with most homes spread far from nearest grocery stores, causing a dependence of personal vehicles.



- Green median dividing lanes on Chancellor Blvd. catches some rainwater.
- Curbs limit the amount of storm water runoff that could be managed. Design would include pathways to allow run off to enter median.

Google Street View and Google Map View

### Zoom Study Area



Before

### Goal

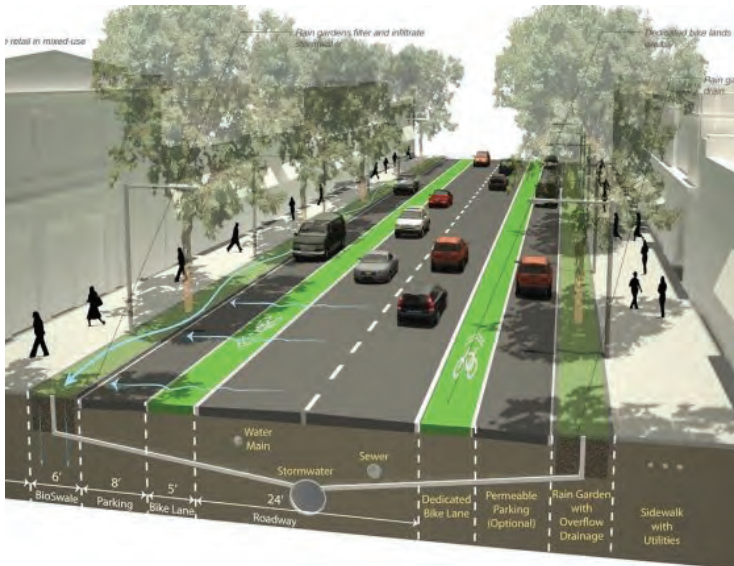
- Increase density
- Increase biophilia
- Improve storm water run-off management
- Increasing connectivity



# Proposal (Jake Robertson)

Area size: 150m x 150m

Example of a city cross section.



Design by Tipton-Associates

## How to Achieve Goal

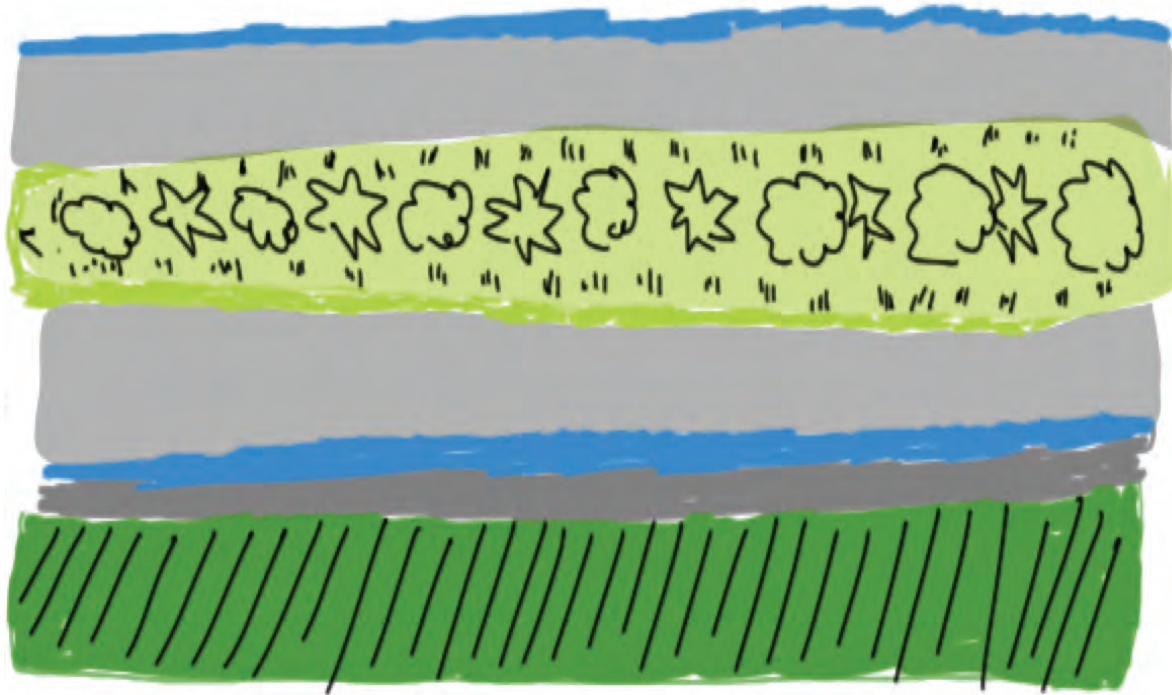
- Designated bike lane to encourage healthier lifestyles and sustainable transportation.
- Functional and aesthetic rain gardens mitigate storm water runoff and reduce runoff pollution.
- Medium and high density buildings to increase density.



