Vanier Nature Park

Garry Oak Tree Survey

October – November 2021

Comox Valley Naturalist Society

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Comox Valley Naturalist (CVN) Volunteers

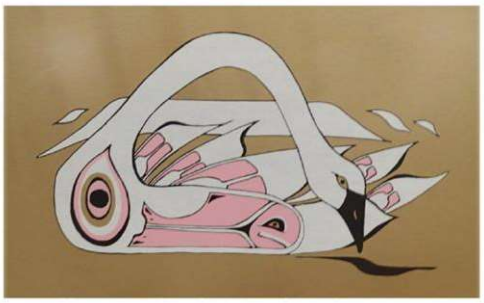
Jim Boulter Bachelor of Technology, BC Diploma Adult Education

Karen Cummins Diploma in Horticulture, ISA Certified Arborist

Daniel Devine BSc Natural Resource Management, Diploma Restoration of Natural Systems

Robert Hauser BSc Geology

Fred Newhouse Registered Professional Forester



Comox Valley Naturalists Society

NOTE

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Introduction

This report is a follow up to the Vanier Forest Garry Oaks Restoration & Stewardship Pilot Project proposal presented to the City of Courtenay Mayor and Council by the of Comox Valley Naturalist Society (CVN) in July 2021.

This report discloses valuable observations and scientific data about the current state of the Vanier Park Garry oaks and its associated ecosystem that was not presented in the July 2021 proposal. The report supplies recommendations for minimally intrusive methods to manage trees that are encroaching on the Garry oaks in Vanier Nature Park.

CVN volunteer members inventoried and assessed the Vanier Park Garry oaks to provide the City of Courtenay with population and health data to aid and inform the city's future decisions about management of the site to conserve its unique natural heritage. The City of Courtenay has public documents which mention the need and intention to conserve the Vanier Garry oaks, including the City's *Urban Forest Strategy*, and the *Parks and Recreation Master Plan.* (**See**: Appendix A – Garry Oaks – City of Courtenay Documents)

The data presented in this report was collected in October through November 2021 using non-invasive methods. Volunteers collected physical and health data on 190 trees in our survey area. These data collections have taken 89 hours of on-site measuring and observation and hours of mapping and drafting this report. We see this report as a start on the process to name specific and practical strategies for improving the conditions for the Garry oaks and their associated ecosystem whilst keeping and respecting the surrounding forest dominated primarily by conifers**.**

Indigenous Acknowledgement and History

We respectfully acknowledge that the land we gather on is on the unceded traditional territory of the K'ómoks First Nation, the traditional keepers of this land.

While we acknowledge that the Garry oak ecosystems of the Comox Valley evolved from the stewardship of the K'omoks people, this report does not intend to usurp or represent Indigenous knowledge or rights.

We do respectfully submit that the conditions of the remnant Garry oak stands left today in the Comox Valley are a result of the joint influences over time of Indigenous practices, past and present climatic changes, and the repercussions of colonial settlement. The latter includes changes to Indigenous

land management such as precluding cyclical burning of meadows that kept the oak savannahs clear of unwanted shrubs or conifers.[1]

A. Purpose for Data Collection

Why the need for data collection? Prior to this survey, little data on the state of the Garry oak trees within the Vanier Park had been collected. The number, size, health and age of the Garry oaks as well as the trees that overtop them were not precisely determined or quantified.

It is not possible to make realistic plans without sound, reliable data. Without the data collected in the survey, it would not be possible to confirm the need or viability of the restoration and stewardship pilot project.

Also, **data collection based on best scientific and professional practices, can be used to find proper methods for Garry oak tree restoration that is minimally invasive.**

Why save these particular Garry oaks? Garry oaks have been on Vancouver Island and west coast of the United States for at least 6000 years, and were culturally maintained by the local Indigenous cultures. It has been estimated that only 5% of the original Garry oak ecosystems survived[2] colonization, and in the Comox Valley that percentage shrinks to less than 1%.

The Vanier Garry oak ecosystem, a deep soil wetland, is so rare it is not even recognized provincially, and the oaks themselves are a unique genotype adapted to living in this particular space. The biogeoclimatic zone is likely CWHxm (Coastal Western Hemlock, dry maritime), and the presence of Garry oaks is considered rare[3].

