UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

UBC Vancouver Campus Cultural and Heritage Tree Inventory

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UBC Point Grey Campus
Cultural and Heritage Tree Inventory

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Planting a large maple tree in front of the Agriculture building. Photo credit: Dominion Photo Co., 1926

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Executive Summary

In alignment with the university's Heritage Conservation policy and the Urban Forest Management Plan, UBC Social Ecological Economic Development Studies (SEEDS) has entered into a partnership with Campus+Community Planning (C+CP) and the Faculty of Forestry to seek innovative and engaging plans to protect and preserve on-campus forests and tress. The university is particularly concerned with capturing the intangible cultural and heritage values of on-campus trees.

In light of the initiative by SEEDS, C+CP and the Faculty of Forestry, this report first discusses the importance of cultural and heritage trees from both a cultural/social and environmental perspective. Although the main objective of this project aims to develop a comprehensive inventory protocol for cultural and heritage trees, this report recognizes that cultural and heritage trees play an important role in forming an iconic landscape. Therefore, five heritage landscapes are identified through expert recommendations. The identified heritage landscapes include the Main Library, the Old Arboretum, Main Mall, the sunken plaza by the Frederic Lasserre building and the Buchanan West Courtyard. The relationship between heritage trees and other landscape features are examined accordingly.

The protection of individual trees with cultural and heritage status is the first step in protecting heritage landscapes as it would often take decades to regrow any trees removed from these landscapes. Thus, a public nomination procedure and heritage tree inventory protocol are developed to better understand current heritage tree status on campus. Public engagement is the corner stone of successful on-campus cultural and heritage tree protection. Seven public engagement strategies are recommended in this report. These ideas targeting different age groups include Scavenger Hunter, Art Contest and Show, Text/Email this Tree program, QR Codes or Geocaching, "Name this Tree" contest and Heritage Tree Walks, and should be organized in a week-long event, UBC Tree week. Finally, the report examined how heritage trees can help to combat climate change.

Long lived trees record the history of a changing landscape and tell the story of a community (Chen & Hua, 2015). Communities take pride in their culturally significant trees, and culturally significant trees in turn inspire community members' imaginations and tie everyone together (Chen & Hua, 2015). As UBC students, we are so proud of our green campus. Thus, it is our sincere hope that this report will make a major impact on preserving invaluable cultural and heritage trees that define the history and shape the identity of UBC.

Introduction

When the young University of British Columbia (UBC) began to enrol its first students in 1915, the university's Point Grey campus was still little more than a derelict expanse of muddy fields, dirt tracks and unfinished buildings (Figures 1 & 2). The campus has since undergone a dramatic transformation to become what is undoubtedly "one of the most interesting and beautiful [campuses] in the world" (Figures 3 & 4) (UBC, 2010a). However, as pointed out in the 2010 UBC Vancouver Campus Plan, the campus currently "lacks a strong centre and unifying presence". Therefore, the university yearns to build a more cohesive campus ambience to accommodate the growing diverse, vibrant campus community (UBC, 2010a).

Figure 1. Leonard Klinck sitting by first building at the Point Grey campus. Photo credit: [unknown], 1915.

Figure 2. Point Grey campus site. Photo credit: [unknown], 1920.

Figure 3. Aerial view of Point Grey campus in 1927. Photo credit: Western Canada Airways, 1927.

Figure 4. Aerial view of Point Grey campus in 2005. Photo credit: UBC Media Relations, 2005.

While the physical planning and design principles listed in the campus plans have been modified over the years to adjust to the changing campus demography and the evolving community culture, there has been one constant unchanging vision underpinning the campus development master plan – “the repeated use of the natural world as a unifying theme” (UBC, 2010a). In particular, exuberant forests and trees should accentuate the distinctive west coast beauty on campus (UBC, 2010b).

Over the last century, campus-wide tree inventories were carried out by UBC staff, students and external professionals for various sustainable and green space management purposes. However, the campus tree inventory database lacks continuous updates and good maintenance which hinders the understanding of on-campus urban forest ecosystems. Therefore, in alignment with the university’s Heritage Conservation policy and the Urban Forest Management Plan, UBC Social Ecological Economic Development Studies (SEEDS) has entered into a partnership with Campus+Community Planning (C+CP) and the Faculty of Forestry to seek innovative and engaging plans to protect and preserve on-campus forests and trees, which in turn unifies the campus through the lens of nature. The university is particularly concerned with capturing the intangible cultural and heritage values of on-campus trees.

In light of the initiative by SEEDS, C+CP and the Faculty of Forestry, this report attempts to 1) discuss the importance of culturally significant and heritage trees, 2) examine the current campus heritage landscape, 3) provide a framework on how to assign social value to culturally significant and heritage trees located on the UBC Point Grey campus, as well as the associated public nomination and tree inventory process, 4) explore different ways of public engagement, and 5) assess the roles of on-campus heritage trees in mitigating climate change.

The Importance of Cultural and Heritage Trees

Trees are universal symbols that hold cultural significance and attachment ranging from ecological functions to stories of mysticism that have been passed down through multiple generations. These ties make trees an important component of our daily lives and can be used as a means to promote cultural diversity. On a multi-cultural campus such as UBC, trees which carry cultural significance can be used to strengthen community relations and engagement, making them an important asset that should be properly considered and managed.

