Urban Forestry Management Plan: Recommendations for the University of British Columbia Vancouver Campus

Jessica Lompart, Thomas Ikeda

University of British Columbia

FRST 449

September 07, 2017

URBAN FORESTRY MANAGEMENT PLAN: RECOMMENDATIONS FOR THE UNIVERSITY OF BRITISH COLUMBIA VANCOUVER CAMPUS

UBC SEEDS 2017

Completed by: Thomas Ikeda and Jessica Lompart as a 3-credit directed studies for the Social Ecological Economic Development Studies (SEEDS) project (FRST449C), with contributions from Stephen Sheppard (Faculty of Forestry)

Supervised by: Cecil Konijnendijk (Faculty of Forestry)

Support from Campus and Community Planning (C &CP) and Building Operations
Karen Russell- Manager of Development Services, C& CP
David Gill- Program & Policy Planner, C & CP
Dean Gregory- Landscape Architect, C & CP
John Madden- Director of Sustainability and Engineering, C & CP
Jeff Nulty- Landscape Architect, Building Operations

EXECUTIVE SUMMARY

The University of British Columbia (UBC) Vancouver campus has a green reputation. It is located within the Pacific Northwest on the lower mainland of British Columbia within the Coastal Western Hemlock Biogeoclimatic zone. The Vancouver campus's landscape was originally designed around the idea of "a clearing in the forest". However, based on interviews with members of the campus community, we noticed that an interest for integrating the forest into campus has emerged. As such, UBC now faces the challenge of balancing its urban forest values and resources, development pressures, and an ever-increasing student body.

The original objective of the project was to review tree retention and protection policies currently in place and provide recommendations to improve them. The need for this was based on significant loss of UBC's urban forest due to development all around campus (Sutherland, 2012). However, based on an analysis of current guidelines and best practices, it was identified that UBC needs a complete urban forest management plan to adequately protect and replace its trees. As such, the scope of this report expanded to provide recommendations to strengthen the implementation and enforcement of tree policies and procedures at the UBC Vancouver campus. In doing so, this report seeks to maintain and improve UBC's current urban forest and reflect the values and needs of campus stakeholders. The recommendations were based on an analysis of current plans and guidelines for the UBC campus, interviews with key actors involved with urban forestry on campus, and an analysis of urban forestry management plans of other major municipalities and university campuses.

Five main recommendations were outlined:

1. Improve implementation and enforcement of urban forest management policies and guidelines
2. Maintain and improve distribution and cohesivity of the campus urban forest
3. Incorporate aesthetics management into urban forest management as a part of campus landscape design
4. Empower the campus community in urban forest management on campus and facilitate community involvement in its governance
5. Take into consideration potential future challenges and opportunities (including the effects of climate change and future development projects on campus) into urban forest management and create achievable, guiding long-term goals for campus's urban forest

Table of Contents

List of Figures

Urban Forestry Management Plan:

Recommendations for the University of British Columbia Vancouver Campus

1. Introduction

1.1 Purpose

This report was commissioned as a Social Ecological Economic Development Studies (SEEDS) project to research and provide recommendations to better protect and manage UBC's urban forest by strengthening and improving management policies. The Vancouver campus consists of a total of 4.02 square kilometres in size and features a robust urban forest throughout its grounds. UBC's reputation as a global leader in sustainability and having a beautiful campus are both intimately related to its urban forest. The concept of the urban forest includes individual and collections of trees within an urban setting (i.e. street trees, larger group plantings of trees, unmaintained urban vegetation, etc.). The urban forest contributes to the aesthetic value of campus and provides many other key ecosystem services, such as temperature regulation and carbon sequestration (Miller, Hauer, & Werner, 2015).

1.2 Rationale

From UBC's Vancouver Campus Plan (VCP), one of its main vision outcomes is to: "Have a beautiful campus that reflects its natural west coast setting and sense of place" (University of British Columbia, 2010a). Based on several interviews with various members of the campus community and a study of general best practices for urban forest management, current policies related to urban forest management do not support this vision. UBC currently lacks a single, unifying urban forest management plan and instead, management falls under a complex web of different policies, plans, and technical guidelines. This has led to a lack of implementation and enforcement of tree protection and produces ambiguities in UBC's goals for its urban forest. Campus's urban forest is likely declining significantly every year, but there is currently nothing directly monitoring this or investigating how much is lost annually. Also, UBC historically used to have an outstanding arboretum planted through a large part of campus. This too has been declining since its establishment (around the same time as the establishment of

UBC) and it goes unrecognized by most of the campus community. Without clear understanding and recognition of the resources on campus, efforts to improve the management of the urban forest may be ineffective. The recommendations provided in this report should act as guidelines to improving urban forest management at the UBC Vancouver campus.

1.3 Aims and Objectives

The overall aim of this report is to contribute to the enhancement of current policies, procedures, and their implementation for urban forest management at the UBC Vancouver campus. These recommendations aim to help create a holistic experience for all users at the UBC Vancouver campus that incorporates all the ecosystem services that an urban forest may provide. The Vancouver campus strives to uphold their reputation as a sustainable and green campus with a focus on beautiful landscape and buildings.

The specific objectives are to:

1. Provide inputs for a long term guiding urban forestry management plan for UBC by analyzing current plans, guidelines, practices, and current urban forest governance.
2. Help UBC achieve its vision of a beautiful and attractive campus with a strong sense of place and a West Coast feeling.
3. Increase the value of the campus urban forest in relation to the health and well-being of the campus community, as well as through its contributions to climate change mitigation and adaptation.
4. Align UBC's current urban forest management practices with UBC's sustainability goals.

2. Methods

To provide recommendations for the implementation and enhancement of urban forestry policies and procedures at the Vancouver campus in the light of massive development pressures, we analyzed documents and reports and carried out stakeholder interviews. The first phase of the research included analysis of primary and secondary sources to better understand what other major municipalities and campuses across Canada and internationally are currently doing to manage their urban forests. In addition, we walked the campus and observed current urban forestry practices at UBC, with particular focus on tree retention and replacement practices. We focused our walks around construction and other development sites to observe

measures being taken regarding tree protection. We also conducted multiple interviews varying from half an hour to an hour in length with various stakeholders representing the administrative and academic sectors of campus community as well as outside, third-party urban forest experts. The interviewees were asked a series of guiding questions to find out their perspective on current management practices at UBC. The following is a list of interviewees from the Campus and Community Planning (C&CP) Division, Campus Building Operations (Building Ops), and Faculty of Forestry & Landscape Architecture;

- Karen Russell – C&CP Manager, Development Services
- John Madden – C&CP Director, Sustainability & Engineering
- Dean Gregory – C&CP Landscape Architect, Planning and Design
- David Gill – C&CP Program & Policy Planner
- Jeff Nulty – Building Ops Vancouver Landscape Architect
- Collin Varner – Building Ops Vancouver Campus Arborist
- Stephen Sheppard – Professor and Program Director, UBC
- Cecil Konijnendijk – Professor of Urban Forestry, UBC
- Cynthia Girling – Professor of Landscape Architecture, UBC
- Peter Brinson – Professional Arborist, and UBC lecturer

Finally, we delivered a presentation to a group of stakeholders and SEEDS representatives on our recommendations followed by a discussion period. We also took part in the International Society of Arboriculture Conference 2017 held in Washington DC, participating in the student presentations.