Concern has been expressed over the current density of oak trees in the grove. This property was preempted in 1862, which accounts for the large percentage of oaks post 1862. The oak grove density is therefore naturally set by this particular genotype, absent any disturbance or competition with other trees for sunlight.

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[1] Barlow, Pellatt, and Kohfeld, *Garry Oak Ecosystem Stand History in Southwest British Columbia, Canada*

[2] Maingon, Loys, personal conversation March 2022

[3] Meidinger & Pojar, *Ecosystems of British Columbia*, B.C Ministry of Forests, page 60

B. Survey Area

The survey area hatched in orange, (Figure 1) covers approximately 0.5 hectares (Ha) of the 0.84 Ha that the oaks occupy in Vanier Park. The total park area is 5.33 Ha.

The survey area is roughly 10% of the park area. This area is the bulk of the main Garry oak grove and the area that requires intervention as soon as possible. There are approximately ten Garry oaks and many conifers in the boundary area between the survey area and the property line to the south. This boundary area receives more sunlight and is in better health. So presently, it has been excluded from the survey and placed on the list of future attention.

Figure 2, on the next page, is a diagram of the survey area with trees named by species and canopy size shown. Following sections of this report describe observations about specific trees. Diagram #8 on page 22 in the Appendix references all the tree numbers.

