Urban Forestry Visioning Project

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UNIVERSITY OF BRITISH COLUMBIA

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(Aerial Views of Campus, UBC Centennial)

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(Mapio.net)

Project Objectives

The objective of the urban forestry strategy is to design a sustainable UBC community that is resilient and adaptive to the effects of climate change. Our main intentions are twofold, considering areas of potential as well as the existing urban forests of UBC and how to create a cohesive vision that bridges with UBC Campus Planning's current strategy. Specifically, our main objectives are:

- increase canopy cover with large scale tree planting and green space on UBC campus
- providing inviting and engaging environment for students and faculty (socializing, recreation, studying, commuting)
- create a climate resilient community by identifying impervious areas that could potentially be readapted to increase infiltration, keep students and residents cool and improve well-being

Overall, we have identified three key criteria for success with which we will evaluate our urban forestry vision: **climate resiliency**, **low carbon community**, and **aesthetic/social values**, which are discussed in depth in the second half of the report.

UBC's Urban Forest in Photos

The following images illustrate the rapid development and decrease of the urban forest of UBC over the past century. As the campus has grown over the past decades, the urban forest has been continuously diminishing to give way to new housing and faculty buildings. Today, only several small patches of forest remain in tact. The importance of maintaining and increasing this canopy cover is discussed on the following page.

UBC campus, 1930 (unbraceyourself.com)

UBC campus, 1947 (*Aerial Views of Campus*)

UBC Campus, 1975 (*Aerial Views of Campus*)

UBC campus, present day (100.ubc.ca)

The Importance of the Urban Forest

Urban forests provide a range of benefits, including environmental, aesthetic and social benefits. The following is an in depth look at the opportunities provided by urban forests and why it is important to create a strong urban forestry strategy for UBC:

Environmental Benefits

1. Improving air quality
2. Trees absorb gaseous pollutants and greenhouse gases by leaf stomata.
3. Trees intercept small airborne particles. Some particles can be adhered to leaf surface. Trees with hairy, rough leaf, and bark surfaces are efficient interceptors (Scott).
4. Trees transpire water and shade surface, resulting in lower temperature, reducing ozone level and energy cost. By shading asphalt surfaces and vehicles in parking lots, trees also reduce hydrocarbon emissions that are a major component of smog.
5. Trees release oxygen by photosynthesis.

Improving Hydrology

6. Tree canopies can intercept and store rainfall, reducing the amount of water reaching ground then thereby reducing ground runoff.
7. Trees can also protect water quality by reducing runoff during rainfall events that are responsible for most pollutant wash-off into receiving waters.
8. Trees can benefit the soil at campus. Tree roots can increase the rainfall infiltration through the soil by creating fine root channels, which also increases the water storage capacity of soil, reducing the risk of surface flow (Cappiella).
9. Tree canopy interception of precipitation and transpiration can reduce soil erosion and soil moisture, improving soil properties and increasing its resilience to high rainfall input.

Carbon sequestration, energy consumption and climate change

10. Urban forest plays an important role in absorbing GHG (primary CO2) and mitigating the impacts of climate change (McPherson). Trees need CO2 to perform photosynthesis that sinks the surrounding atmospheric carbon into solid biomass and thereby directly resulting in reduction of GHG in the air.
11. Trees are the highly effective green element for reducing overheating in urban areas as they provide shades and perform evapotranspiration that increase air moisture-cooling effect.
12. Urban forest reduces GHG indirectly. The natural shading of trees near buildings can reduce the demand of heating or cooling, which reduces the emissions produced by power plants.
13. Instead of fossil fuel, the use of wood (e.g. residuals) as a biofuel also provides alternative energy source for campus consumptions.

Other Environmental Benefits

14. Trees and other vegetation can reduce noise. Noise can be mitigated by urban forest as trees have the ability to absorb and reflect sound energy from atmosphere. Study indicates that trees absorb more high-frequency noise which is most distressing to human.
15. Urban forests provide important habitat for wildlife and improve biodiversity. They provide nesting sites, food (e.g. fruits, insects) for birds that are highly valued to communities (Tyrväinen).
16. Urban trees create buffer zone between pedestrians and traffic, and they can shelter and protect road surfaces from high temperature during hot weather, reducing the road and street maintenance.

The Non-Environmental Benefits

Aesthetic: The existence and enhancement of urban forest can add more diverse visual elements and features such as color, texture and forms to the urban landscape, which usually soften campus constructions and provide welcome and attractive environments by adding aesthetic values.

Recreation, health and socialization: The green space offers a range of recreation and social opportunities to enjoy the green nature and release stress, promoting an active and healthier lifestyle for community.

Ecosystem Service	Summarized benefits
Regulating Services:	
1. Carbon storage	Potential mitigation of urban carbon emissions and regulation of global climate, but strongly dependant on size of trees and their extent cover
2. Air quality	Absorb air pollution, but net benefit is highly dependent on species and size
3. Water flow regulation	Intercept falling rain and reduce runoff
4. Reduction of noise, wind, and solar radiation	Improve physical environment for human well-being while reducing building energy needs
Cultural Ecosystem Services:	
5. Community identity and character	Help define neighborhoods and build social ties
6. Educational opportunities	Restore attention, foster intellectual inspiration and offer research and learning opportunities
7. Health and well-being	Aesthetics offer stress and anxiety relief and potentially increase resilience to illness
Supporting Ecosystem Service:	
8. Wildlife habitat and biodiversity	Potential to lessen impacts to natural ecosystems displaced or harmed by urbanization

Eight ecosystem services provided by urban tree canopy identified to be of high relevance to UBC (Sutherland)

Other Social and Economic Benefits

17. Reducing crime rates, violence and enhancing public safety
18. Providing jobs and education related to urban forestry and the nature
19. Providing local foods for residents and wildlife

Site Analysis and Mapping

Rationale for Analysis Maps

Currently, UBC Campus Planning uses an overall design guide that not only provides guides for new development, but highlights overall campus-wide strategies that are used to unify and create cohesion for UBC as a whole. In order to begin to understand some of the urban forestry and green initiatives put in place by Campus and Community Planning, several maps were analyzed in detail. Specifically, our team looked at current street tree strategies for the main UBC corridors, open space and green corridor strategies in place, as well as parking. These maps were selected and analyzed in order to create a visioning strategy and scenario analysis that integrates with the current goals and strategies outlined by Campus and Community Planning.

Open Space, Green Corridors and Street Trees (Figure 1,2)

The open space and green corridor map highlights current and future green networks to be integrated within the campus. Currently, there are two notable green networks that run from east to west across campus, and several peripheral networks on secondary streets. The two major areas for future greenway development are north of main mall toward the Museum of Anthropology and at the southeast end of campus near the stadium. An area of opportunity identified on the map is the area between Pacific Spirit Park and Marine Drive/Wreck Beach. There are currently no green corridors that connect the north and south part of campus, aside from University Boulevard, which terminates at Wesbrook Mall and doesn't connect the two peripheral forests.