3. Recommendations

Please refer to the **Appendix A for a summary of recommendations.*

To understand what an enforceable urban forestry management plan might look like for the Vancouver Campus we began by drawing inspiration from Tree Campus USA. Tree Campus USA is organized by the National Arbor Day Foundation and outlines 5 standards that a university campus must adhere to in order to receive Tree Campus USA recognition. These 5 standards are as follows (detailed description found in the **Appendix B**):

1. Campus Tree Advisory Committee
2. Campus Tree Care Plan
3. Campus Tree Program with Dedicated Annual Expenditures
4. Arbor Day Observance
5. Service Learning Project

The University of British Columbia has the opportunity to develop and strengthen standards 1 to 4. Standard 5 is represented by the current SEEDS program that allows for campus service learning projects to be implemented, such as this project on campus tree policies and procedures. Expanding beyond these five standards and focusing on strengthening campus urban forest management regarding implementation and enforcement of policies and procedures we have determined five foundational recommendations:

1. Improve implementation and enforcement of urban forest management policies and guidelines
2. Maintain and improve distribution and cohesivity of the campus urban forest
3. Incorporate aesthetics management into urban forest management as a part of campus landscape design
4. Empower the campus community in urban forest management on campus and facilitate community involvement in its governance
5. Take into consideration potential future challenges and opportunities (including the effects of climate change and future development projects on campus) into urban forest management and create achievable, guiding long-term goals for campus's urban forest

3.1 Improved implementation and enforcement of urban forestry management policies and guidelines

I. Roles each department (i.e. C&CP and Building Ops) play in urban forest management should be clarified, collaborative goals in urban forest management better defined, and communication and processing between departments made more efficient and effective
II. Creation of a regularly updated and maintained tree inventory
III. Creation of a significant tree registry
IV. Clarify urban forest values and goals, including specific definitions of what is trying to be achieved and how it will be achieved

V. Top staff in planning and permitting side of urban forest management should be International Society of Arboriculture (ISA) certified, as well as those involved in direct maintenance of trees. Also have at least one/a few ISA certified staff in each department/division involved in urban forest management

3.1.1 Urban Forest Management Roles

The current governance structure for urban forest management at UBC is split mainly between two different departments, C&CP, which is responsible for general campus landscape planning and permits, and Building Ops, which is responsible for maintenance of the campus landscape. This split has led to challenges in the implementation and enforcement of urban forest guidelines and plans. In interviews with members of the campus community, there are multiple occasions where actions and plans regarding a site design or tree removal was permitted by the planning side of urban forest management but the other members of the campus community strongly opposed these actions. As such, the roles that Campus and Community Planning and Building Operations Divisions play in urban forest management should be clearly defined between them to avoid miscommunication and mismanagement on decisions regarding tree replacement, removal, and retention. Both departments, C&CP and Building Ops, have many responsibilities, and we propose they come together to better define the roles of each, set overarching goals for the campus urban forest, and determine potential limitations. An urban forestry task force needs to be created in order to align goals, communication, and budgets to achieve a campus urban forest that reflects the vision of all stakeholders. Also, a position for a bylaw enforcement officer dedicated to urban forest related issues should be created to help fill gaps within the current implementation and enforcement of urban forestry policies and procedures. This position is crucial to the longevity of UBC's urban forest, as it ensures that the vision for the urban forest is met.

The City of Surrey is a great example of how their clearly defined roles within their urban forestry staff help form a strong urban forestry department. The foundational structure of how the City of Surrey deals with urban forestry matters is similar to that of UBC, where separate departments handle bylaw enforcement and maintenance of trees and parks. The City of Surrey Trees and Landscape Section staff is made up of Landscape Architects, Arborists, Clerks, and a Manager. The responsibilities of each of these positions is quite similar to that of UBC's staff responsibilities, with a prominent difference being that all City of Surrey's Arborists and

Landscape Architects hold an ISA Professional Arborist certification along with the arborists also having Tree Risk Qualifications.

3.1.2 Tree Inventory

A complete and maintained tree inventory is crucial to the proper implementation and enforcement of tree policies and procedures on campus. Equipped with this knowledge, campus urban forest planners and managers will have a better understanding of existing ecosystem services and their distribution across campus. Currently, during the summer of 2017, there is a new tree inventory which is being established.

3.1.3 Significant Tree Registry

Currently included in the VCP is a list of significant trees. According to the VCP, these trees are given special protection and should be retained. However, through our interviews, many members from different parts of the campus community voiced their concern that this list is too short and the trees on this list are not given the level of recognition or protection that the VCP states they should. The criteria for this significant tree registry should be expanded to include trees of a notable age, rare species, and great historical value, as well as include trees of significant value to the identity of UBC campus. Also the campus community should be given the ability to nominate trees to this list, as this fosters a sense of ownership among the campus community for the urban forest. An example of a successful implementation and enforcement of a significant tree registry can be found with the City and County of Honolulu, which, in 1975, passed the Exceptional Tree Act to protect trees from development pressures. The protected trees are deemed exceptional by the Arborist Advisory Committee based on criteria including: historic/ cultural value, age, rarity, location, size, esthetic quality, and endemic status (City and County of Honolulu, 2017). These trees can be nominated by normal citizens and, once accepted, these trees require special permits for any project that may harm them.

3.1.4 Clarity and agreement on key concepts and definitions related to urban forestry

We have found that the current definitions for the concepts of a greenway, west coast feel, and biodiversity, which are key terms related to the urban forest on campus, are inconsistent or lacking altogether. This creates confusion on what is being managed for and what the campus urban forest is supposed to look like. These definitions must be clearly outlined, focusing on user experience, to support the implementation and enforcement of the urban forestry policies and procedures. This helps unify the vision for the campus urban forest

and clarify the overall goals. Also, within the VCP, the UBC Technical Guidelines, and other pertinent documents related to urban forestry management, a glossary of terms should be included to resolve any potential confusion in interpretation.

3.1.4.1 Greenway

The term “greenway” is used frequently in the VCP in explaining how UBC will integrate an open space network into the campus landscape (see **Figures 1 & 2** for photos of greenways on campus as defined in the VCP). A greenway can also go hand in hand with the term green corridor and these terms should be aligned and expanded upon. However, the concept of a greenway should not be too narrow, as it can vary with land use, composition, structure, etc. What should remain consistent are the key components, such as different types of ground cover, landscape aesthetic, and general long term goals for species composition. The temporality needs to be taken into consideration as well, as the canopy will vary seasonally due to the deciduous species losing their leaves in the autumn season versus being fully flushed with leaves in the summer season (see **Figure 3** for photo displaying significance of this). Lastly, consideration for the connectivity and continuity of greenways as a component of a larger green, open space network.

Figure 1: University Boulevard greenway (Ikeda & Lompart, 2017a).

Figure 2: Main mall greenway (Ikeda & Lompart, 2017b).

Figure 3: Difference in leaf flush timing for differing tree species (Ikeda & Lompart, 2017c).

3.1.4.2 West Coast Feel

In one of the visions from the VCP, UBC strives to create a 'West Coast Feel' on campus for all users. The urban forest plays a key role in achieving this in the campus landscape. The vegetation found around campus is one of its most notable features and is especially important regarding this vision as this part of the West Coast is known for its lush greenery (see **Figure 4** for example on campus). To properly work this into UBC's urban forest management practices, a 'West Coast feel' must be clearly defined. This will strengthen the implementation of a West Coast feel across campus by specifically guiding urban forest management around clear specification, which will have a stronger impact on decisions made regarding the campus landscape. This definition should include native understory such as salmonberry, salal, sword fern, and kinnikinnick and potentially native conifers such as Western Redcedar, site conditions permitting. Campus design need not be solely native, however. Urban conditions may not be suitable for many native species and such restrictive plantings would limit campus biodiversity, another key objective for UBC. As such, a West Coast feeling on campus must include a mix of both native and exotic species and must be approached from a different angle than simply species selection.