Figure 1 *- Survey Area in Vanier Park*

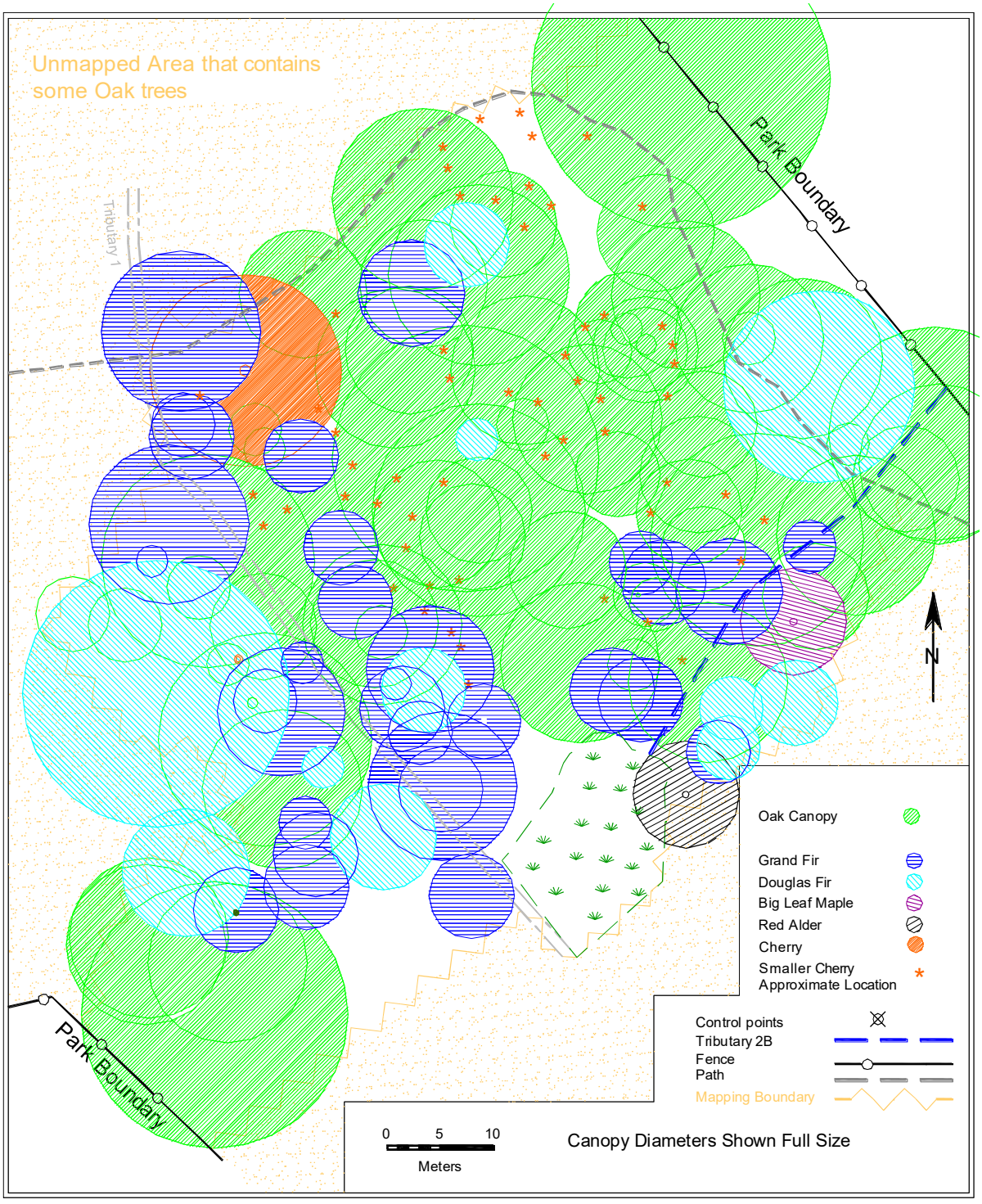

Figure 2*- Survey Area with Trees Identified by Species and the Full Canopy Size*

C. Data Collection Methodology

We used 1" by1" pine stakes driven into the ground near the trees to uniquely identify each tree, and recorded size, health, and vigor of the individual tree.

A 30-meter tape and laser range finder were used to measure distances as GPS used under the dense canopy of this forest was inexact for finding trees. Compass readings were taken with palm compasses and corrected for true North. **Tree diameter was measured with a DBH tape in cm**. **Live crown height and crown diameter were measured in meters and the live crown ratio determined. The crown die back in the Garry oaks was estimated**.

A subjective evaluation of health and vigor of the Garry oaks was done by certified arborist and forester volunteer members of CVN. This included **seeing and noting any epicormic growth** on the Garry oaks, as well as **inspecting the stem for wounds, disease, or other defects**. **A subjective analysis of the state of the ecosystem was recorded**, as were the presence of any test ground wells that were installed for an earlier survey.[4] All 9 wells appeared to be intact, but no current data have been taken from them.

D. Survey Area Ecosystem Overview

Data from 190 trees, including 62 live Garry oaks and 15 dead Garry oaks, were collected in our survey area and the trees mapped. (See: Figure 2)

The **largest Garry oak tree** in this survey was **tree #89**, with a diameter at breast height (DBH) of 106.2 cm (**See**: Appendix C - Estimating Tree Age for calculation details). The **estimated age of this tree is about 265 years. No other live Garry oak trees less than 70 years old (28 cm) were seen and are unlikely to be present due to the elevated level of shade. Few live seedlings were noted, and few acorns were found.**

Two exceptionally large Douglas firs were found and mapped: **Tree # 94** (DBH 145cm) is on the southern edge of the grove and **tree #108** (DBH 138) is on the northern edge.

The ground slopes south and south-east to a small vernal stream (Tributary 2B) that originates above the park on private land to the east and joins the wet lowlands to the south-west before flowing into Towhee Creek. **To the west of the plot is a deep trench Tributary 1** (approximately 1 meter deep and 2

[4] Current Environmental et al., *SD 71 Vanier Oak Property Ecological Assessment and Protection Plan*

meters wide). We suspect this was dug for the Sandwick Army Base in the 1940-1950s. **Many large grand firs and other species of trees have grown up on its edges**. One of these, a large Douglas fir, tree was blown down during the windstorms of October 2021.