After

## Final Image (Jake Robertson)

What this site could look like with the developments.



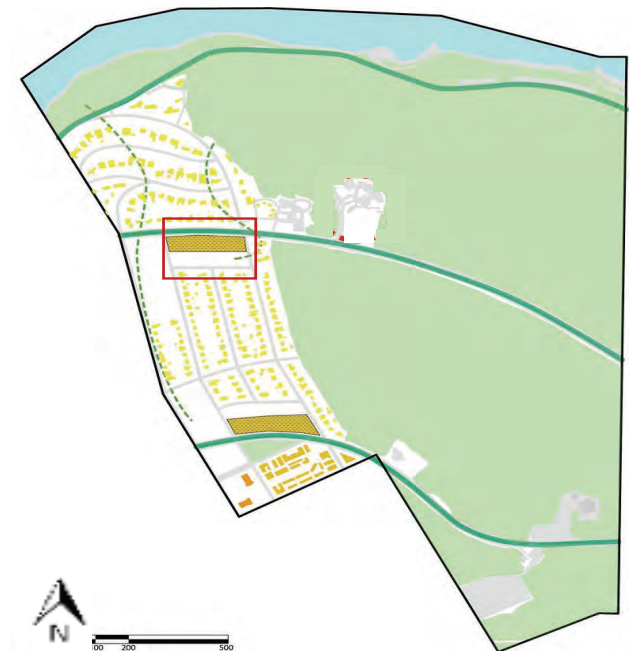
- = Street
- = rain garden
- = sidewalk
- = Bike lane
- = mixed density building
- ∨ = grasses
- ☁ = shrubs
- ★ = coniferous trees

Site Changed

## Alterations

- Bike lane that is clearly marked for safety and connectivity.
- Functional Rain garden with a diversity of plants
- Mixed density housing to add more residents and shops.
- Higher density site

## After





## Accomplishments (Jake Robertson)

### Dwelling units:

- Originally 18
- Revised 39 - 52

### Ecosystem Services:

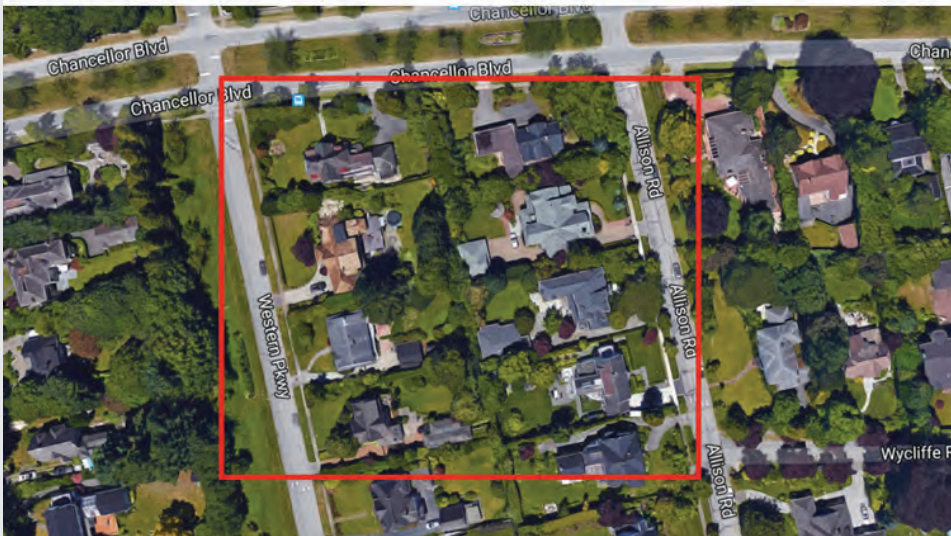
- Cultural: increase in aesthetically pleasing location with increase in connectivity to connect communities.
- Regulating: storm water run-off management has been increased because of the access rain water has to the functional rain gardens. Increase in vegetation also improves CO2 sequestration and air purification.