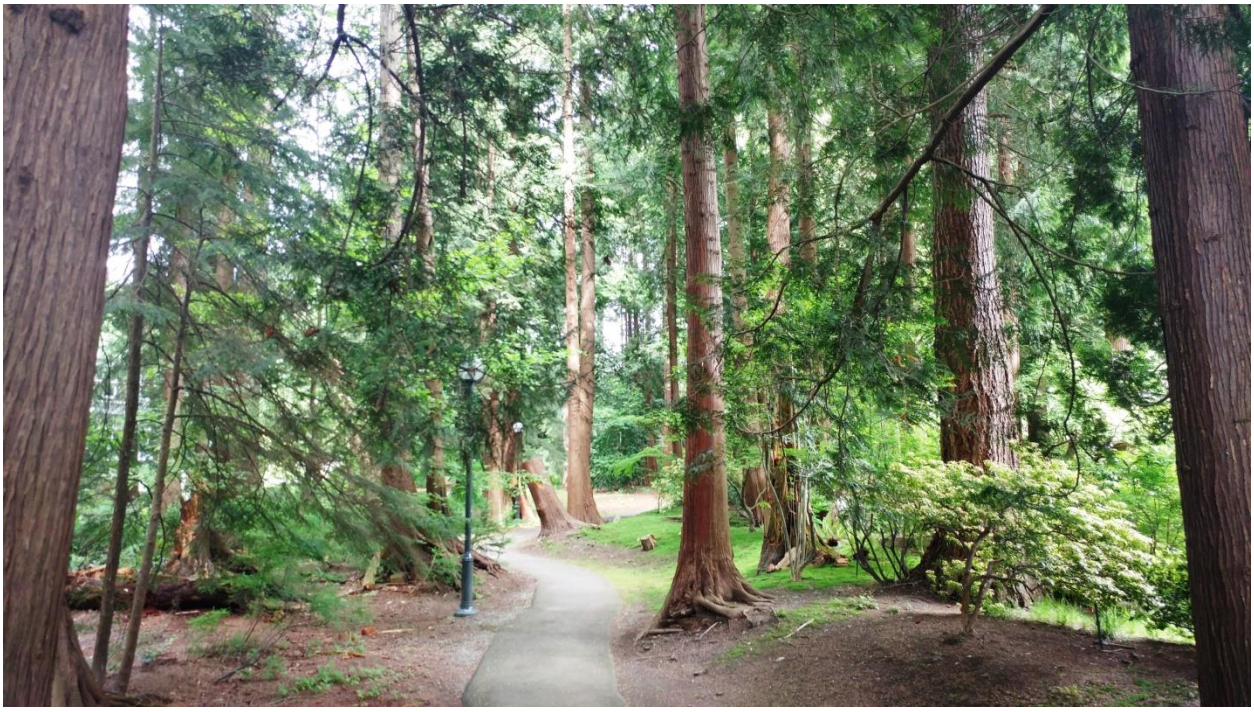

Figure 4: Forested area near Asian Centre on UBC Vancouver Campus (Ikeda & Lompart, 2017d).

3.1.4.3 Biodiversity

UBC has a large amount of tree species diversity on campus but is threatened by the pressure from both development and the loss of many trees due to poor health. However, although this problem is recognized, biodiversity involves much more than just species or even genus diversity. Biodiversity includes genetic diversity within species, diversity in form and function in relation to people and structures, and diversity in ecosystem services. The definition for biodiversity must include these other aspects of biodiversity to better manage for this in the urban forest. UBC is in position to be a leader in biodiversity through its urban forest, as its Vancouver campus has abundant biodiversity resources in what remains of the old arboretum, its numerous gardens, and its street trees. A holistic approach to biodiversity aligns perfectly with UBC's reputation as a leader in sustainability and this approach to biodiversity is not commonly implemented elsewhere.

3.1.5 ISA Certification

To help align decisions made regarding urban forestry management on campus we recommend ISA certification for the landscape architects within Campus and Community Planning as well as Building Operations. The ISA certification should also be held by all grounds crew staff who deal with the hands-on maintenance of campus trees. This certification is important because it can help improve legitimacy to decisions made regarding trees on campus, as well as provide a larger knowledge base on tree biology and maintenance. This includes an understanding of soil science and how the soil is impacted by construction, including compaction within a tree's critical root zone and the type and amount of soil which must be provided for new trees on a developed site to ensure their long-term survival. The education and experience of all staff involved in urban forestry management on campus may vary and so the ISA Certification will help create some common ground for staff and bridge gaps in communication.

3.2 Improved Distribution and Connectivity

I. Create an open space network
II. 5 min access to greenspace from anywhere on campus

3.2.1 Open Space Network

Currently, greenspace exists throughout the Vancouver Campus. However, these green spaces are unevenly distributed, with a greater area of greenspace along the outer edge and north-side of campus, as seen in **Figure 5**. This may be influenced by the character districts described in the VCP, as the Forest Character district (**Figure 6**) is the only character district that recommends larger coniferous trees (examples of which can be found currently near the Chan Centre and at Totem Park). The campus open space and commons network map (**Figure 5**) identifies two greenways: Main Mall going North-South and University Boulevard going East-West. These two greenways fail to connect a large portion of the greenspace on campus, as they only pass through its center axes. UBC can create a better connected open space network by connecting pockets of greenspace throughout campus to these already established greenways in a 3 x 3 matrix of greenways across campus. This may be accomplished by converting and designating East Mall and West Mall as greenways, which are aligned north-south, along with greenways going east-west in South Campus and North Campus. A potential greenway in South Campus is, as of the writing of this report, currently being studied along Agronomy Road.

It is not enough to simply establish these this network, however. It must be maintained and protected to continue to enrich the campus landscape and provide ecosystem services. The protection and enhancement of a green network on campus should be of high importance as it plays an important role in the Vancouver campus's reputation. People come from all over the world to visit, study, work, and/or live at the UBC Vancouver campus and UBC must maintain its image and reputation as a sustainable and green campus to continue to attract the quality of people it does. If most green corridors consist of deciduous species which hold no leaves over the winter, then the user experience during winter, the busiest time on campus, should be studied to better understand the health and well-being benefits of these leaf barren green corridors. This network and the individual greenways that it consists of should therefore be designed with the goal of longevity and protected as such.

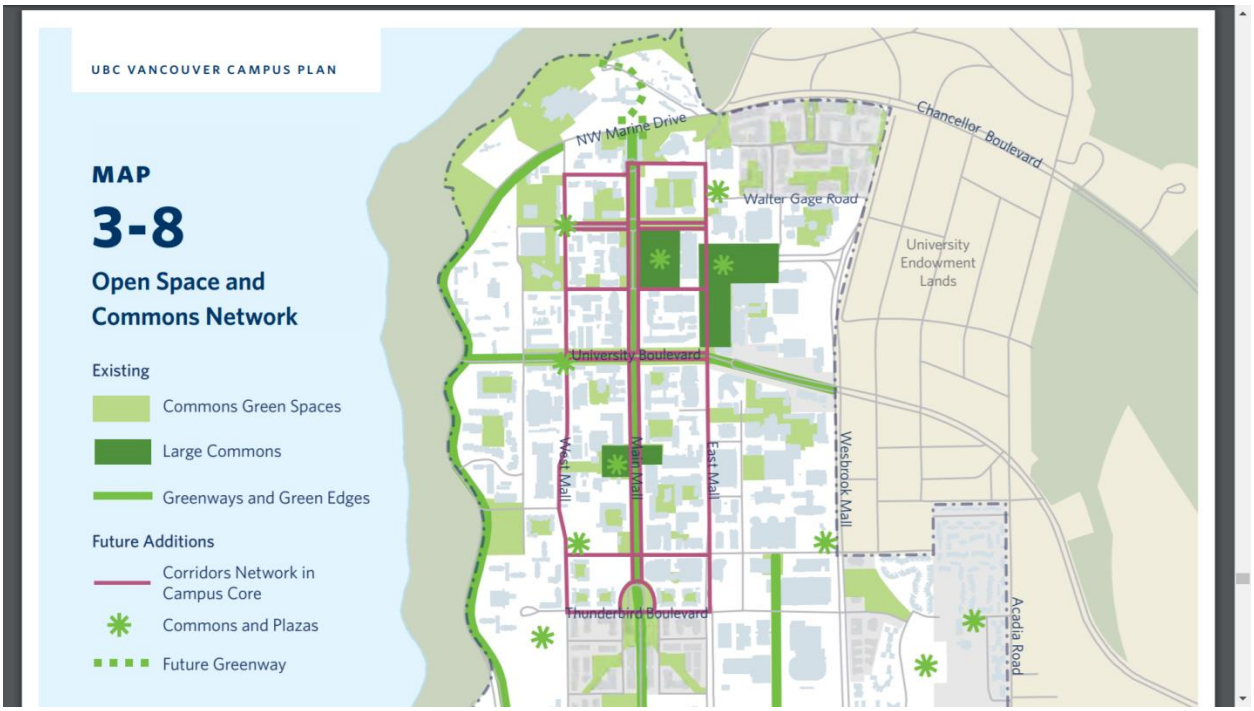

Figure 5: Map of Open Space and Commons network across UBC Vancouver campus (The University of British Columbia, 2010d)