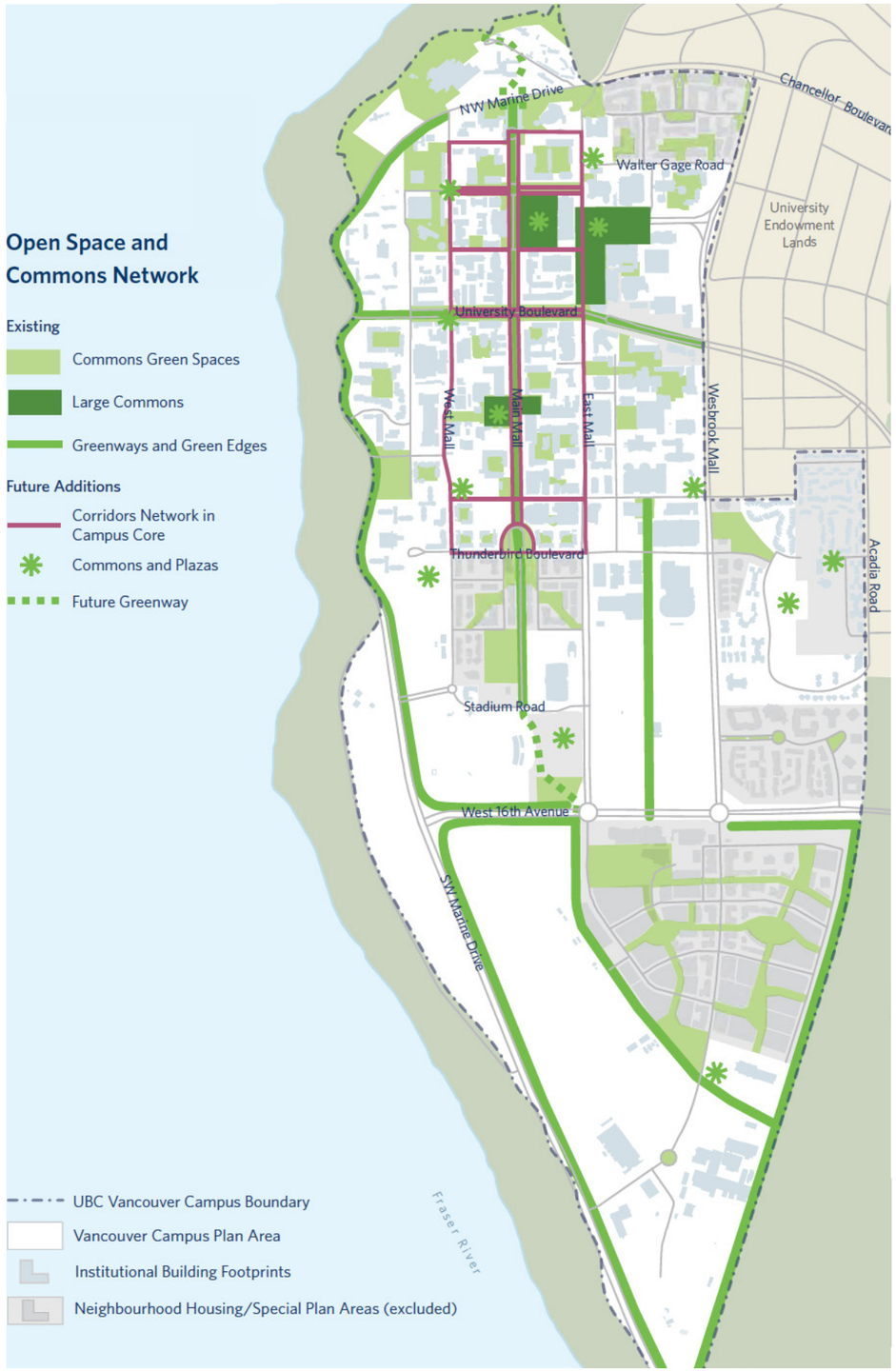


Figure 1: Open Spaces and Commons Network (University of British Columbia)

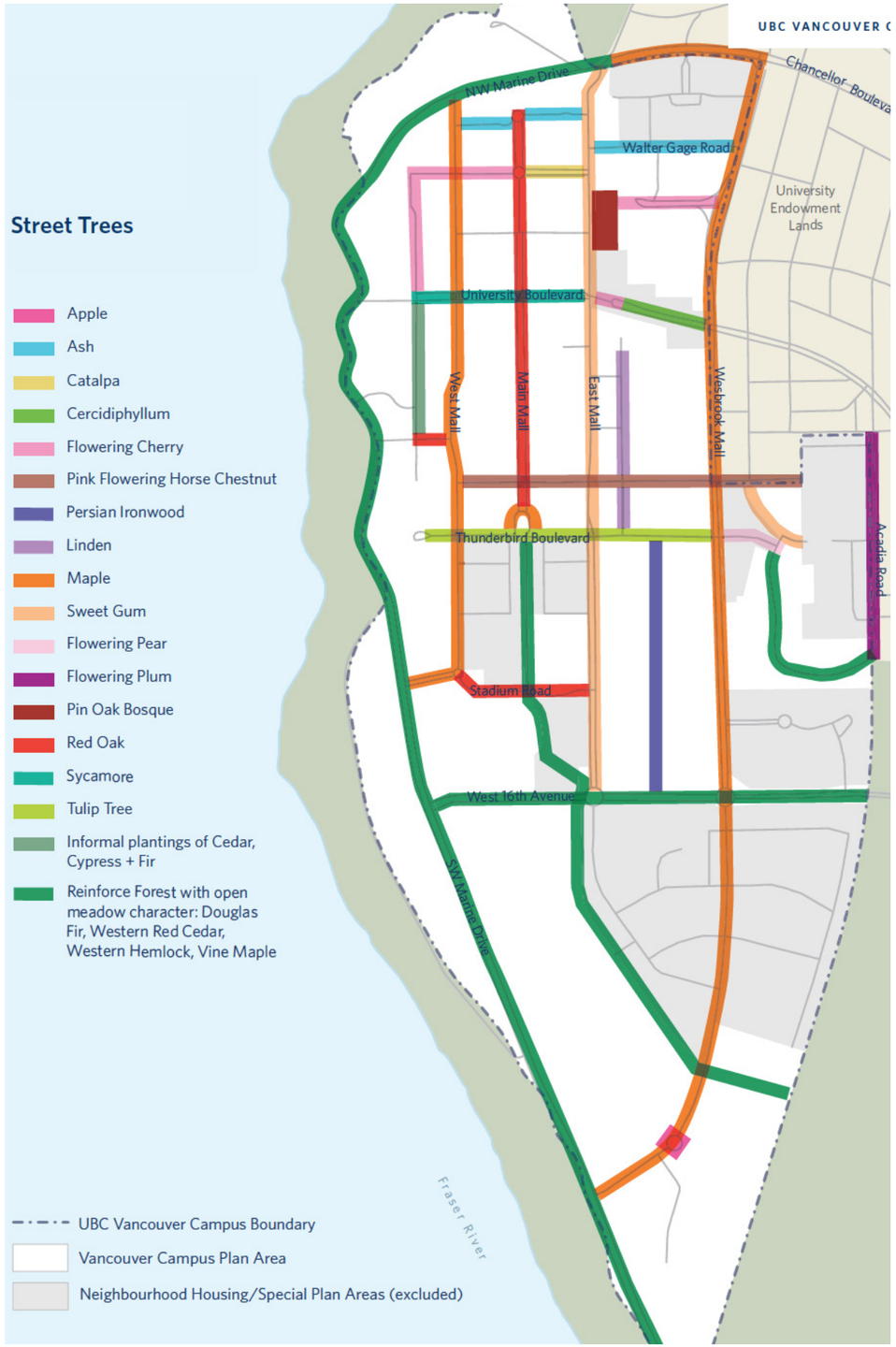


Figure 2: Street Trees of UBC (University of British Columbia)

Site Analysis and Mapping

Parking on Campus

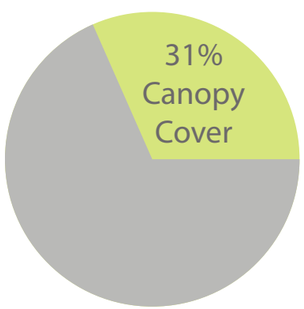
The street tree map highlights the street tree strategy put in place by UBC Campus Planning.

Parking (Figure 3)
Parking was mapped, as UBC still has numerous surface lots, that are not only entirely impervious, but house many cars on a daily basis. As UBC encourages and moves towards a walkable, pedestrian oriented campus, parking was identified as an area of potential for future urban forestry strategies.

Tree Canopy Cover (Figure 4)
In addition, iTree is an online tool that was used to calculate the green and grey space on campus and better understand the current tree canopy percentage. Currently, UBC canopy cover accounts for 31% of the campus, while the remaining area is characterized by impervious surface.