Trees can be culturally significant for either their age or their species. Old trees are significant since they evoke specific sentiments and history of a landscape and its past conservation practices (Sills, 2013). Since UBC’s landscape has changed so drastically since

1964, older trees on campus serve as some of the only remaining living landmarks which tell stories about the campus and all the changes which have occurred over multiple generations. It is important for new and returning students alike, who can use old trees to orient themselves on campus and revisit past memories, but also Indigenous communities that have long-lasting traditional ties to native old growth forests within the region. Old trees not only serve as a historic link between people, but also contribute to the attractiveness and significance of a landscape, increasing people's "sense of place" and promoting cultural practices such as bark stripping which hold spiritual meaning to many Indigenous groups (Blicharska & Mikusinski, 2014).

Different communities also have different visual and aesthetic preferences when it comes to trees, and will often prefer tree species that remind them of their home country and region (Buijs *et al*., 2009). This highlights the importance for UBC to maintain a variety of introduced species since they carry specific meanings to different communities. For instance, students from Europe are more likely to prefer the different variety of oak and linden trees, whereas the American and Canadian students will prefer large, native conifers such as ponderosa pine, red cedar and Douglas fir. Students from China and Japan are most likely to prefer deciduous flowering trees such as cherry blossoms or large rhododendrons depending on which specific region they are from. Furthermore, communities can also be grouped by age, such as older generations of students and faculty staff, finding significance in older botanical and heritage plantings, as well as the individual trees planted on specific years of graduation (Cassar, 2017).

Heritage trees are also significant to local indigenous groups, and are of great importance with regards to Canadian culture. Trees have been used as medicine, food sources and religious symbols for centuries by local groups, and are often treated as sacred symbols that are to be worshiped and respected (Turner *et al*., 2018). Heritage trees are often used in rituals or traditional ways such as bark stripping or construction of utilitary items, while tree sap, seeds and cones are often used in spiritual ceremonies (Turner *et al*., 2018).

Due to the immense symbolic and cultural values that UBC trees possess, good management and campus engagement is crucial in order to ensure longevity of these trees, as well as creating a sense of community that will help maintain tree health and propose creative solutions when it comes to tree replacement. Due to the amount of significance they carry, culturally important trees can often cause extreme backlash and emotional distress to the public if they have to be removed, and can result in large scale protests, as well as overall dissatisfaction (Blicharska & Mikusinski, 2014). Having the community involved is therefore an excellent way of educating the public on tree health and getting feedback on the removal process to ensure no

cultural offences are being committed. Trees that have different cultural significances should be grouped separately, as they carry different symbolic meanings. This can be based on specific countries or regions, age groups or historic backgrounds.

Public engagement can be encouraged through facilitation of different cultural events, fundraisers, as well as educational tours which explain the history of significant campus trees, their current situation, and future solutions when it comes to tree removal. Engagement is important since it helps the public understand the issues at hand, and feel connected in decision making, rather than having their cultures or communities violated (Center for Public Involvement, 2015). In addition, it will also encourage the public to spot any diseased trees and subsequently report to UBC.

To show that UBC is dedicated in its efforts to protect culturally significant trees, campus authorities will be advised to install informational placards on these trees, as well as greetings in multiple languages, outlining the importance and significance to certain communities and groups. An example of this can be seen in Figures 5 & 6. These placards can direct the public to an official UBC website where more information can be accessed, and historical data in addition to online background stories will encourage the public to engage and further appreciate these trees.

When a tree is set to be removed, meetings should be held with communities to ensure they understand why the procedure needs to be carried out, and community wishes should be considered on what should be done with the felled tree. Indigenous groups should be consulted if the heritage tree is of cultural importance to them, and given full rights to construct parts of the tree into cultural items such as furniture, canoes and totem poles, which can be displayed or honored in faculty buildings or in open spaces. This will ensure that the community is respected and that they will have memorabilia from the tree. Any events that the community wishes to orchestrate before the tree removal should be granted in order to show respect towards that cultural group, and UBC can host a tree planting event afterward to compensate for the loss to the community's biodiversity.

Figure 5. The informational placard mounted on a heritage tree.

Figure 6. A zoom-in view of the placard.

UBC Heritage Landscape

A cultural heritage landscape may include "features such as structures, spaces, archaeological sites or natural elements that are valued together for their interrelationship, meaning, or association" (City of London, Canada, 2019). Therefore, by providing heritage designation to landscapes on campus, a more holistic preservation approach can be taken. For example, a heritage landscape designation would enable trees and other forms of vegetation that otherwise wouldn't qualify for heritage tree protection to be recognized and protected for the value they provide. Moreover, the preservation of landscapes would provide increased continuity of landscape aesthetics, enabling future generations of faculty, staff and students to feel immersed in the legacy of UBC.

Due to the constraints of the project timeline, a campus wide analysis of heritage landscapes was infeasible. Additionally, it was not one of objectives of this SEEDS project. However, we recognized that cultural and heritage trees play an important role in forming an iconic landscape. Therefore, in this section we examine some of the heritage landscapes identified through expert recommendations, as well as the relationship between trees and other landscape features. In particular, this section will briefly describe heritage landscapes that range from lost/heavily altered to well-preserved. Note, the following landscapes are only a sampling of the many potential heritage landscapes within the UBC Point Grey campus.

Heavily altered/lost landscapes

Main Library

As one of the first permanent buildings on the Point Grey campus, the Main Library, which is now a part of the Irving K. Barber Learning Centre, provides a strong link to UBC's early history (Archibald, n.d.). While the original building still exists, the majority of the original landscape has been lost. If the original landscape were to exist today, it would be a distinct and cohesive landscape on campus with its formal geometric shapes delineated by the paths, hedges and the reflection pool. As shown in a superior view from the balcony of the Main Library (Figure 8), the observer's eye is immediately drawn to the reflection pool. The reflection pool stands out as a feature due to its position in the forefront and its geometric shape which is reinforced by the hedges surrounding it. This landscape composition also draws the viewer's eye to the background as the two walking paths provide strong lines for the eye to follow.