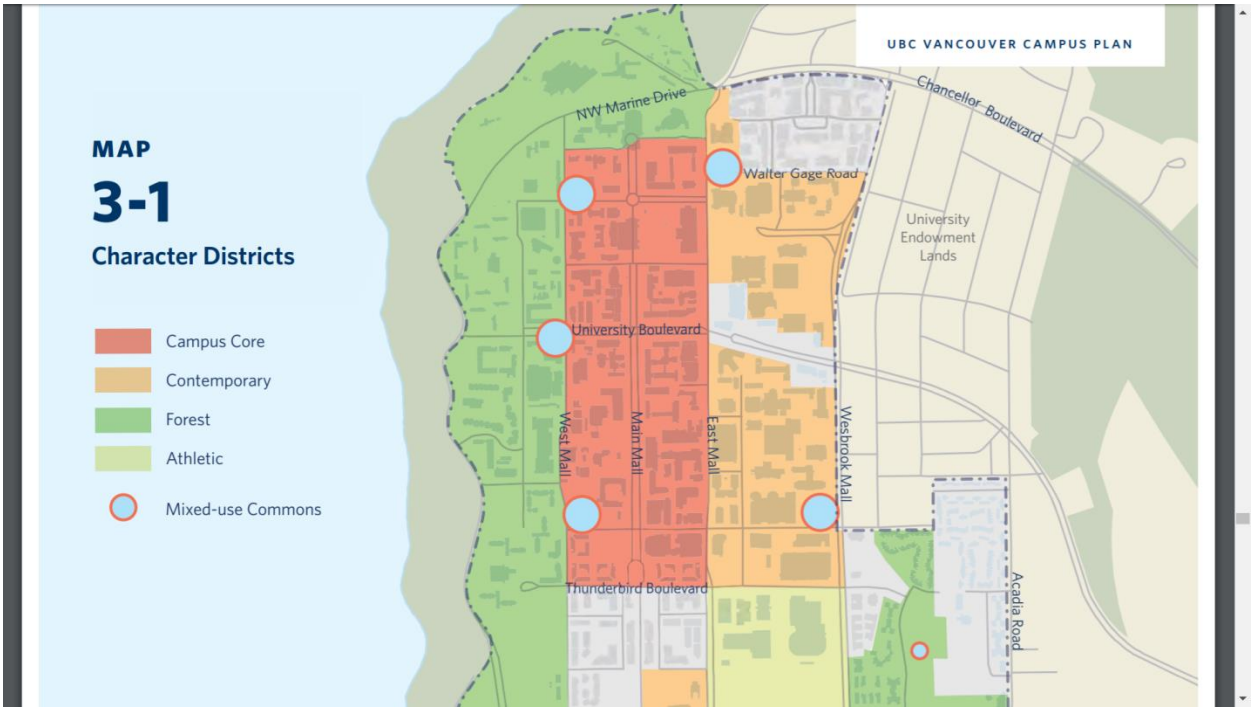

Figure 6: Map showing character districts at the UBC Vancouver campus (The University of British Columbia, 2010c)

3.2.2 Access to Greenspace

UBC has the potential to be a leader in access to greenspace in and around the Metro Vancouver area. The Vancouver campus currently has a good distribution of greenspace throughout campus, which potentially offers a 5 minute walking access to a greenspace from anywhere on campus, which is a goal the City of Vancouver is currently attempting to achieve (City of Vancouver, 2017). There should be more studies done on the actual user experience from these various greenspaces on campus and their experience travelling from one to the other. UBC should also conduct a study to determine the distribution of land use across campus to understand the ratio of hardscapes to softscapes to incorporate land use/cover in access planning. A better understanding of land use/cover will allow for more of a balanced approach when ensuring a 5-minute access to greenspace and how that might be distributed among a network of hardscapes which can be used in conjunction with the green spaces.

3.3 Enhanced Consideration of Aesthetics

I. Explicitly manage for aesthetics in urban forest policy
II. Address conflicts in UBC's Vancouver Campus Plan
III. Incorporate historical context of UBC into landscape and development plans, by formally recognizing and preserving cultural heritage resources such as the coastal First Nation's landscape features of significance, intact or restored elements of the John Davidson arboretum, etc.

The aesthetics of the urban forest on campus can be somewhat subjective, as a beautiful tree or urban forest can mean different things to different people. However, many other jurisdictions have established successful methods of managing and planning for aesthetics, in order to protect important natural, social, cultural and institutional benefits (see **Appendix C**). When managing for tree planting, retention, removal, and replacement, along with all other biological considerations such as biodiversity, the look of the urban forest in relation to the campus landscape should be explicitly considered. The visual experience that is provided from certain tree species individually and in groups can be assessed to better understand which aesthetic qualities are generally more desirable than others. Currently (summer of 2017) there is a study being done on campus to determine the campus user's experience with the current urban forest, which together with ongoing forest inventory mapping and professional principles for campus aesthetics (see **Appendix C**), can determine which aesthetic components serve

more positive outcomes than others. It is important to also incorporate historical context of the area when managing for aesthetics, taking into consideration First Nation's cultural perspectives on aesthetics as well as heritage resources such as the John Davidson's arboretum.

3.4 Empower and Engage the Campus Community

I. Creation of a campus urban forestry committee
II. Tree and arboriculture events/celebration

3.4.1 Campus Urban Forestry Committee

UBC should focus on strengthening community engagement to better enfranchise the various actors of the campus community regarding urban forest management. The community will gain knowledge of the urban forest and the services it provides to campus by becoming more involved in the decision-making process. This approach addresses two significant problems identified through our interviews:

- Under representation of the campus community and their various interests in urban forest management and planning
- Lack of knowledge and understanding of what the urban forest is and what benefits it provides to campus

Both problems can be addressed in the creation of a campus urban forestry committee. Referring directly back to the Tree Campus USA Standards, Standard 1- Tree Advisory Committee is an important addition to current urban forest governance at UBC. Currently members of the campus community outside of current administrative and maintenance positions (i.e. C&CP and Building Ops) do not have any direct representation in urban forest governance on campus. They are unaware of the negative factors regarding the degradation of the campus urban forest as well as the positive work that campus staff are doing to protect the campus trees. The campus community should be informed on and be allowed to provide input in future plans for green corridors and the establishment of an open space network across campus. The newly formed committee will have the opportunity to meet on a regular basis to engage in an exchange of information and ideas and oversee the long-term vision of UBC's urban forest management. UBC already has several committees involved in the governance of many other aspects of campus, so there is precedent for a committee in this role.

This sort of empowering community engagement creates a sense of ownership for the campus landscape and provides a platform for members of the community who already hold an

interest in urban forest management. The campus community will be equipped with knowledge of proper management of the campus trees and a better understanding of tree health and risk. This could potentially alleviate anger and frustration that comes with the removal of trees. Also, a more knowledgeable community can then facilitate community monitoring of the urban forest, providing “more eyes” for the enforcement of proper management. Finally, an urban forest committee will help streamline reporting and increase awareness on how members of the campus community can get involved.

The following is a list of potential members of the Campus Urban Forestry Committee representing various stakeholder groups:

- Building Operations and Arborists
- Planning and Design
- Urban Forestry Program Representatives
- Forestry Staff
- University Neighborhood Association
- Musqueam First Nation
- AMS and AMS clubs
- Campus Experience
- Biodiversity Project Steering Committee
- Metro Vancouver (in charge of Pacific Spirit Park)

3.4.2 Tree Events and Celebrations

An important step in engaging the campus community in regards to the urban forest is to celebrate the abundance of greenspace on campus, expanding upon Standard 4 - Arbor Day Observance from Tree Campus USA. This can be accomplished by collaborating with potential partners and organizations such as the Alma Mater Society (AMS) events team or the Campus Experience team. UBC can draw inspiration from the City of Surrey who holds an annual Arbor Day Event organized by the events team which also falls under their Urban Forestry Department. The Arbor Day events that the City of Surrey holds are successful in bringing together the community via music and tree planting as well as educational opportunities on the current condition of the urban forest and how everyone’s contribution helps to enhance the area. Given the reputation of UBC based on sustainability and a green image, there should be events to celebrate the beauty of the campus in terms of its urban forest. The Tree Day Parties could include campus walks with guides showcasing the campus trees and the green network. The

history of the trees can be discussed as well as their ecosystem services and role within the urban forest. During the guided walks there is also a chance to show people where the green corridors exist along with the green spaces they connect. Along with creating new tree-focused events, there are opportunities to enhance and expand upon events that already occur, such as the yearly graduation tree planting. The yearly graduation tree planting could be made into a Tree Day Party which includes a BBQ and campus walk with an updated map of the location of all graduation trees.

3.5 Capitalize on Opportunities and Challenges

I. Incorporate the urban forest and the retention of trees into the vision for development on campus
II. Address the potential effects of climate change into urban forest management and design

3.5.1 Future Development on Campus

An important concept that needs to be understood in the design of a landscape is that trees can live for hundreds of years, even in urban environments. On the UBC Vancouver campus itself, there are many trees that were planted/seeded at or before the establishment of the university and have survived relatively well, even in the face of significant changes in the campus landscape (notably the red oaks on Main Mall and a few trees in the botanical garden). However, it is clear that the longevity of individual trees and the urban forest as a whole has not been fully appreciated, as trees are frequently removed and replaced again and again because of disease, poor care, development, etc. To address this, urban forest design should take into consideration future development needs and greater effort should be made to retain trees, in good condition, in development projects. This will help create a sense of place, as the trees serve as an anchor/connection to the past for a given site.