Figure 4: Overall Canopy Cover of UBC

As calculated by iTree



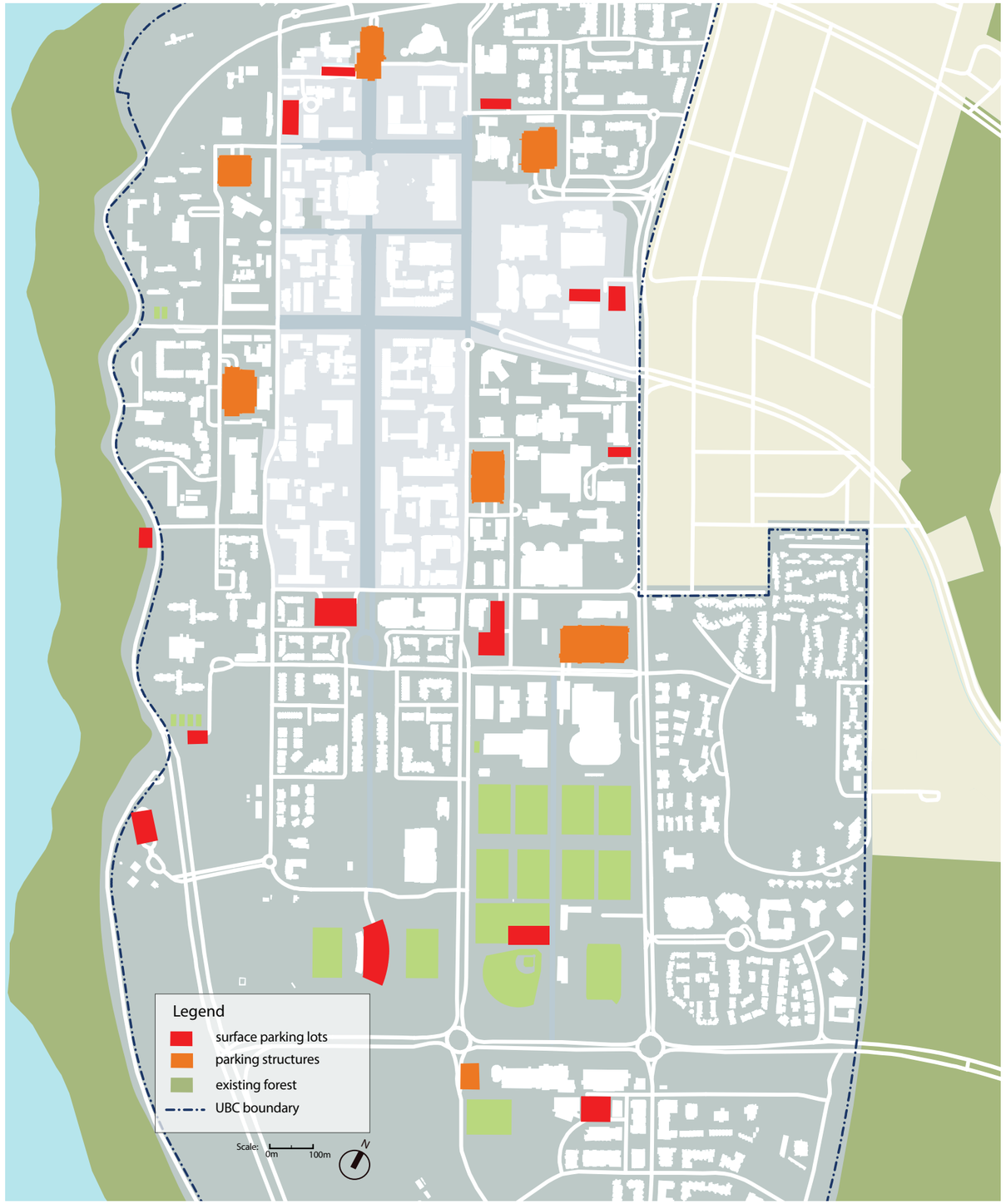


Figure 3: Surface and Above Ground Parking Structures, UBC Campus (Adapted from UBC Campus Plan)

Rose Garden Underground Parkade

West Parkade, Above-Ground Structure

Agronomy Road, Surface Parking Lot

Photographs taken by Ivy Smith

Site Selection and Rationale

The Agronomy Road corridor was selected as the site for our visioning project for several reasons. After further analysis of the UBC Design and Campus Planning Guide, Agronomy Road is a neglected lateral connection in the campus that has not been addressed as an area for current/future development by Campus Planning (see figure 1). In addition, this is an opportune time to develop a visioning strategy, given the current construction of an international student housing high rise development on the south end of Agronomy. As we critically analyze how the UBC design guide has been implemented in recent projects along the Agronomy corridor, this international student residence can be used as a real-time example to explore the possibility of community amenity contributions the developers must contribute as compensation for construction. In addition, Agronomy Road is a transect through several notable nodes. It stands as the terminus of the Main Mall corridor, and also is home to the landscape architecture, and forestry faculties. The north end of Agronomy terminates at a housing node, and there is an opportunity to extend the corridor through the north end so faculty, students, as well as residents can reap the benefits of an urban forestry strategy. Moreover, the area is predominantly impervious, and while according to the street tree map illustrated in the design guide (see map B), there is little presence of street trees along the corridor. The design guide also states that it considers both Agronomy and Main Mall, as well as Agronomy and Thunderbird two of the most important mixed use hubs to develop on campus. This is a goal we integrate in our visioning strategy below.

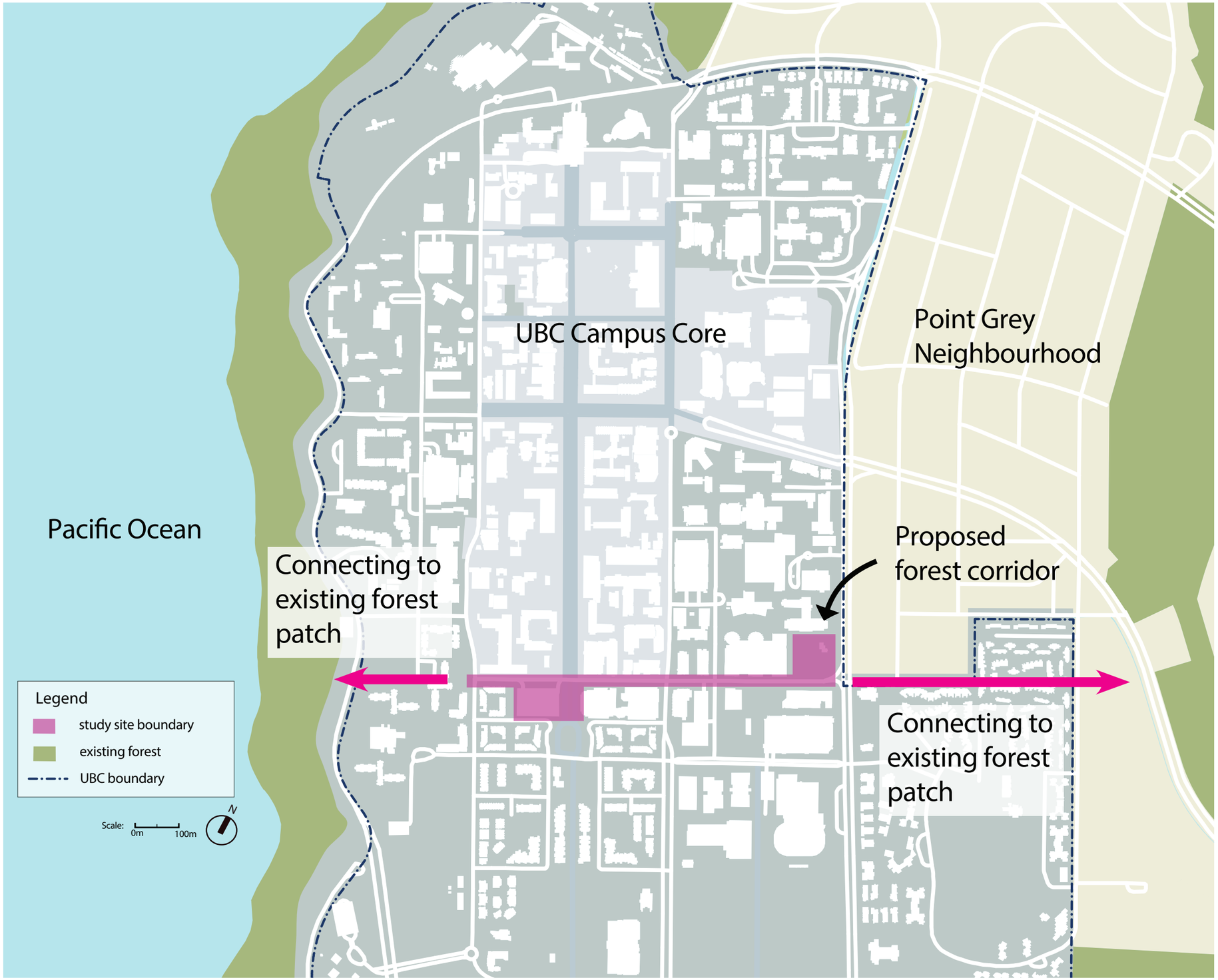


Figure 3: Agronomy Road Site Boundary, University of British Columbia (Adapted from UBC Campus Plan)