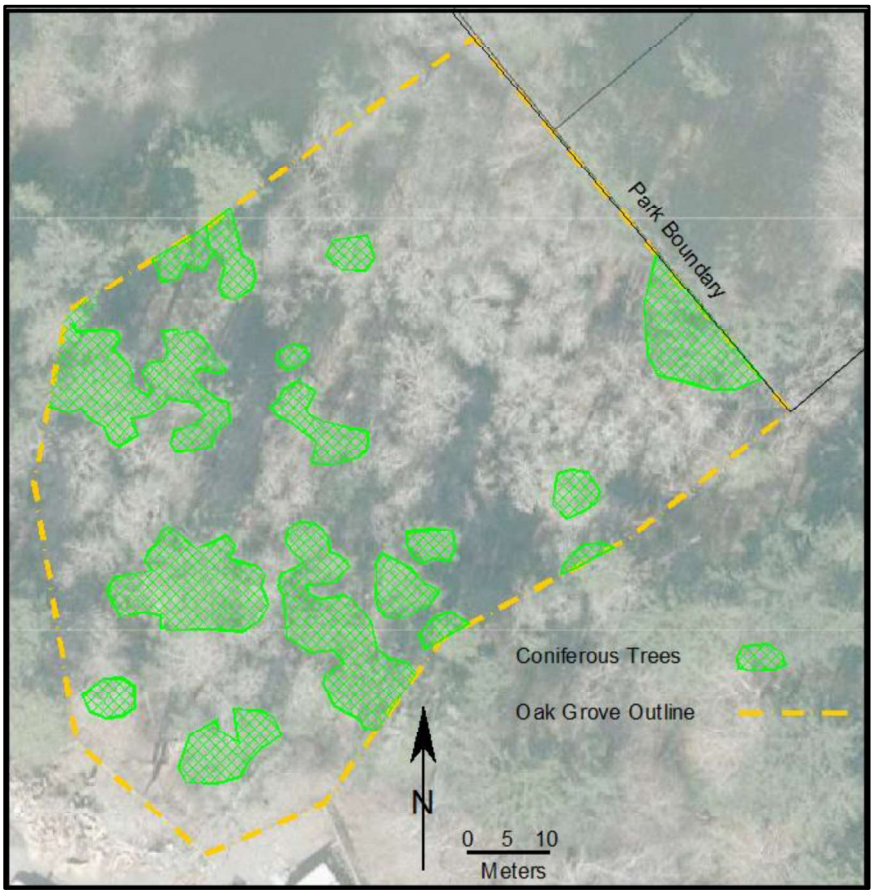

Figure 3 *- Coniferous Tree Coverage in Survey Area*

Crown cover is almost complete. The Garry oaks dominate the canopy in some areas of the main grove but are being overtopped by Douglas firs (*Pseudotsuga menziessii*) **and grand firs** (*Abies grandis*).

The green hatched pattern in Figure 3 shows the coniferous tree coverage in the Garry oak grove. The coniferous coverage was digitized from an air photo taken on March 19, 2020, at approximately noon and represents 19% of the area of the grove. **Darker areas north of the trees are the shadows of the trees**. Shadows in the photo would be roughly half the size during the May to Sept growing season and will of course change position during the day. **The evergreen trees and their shadows create significant shade for the Garry oaks beneath them and immediately to the north.**

Non-native sweet cherry (*Prunus avium*) **is intermediate to co-dominate with the Garry oaks**. **Other tree species present** include **red alder** (*Alnus rubra*), **Pacific dogwood** (*Cornus nuttalii*) and **big leaf maple** *(Acer macrophyllum).* **Undergrowth is mostly ferns**, **mosses**, and **snowberry**, with patches of **non-native shrubs daphne laurel** (*Daphne laureola,* **English ivy** (*Hedera helix)* and **Himalayan blackberry** (*Rubus armeniacus*)

While we have focused on sunlight being a major limiting factor to the health of the Garry oaks in Vanier Park, the competition for resources with the English holly, Daphne, Himalayan blackberry and English ivy is also a major issue. English holly is admirably adapted to the shade of understory forests, can grow to up to 20m tall and 25cm DBH and reach 55 years of age. **The regeneration of Garry oaks and the persistence of native understory forbs and grasses without removal of these invasive plants are impossible**. We are just now learning of the long-term effects of English holly on the physical and chemical properties of forest soil such as lower pH and higher amounts of sulfur. [5] Even more recently studied is the effect of exotic invasive plants on soil fungal communities that can alter the structure and health of native plant communities.[6] **We could speculate that without management it is possible that the climax state of this woodland could be English holly**.

E. Initial Observations

1. Establishment Date vs Number of Living Garry Oaks (n=65)

Analysis of the tree population and their ages is essential to understanding where the grove currently is in the forest succession sequence. In a healthy Garry oak grove, the general shape expected is a bell-curve, with median-aged individuals in the mid-range life span. Noticeably young and old individuals will be fewer, but young individuals should have a higher population compared to elders to promote continuity. Although Garry oaks can exceed 500 years, existing trees over 300 years old are rare and their ecosystems are doubly so.[7]

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[5] Berger, Soil Impacts Due to the Invasion of Ilex Aquifolium (English Holly) into Second Growth Forests of the Pacific Northwest

[6] Pickett, Maltz, and Aronson, *Impacts of Invasive Plants on Soil Fungi, and Implications for Restoration*