3.5.2 Climate Change

Another challenge that the urban forest on campus will face are the effects of climate change. It is not fully understood how exactly the urban forest will be affected in this region, however climatic predictions exist that can be used to guide future tree selection and maintenance. Addressing this is important to ensure the longevity of the campus urban forest.

4. Conclusion

Outlined in this report are recommendations on actions UBC should take to become a leader in urban forest management in North America. In these recommendation, we sought to incorporate current best practices and forward-thinking ideas based on the recommendations and concerns of the campus community. Starting with the original focus of this project, tree protection and retention, it was clear from our research that a significant reorganization of the urban forest governance structure and improvements in coordination and roles among actors was needed. The technical guidelines related to trees were found to be up to standard for current best practices, so this is the most crucial recommendation for improving tree protection and retention.

In researching current practices on campus, we expanded our recommendations beyond just tree protection and retention. A guiding vision from the VCP was the establishment of an open space network on campus, however the value of the urban forest is not fully recognized and could be integrated better into the plan's design guidelines. Continuing from the VCP, we noticed that, although the creation/maintenance of a beautiful campus was another part of UBC's vision, there is very little guidelines, explanations, goals, etc. on managing for a beautiful urban forest. This is a crucial part of the landscape's aesthetic value and it should not be assumed that it will be and remain beautiful throughout the year without being specifically managed for such.

An issue that came up frequently in interviews with various actors in the campus community was difficulties in informing, engaging, and empowering the community in the governance of the urban forest on campus. It was clear that the community placed significant value on the urban forest, yet it is currently difficult and complicated to voice complaints and become involved. A campus urban forestry committee should be created to empower the community and better connect it to the urban forest.

Finally, although there exist long term goals for UBC and campus, there are no long-term goals for the urban forest that will guide urban forest management and design or direct individual development projects. The VCP includes guidelines on species selection and general aesthetic guidelines for different areas on campus, however they focus mainly on architecture and, based on our interviews, not easily enforceable with regard to trees. Also, there appear to be no policies, guidelines, etc. addressing the possible effects of climate change on the urban forest. Both development and climate change will be (in part, already are) significant challenges to urban forest management on campus and UBC policies should set goals, visions, etc. guiding the university on how to address them.

Future actions that can and should be taken to improve urban forest management on campus and address enforcement and implementation issues are the establishment of a tree inventory of all of campus and the creation of an urban forest management plan (both of which are just starting as of the writing of this report). A tree inventory is foundational to understanding the resources that the campus urban forest currently contains and tracking changes. The urban forest management plan for UBC Vancouver campus should address all of the issues included in this report and support the tree inventory. Future opportunities for UBC include further studies on how ecosystem services overlap and are affected by loss and fragmentation of greenspace due to development on campus. Other studies should look into the effects of climate change on the urban forest in this region to determine the best approach to adaptation for the Vancouver campus. There is also an opportunity to map and rate greenspaces across campus to study user experience. These maps will help to determine the areas across campus which need improvement. Lastly, community engagement in regard to the urban forest should be explored to inform the campus community about current initiatives underway on campus and also reach out to its various actors for their input. Initially, this can be done through the greenspace celebration events mentioned earlier, however more empowering integration of the community into the governance of the urban forest (e.g. creation of an overseeing committee) should follow.

These are the first few steps that UBC can take to improving the management and governance of the urban forest on campus. There is tremendous opportunity for the university and the campus community is largely in support of this initiative. By adopting long term management strategies and remaining flexible in its approach, UBC can become a world leader in the field of urban forestry.

References

Arbor Day Foundation. (2017). Tree Campus USA. *Tree Campus USA Standards.* Retrieved from https://www.arborday.org/programs/treecampususa/standards.cfm

City and County of Honolulu. (2017). Trees and Gardens. *Exceptional Tree Program.* Retrieved from https://www.honolulu.gov/parks/hbg/exceptional-tree-program.html

City of Vancouver. (2017). Green Vancouver. *Access to Nature*. Retrieved from http://vancouver.ca/green-vancouver/access-to-nature.aspx

Government of British Columbia. (2016). Biogeoclimatic Zones of British Columbia. Retrieved from https://www.for.gov.bc.ca/hfd/library/documents/treebook/biogeo/biogeo.htm

Ikeda, T. & Lompart, J. (2017a). Figure 1. University Boulevard greenway

Ikeda, T. & Lompart, J. (2017b). Figure 2. Main mall greenway

Ikeda, T. & Lompart, J. (2017c). Figure 3. Difference in leaf flush timing for differing tree species

Ikeda, T. & Lompart, J. (2017d). Figure 4. Forested area near Asian Centre

Miller, R. W., Hauer, R. J., & Werner, L. P. (2015). *Urban forestry: Planning and managing urban greenspaces.* Long Grove, IL: Waveland Press, Inc.

Sutherland, Ira. (2012). *UBC's urban tree canopy: Growing towards sustainability or a declining resource?.* Retrieved from https://circle.ubc.ca/bitstream/handle/2429/50390/Sutherland_I_SEEDS_2012.pdf?sequence=1

The University of British Columbia. (2010a). Vancouver Campus Plan. *Part 2 Campus Plan.* Retrieved from https://planning.ubc.ca/sites/planning.ubc.ca/files/documents/planning-services/policies-plans/VCPUpdate2014_Part2.pdf

The University of British Columbia. (2010b). Vancouver Campus Plan. *Part 3 Design Guidelines.* Retrieved from https://planning.ubc.ca/sites/planning.ubc.ca/files/documents/planning-services/policies-plans/VCPUpdate2014_Part3.pdf

The University of British Columbia. (2010c). Vancouver Campus Plan. *Map 3-1 Character Districts..* Retrieved from https://planning.ubc.ca/sites/planning.ubc.ca/files/documents/planning-services/policies-plans/VCPUpdate2014_Part3.pdf

The University of British Columbia. (2010d). Vancouver Campus Plan. *Map 3-8 Open Space and Commons Network.* Retrieved from https://planning.ubc.ca/sites/planning.ubc.ca/files/documents/planning-services/policies-plans/VCPUpdate2014_Part3.pdf

Wikimediacommons. (2009). UBC aerial view. Retrieved from https://commons.wikimedia.org/wiki/File:UBC_aerial_view.jpg

Wikimediacommons. (2016). Party in Moscow. Retrieved from https://commons.wikimedia.org/wiki/File:Wiki_Party_in_Moscow_2013-05-18_(City_tour;_Krassotkin;_08).JPG

APPENDIX A

Recommendation List

Recommendations to come up to standard on urban forest management
Recommendations to exceed standard and become a leader in urban forest management

1. Improve implementation and enforcement
    a. Roles of each department (i.e. C&CP and Building Ops) involved in urban forest management should be clarified, collaborative goal in UFM better defined, and communication and processing between these two departments made more efficient and effective
        i. Secure a budget specifically for urban forest management
            1. Specifically includes hired position responsible for tree protection and retention bylaw enforcement (e.g. tree protection enforcement officers)
        ii. Avoid management/administration split
        iii. Have UBC urban forest managers (NOT third-party consultants) involved in development on campus as early as possible
    b. Establish a regularly updated and maintained tree inventory
    c. Create a heritage/significant tree registry that has special protection (must be enforceable)
            1. Include system/process allowing campus community to nominate trees
    d. Clarify urban forest values and goals, including specific key terms, what is trying to be achieved and how it will be achieved
        i. Define key urban forest terms clearly
            1. Greenway and/or green corridor
            2. Natural west coast feel
            3. Biodiversity
    e. Top staff in planning and permitting side of urban forest management should be ISA certified as well as those involved in direct maintenance of trees.
2. Improve and maintain distribution and cohesivity of urban forest
    a. Create a green network throughout campus
        i. Main mall, West Mall, East mall as corridors
        ii. University Boulevard, Agronomy, additional E-W corridor in North Campus
    b. 5 min access to a certain kind of green experience greenspace from anywhere on campus
        i. Requires study of campus
        ii. Dependent on definition of greenspace
3. Incorporate management for aesthetics
    a. Explicitly manage for aesthetics in urban forest policy

i. Identify, map, and designate significant landscape features, protected viewsheds, and smaller character sub-districts (landscape/experience units)

ii. Develop specific guidelines for aesthetic design and landscape feature retention in all campus character districts, with key thresholds or targets, benchmarks, and protection requirements on aesthetic outcomes

iii. Provide aesthetics input to planning for new or designated greenway corridors/network, to optimize physical/visual access and view protection

b. Address conflicts in UBC's Vancouver Campus Plan
   i. Appoint Design Review Panel on difficult aesthetic or related issues
   ii. Ensure presence of urban forestry and aesthetics representatives at early planning meetings for new development projects, to identify trees and landscapes at risk from development and collaborate on solutions
   iii. Consider the concept of an urban containment boundary or maximum build-out, consistent with aesthetic image and other sustainability limits
   iv. Develop best practices and other ways to reduce conflicts between maintenance & planning, and improve aesthetics management, enforcement, engagement and planning processes

c. Incorporate historical context of UBC
   i. First nations cultural landscape values
   ii. John Davidson and his arboretum
   iii. Class trees