Side by Side Comparison

# Proposition: Renovated Community (Peiyang Li)

Location: The community in the cross of Chancellor Blvd and Western Pkwy



Google Street view and Google Map area

## Zoom Study Area



## Renovation Plan Draft

### Goal

- Promote connection between communities
- Enhance stormwater management
- Introduce green infrastructure
- Improve biophilia



# Proposal (Peiyang Li)

Area Size: 120m x 140m

- Community garden
- Children playground
- Mixed-use building
- Green roof garden
- Pedestrian friendly trail
- Seating area

<http://cityofpowell.us/wp-content/uploads/2015/07/FullSizeRender.jpg>



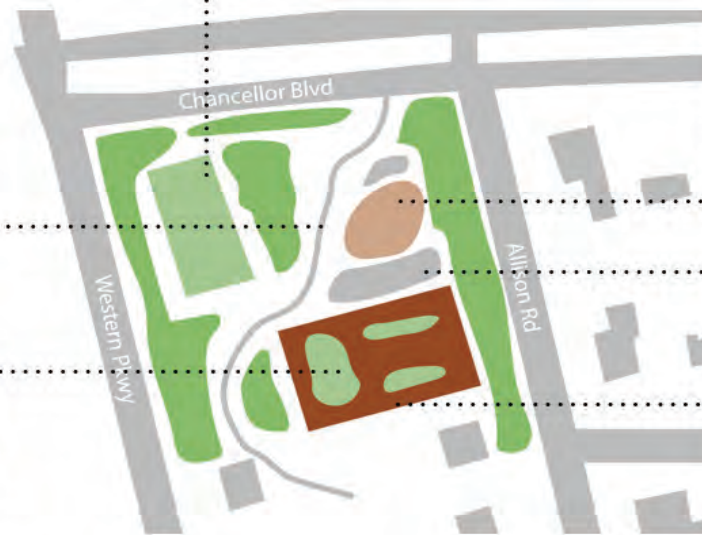
<http://www.greendreams.org.uk/wp-content/gallery/goose-green/wider-view.jpg>



<https://www.tofinohiking.com/images/featured/bog-trail.jpg>



<https://media.treehugger.com/assets/images/2011/10/v3.jpg>



[https://c1.staticflickr.com/9/8598/16828632441\\_6c07d88da6\\_b.jpg](https://c1.staticflickr.com/9/8598/16828632441_6c07d88da6_b.jpg)



<https://www.pyramidbrokerage.com/wp-content/uploads/2016/10/College-Town-Pic.jpg>

## Community Renovation Plan

## Compare (Peiyang Li)



Before

- Low-density single family house
- Absent urban stormwater management
- Isolated close community
- Vehicle-use street



After

- Mixed-use medium-density building
- Enhanced ecological roof garden
- Connected open community
- Pedestrian, elders and children friendly street



## Accomplishment (Peiyang Li)



### Policy Context

#### The Greenest City 2020 Action Plan

Improving access to green spaces—like parks, community gardens, and greenways—builds the community and improves the health of residents.

#### Integrated Stormwater Management Plan

Capture and local treatment of roof rainwater can provide water for irrigation, toilet and urinal flushing, and other non-potable uses, and reduce the city’s reliance on potable water.

### Achievement

22.4% increase in green space

Increased human connectivity with 7 adjacent community

13200 square meters increased in the study area which is within 100 meters of nature.

### Ecosystem Service

Provisioning: Bring production of food.

Regulating: Decrease runoff pollution.

Cultural: Promote connections between people and nature, enhance health well-being.

## Improving Green Space Accessibility (Emily Tu)



Map 1 - Our site before the development and improvements are made






“Our targets: Ensure that every person lives within a 5 minute walk of a park, greenway, or other green space by 2020; restore or enhance 25 ha of natural areas between 2010 and 2020”

- City of Vancouver; Greenest City Action Plan

### Goals:

- To promote access to and maintenance of natural areas, by creating new innovative public green spaces
- To foster public interest and education in the appreciation and study of nature
- To protect important natural areas to contribute to regional liveability and enhance connections

### LEGEND

-  Deciduous Canopy
-  Park Space
-  Water
-  Within 100m of Nature
-  Within 400m of Nature



Zoom Site: Pacific Spirit Park (Emily Tu)

Before Improvemnts	
Within 100 metres of Nature	36.4%
Wihtin 400 metres of Nature	63.6%
After Improvements	
Within 100 metres of Nature	68.4%
Within 400 metres of Nature	31.6%

- LEGEND**
- Evergreen Canopy
  - Mixed Canopy
  - Herbaceous
  - Green Space
  - Water
  - Within 100m of Nature
  - Within 400m of Nature
  - Playground
  - Education Centre