[7] Dunwiddie et al., *Environmental History of a Garry Oak*

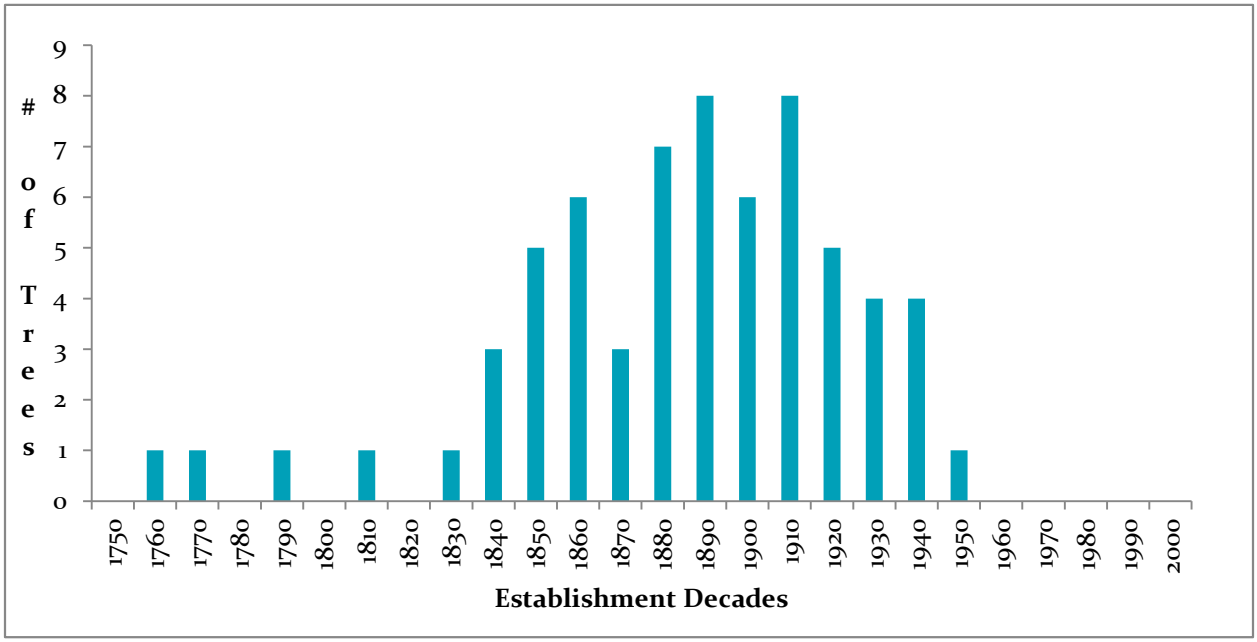

Figure 4 *- Estimated decades of establishment for 65 oak trees in Vanier Park.*

2. Study Area Observations

a) **Smallest live Garry oak** (DBH) was **28 cm (#4**), estimated to be **70years old**.

b) **The largest Garry oak** was **106.2 cm (#89),** estimated to be **265 years old**.

c) **No living Garry oak trees established after the 1950s were found**.

d) **Few seedlings were found and few acorns were present**.

e) **The grove was self-sowing after pre-emption in 1862, but seedlings ceased to be viable after 1950**.

3. Total Tree Height and Relative Positions to Each Other

Total tree height and the relative positions of trees to each other are crucial factors in considering how the Garry oaks are currently shaded and how to plan for their release from shading.

Noting the live crown heights of overtopping conifers has been valuable in planning how to subordinate these trees.

In measuring and mapping the **62 sweet cherries** we realize that though these trees are small in diameter (12-25cm DBH with two specimens 32 and 36 cm DBH) they range from 10-23m in height while the 49 Garry oaks in the same area

range from 16-27m in height. **The sweet cherries are competing with the Garry oaks for sun and other resources such as nutrients and wate**r. Being another new species to this ecosystem we do not know what other effects sweet cherries may be having on the physical characteristics of soil or soil biology.

4. Live Crown Ratio, Epicormic Growth and Crown Dieback

A high live crown ratio generally indicates more leaf surface, better health, and more access to sunlight. **From earlier studies[8] we expect that the Garry oak trees with a higher live crown ratio will have the greatest response to "release" from shade in their production of epicormic growth and increased diameter growth**. Trees with smaller crowns may produce less or varied epicormic and diameter growth but all the released trees will have more new growth than trees that are still shaded.