4. Improve community engagement and empower campus community in governance of urban forest
   a. Creation of a campus community committee
   b. Tree and arboriculture events/celebration (involve SEEDS)
5. Future Opportunities and Challenges
   a. Incorporate the urban forest and the retention of trees into the vision for development on campus
   b. Address the potential effects of climate change into urban forest management and design

APPENDIX B

Tree Campus USA 5 Standards as outlined by Arbor Day USA (2017)
Taken from: https://www.arborday.org/programs/treecampususa/standards.cfm

Standard 1 - Campus Tree Advisory Committee

A Campus Tree Advisory Committee comprised of members representing the diverse audience of those with a stake in campus trees is established and meets regularly.

This committee must include a representative from each of the following audience:

- Student (undergraduate or graduate).
- Faculty.
- Facility Management.
- Community - for example - city forester, municipal arborist, community tree board member.

Each individual campus may also have other interested student organizations, alumni, faculty, or staff that could be represented such as administration, sustainability coordinator, professor emeritus, etc.

While responsibility of the campus trees often ultimately lies with the campus forester, arborist, landscape architect, or designated facilities department, the Campus Tree Advisory Committee can assist in providing guidance for future planning, approval of a comprehensive campus tree plan, education of the campus population as to the benefits of the campus trees, and development of connectivity to the community.

Standard 2 - Campus Tree Care Plan

A Campus Tree Care Plan should be flexible enough to fit the needs and circumstances of the particular campus. The Tree Care Plan should be goal oriented and provide the opportunity to set good policy and clear guidance for planting, maintaining, and removing trees. It also provides education to the campus community, citizens, contractors, and consultants about the importance of the campus forest and the protection and maintenance of trees as part of the growth and land development process.

A Campus Tree Care Plan must include:

1. Clearly stated purpose.
2. Responsible authority/department - who enforces the Campus Tree Care Plan.
3. Establishment of a Campus Tree Advisory Committee, terms of the representatives, and role committee plays.
4. Campus tree care policies for planting, landscaping, maintenance and removal including establishing and updating a list of recommended and prohibited species; managing for catastrophic events.
5. Protection and Preservation policies and procedures - include process for implementing tree protection plan including step-by-step process that every project must follow including construction and trenching.
6. Goals and Targets - develop at least one goal and target for your Campus Tree Plan. These could include (but are not limited to) tree canopy target, development of a link between the Campus Tree Plan and other green initiatives on campus or in the

community; completion of a campus-wide tree inventory, etc. Include how the goal will be measured.
7. Tree damage assessment - enforcement, penalties, and appeals.
8. Prohibited practices.
9. Definitions of terminology related to campus trees.
10. Communication strategy - how the campus tree care plan will be communicated to the college community and contractors to heighten awareness about policies and procedures as well as the goals of the institution.

Both Georgia Tech and Virginia Tech have great examples of a comprehensive Campus Tree Care Plan. You may download PDFs of their documentation:

1. Georgia Tech's Campus Tree Care Plan
2. Virginia Tech's Campus Tree Care Plan

Standard 3 - Campus Tree Program with Dedicated Annual Expenditures

A college campus, to be designated a Tree Campus USA, must allocate finances for its annual campus tree program. Evidence should be shown that an annual work plan has been established and expenditures dedicated towards that work plan.

It is suggested, but not mandatory, that campuses work towards an annual expenditure of $3 per full-time enrolled student.

Expenditures could include, but are not limited to:

- Cost of trees purchased
- Labor, equipment and supplies for tree planting, maintenance (pruning, watering, fertilization, mulching, competition control, etc.) and removal, if needed
- Value of volunteer labor and other contributions from student or civic organizations
- Staff time dedicated to campus forest planning, tree care contractors
- All associated costs of the campus tree management including:
    - public education related to the campus forest;
    - professional training;
    - related association memberships (International Society of Arboriculture and local chapter, Society of Municipal Arborists, state urban forest council, etc.);
    - campus tree inventory

Standard 4 - Arbor Day Observance

An Arbor Day observance provides a golden opportunity to educate the campus community on the benefits of the trees on their campus property and in the community. The Arbor Day observance can be on the campus or held in conjunction with the community where the campus is located. Your observance may be held at an appropriate time for your campus as long as it is related to trees in some way.

Evidence—recording of the date the observance was held with attachment that includes program of activities, news coverage, and/or pictures—will be required when submitting your application.

Click here for free materials to help you promote your Arbor Day observance.

Standard 5 - Service Learning Project

The Service Learning Project should be an outreach of the spirit of the Tree Campus USA initiative. This project should provide an opportunity to engage the student population with

projects related to trees and can be part of a campus or community initiative. The project must be done within the course of the year application is submitted.
Project ideas include, but are not limited to:

- Volunteer tree plantings or tree maintenance
- Tree inventory (campus or community)
- Establish a Nature Explore Classroom for young children at an early childhood development center on your campus or in your community. Learn more about Nature Explore Classrooms.
- Establishment of campus arboreta
- Student-led effort to have community designated a Tree City USA
- Coordinate internships with the urban forestry or parks department in your community
- Assist Project Learning Tree or other programs centered around trees in training teachers at schools near your campus or organize training for your school's College of Education
- Other tree-related service learning or educational programs for students
- Partnership with state forestry departments on regional projects

APPENDIX C

Aesthetic Policy Recommendations for UBC Campus Urban Forest

1 Rationale

The Vancouver Campus Plan states as one of its guiding outcomes that UBC aims to: "Have a beautiful campus that reflects its natural west coast setting and sense of place". The Plan recognizes various values associated with an aesthetic campus, including its urban forest and overall image as an attractive place for students, staff and faculty, but these values are not comprehensively listed, or backed up by measurable criteria for decision-making. This lack of specific tools to protect aesthetics values has contributed to the loss of valued features and degradation of the overall integrity and aesthetics of the campus landscape. As a subset of cultural ecosystem services, aesthetics is related to other critical values including health & psychological wellbeing of students & staff, educational performance, attracting & retaining highly qualified personnel, and UBC's internationally-known image and reputation. Vancouver and many other urban & rural areas have seen major public conflicts over aesthetic impacts. Clearly, impacts on UBC's campus landscape values could have many serious implications.

Landscape aesthetics is however sometimes seen as a "soft science" topic, often with debate and disagreement on what makes something beautiful or ugly, and on how important it is relative to other priorities. While we have found few precedents for systematic aesthetic policies for campuses specifically, forest & landscape aesthetics as a system of professional practice and evaluation has been well established since the 1970s in Europe, USA, and British Columbia (eg. USDA Forest Service 1974; BC Forest Service, 1984). The City of Vancouver and many other cities around the world protect key views with quantifiable view-cones, viewsheds, and aesthetic regulations (http://vancouver.ca/docs/planning/view-protection-guidelines.pdf). Studies by TD Bank and UBC have assessed the economic values (including aesthetic values) of the urban forest in cities such as Vancouver in the billions of dollars. Countless environmental psychology research studies and community-based landscape assessments have demonstrated cross-cultural human preferences for natural and forested landscapes. These precedents provide both a rationale and principles for assessing and protecting aesthetic values of landscapes on campus.