Agronomy Site Analysis

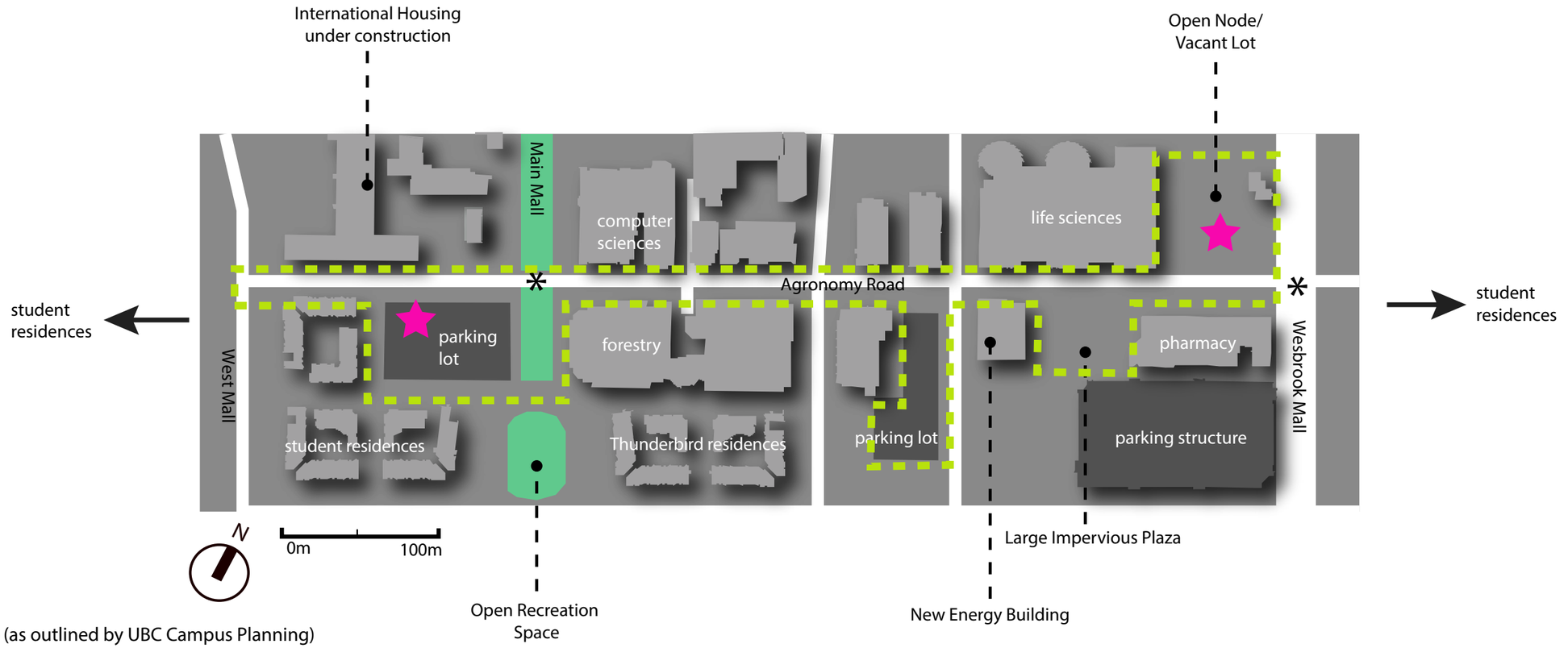
Site Map

Agronomy Road represents a diverse and dynamic transect of the UBC campus that encompasses many different programs and user groups. The corridor is home to many faculties, including land and food systems, forestry and pharmacy, as well as non-UBC businesses and residential units. There is a diverse range of working professionals, students, faculty, and families that live and work along the corridor. The site sits between two major forested areas, along the coast of Marine Drive as well as Pacific Spirit Park. This is an area of opportunity as Agronomy Road has the potential connect these two urban forests. Currently, the selected site consists of 25% canopy cover and the remaining percentage characterized by hardscape. Some of the notable sites along the corridor include a towering new international student residential development, the terminus of Main Mall (an important intersection on campus), a recently completed energy building, a large impervious plaza in front of the faculty of pharmacy and a vacant lot yet to be developed by the university (see page 11).

We have identified two nodes along the corridor, both of which represent two unique conditions and areas of potential for applying a visioning and future alternatives strategy.

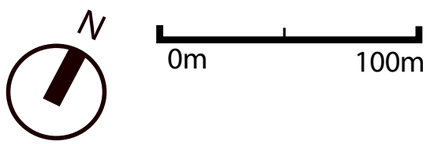
The first node is a vacant lot at the intersection of Agronomy Road and Wesbrook Village. Not only has this intersection been identified by the UBC Design Guide as a key node for mixed use development (reference), there is no development planned just yet for this lot. This represents an opportunity to re-envision this space as an urban forest, rather than the more likely scenario of another structure being built in its place. The surrounding area is also highly dense and is characterized by a significant amount of impervious surface, namely the pharmacy plaza to the southeast of the site. There are also many families and individuals who live close to this intersection who are not necessarily students or faculty. There is an opportunity to create an urban forest that accommodates and encourages interaction among all of these user groups.

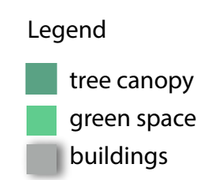
The second node identified for the visioning strategy is the surface parking lot at the intersection of Agronomy and Main Mall. This is one of the last remaining surface parking lots on campus. The UBC Campus Planning division has identified this area as a potential for an underground parking lot so the surface can be repurposed for future development (reference). This node is highly impervious and is characterized by heavy vehicular use. At the same time, as the terminus of Main Mall, there is heavy pedestrian use and open grassy space that is popular among students. There is an opportunity here to integrate urban forestry, reduce imperviousness, and improve aesthetic and wellbeing for students and faculty who frequent the area.