Our inventory notes the presence or absence of existing epicormic growth on the stem and first order limbs below the live crown base. Photographs and counts should be taken of the Garry oaks before any release treatment to compare epicormic growth response in post release oaks.

The live crown ratio of the Garry oaks will continue to be reduced as the over-topping conifers further restrict the amount of light the Garry oaks receive, which will lead to increased crown die-back, and eventually the death of the Garry oaks.

The degree of crown dieback in Vanier Park is the most concerning factor of these three factors at present. The stand of Garry oaks nearby to the northwest of the Sportsplex that has good exposure to sun from the south and southwest has similar live crown heights and ratios to those in our survey in Vanier Nature Park. Yet the stand by the Sportsplex shows little sign of dieback or crown thinning and produces a healthy crop of acorns.

5. Tree Health and Disease Observations

a) Grand Firs

There are three standing dead grand firs found in three locations within our study area (tree #75, #101 and #116) as well as tree #130 that is dead and down at the bottom of the small stream coming from the east. **Fanning out from these trees are other grand firs showing signs of decline: crowns are thin and new foliage is sparse**. These symptoms can be associated with root rot. We consulted Regional BC Forest Service Pathologist Dave Rusch who found no direct

[8] Devine and Harrington, *A Practical guide to Oak Release*

evidence of root rot and saw no history of typical disease centers which would be characterized by downed trees with distinctive root wads[9]. The pattern for these declining grand firs is to remain standing a long time though the top may break off.

Environmental stress generally contributes to trees being vulnerable to root diseases.[10] Pacific Forestry Center research scientist Mike Cruikshank shared with us his opinion that "Our summers have been getting hotter and we have longer periods without rain. Grand fir is one tree that is least able to handle this (condition) followed by western hemlock and western red cedar. Garry oak and arbutus are best at this (condition) followed by Douglas fir." Garry oaks are not susceptible to laminated root rot.

b) Garry Oaks

We have noted **three sightings of *Armillaria* fruiting bodies** on a dead and downed Garry oak and two dead standing Garry oaks. *Armillaria* can live for many years as a saprophyte (living on dead or decaying plant material) in soil, infected stump and roots.[11]

Garry oak trees can also be infected with *Armillaria* and survive by compartmentalizing the infection and replacing roots. Stress, however, can tip the balance in favor of the fungus. Some symptoms of root system decline due to *Armillaria* are the same as those of trees experiencing too much shade: dieback and crown thinning. Other positive signs for the identification of pathogenic infection by *Armillaria* are the sighting of fruiting bodies at the base of live trees, white fan-like mats of mycelium (fungal tissue) and decayed wood under the bark as well as rhizomorphs (black string like fungal tissue) under the bark or on the exposed wood of stems or roots. We have not seen any *Armillaria* fruiting bodies on live trees. Exploring under the bark of a live Garry oak that fell this winter after the heavy snowfall (this tree had been leaning heavily) we found no evidence of mycelial growth and no rhizomorphs on the roots. This suggests that at least for this Garry oak, *Armillaria* was either not present or not pathogenic. Mycelium and rhizomorphs can grow through the soil to new roots and the fruiting bodies produce spores carried by the wind.

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[9] Rusch, David, personal communication

[10], Ministry of Forests, Lands, Natural Resource Operations and Rural Development, *Managing Root Disease in British Columbia*

[11] Pacific Northwest Extension Publication, Oregon State University, "Oak (Quercus spp.)-Armillaria Root Rot".

One of the top recommended strategies for managing *Armillaria* in Garry oaks is to increase their vigor. In the case of the Vanier oaks this would mean increasing the sunlight they receive by decreasing the competition for it.

6. Current Hydrology Conditions

Vanier Forest is the located in the Towhee Creek watershed, and provides seasonal flows to this fish bearing stream. The lower stretches of the Towhee often dry up in the spring, before the juvenile Coho salmon are ready to leave the creek and move to the Tsolum River. Although no flow records for Towhee Creek are known to the Tsolum River Restoration Society, TRRS suspects that this has been a problem since the Comox Valley Sportplex and the School district increased their foot print further into the Vanier Forest in the 1990s.[12]

The wetlands of the Vanier Forest are created by two main sources. Wet seeps on the upper slopes provide near-surface ground water in the upper soil levels which are moderately well-drained. The second source is the deep trench, the upper end of which ties into the drainage ditch along Vanier Road. This ditch has water most of the year, much of which is intercepted sub-surface flow. Except for the open streams, surface water rarely, if ever, occurs in the principal grove[13] as water sinks quickly through the loose, upper soil layers. An impermeable layer, about 1 meter below the surface, limits further downward movement.