In comparison, Figure 9 reveals some of the drastic changes that have occurred to the same landscape since 1956 (Figure 8). The reflection pool (identified by the blue star) may be used as a point of reference in each of the three photographs. Overall, the current landscape has reduced symmetry and no longer has the same formal composition. Moreover, if it had been possible to take a present-day photo from the same angle as Figure 7, the viewer's eye would likely be drawn past the landscape in front of the library to the building in the background (Walter C. Koerner Library). While aesthetic preferences may vary, it should be noted that this heavy alteration of the original landscape is a physical loss of UBC's history.

Figure 7. Main Library landscape. Photo credit: Frank, L., 1943

Figure 8. Main Library landscape. Photo credit: [unknown], 1956.

Figure 9. Main Library landscape. Photo credit: Borschneck, S., 2019.

Old Arboretum

Established in 1916 by John Davidson, the Old Arboretum is a key piece of the UBC Botanical Garden's history (UBC Botanical Garden, n.d.). With only an aerial view of the Old

Arboretum (Figure 10), it is difficult to describe the landscape created by the collection of trees; however, it is clear that large portions of the landscape have been lost as numerous buildings are now located on the site (Figure 11). The Old Arboretum exemplifies how it may be difficult to know exactly what we have lost from our campus landscapes. There is at least some documentation for the Old Arboretum; whereas, a significant number of the landscapes have likely been unknowingly lost over the years due to a lack of documentation.

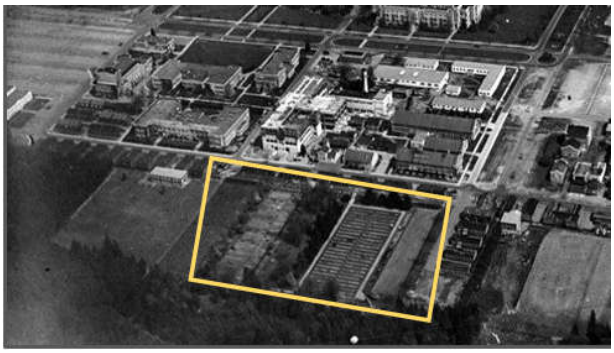

Figure 10. Aerial view of Old Arboretum. Photo credit: Steiner, R., 1948.

Figure 11. Remnants of Old Arboretum 2018. Photo credit: Google Earth, 2018.

Declining landscapes

Main Mall Looking North

Main Mall looking north (Figure 12), may be one of the most iconic landscapes on the Point Grey campus. It consists of a wide section of turf grass framed by pavement paths and an allée of oaks on each side. This landscape composition directs the viewer's eye to a Canadian flag with the Coast Range Mountains in the background. The allées of oaks were originally

Figure 12. Timeline of Main Mall looking north. Photo credit: UBC Archives.

planted in the 1920s and is one of the few remaining hallmarks of the original UBC campus master plan (University of British Columbia, 2019).

Currently, many of the oaks are in a state of decline and some have already needed replacement. These oaks are likely declining at an accelerated rate due to development that has occurred on campus and high levels of foot traffic (e.g. root loss/damage during the installation of brick pavers and soil compaction from people walking across the grass).

The replacement of declining red oaks with young oaks (identified in Figure 14) helps to ensure the continuation of the allées; however, the landscape loses some of its visual impact as it is less coherent with trees drastically differing in size and form. A visual comparison between Figures 13 and 14 reveals this loss of coherence, especially on the left-hand side of the allée. Consequently, it would be highly beneficial to focus on increasing the lifespan of the oaks that remain by undertaking remediation tactics to help improve tree vigor. This should include soil restoration to alleviate soil compaction. Overall, the red oaks on Main Mall signify the need to invest in maintenance to ensure the continuity of on-campus heritage landscapes

Figure 13. Main Mall looking north. Photo credit: [unknown], 1977.

Figure 14. Main Mall looking north. Photo credit: Borschneck, S., 2019.

Relatively unaltered landscapes

Sunken plaza by the Frederic Lasserre Building

The sunken plaza by the Frederic Lasserre building was recommended by Egan Davis as a brilliant example of Modernist landscape architecture from the 1960s. He noted how the *Lirodendron tulipifera, Pinus nigra* and the *Quercus* are ubiquitous trees on their own, but within the context of the plaza contribute to an outstanding composition. The excellence of this composition is due to the diverse yet compatible physical forms of the trees, tree species

selection and the placement of the trees which reads well with the Frederic Lasserre building. Mr. Davis further noted that even if you were to replace one of the trees with the same species, it would be missing the point as the value is in the context.

It is remarkable how little the landscape within this sunken plaza has changed, as depicted in Figures 15 and 16. Consequentially, a person is able to physically connect with this landscape created over half a century ago.

Figure 15. Sunken Plaza looking south 1979. Photo credit: [unknown], 1970.

Figure 16. Sunken Plaza looking south. Photo credit: Borschneck, S., 2019.

Buchanan West Courtyard

The Buchanan West Courtyard was also recommended by Egan Davis as a heritage landscape. Additional research revealed that the Buchanan Courtyards are viewed as the finest example of a Modernist civic space on campus (UBC C+CP, 2009). The Courtyards were originally designed to inspire and culturally elevate an inclusive university society (UBC C+CP, 2009). Additionally, the two Courtyards exemplify the Modernist practice of integrating the design of a landscape and buildings as one (UBC C+CP, 2009). Some of the character-defining elements of this landscape include the elongated rectangular form incorporated at various scales (e.g. Roman brick pavers), building overhangs which provide covered spaces and the discrete spaces created by the raised rectangular planting beds (UBC C+CP, 2009).