Agronomy Site Analysis

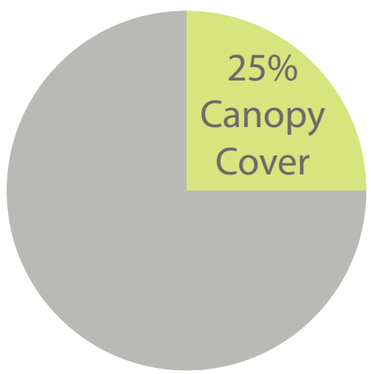
Grey/Green Space





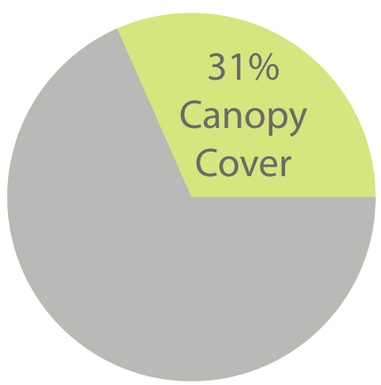
Canopy Cover on Agronomy Road

As calculated by iTree



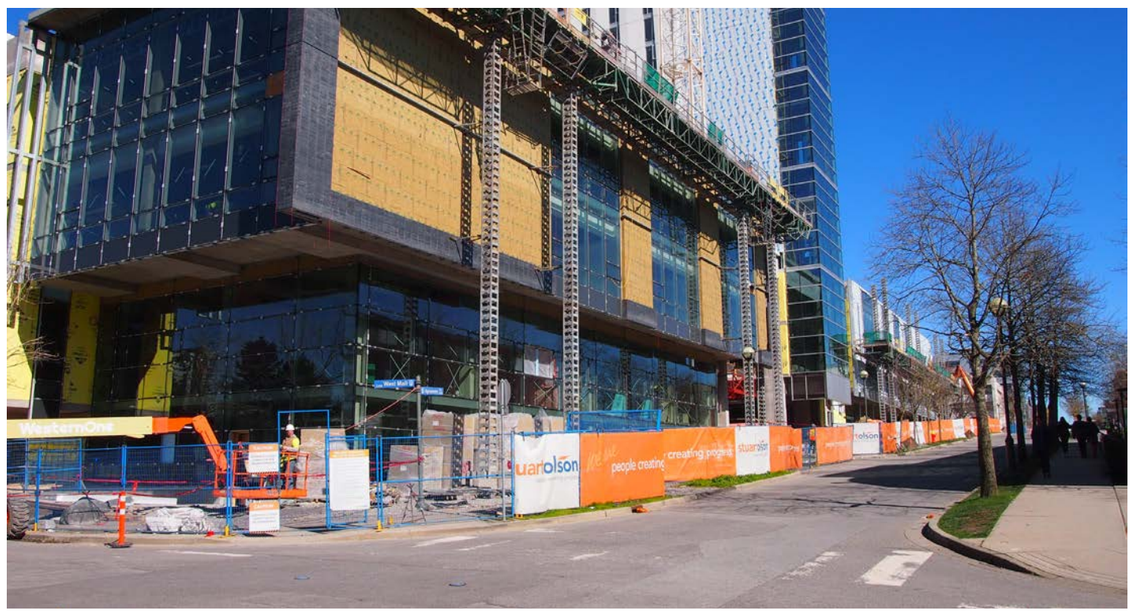
Overall Canopy Cover of UBC

As calculated by iTree



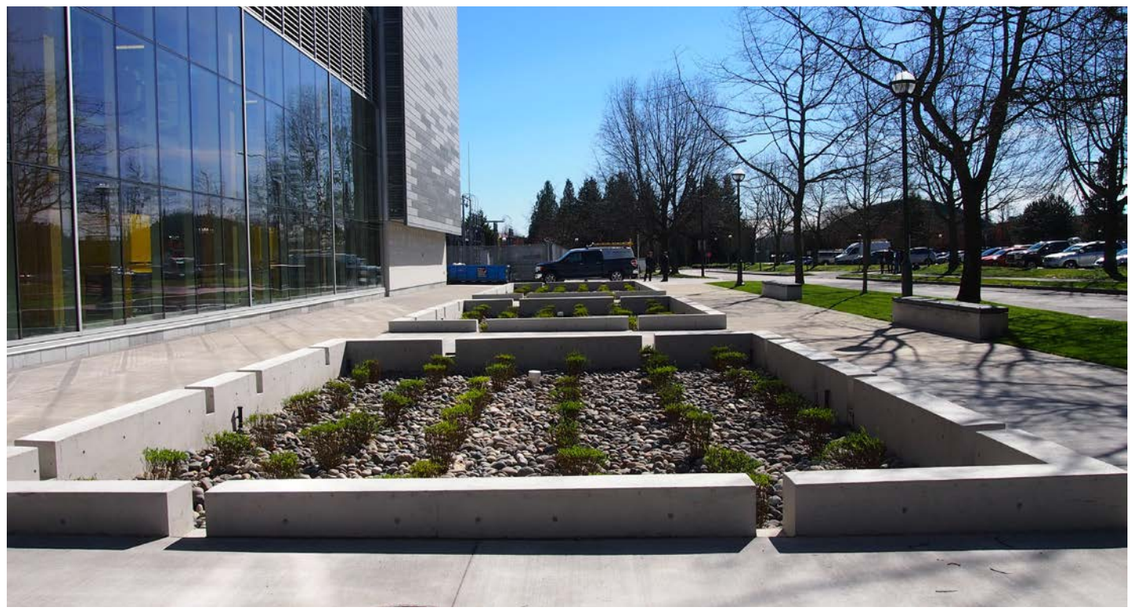
Agronomy Site Analysis

Site Character

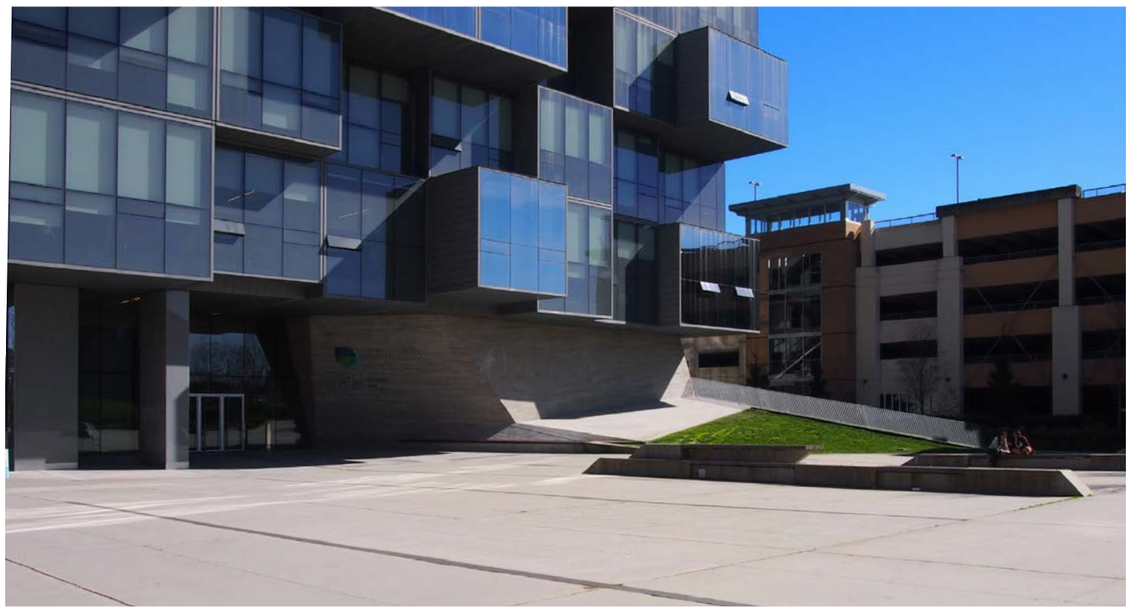


New international student housing building

Terminus of Main Mall



Energy building



Large impervious plaza

Photographs taken by Ivy Smith

Case Studies

City of London

"Plant More, Protect More, Maintain Better"

The City of London has been known as "the Forest City" when it was described as city built in the middle of a forest. It has an extensive urban forest that provides social, health, environmental and economic benefits to the community but it is under pressure from urban growth, economic challenges. Elevating the importance of the urban forest in London enhances its reputation as a place where people want to live, work and play, and create an environment that is resilient to change. The City of London urban forest strategy is developed to provide the vision and strategic direction for long-term education, planning, planting, protection and maintenance of trees, woodlands, green space in the City of London. The strategy describes the background of urban forest in City of London, the definition and benefits of urban forest, and more importantly, it outlines the principles of urban forest strategy, evaluates the performance of current urban forest program and highlights Londoners' Concerns and Vision for the Urban forest. There are 4 principles that provide overall guidance in developing the strategy: plant more, protect more, maintain better, and engage the community The concept of "right tree, right place" is fundamental to urban forest management. It suggests that suitable tree species should be selected to match their intended function and available growing space conditions.

Under 4 principles, the Urban Forest Strategy consists of 18 Strategic Goals and their associated Actions, with priority and time frame. For example, achieve appropriate canopy cover across the community; Preserve and enhance local natural biodiversity; Maintain publicly owned trees to maximize current and future benefits provided to the site; Consult and cooperate with large private landholders to embrace city-wide urban forest goals and objectives.
The key lesson from this case study is that evaluating the current urban forest project is an approach to measure potential opportunities for a new project. The existing UBC plan can be used as a based scenario -"if we do not change anything". The tree species selection and 4 principles also provide suggestions on high sustainability for long-term urban forestry strategy.