Map 2 - Our site after the development and improvements are made

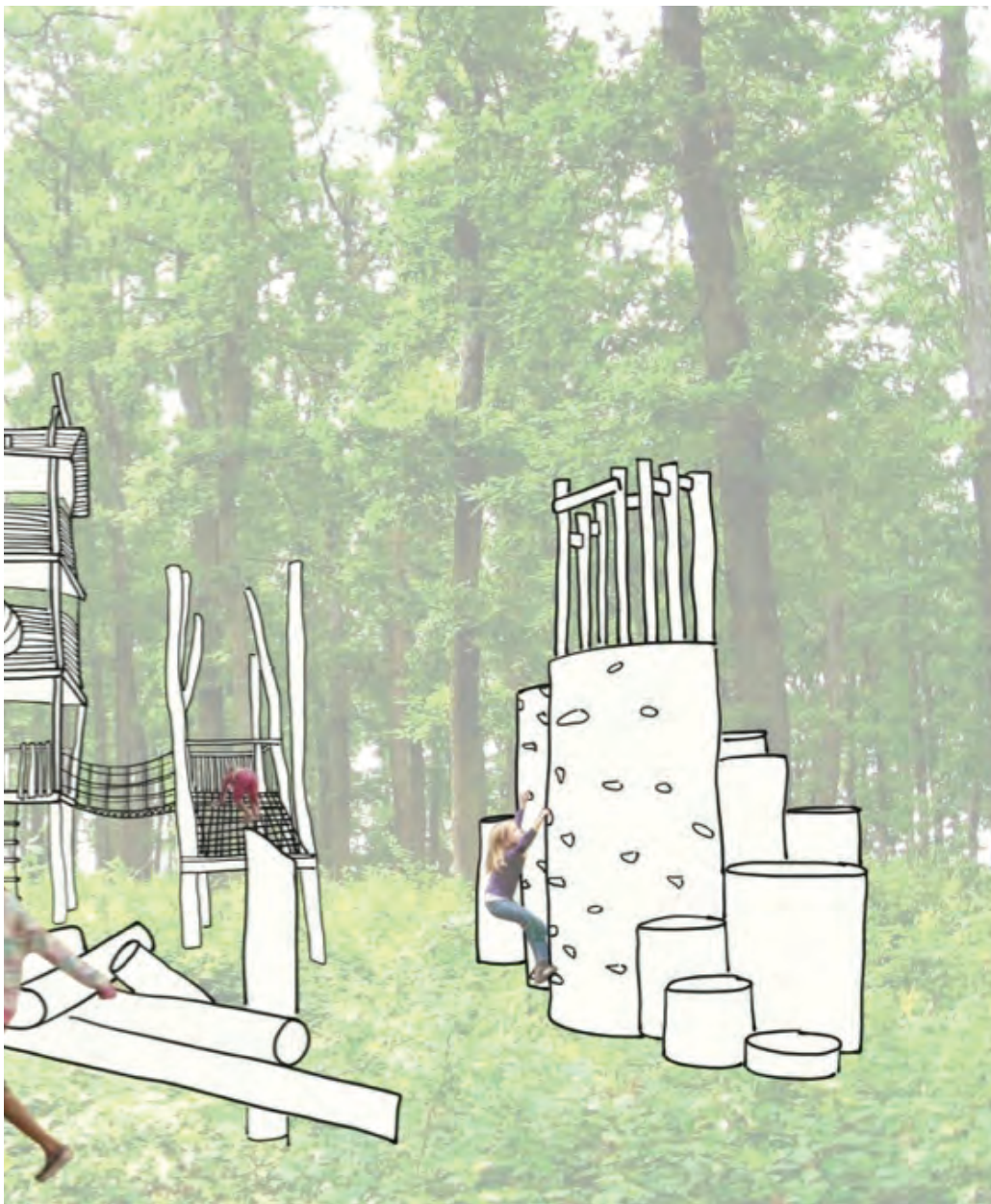
“Plant 150,000 new trees by 2020”

- City of Vancouver; Greenest City Action Plan

Like the Greenest City Action Plan, our goals are comparable. We want to promote access to natural areas and public green spaces, as well as foster Public interest and education in the appreciation and study of nature. We hope to achieve these goals, while at the same time, protect the important natural areas that not only contribute to the regional liveability, but also enhance connections.







“Work to acquire new parks in priority neighbourhoods:

- City of Vancouver; Greenest City Action Plan

This zoom study is part of Pacific Spirit Park, that borders the neighbourhood. In order to promote other people, such as families, to use this space, we will create two dynamic playground and picnic areas that are surrounded by wildlife and nature. We will also include an education centre, as well as increase the amount of educational signage along trails and around the park. We can work closely with other associations like Pacific Spirit Park Society and nearby schools, to organize a tree planting. In order to conserve the natural resources around the zoom site, we won't clear cut the site, instead we will build around the environment and work with it.



## Conclusion

Forest Restoration	35.3% (995 m <sup>2</sup> ) increase in mixed canopy
Sustainable Streets	better cityscape with sustainable urban transportation
Storm Water Management	4.5 km rain gardens along the streets
Renovated Community	22.4% increase in green space
Green Space Accessibility	32.0% increase in areas within 100 meters of nature
Park Renovation	improve space in nature for activities

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