The West Courtyard is also historically important due to its association with the Thompson Berwick & Pratt firm descended from the firm Sharp & Thompson which won the competition for the original campus plan and design (UBC C+CP, 2009).

This heritage landscape could have been lost during a recent redevelopment; however, the Buchanan Courtyard Concept Design Report (2009) recognized the architectural and cultural significance of the Buchanan Courtyards and incorporated the underlying intent of the

original design. Key considerations of the redevelopment plan included the geometry of the West Courtyard and the Courtyard's design as an enclosed space with visual and physical connections to the south and north (Space2Place Design Inc., 2009).

Figure 17. Buchanan West Courtyard looking south. Photo credit: [unknown], 1979.

Figure 18. Buchanan West Courtyard looking south. Photo credit: Borschneck, S., 2019.

Overall, the redevelopment of the West Courtyard was successful in respecting the original design while achieving the redevelopment goals (e.g. increased functionality via outdoor seating) (UBC C+CP, 2009). This redevelopment exemplifies how heritage landscapes may be updated while respecting the original landscape design and plant community (trees that exist in both Figures 17 & 18 have been signified by stars).

Heritage Landscape Conclusion

This report doesn't attempt to identify how heritage landscapes should be designated, as the process for recommending and designating heritage landscapes is worthy of its own study. The intent was to highlight some of the landscapes that we have lost, with the hope that it motivates the university and the public to protect and maintain the landscapes that remain. The next section of this project aims to develop a comprehensive inventory protocol for cultural and heritage trees. The protection of individual trees with cultural and heritage status is a first step in protecting heritage landscapes as it would often take decades to regrow any trees removed from these landscapes.

Public Nomination Procedure

As the first step of on-campus heritage landscape protection, cultural and heritage tree preservation cannot be achieved without public engagement. Heritage trees should reflect the collective stories of the entire on-campus community. Therefore, active public involvement not only promotes an awareness of the importance of urban green spaces, but also allows campus inhabitants to feel a sense of involvement in the community which UBC seeks to create. On one side, enabling local campus inhabitants to nominate cultural and heritage trees can reveal new perspectives on the cultural significances of trees, as well as keep the tree inventory up to date. In particular, through the nomination process, various cultural perspectives from different ethic groups on campus can be captured. On the other side, a tree granted with cultural and heritage significant status can be protected from tree removal due to rapid campus development thus preserving its "significant impact on the environment and its enjoyment by the public", as well as maintaining iconic heritage landscape integrity (Bedford Borough Council, n.d.).

After examining other cities' nomination procedures in North America and the Tree Preservation Order from Borough of Bedford, United Kingdom, the recommended UBC Public Cultural and Heritage Tree Nomination criteria were formulated (Figure 19 and Appendix I). The nomination criteria were developed based on the below rationale:

1. The nomination form should be user friendly and easy to complete with minimum instruction and mensuration training.
2. The nomination criteria set thresholds via the tree score estimation to avoid a potential large volume of ineligible applications. In addition, tree score estimation information which is included in the inventory tally card can be used to assess whether the tree nominee has a reasonable life expectancy (Bedford Borough Council, n.d.). Dead or dying trees are not qualified for this nomination process (Bedford Borough Council, n.d.). However, this does not mean dead or dying trees are not culturally significant. If a dead or dying tree is removed, the material should be used for on-campus construction. If it is also culturally significant, a placard should be displayed.
3. The nomination criteria can capture the preliminary characteristic information of a potential cultural and heritage tree. Unlike other tree inventory focusing solemnly on a tree's physical performance, the form intends to discover the cultural and social aspects of a tree. It asks a nominator questions like "What is most noteworthy about the tree(s) that meets the criteria? (Size, beauty, history, unique species, shape/condition, function, others)", as well as to provide supporting

rationales/documents of the tree nominee (City of Vancouver, n.d.). In addition, the criteria align with the "Heritage" section in the proposed inventory tally card for later professional verification and inventory updates. Whereas, the two "Health" and "Structure - Wildlife Danger Tree Assessment (WDTA)" sections in the tally card will be conducted separately by a certified professional to 1) avoid complicated nomination procedure, 2) understand a cultural and heritage tree's health and safety condition for better maintenance and preservation, as well as circumventing potential impediment complaints from the public before granting the tree nominee cultural and heritage significant status, and 3) preserve on-campus biodiversity and wildlife habitat (Bedford Borough Council, n.d.).

4. Some of the nomination criteria (i.e. tree score estimation) is compatible with other tree registration criteria in Canada and North America (i.e. BC Big Tree Registry) to create data compatibility

THE UNIVERSITY OF BRITISH COLUMBIA
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Cultural and Heritage Tree Public Nomination Form

Nominator Information

Nominator Name: _____

Email: _____

Day Time Phone: _____

Affiliation: ☐ student ☐ faculty/staff member ☐ resident ☐ other _____

Does the nominator wish to remain anonymous? ☐ yes ☐ no

Tree Nominee Information

Common/Nickname Name: _____

Scientific Name: _____

GPS Location by Phone: _____

Tree Score Estimation:

____ (DBH in centimeter) + ____ (Tree Height in meter) + ____ (Tree Crown Width in meter) = _____ (Total Score unitless)

Single or grove of trees? ☐ single ☐ grove of trees

What is most noteworthy about the tree(s) that meets the criteria?