Examples of canopy cover differences in two neighbourhoods. Old North neighbourhood on the left is a mature canopy with 39% cover; Sunningdale neighbourhood on the right is a young canopy with 5% cover. (City of London)

City of Toronto

Sustaining and Expanding Toronto's Urban Forest

The City of Toronto has been called "a city within a park" with a range of 26.6% to 28% tree canopy cover. However, some potential threats to urban forest have been recognized and need to be addressed. Key challenges and issues to sustaining and expanding Toronto's urban forest include forest health threats (pests), balancing urbanization Impacts and sustaining the urban forest, climate change impacts and increasing Public Awareness of the Value and Sensitivity of the urban Forest.

There are 6 strategic goals:

1. Increase canopy cover (to 40%)
2. Achieve equitable distribution
3. Increase biodiversity
4. Increase awareness
5. Promotes stewardship and education
6. Improve monitoring

This urban forest management plan aims to achieve the long-term vision: Toronto's diverse urban forest provides the vital green infrastructure that creates healthy neighborhoods, supports habitat and biodiversity, promotes clean air and water, offers opportunities for recreation and education, fosters economic prosperity and enhances quality of life for everyone in the city.

In conclusion, two case studies show similarities. Increasing canopy cover is the most fundamental to urban forestry planning. Maintaining, monitoring, evaluating and community engagement are important parts to achieve higher, long-term sustainability. Increasing biodiversity and multi-species can improve the resilience of the community. Toronto's strategic forest management plan suggests that there is an interaction climate change and urban forest. We need to take into account the influence of climate change on trees in urban area. Moreover, it is important to consider the opportunities for both existing area and potential areas. There may be a bigger opportunity for new area in UBC as the population is expected to increase stably in the future and expansion of campus is also predictable.

Palmerston Avenue, Toronto. 1908 (left) and 2002 (right) (Toronto Strategic Forest Management Plan)

Strategy + Framework

Evaluation Matrix for Assessing Future Alternative Scenarios

A simple evaluation matrix was used to determine and assess the future alternative scenarios of the areas along the Agronomy Road Corridor. Representations of the current and future scenarios were based on a set of evaluative criteria. Three criteria were used to inform the composition of elements within the representations:

The visioning exercise demonstrates the presence or absence of these criteria in the current, future do-nothing and future resilient scenarios. The future scenarios were generated projecting estimated changes 50 years into the future.

1. Climate Resilience

This criteria includes:

- Balancing the grey-green spaces, to create sites that respond and adapt to high or low amounts of rainfall, allowing the site to appropriately manage storm water.
- A diversity of tree and plant species to create vegetation populations that are adapted to changing climatic conditions and can withstand disease and natural disturbance.
- Promoting diverse animal populations through habitat creation and food source availability.
- Erosion control and slope/bank stabilization.

2. Low Carbon

This criteria includes:

- Providing shade and shelter on the street level and for buildings to reduce energy cost of artificial heating and cooling systems.
- Changing behaviors by creating more opportunities for active transportation and minimal spaces for single occupancy vehicular traffic.
- Carbon sequestration potential of tree populations and understory vegetation materials.
- Air pollution and quality control.

3. Social Values

- Appealing visual aesthetics.
- Providing spaces for social interactions, strengthening the social community.
- Offering recreational and educational opportunities.
- Promoting psychological and health benefits.
- Offering a diversity of programmed areas on site to allow optimal use of the site.
- Noise buffer and absorption.
- Cultural and spiritual values.

Evaluation Matrix

CRITERIA

SCENARIOS

	LOW CARBON	CLIMATE RESILIENT	SOCIAL / AESTHETIC
CURRENT			
FUTURE DO-NOTHING (50yr)			
FUTURE RESILIENT (50 yr)			

Strategy + Framework

An Analysis of UBC's Design Guidelines

It is important to consider some of the key elements of UBC's design guidelines. These pivotal guides are used as a basis for all constructed projects undertaken on campus, and thus have an important and lasting impact on our campus community. We have highlighted several key components of the design guide that can be used as a basis upon which we evaluate our future alternative scenarios in the second half of the project. Specifically, we look at the 'sustainability guidelines' section of the guide. Some of the key components of the sustainability guidelines include:

Sustainability Guidelines

A. Social, Economic and Environmental Considerations — All projects must be designed to integrate sustainable best practices in design including:
i. An emphasis on social sustainability to bring students, staff, faculty, local
neighbourhood residents, and visitors together for academic, recreational, cultural and leisure activities.
ii. Consideration of economic sustainability through use of design and material selection strategies that promote cost-effective, durable, and low maintenance buildings and public realm improvements
iii. Environmental sustainability through energy and water demand management, rainwater management; respect for the forested setting for habitat and recreation; encouragement of horticultural diversity and low water-use landscaping; health and well being; and showcasing of learning, research, and demonstration projects.

B. All projects must develop specific sustainable design strategies and targets based on goals identified in individual project design briefs.

C. Leadership in Energy and Environmental Design (LEED) — All building
projects, including major renovations, on institutional campus lands must be designed to achieve LEED. Gold certification or equivalent certification: In addition, some LEED credits are mandatory for projects at UBC. See Appendix 2: UBC LEED Implementation Guide.

D. Sustainability Best Practice Building Design — To maximize the environmental sustainability and construction and operating cost efficiencies, all projects are to follow Sustainability Best Practice Building Design Guidelines itemized in Section 2.3.10 of this document.

E. Living Lab Sustainability Opportunities — As part of UBC's Living Lab objectives, all new buildings, additions, and significant renovations will be encouraged to embrace innovation and managed experimentation in their design and construction.

F. UBC Climate Action Plan — All projects will follow supplementary technical sustainability design criteria identified in the UBC Climate Action Plan, as amended from time to time.

G. Stormwater Management — All projects are to follow the stormwater
guidelines below:
i. Where possible, public amenity will be combined with surface (ponds, swales,
rain gardens) and rooftop (green roof, re-use system) stormwater facilities such that multiple benefits are realized, including potable water or energy savings, and stormwater volume reduction or flow control.
ii. Stormwater may be directed to the deep aquifer at all locations on campus.
iii. Passive infiltration to the upper aquifer is permitted only in those locations east of Main Mall Greenway and south of Crescent Road.

H. Water Management
i. All new buildings are to be designed to work with existing fire flow capacity.
System upgrades shall only be considered as the last alternative.
ii. Developments are to collect and use rainwater and stormwater where possible for appropriate uses such as irrigation or other non-potable uses.
iii. Developments are to minimize the consumption of potable water by eliminating its use where and when it is not necessary, and by maximizing efficiencies in its distribution and use.
iv. Developments shall minimize domestic, institutional, and industrial wastewater transported off site by reducing volume, reusing or treating on-site.
v. All new buildings are to be designed to follow and support UBC's waste management objectives and infrastructure.

I. All new buildings are to be designed to follow and support UBC's waste management objectives and infrastructure.

J. All new buildings shall provide performance monitoring (metering) infrastructure for the following systems:
i. Water
ii. Electric: to allow discrete monitoring of lighting, plug loads and mechanical systems
iii. Thermal

K. All new building performance monitoring equipment shall be compatible with UBC's data collection system and building design shall include display features for building occupants and passersby to show building performance.