Objectives of this report:

The purpose of this paper is to build on and go deeper than the Urban Forestry Management Plan Recommendations report, to identify areas of improvement in UBC's current campus/landscape management policies regarding **aesthetic values**, with particular reference to the urban forest. In particular, we aim to sketch out policies and standards to provide stronger, more explicit policy tools for managing aesthetics of urban forest landscapes. This calls for approaches such as inventory mapping, quantification, and setting targets, so that they can be weighed more readily against policy pressure for future development on campus, and as a benchmark for considering the urban forest implications of climate change. It is considered likely that most (but perhaps not all) of these improved policy tools will be complimentary to other urban forestry and sustainability policies for the campus, addressing issues such as student health and wellbeing, comfort, productivity, satisfaction, and energy conservation.

In this report, we consider not just trees, but also other kinds of greenspace as well as the relationship to architecture and infrastructure. Trees do though play a dominant role (along with buildings) in setting the character of UBC.

2 Overview of Existing Aesthetic Conditions

2.1 Existing Policy Overview

What makes UBC's campus beautiful & guidelines on how this can be achieved are addressed in Part 2: Vancouver Campus Plan – Details and Part 3: Vancouver Campus Plan - Design Guidelines (http://planning.ubc.ca/sites/planning.ubc.ca/files/documents/planning-services/policies-plans/VCPUpdate2014_Part2.pdf, http://planning.ubc.ca/sites/planning.ubc.ca/files/documents/planning-services/policies-plans/VCPUpdate2014_Part3.pdf). However, these guidelines do not address all aspects of UBC's urban forest landscape, and need more comprehensive and sharply defined standards and criteria if they are to be upheld in the face of other UBC campus priorities. The design guidelines focus primarily on native plantings and the natural forest aesthetic on the edge of campus, with less specifics on the range of urban and greenspace landscape types.

The Vancouver Campus plan includes maps indicating various general values, including an open space network divided into commons, plazas, natural areas, green academic areas, and greenways and green edges (Vancouver Campus Plan Part 2, 2010, p. 54). However, the Vancouver Campus plan does not have a more specific typology of greenspace: needed to recognize and manage considerations such as aesthetics, to which more prescriptive guidelines could be attached.

There is also the problem of conflicts with other policies within UBC's Vancouver Campus Plan. Despite some good built examples and the efforts of many staff, the vision of a "beautiful campus" and a "natural west coast feel" is often not borne out by actions and development on the ground, suggesting that both the policies and their implementation do not prioritize important aesthetic values. Evidence for this includes:

- quantitative decline in the amount and visibility of trees, offsite views, and sky through tree removal and view blockage (Sutherland, 2012)
- increased area of hardscape and reduced green area
- damage and weakening of existing tree stock though construction
- actual conflicts with student opposition to landscape change on campus

Though UBC has beauty on campus as one of its main goals, it seems to be a lower priority than current interpretations of policies such as Policy 12: "The capacity to house 50% of full-time students on campus will be maintained" (http://planning.ubc.ca/sites/planning.ubc.ca/files/documents/planning-services/policies-plans/VCPUpdate2014_Part1.pdf), requiring the campus to "develop housing wherever possible". As a result, this has placed student housing as well as other new academic buildings in direct competition with the amount and quality of greenspace. Also, there appears to be inadequate enforcement of existing UBC policy relating to the urban forest, where tree protection practices are sometimes not followed (**Figure 1**). Urban forest management policies in their current state thus are too weak to sustain a beautiful campus.

***Figure 1**: Broken tree protection fencing on University Boulevard*

2.2 Existing Landscape Types and Aesthetic Conditions

The campus landscape can be classified into various basic greenspace types, such as:

1. **Large connected forested areas**, such as Oak Bosque (**Figure 2**), Totem Park, UBC Botanical Garden, Rhododendron Wood, Nitobe Garden area, Rose Garden, and UBC Farm.
2. **Gathering areas with tree groups** where people can sit under a limited area of tree canopy, often with surrounding grassy areas, such as Nest courtyard (**Figure 3**), area behind UBC hospital, and near the Pharmaceutical Science building (**Figure 4**).
3. **Open gathering areas** where people can sit near or in sight of trees/tree groups, such as near Sauder building cafeteria, Buchanan courtyard, outdoor seating near Bookstore Starbucks, near Thunderbird Crescent (**Figure 5**)
4. **Linear greenways or networks**, where people use travel corridors under or close to trees and greenery, such as Main Mall and very few other locations of limited extent (University Boulevard on campus is not considered a greenway due to lack of extensive vegetation).

***Figure 2**: Oak Bosque*

***Figure 3**: Nest courtyard (the Knoll)*

***Figure 4**: Area (hill) near Pharmaceutical Science building*

***Figure 5**: Thunderbird Crescent*

Most of the green spaces identified above, while very valuable and popular, are small scale, isolated, and not mapped or recognized in policy. Another issue is the distribution of these identified greenspace, which affects physical and visual access to nature and greenery. In the campus core district and contemporary district, most identified greenspace are located in the northern centre areas. The UBC Vancouver Campus Plan Design Guidelines divide the campus into four broad Character Districts: campus core district, contemporary district, forest district, and athletic district. Green spaces with positive aesthetic qualities are limited in the campus core district and contemporary district. UBC's character areas and edges are generally not well defined in terms of vegetation or tree cover, which could be used to distinguish areas and increase sense of place. Some trees are planted to increase screening of building facades, and could be used more widely to reduce the visible mass of building to increase the dominance of greenery and reduce the experience of concrete on campus.

In the Vancouver Campus Plan, the goal of "natural west coast feel" is not defined. For this aesthetics study (in additional to actual coastal views which are very limited), we suggest a working definition for the urban forest: "connected natural-appearing forest areas including large, mature trees and native understory, which are capable of visually dominating nearby architecture that does not itself evoke a west coast character". Based on this definition, areas exemplifying a west coast feel only exist at the edge of campus. In order to connect the core campus district and contemporary district with these large connected mature forests in the forest district, the original UBC Vancouver Campus Plan designated University Blvd, located in the centre of campus, as an east-west greenway. However, as noted above, University Blvd. is not currently a visually effective east-west greenway corridor, nor are there any other east-west corridors connecting to large connected mature forests. There is potential for the creation of at least two more east-west greenways north and south of University Blvd., as well as the restoration of University Blvd as a greenway (incorporating ides for a more sustainable Stormwater Cascades project design, as proposed in a recent FRST 490/LARC 542 course project). This would provide a stronger visual framework or network to enhance the campus image.

The UBC Vancouver Campus Plan mentions several times that more native species should be planted to create a west coast feel. However, in the plant recommendation list, most recommended species are not native (outside of the forest edge district). The consequence is that only a few native species have been planted in campus and, similar to the distribution of

greenspace on campus, these are located mainly at the edge of campus. Wider use of natives, including understory shrubs, would strengthen the visual character of the campus, increase visual diversity in the core areas, and enhance sustainability & biodiversity. Relic individual native tree specimens still exist in a few places outside the forest district, often as distinctive visual landmarks (eg. the old arbutus at Orchard Commons), but these are not currently protected as an important visual resource. Other heritage trees (eg. relics of the old arboretum) would also benefit from recognition and visual labelling, as would socially important or 'sacred'' gathering places under trees.

In order to meet the Vancouver Campus Plan goal of a beautiful campus with a natural west coast feel, remaining visual assets need to be protected and significant parts of the campus lacking greenery need to be aesthetically restored. The original campus design when UBC was first founded was campus as a "clearing in the forest". With the scale of the university and current development, it can no longer appear as a "clearing in the forest" due to view blockage and reduced canopy areas, and the west coast feel is lacking in the campus core and contemporary district. In general, only the forest district containing the surrounding forests, naturalistic gardens, and coastal views, as well as remaining open views from the athletic district, give an impression of west coast feel. In order to achieve UBC's aesthetic goal, a complete green network is needed to connect the campus areas lacking forest to surrounding forest areas and isolated greenspace pockets, bringing the forest into campus. This has been encouraged previously by UBC staff in order to balance the adverse visual effects of large new building projects on campus.