☐ size ☐ shape/condition ☐ unique species ☐ function (shade, natural resources)

☐ beauty ☐ history ☐ culturally modified tree(s) ☐ other _____

Please explain why you think this tree should be listed as a cultural and heritage tree (use the back of this page if needed, or attach relevant documents).

_____

_____

_____

Please include two colour photos of the tree when submit this form to heritagetree@ubc.ca or 2329 West Mall, Vancouver, BC V6T 1Z

Figure 19. UBC cultural and heritage Tree public nomination form. Adapted from Vancouver (Washington) Heritage Tree Program (n.d.) and BC Big Tree Registry (n.d.). Redesigned by Miao, A.

Once the form is submitted, a certified professional will review a tree nominee's eligibility. As we have noted, a tree may be identified as culturally significant due to a combination of amenities including (but not limited to) its size, age, specimen, function and/or historical/social values. Therefore, a set of rules for eligibility screening is adapted from the the Tree Preservation Order from Borough of Bedford (n.d.) (not in order):

- "A reasonable degree of public benefit must accrue" once the status is granted.
- "Trees should [ideally] be visible from a public place […] although exceptionally other trees may be included".
- "The benefit may be present or future (for example, when proposed development has taken place)".
- "The trees are worthy of preservation for their intrinsic beauty, for their contribution to the landscape" or for their importance to certain ethnic group(s) on campus.
- "The trees have scarcity value".
- "Other factors (such as importance as a wildlife habitat) may be taken into account, which alone would not be sufficient to warrant" cultural and heritage tree status.

After preliminary screening, the tree nominee is subject to verification if it is deemed as a potential culturally significant candidate. If all information in the form is confirmed by a certified professional, further health and WDTA assessment will be carried out before granting a tree cultural and heritage tree status. All mentioned information will then be added into the inventory database. In the next chapter, detailed tree inventory protocol will be examined, and technical terms will be defined.

Cultural and Heritage Tree Inventory Protocol

Once a heritage tree nomination is submitted to UBC Plant Operations, it will be treated like a service request put into a priority sequence process based on any perceived risk associated with the tree and location, and how many nominations the tree has gotten (O. Croy, personal communication, March 21, 2019). UBC Arborists and/or subcontracted arborists working on UBC projects will conduct heritage tree inventory with the inventory sheet ready at hand (Figure 20 & Table 1). The inventory protocol is comprised of three assessments: a heritage assessment, a health assessment, and a structure assessment.

First, the essential elements of every tree inventory report should be noted: the tree tag number, species, and size measured at 1.3 meters (DBH). Heritage tree designation has historically been a rather nebulous task since all trees could be deemed culturally significant by anyone. For the sake of conservation, nowhere is a bad place to conserve nature. Individual, mature trees of especial cultural value are not a bad place to start either. For simplicity sake as well, this heritage tree assessment is broken down by size, age, rarity, and heritage types.

Figure 20. A red oak from the original planting on Main Mall. See Table 1 for application of the inventory protocol. Photo credit: Bishop, S., 2019.

Table 1. Application of the inventory protocol. Designed by Bishop, S.

Heritage						Health			Structure - Wildlife Danger Tree Assessment (WDTA) [1]				
Tag #	Common name *Botanical name*	DBH (cm)	Age (yrs.)	Rarity [2] (Y/N)	Heritage type [3] (Historical, CMT, Specimen, Significant Grove)	Live crown ratio [4] (%)	Comments [5]	Condition (Good, Fair, Poor)	Defects (I.e. Hazardous Top, Dead/ Detached Limbs)	Risk rating (Danger/ Safe	Habitat value (Low, Medium, High)	Wildlife uses [6] (I.e. Perch, Food, Nest)	Management action (I.e. Monitor, Modify, Move Target, Fall)
360	Red oak Quercus rubra	80	~99	Yes	Historical, Significant Grove	80	Superficial frost cracks on stem, mechanical damage on lower bole, deadwood in mid-crown	Good	Dead limbs	Danger	High	Crow and squirrel nests, perch, food source	Modify- Remove dead limbs

[1] Wildlife Dangerous Tree Assessment is sublimated into the heritage tree inventory to assess aging trees for species-specific dangerous defects and wildlife value. A WDTA field data sheet will be completed before filling out the "Structure" section of the inventory sheet and inform columns in this section.

[2] Rarity may be based on genetic constitution, conservation status, and/or spatial significance.

[3] **Historical** heritage trees are associated with local folklore, myths, legends, or traditions.
CMT (Culturally Modified Tree) are heritage trees that display evidence of cultural modification by Aboriginal or non-Aboriginal people.
Specimen heritage trees are associated with a historic person, place, event or period.
Significant Grove are groups of heritage trees and/or trees that belong to a historical group of trees.

[4] Live crown ratio is the estimated amount of live crown over the estimated amount of potential live crown.

[5] Speculative reasons with rationale as to why the tree may be in fair or poor condition.

[6] If federally and/or provincially protected wildlife is actively using the tree, management actions will be altered accordingly.