L. Street Trees: Street tree planting for all primary and secondary streets must be consistent with Map 3-9 Street Trees. These choreographed selections will, over time, bring beauty and coherence to the campus while still allowing a wide range of seasonal colour, scale, and biodiversity. Gateways, special places and routes are accentuated. Consistency along significant spines enhances character place-making and way-finding

(UBC Campus Plan Design Guidelines)

FUTURE ALTERNATIVES SCENARIOS

(research.ubc.ca)

Existing Conditions

Site 1:
Wesbrook @ Agronomy

Site 2:
Agronomy and Main Mall Surface Parking Lot

Site 1: Wesbrook @ Agronomy

“Business as Usual” Scenario

Assumptions

In this scenario, it is assumed that a multistory mixed use development will inhabit this vacant site within the next 50 years. This mirrors the current level and pace of development that can be seen throughout campus today. In addition, the buildings would be mixed use, as the UBC Campus Planning has goals for the Wesbrook and Agronomy Road intersection to be a mixed use hub in the overall campus plan. They would also be LEED certified, as the campus design guide has a requirement for all new projects to be LEED gold certified or higher. Planting would be characterized by an adequate amount of open space, with street tree planting to likely be ornamental species (as currently seen further down Agronomy Road). Vegetated buffer strips would likely be predominantly grass, otherwise boxwood planting as seen in front of the Life Sciences building. Regardless, there is little biodiversity value in either grass or boxwood. In addition, neighboring open space (seen at the bottom of the image) would potentially be filled with additional residential towers.

Evaluation and Trade-offs

The most important trade-off in this example is that the current permeable lot would be converted to a development site, adding density but reducing potential for natural, green open spaces. In turn, there would be reduced opportunity to plant large canopied trees that could help mitigate the impacts of the amount of hard surface at this particular intersection. Additionally, significant impermeable surface would leave little room for diverse understory planting that could support a range of species including birds, butterflies and bees. Overall, there are several positive elements of the campus design guide that could potentially manifest on this vacant lot within the next 50 years. Increased density as an adaptive strategy to climate change, low maintenance planting, low irrigation needs, and stormwater collection, are just a few of the strategies that could take place in the “business as usual” scenario. However, the overall sustainability guide in the UBC Design Guidelines suggests that there is less of a focus on increasing canopy cover and biodiversity, and rather, more of an effort on ensuring a cohesive street tree strategy as outlined by the guide, which would lead to more of a monoculture of trees, increasing susceptibility to disease. These components represent the downside of the “business as usual” scenario..

1. High-rise Mixed Use Development
2. High Maintenance Vegetation
3. Impervious Surfaces Leading to Increased Runoff
4. Small, Ornamental Trees with Little Biodiversity Value
5. Continued High Rise Construction In Adjacent Areas

Site 1: Wesbrook @ Agronomy

"Resilient" Scenario

Assumptions

The resilient scenario represents a radical, though potentially realistic example of what the vacant lot could look like should a full scale urban forestry strategy be adopted. Instead of populating the site with tower development, the permeable site would remain permeable and become a forest patch. Tree canopy cover would increase dramatically, cooling the predominantly paved area and providing a social space for users. The site would be divided into 3 major forest patches with ample walking room between, to ensure the area felt safe enough for students to walk through at night. Instead of following the slightly limiting street tree strategy utilized by UBC, site planting would be inspired by the Western Coastal Hemlock Zone, that is characterized by cedars, hemlock trees, salal, sword fern and other native species. This plant and tree selection would then support an abundance of species and become a site rich in biodiversity. The forest patch could also be an ecological connector that linked the two disconnected forests to the north and south of the campus, allowing birds, animals and other insects to establish habitat. This is a stronger scenario than one provided by a static and uniform street tree strategy that could result in rapid spread of disease.

Additionally, pedestrian circulation and bike paths would be converted to permeable paving, allowing water to infiltrate directly into the ground. The bike path would widen to take up one vehicular lane, reducing traffic and potentially encouraging walking/cycling as the dominant form of transportation.

Evaluation and Trade-offs

The major trade-off in the resilient scenario is that UBC would have to trade density for open space. However, as reinforced in this project, the value of open space is immense, especially if open spaces begin to integrate increased forest canopy cover. While this lot may not house classrooms, apartments, or offices, it is contributing to student life by cleaning the air, reducing heat island effect, providing shaded social spaces for students, increasing permeability and water collection, and many other benefits. In relation to the UBC Design Guide, the site is literally and figuratively becoming a living lab, integrating a dynamic ecological patch that provides environment and social benefits, as well providing research opportunities for the faculties that are located along agronomy (Land and Food Systems, Life Sciences, Forestry). In short, it is creating a living laboratory for these students. In addition, considering the significant increase in density attributed to the new international student housing project on the south end of Agronomy Road, this vacant site could be considered a community amenity contribution opportunity for the developer. Thus, in the face of such great amount of construction occurring along Agronomy, it is essential that some space get preserved as open, green, and natural.

1. Mulch and Moss groundcover to support stormwater infiltration
2. Douglas Fir, Cedar, Salal, Ferns
3. Permeable Paving on Pedestrian Route
4. Expanded Bike Lane with Permeable Pavers
5. Understory to Support Biodiversiy
6. Increase Tree Canopy along Road Medians
7. Replace Grass strips along sidewalk with native planting
8. Benches and Fixed Seating

Site 2: Agronomy and Main Mall Surface Parking Lot

“Business as Usual” Scenario

In this “Business as Usual” scenario, UBC design guidelines were used to guide the visioning scenario elements. Typical UBC campus new development trends are shown here to show how the surface paking area may appear if it were to be developed according to development history on campus.

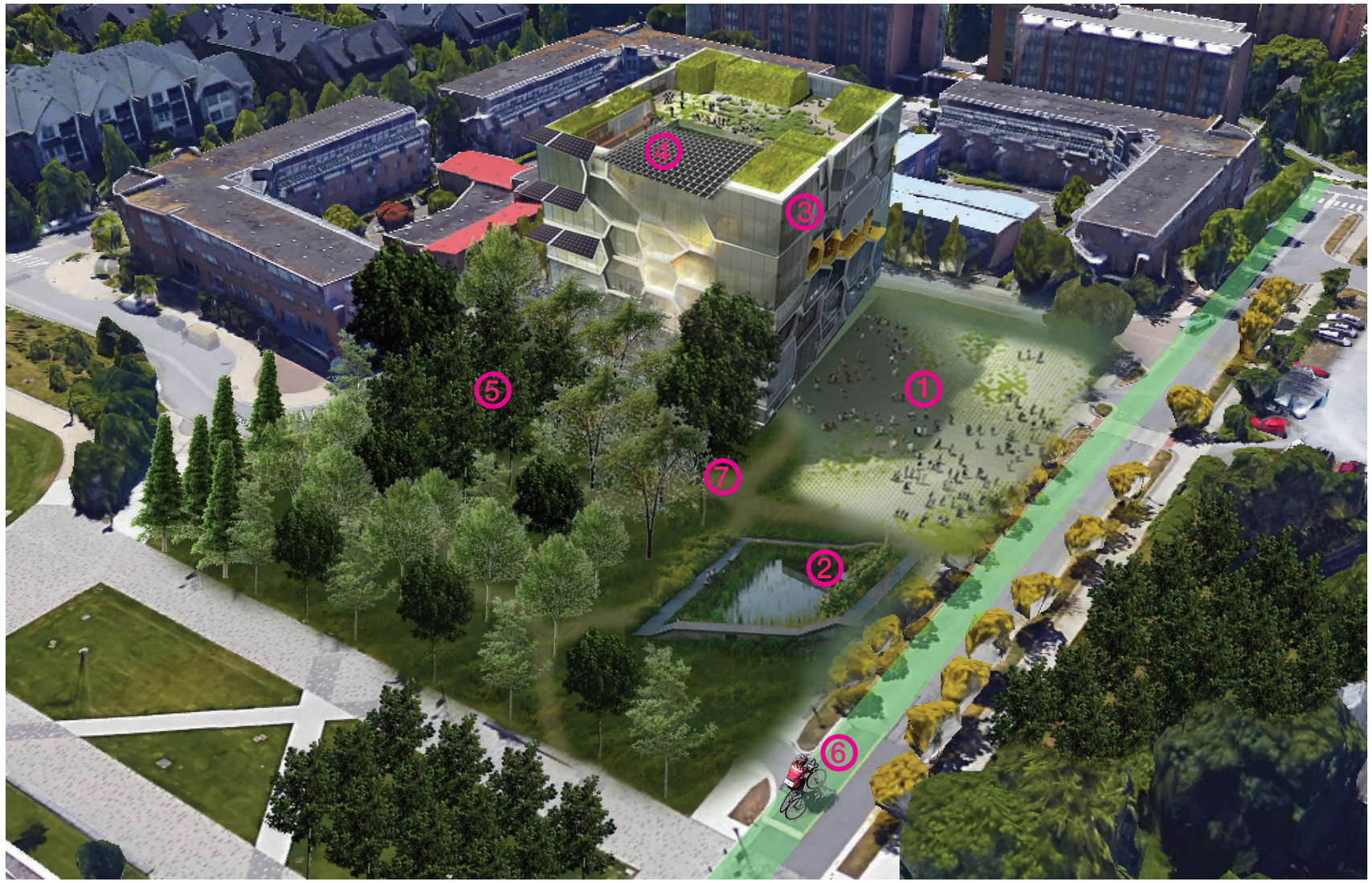
1. Underground parking supporting vehicular transportation to campus
2. Typical new development
3. Single species of tree planted in unfavourable conditions
4. Driving culture supported through road configuration (lack of bike lanes)
5. Large areas of impermeable or low permeability paving

Site 2: Agronomy and Main Mall Surface Parking Lot

“Future Alternative” Scenario

This visioning scenario imagines the potential of the surface parking lot on Main Mall and Agronomy Road. This scenario incorporates green infrastructure and buildings, an increased and more diverse canopy cover as well as more chances for human nature interaction right on campus.