3 Future Challenges to Campus Aesthetics

Two main trends or challenges need to be considered in planning for future aesthetic conditions for campus users:

- **Climate change:** The Pacific Climate Impacts Consortium (PCIC) (n.d., p. 11) has projected likely changes in climate for Vancouver, with increased average annual precipitation but decreased summer rainfall by the 2050s and 2080s. Average annual temperature are expected to increase around 1.7°C by the 2050s and 2.7°C by the 2080s, with more than doubling of summer days above 24~25°C by the 2050s. With hotter and drier summers, human health, water supplies, and tree survival all are threatened, with related impacts on aesthetics. Increased urban forest canopy will be needed to cool neighbourhoods and public use areas, as well as reduce air conditioning/energy use. Improved management, watering strategies, and adaptation of planting practices will be needed. Both the City of Vancouver and Metro Vancouver have begun to update their urban forest management plans, policies and practices to conserve and expand the urban forest (City of Vancouver, 2016 - planting 150,000 new trees by 2020), as possible precedents for UBC. Aesthetics outcomes could be positive if water is well managed (focused on trees rather than large open grass areas), cool shady areas are increased, and campus users learn to accept golden lawn areas or drought tolerant groundcovers.
- **New construction:** large projects such as the UBC Bus Exchange, Gage South Student Housing, and new academic buildings will be ongoing in next several years and are likely to further tilt the balance towards dominance of built form and urban intensity, rather than west coast feel and greenery, unless very carefully designed. As all these areas are close to trees, it is important to conserve existing large trees by designing around them wherever possible, given the low canopy cover on campus and increasingly important aesthetics effects of remaining trees. As described in UBC's Technical Guidelines on Tree and Shrub Preservation, protection and care of existing trees and plantings is the goal rather than

removal and replanting with new young trees, since it will take time to restore shade and aesthetic effects, and it is important to retain age diversity in the canopy. The goal should be to retain and expand canopy, as well as retain key views of valued landscape features and forests. See the broader policy document for other key recommendations.

Without changes in policy and practice, these continued trends are likely to have negative consequences on aesthetics and the campus experience, including for example: impacts on student and staff well-being, dissatisfied students and possible protests, frustrated instructors attempting to teach best practices on sustainability, and increasing impacts on UBC's image and international reputation as a leader in sustainability.

4 Guiding Principles for Campus Aesthetics

Based on UBC's existing aesthetics goal ('a beautiful campus that reflects its natural west coast setting and sense of place') and existing policies, the above analysis, and precedents in literature and practice, we offer the following expanded list of aesthetic principles, to guide policy directions and more specific recommendations on aesthetics:

1. Maintain a balance between buildings/grey infrastructure and greenspace/trees (to retain west coast feel and identity)
2. Provide/retain visual access to vegetation everywhere (including large mature trees), key views (onsite and offsite), daylight, and sunsets, with a green network penetrating across campus
3. Recognize and conserve unique landscape features, tree specimens and landmarks, to aid visual orientation and enhance sense of place
4. Recognize and preserve cultural heritage as historical context for the UBC experience, including First Nation landscape features of significance (eg. sacred trees/plant species), John Davidson arboretum, etc.
5. Use large trees and other vegetation to screen, filter, and/or frame views of large buildings and infrastructure that do not reflect west coast feel
6. Provide visual diversity in vegetation, views, colours, textures, seasonal variation, sun & shade, and scale & enclosure, consistent with the overall west coast feel & UBC image. Provide both deciduous trees for winter sun/summer shade and conifers for winter greenery.
7. Maintain a balance between native species and compatible exotic species, and promote attractive sustainable ecosystems that reduce maintenance, allow for ecological succession and natural regeneration.
8. Provide, recognize and conserve student/staff outdoor gathering places associated with tree groups, knolls, glades etc., as well designed spaces for informal learning and social/psychological restoration
9. Promote education on/interaction with greenery through signs, labelling, educational activities, as an aesthetic experience and to provide visible examples of stewardship

5 Interim Recommendations on Aesthetics

5.1 Develop better policy tools for meeting aesthetic goals

The campus needs better metrics & standards that address aesthetics (jointly with or additional to those for other related values), as endorsed by many other municipalities, including:

1. Develop and adopt better definitions:
    a. Greenway
    b. Greenspace types
    c. Natural west coast feel

2. Develop more formal and comprehensive identification, mapping, and designation of significant landscape features, protected viewsheds (eg Rose Garden), and smaller character sub-districts (or landscape/ experience units), as a component of the urban forestry strategy and campus plans.

3. Develop more comprehensive & specific guidelines for aesthetic design and landscape feature retention in all campus character districts, and establish key thresholds or targets, benchmarks, and protection requirements on aesthetic outcomes for all key features and landscape units (including large connected areas and gathering places). Such thresholds could include for example:
    - Visual access or view blockage restrictions on coastal views, views to trees within 5 minutes walk from gathering places, views of trees from windows in every building, etc.
    - Proportion of native species/ecosystems
    - Proportion of evergreen trees/groups for winter viewing
    - Protection of all big trees and medium sized shade trees, to buy time for new surrounding planting to replace them.
    - Canopy cover targets or ratios of greenspace coverage
    - Screening/filtering requirements for trees to frame proposed or existing the buildings, eg. using large long-lived native tree species (eg Douglas fir) that can balance the scale of 10-20 storey buildings over time.

4. Provide aesthetics input to planning for new or designated connected greenway corridors/network, to optimize physical/visual access and view protection, including additional east-west greenways

5. Consider appointing a design review panel on difficult aesthetic or related issues, comprised of aesthetics and design experts from on and off campus, and campus user representatives, in coordination with the Campus Urban Forest Advisory Committee

6. Ensure presence of urban forestry and aesthetics representatives at early planning meetings for new development projects, to identify trees and landscapes at risk from development and collaborate on solutions.

7. Consider/discuss the concept of an urban containment boundary or maximum build-out, consistent with aesthetic image & other sustainability limits for the medium and long term

8. Develop over time best practices and other ways to improve aesthetic tree management, enforcement, and planning processes, to address:
    - Reporting
    - Student/staff/faculty engagement in stewardship/watering
    - Enforcement, staff training/education

- Better participation/engagement processes

5.2 Suggested next steps

- Complete aesthetics inventory, mapping, landscapes and key pathways/circulation routes, entries, etc, informed by this report and current urban forest inventory and experience-mapping studies
- Plan for further future perception study with representatives of campus user groups (including psychological health studies) to support the social benefits and rationale to upper management for policy change on aesthetics and urban forestry. These could also include conventional tree valuation studies for $ values.
- Integrate climate change action plan and adaptation/vulnerability assessment with landscape/aesthetic planning and future development, to confirm viability of tree species selection etc.
- Promote SEEDS projects on relevant topics such as architectural visual quality-studies, testing policy alternatives with future projections/scenarios/visualisations, assess implications/co-benefits of energy shading/cooling, and solar access, etc.

Acknowledgements

This policy draft is based in part on a course project report for FRST 490 Visual Resource Management, by Thomas Ikeda, Xudong Bao, & Sarah Suh (2017), and a Directed Study by Thomas Ikeda on a SEEDS project for Recommendations on UBC Campus Urban Forest Management. The authors would like to thank the various UBC staff who have also contributed their experience, knowledge, advice to this report. Recommendations made here are solely the product of the authors, & should be considered preliminary, pending further review.

Key References

BC Forest Service, 1984. Visual Landscape Inventory System

Business Facilitation Advisory Committee Town Planning Task Force. (n.d.). Retrieved April 22, 2017, from Government of Hong Kong website: https://www.gov.hk/sc/theme/bf/pdf/TPTFPaper7.pdf

City of Vancouver. (2016, May 09). *Developing Vancouver's Urban Forest Strategy*. Retrieved April 22, 2017, from http://vancouver.ca/home-property-development/urban-forest-strategy.aspx

Climate Change Adaptation Strategy. (n.d.). Retrieved April 22, 2017, from City of Vancouver website: http://vancouver.ca/files/cov/Vancouver-Climate-Change-Adaptation-Strategy-2012-11-07.pdf

Metro Vancouver Adaptation report

Timeline. (n.d.). Retrieved April 22, 2017, from http://planning.ubc.ca/vancouver/planning-areas/u-boulevard-area/timeline

Vancouver Campus Plan Part 2 Campus Plan. (2010). Retrieved April 22, 2017, from http://planning.ubc.ca/sites/planning.ubc.ca/files/documents/planning-services/policies-plans/VCPUpdate2014_Part3.pdf

Vancouver Campus Plan Part 3 Design Guidelines. (2010). Retrieved April 22, 2017, from http://planning.ubc.ca/sites/planning.ubc.ca/files/documents/planning-services/policies-plans/VCPUpdate2014_Part2.pdf

UBC Technical Guidelines. (2016). Retrieved April 22, 2017, from University of British Columbia website: http://www.technicalguidelines.ubc.ca/Division_32/2016_Division_32_PDFs/320193.01-2016_Tree_Shrub_Preservation.pdf

USDA Forest Service, 1974. Visual Management System