Heritage status is sometimes given to trees once they reach a certain size, the City of Maple Ridge has a small minimum DBH of 50 cm, compared to other cities in Metro Vancouver (City of Maple Ridge, 2015). UBC could adopt this standard to optimize heritage tree retention. The Arborists can assess rarity on the grounds of genetic constitution, conservation status, and/or spatial significance (i.e. a conifer in a group deciduous trees) (D. Justice, personal communication, March 14, 2019). Arborists eventually assign a heritage type to a subject tree or group of trees based on research conducted in and out the field. Heritage types are useful for public engagement strategies, people are more willing to retain trees that have stories. The heritage types in this inventory protocol are four categories adapted from Tree Ontario's definitions of a heritage tree. Historical heritage trees are associated with local folklore, myths, legends, or traditions. A Culturally Modified Tree (CMT) displays evidence of cultural modification by Aboriginal or non-Aboriginal people. This cultural modification includes, but is not limited to, strips of bark removed, test hole cut to determine soundness, furrows cut to collect pitch or sap, or blazes to mark a trail (Nolon, 2003). A Specimen heritage tree is associated with a historic person, place, event or period. A Significant Grove is a heritage type that can used for a group of historical trees or an individual tree that belongs to a historical group of trees.

Why include a health assessment and structure assessment? These assessments are essential for making retention plans for heritage trees. The health assessment, particularly the 'Comments' section, signals if professionals in other tree-related fields, for instance tree pathologists and tree entomologist (insects), need to be advised on treatment options and informs management options on how to improve a tree's health if it is in decline. Results in tree health assessments are option interrelated with results in the structural assessment. In some cases, if a tree has a low live crown ratio (under 50%), there may be a problem with the roots. Ultimately a condition will be assigned to the subject tree based on the live crown ratio and the arborist's discretion.

A long pre-existing tree inventory protocol is folded into the structural assessment, the Wildlife Danger Tree Assessment. This is an ideal tree risk assessment for heritage trees because it has a balanced treatment of defects in aging trees that leans towards retention for the sake of protecting habitat. Tree defects have pros for habitat value as well as cons for public safety depending on where the tree is located. First the subject tree is sorted based on level of disturbance for workers and/or visitors in the surrounding site. There is a scale of 1-4 levels of disturbance a heritage tree could potentially pose if it failed in anyway. For instance, the first level of disturbance most examples for work activity and potential targets that fall into that category are

in stationary positions for a short amount of time with their heads down (i.e. tree planting and rest stops). Whereas in the third level of disturbance the human activity is stationary for a longer time because of the work activity or infrastructure the tree is next to (i.e. tree falling and permanent buildings/facilities). Once a level of disturbance is established, the tree is inspected for defects based on its age and species-specific thresholds to failure. For examples, Western red cedar can withstand twice as much stem damage compared to Douglas fir before the defect becomes dangerous. The main defect categories assessed are hazardous top(s), dead limbs, Witches' broom, splits in the trunk, stem damage, thick sloughing bark or sapwood, cankers, fungal fruiting bodies, tree lean, root inspection, and sometimes a stem test if it's called for. If any one of these defect categories exceeds the species-specific threshold, it will be recorded as dangerous and the whole tree will be considered dangerous. However, habitat value associated with defects are also taken into account before a management action can be determined. Broken tops can serve as nests for owls, perches for eagles. If protected wildlife is actively using the heritage tree, it can be protected by provincial and federal laws (i.e. Wildlife Act and Migratory Bird Convention Act).

Community Engagement Recommendations

Several strategies are proposed to increase opportunities for and improve public engagement for on-campus heritage trees preservation. These strategies are to complement the UBC Campus Cultural and Heritage Tree Inventory Project. The proposed public engagement strategies are designed based on targeted audiences: 1) families and children, 2) teenagers to young adults/UBC students and 3) seniors. By targeting specific audiences, UBC creates an opportunity and provides roles for everyone in the UBC community to participate in caring for the urban forest with an emphasis on heritage trees.

1. Families and Children

Many young families with children are currently living on the Point Grey campus; so many that there are multiple daycare programs and family housing subsidies for mothers or fathers that are students. Families with children are one of the targeted audiences due to the importance of educating future generations to share environmental responsibilities for a greener and more sustainable world. If we teach children values of caring for their environment and heritage trees, there is a higher likelihood that these special heritage trees will be cared for in the future.

Potential Strategy 1: Heritage Tree Scavenger Hunt

The Scavenger Hunt can be incorporated into the regular daycare programs for the purposes of getting kids outside and learning about nature. During this event, a wax paper with a short story about the specific tree's history and relation to UBC will be deposited next to each selected tree. Participating children will be asked to write down one thing they have learned from each particular heritage tree until they finished collecting all five "treasures" in the Scavenger Hunt.

2. Young Adults and UBC Students

Students make up the majority of the on-campus population and often bring forth new innovative ideas about the world. As a whole, students can have a strong voice in deciding which heritage tree will be protected, thus determining which trees will be able to pass down their intangible memories for future generations. These ideas should be utilized and reflected in the cultural and heritage inventory records.

Strategy 2: Art Contest and Show

The Art Contest/Show provides an opportunity for creative, artistic students to visually display UBC's heritage trees, and their importance and history to UBC. Students can draw, paint, sculpt (or any other creative art form) selected heritage trees and submit to a panel. The winner (or winners) will receive a prize. All art pieces handed into the contest will be put on display – for instance, in the Nest. The art show is another form of public engagement for everyone to attend, see and learn about UBC's heritage trees from the angle of UBC students.

Strategy 3: Text/Email this Tree program

Strategy 3 is adopted from Melbourne's "email a tree" program where officials give each tree an ID # and an email address for citizens to email when there are problems with a tree (e.g. broken branch). The "email a tree" program has been successfully implemented in a small park in Vancouver. This program is a convenient method for citizens to contact city officials for tree maintenance. In addition, this program creates personal connections between people and their environment. Therefore, this program would be effective in connecting people with heritage trees on campus.