In this scenario building footprint has been traded for increased natural space. We suggest to compensate for this lost building square footage potential, existing campus buildings are retrofitted to incorporate higher density floor space. Also this natural area offers an outdoor classroom and outdoor learning space bringing students outside to learn.



1. Permeable plaza
2. Stormwater retention pond also functions as gathering space
3. Living building with green roof has smaller footprint
4. Solar panels produce energy for new building operations
5. Increased tree canopy cover with diverse forest (age and speceis)
6. Designated cycling lane
7. Safe and inviting forest trails and access promotes outdoor classroom and recreational uses

Visioning Results and Recommendations

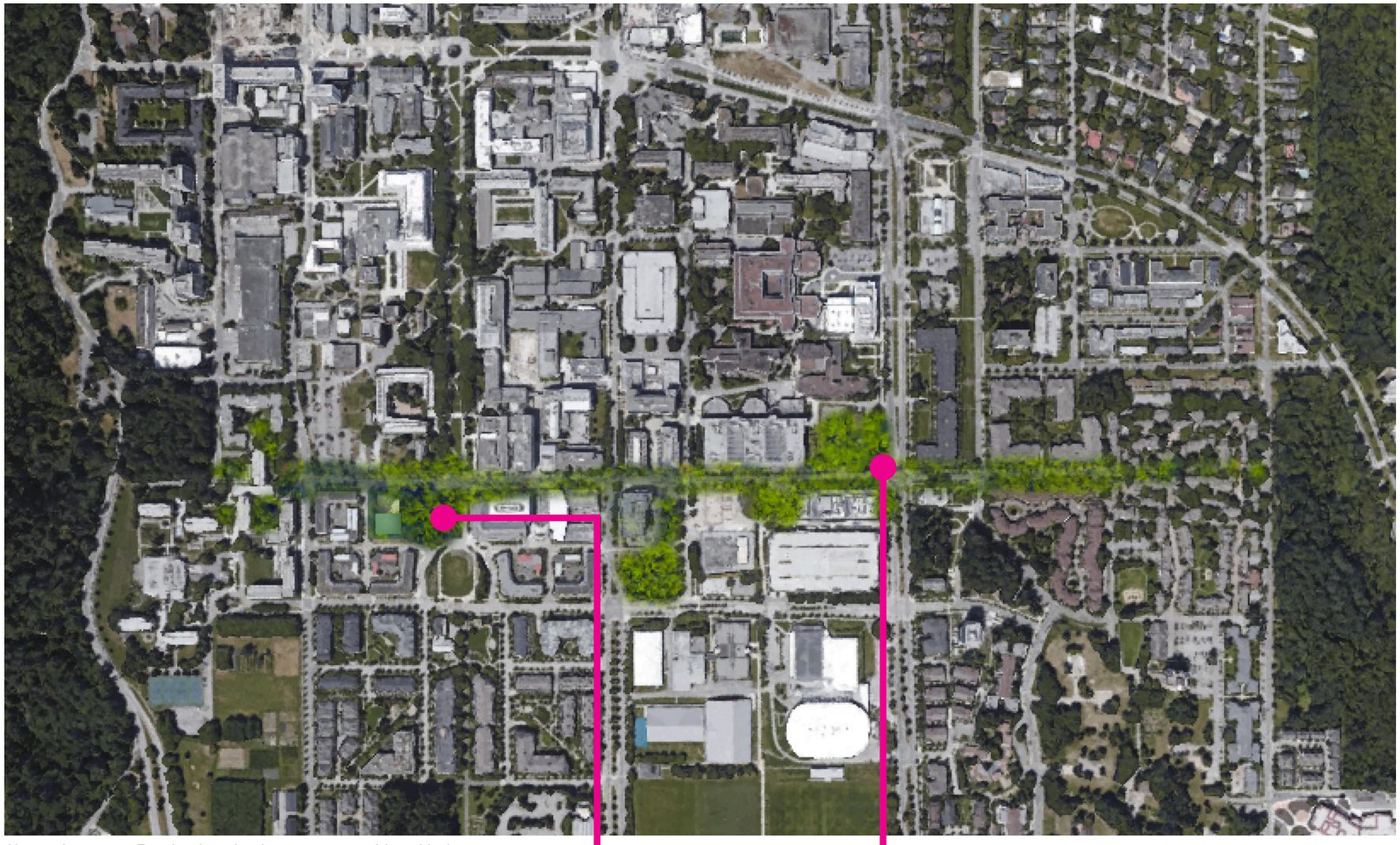
Based on our analysis of the future alternative scenarios, we have outlined 5 recommendations that should be incorporated into the Design Guidelines to better protect UBC's urban forest and move the community towards a more resilient and adaptive future:

1. Biodiversity guidelines should be included within the 'Sustainability Guidelines' portion of the design guide. That is, an overall goal addressing the need for diverse plant species, and consideration for larger ecological systems that support animals, pollinators, and other integral components of our ecosystem.

2. There should be a goal outlining current canopy cover percentages and future percentage cover goals, especially given the amount of development that takes place on campus. This percentage goals should be evaluated every year to ensure that construction is not harming UBC's urban forest. Also, developers should be responsible for ensuring canopy cover percentage does not diminish as a result of construction.

3. UBC Planning's current street tree strategy should be removed and revised with a more dynamic, diverse and resilient strategy. Currently, the street tree strategy is characterized by uniform and aesthetically pleasing species that are planted along entire streets. Rather than focusing on aesthetic qualities and trees as tools for wayfinding, UBC should consider a less 'uniform' strategy, and implement one which allows for ecologically valuable species that prevent spread of disease and are resilient in the face of natural disturbance. Additionally, there should be guidelines for designing and planting a rich understory that complements the street tree strategies. Rather than opting for grass, the guidelines should address planting of other native and biodiversity rich species that promote pollinators, birds and other ecologically valuable species.

4. The campus design guidelines should address eliminating grass buffers between street and road to accommodate for more resilient and multifunctional use. This could be a rich shrub layer, rain gardens that collect stormwater, or a native seed mix that is a low maintenance alternative to grass. Overall, the use of grass should be decreased and replaced with one of these more sustainable and resilient options.



Above: Agronomy Road re-imagined as a green corridor with dense tree canopy

5. Finally, given the amount of development on campus, UBC Campus Planning should consider enacting a strict public amenity contribution strategy for any development on campus. For example, the new international student housing building on Agronomy Road should be required to contribute to either canopy cover goals or open space on campus, given the scale and footprint of the building. Existing open space or new vacant spaces could be potential sites for such contribution.

Total Site Surface Area:	*448,327 sqft.*
Current Canopy Cover Area	*112, 081 sqft.*
Current Canopy Cover %	*25%*
New Canopy Cover Area	*86,982 sqft.*
Total Canopy Cover	*119,063 sqft.*
New Canopy Cover %	*44%*

Note: calculations are an approximation and were calculated using a scaled map and polygons to determine surface area of tree canopy

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