Strategy 4: "Name this Tree" contest

Similar to Vancouver Aquarium's "Name this Beluga" program, the "Name this Tree" contest would be just as effective in engaging students about UBC's heritage trees. This contest creates media opportunities around campus to highlight heritage trees to raise awareness while giving students an incentive to engage in this important topic. Furthermore, this strategy creates personas for each heritage tree making the tree relatable. If there were a reason to take a tree down in the future, developing personas will be helpful in creating a rationale as to why the tree should not be taken down – people care about it.

Strategy 5: QR Codes or Geocaching

Most students walk around UBC looking down at their phones. Then why not use technology as a way to engage the public? Technology is a user-friendly, quick, and relatively inexpensive (since most students have phones) way of engaging the public. QR codes can be placed at each heritage tree to direct people to a website for more information about specific trees. In order to get people to know that trees have QR codes, marketing plans should be developed accordingly. In addition, geocaches (i.e. scavenger hunt on your phone) can be made and placed near heritage trees for people to discover. Geocaching has become more and more popular in recent years and is a great way to get important messages across.

3. Seniors

Opinions from seniors should be taken into account when major land use decisions are made about their community. As a general observation, as people age, their attachment to their home communities also grows deeper just like the development of tree roots. As a result, senior well-being should be considered.

Strategy 6: Heritage Tree Walks

Egan Davis, Chief Educator at the UBC Botanical Garden, has led numerous tree walks, specifically, heritage tree walks. He has found that these short walks are quite attractive to seniors for mild outdoor/social activity and sharpen their minds.

UBC Tree Week

Six potential strategies are proposed to engage the public to learn more about heritage trees on campus. However, all these events and programs would be most effective if they are combined into one big event, the UBC Tree Week (Figure 20). During the UBC Tree Week,

different events/programs will be featured on each day for a week to create a sense of community awareness about maintaining urban green space which includes heritage trees.

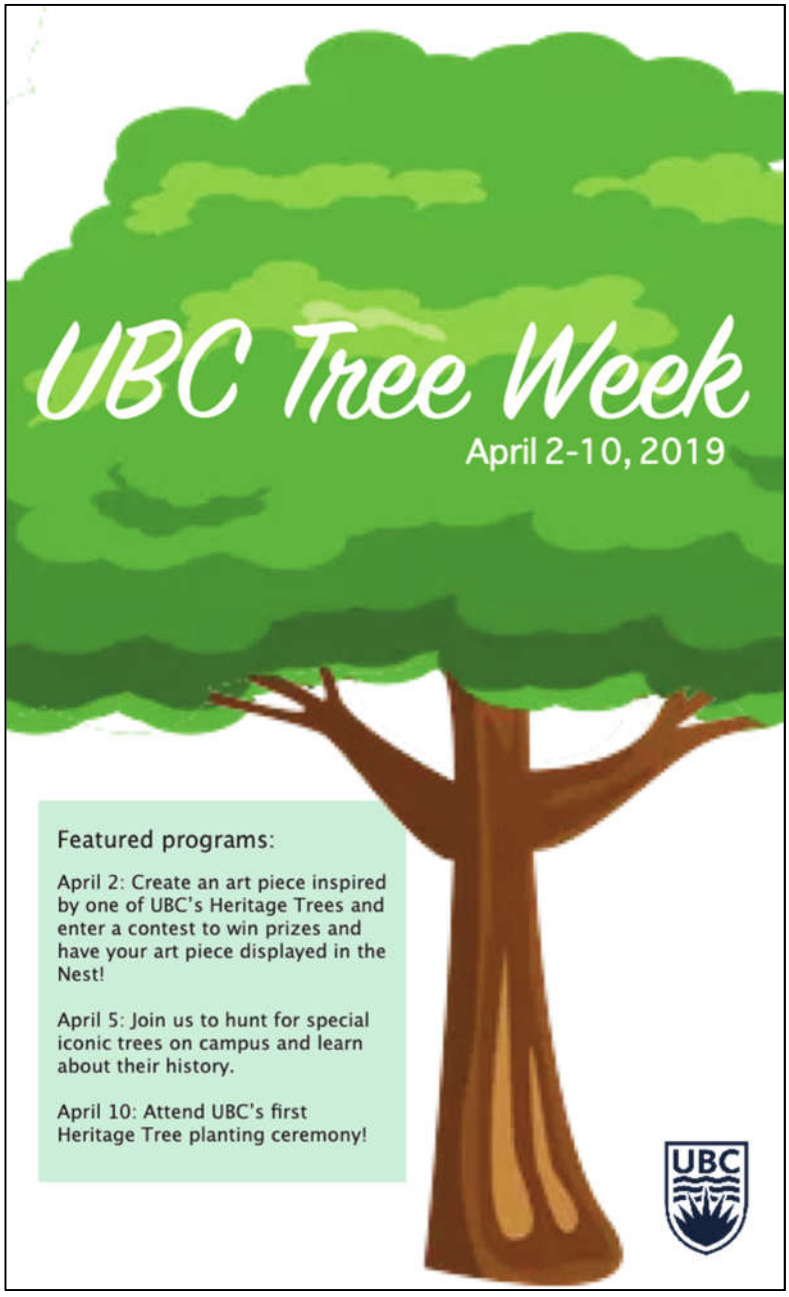

Figure 21. UBC Tree Week poster. Design credit: Kim, A.

Climate Change Mitigation and Adaptation

With multiple scales of landscapes being altered on campus as identified in the chapter, UBC Heritage Landscape, it's important to emphasize the reasons for incorporating both urban and ecological development. Ideally, landscapes should be able to incorporate both in order to satisfy the needs of all types of people, whether that be through aesthetically pleasing trees, culturally inclusive relationships with plants or even combating climate change.

Increase Resilience through Heritage Landscapes Restoration

Changes on campus can be detrimental to pleasing not only students but also faculty, staff and campus stakeholders. Future planning has to be done in not only an efficient way but also in a culturally sensitive way due to people's attachment to specific landscapes. This is especially important when trees are removed, re-planted and replaced in order to fulfil the goals of the campus planning masterplan. For this to occur with minimum negative effect on people, justifications, such as maintaining tree health, increasing resilient trees and aesthetic beauty, must be stated in order for people to better understand the actions that are being pursued in these development plans.

By successful planning of future tree planting, it may then be possible to create a resilient heritage landscape which encompasses a heterogeneous mosaic of ecological and urban features. Consequentially, the setting, processes, connectivity, diversity/complexity, redundancy, scale and people must be considered in order to get the most realistic representation of all things that affect resilience (Beller *et al*., 2019). Additionally, if incorporated properly, research from many academic fields, whether it be conservation science, landscape architecture or biology, could be incorporated into the planning phase. By having a more thorough understanding of the environment from the perspectives of different fields, the campus would be able to then approach resilience in many ways, in places with little to a high amount of modification (Beller *et al*., 2019).

Climate Change

In the present day, considerations for campus planning need to include climatic conditions that are changing rapidly and will continue to change for many years to come. Future projections for the province of British Columbia include a temperature increase from of 1.3°C to 2.7°C by the year 2050 (Government of British Columbia, 2018). This in turn will shift the coastal western hemlock biogeoclimatic (BEC) zone that UBC currently resides in (Islands Trust, 2015), as well as alter both the landscape and the vegetation. Other characteristics of the climate are also

expected to change including longer growing seasons with more frequent and severe droughts, wildfires, insect outbreaks and diseases, intensive heat waves and heat related stresses (British Columbia, 2018).

Present GHG Emissions

With climate change occurring, it's important to think of how the UBC campus is currently contributing to the storage of greenhouse gasses (GHG) in the atmosphere. In 2017, UBC produced a total of 60,883tCO2e (UBC, 2017). In accordance with the campus emissions to be offset, a total of 42,786 tCO2e of emissions are from sources such as fossil fuel, and electricity usage, and paper consumption amongst all of campus (UBC Sustainability, 2017).

Doing Our Part for Future Planted Trees

In order to accommodate the change that is to occur within the environment, more climatized trees should be selected for future heritage trees. By doing this, not only can we mitigate the campus emissions, but we will also be planning for the future of a UBC heritage landscape that incorporates multiple core values both sentimental and aesthetic. Using "Tree Species Selection Database" through Metro Vancouver, physical characteristics such as large size, wide canopy coverage, long life expectancy and drought resistance can be future tree selection criteria (Metro Vancouver, 2017). Tree functional characteristics to consider include: shading, blocking wind, rain cover and combatting emissions from the campus. Social/cultural tree characteristics may include beauty, memories, symbolism and incorporating an environmental atmosphere to the university development. By acknowledging the many uses of heritage trees, people will be more inclined to support the cause to preserve them. Therefore, to better prepare the campus for the future, resilient trees that retain aesthetic and cultural values will be planted to restore a heritage landscape.

Conclusion

Heritage trees are living, breathing witnesses of UBC history for First Nations, students, faculty, residents, and visitors. To be able to protect heritage trees and their stories during inevitable development, thorough community engagement strategies and an inventory process must be in place. Heritage landscape preservation, the diverse cultural backgrounds present in the UBC community, and climate change mitigation and adaptation are undeniable reasons for a heritage tree protection apparatus. The public nomination procedure, inventory protocol, and

community engagement strategies this report puts forward are integral tools for this apparatus intended to inform the UBC Heritage Conservation policy and Urban Forestry Management Plan.

Communities take pride in their culturally significant trees, and culturally significant trees in turn inspire community members' imaginations and tie everyone together. As UBC students, we are immensely proud of our green campus, it is our sincere hope that this report will be a major help to heritage trees.

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Appendix I. Cultural and heritage tree public nomination form draft. Adapted from Vancouver (Washington) Heritage Tree Program (n.d.) and BC Big Tree Registry (n.d.). Redesigned by Miao, A.

THE UNIVERSITY OF BRITISH COLUMBIA Campus + Community Planning

SEEDS Sustainability Program

forestry university of british columbia

Cultural and Heritage Tree Public Nomination Form

Nominator Information

Nominator Name: _____

Email: _____

Day Time Phone: _____

Affiliation: ☐ student ☐ faculty/staff member ☐ resident ☐ other _____

Does the nominator wish to remain anonymous? ☐ yes ☐ no

Tree Nominee Information

Common/Nickname Name: _____

Scientific Name: _____

GPS Location by Phone: _____

Tree Score Estimation:

____ (DBH in centimeter) + ____ (Tree Height in meter) + ____ (Tree Crown Width in meter) = _____ (Total Score unitless)

Single or grove of trees? ☐ single ☐ grove of trees

What is most noteworthy about the tree(s) that meets the criteria?

☐ size ☐ shape/condition ☐ unique species ☐ function (shade, natural resources)

☐ beauty ☐ history ☐ culturally modified tree(s) ☐ other _____

Please explain why you think this tree should be listed as a cultural and heritage tree (use the back of this page if needed, or attach relevant documents).

_____

_____

_____

Please include two colour photos of the tree when submit this form to heritagetree@ubc.ca or 2329 West Mall, Vancouver, BC V6T 1Z