Waters feeding fish bearing streams need to be cool, consistent in volume, and unburdened by sediment and pollutants. In addition, the water should carry nutrients, both for the fish directly and for the organisms the fish feed on.

Lack of shading for the riparian areas, especially for surface water, is of concern. The Park has a number of vernal wetlands above and below the principal oak grove which are unshaded, allowing the surface water to rise in temperature. These wetlands will not be affected in any way by the work proposed. Water temperature of sub-surface flows is less susceptible to variation as sub-surface ground temperatures remain relatively constant during the day. **There is enough existing Garry oak canopy to maintain shade over the tributaries from the time the oaks leaf out in April until the late fall.** The reduction of early spring shading may increase insect populations[14] and encourage growth of native plants.

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[12] Tripp, Chamberlain & Heim "*Juvenile Coho Salmon Rescue, Procedures and April Population Estimate…"*

[13] Current Environmental et al., *SD 71 Vanier Oak Property Ecological Assessment and Protection Plan*

[14] Banks, li, & Herlihy "*Influence of clear-cut logging…Central Oregon Coast Range*"

Water retention in the forest is managed by reservoirs created in pockets of the porous soils in the earth column. This subsurface water moves through the soil in its downward flow to Towhee Creek. **Larger and more frequent rain storms are predicted by climate change models, and it is likely that these will cause greater surface flow in the grove.** The deep trench would likely collect much of the storm water, flood the wetlands below the grove, and create a surge down Towhee Creek, which would bring sediments and pollutants directly into the creek. Remediation of the trench to encourage more surface water infiltration and flood mitigation may be possible, but is beyond the parameters of this project.

Fish productivity is adversely affected by low pH levels[15] in the water, a condition exacerbated by populous stands of firs. Conifer litter and phytochemicals created by conifers increase the acidity, while **Garry oak litter is more alkaline and therefore more conducive to fish production.** One of the historic reasons for the pre-settlement salmon productivity of the Tsolum River system is the chemistry of the oak dominated "prairies" which lined the Tsolum to Headquarters.[16]

F. Recommendations for Managing Encroaching Trees

The definition of "woodlands" generally refers to stands of deciduous or mixed deciduous-conifer trees with a continuous or semi-open canopy.[17] **We are about to lose the Garry oak component of this woodland**. Even though the encroachment of conifers and other competing plants into the Garry oak ecosystem is a natural process**, consider that it is our human activities that have led to remnant Garry oak groves such as Vanier Nature Park to be fewer in number, fragmented and degraded**. **We suggest accepting responsibility for this and intervening now to simulate past processes used by the First Nations such as fire to return the Garry oaks to dominance and health in their area of Vanier Park**. **In place of controlled burning, various manual management methods are available to us.**

To "release" the Garry oaks to sun and improved health we need to:

1) Subordinate those specific overtopping trees that are within one oak height to the south and southwest of the Garry oaks and remove the 62 non-native sweet cherries that are competing at the intermediate to co-dominate level, so the Garry oaks dominate in the main grove (see Figure 5). Invasive removal will be an

[15] Rombough, Peter J. *Effects of Low pH on Eyed Embryos and Alevins of Pacific Salmon*
[16] Maingon, Loys, Personal Communication, March 2022
[17] US Bureau of Land Management. *A Landowner's Guide for Restoring and Managing White Oak Habitats*

ongoing task, and should be initiated before any major tree subordination.

2) Remove the invasive understory such as holly, Daphne, blackberry and ivy that restrict the regeneration of the Garry oaks and other native plants that would naturally associate with the Garry oaks on this site. While native snowberry shrubs are abundant, the herb layer we would expect on this site, such as great camas, white fawn lily, chocolate lily, blue wild rye and California brome are noticeably absent. These plants may regenerate from existing seedbanks once the invasive plants are removed.[18] Low impact invasive control initially requires use of hand tools and many hours of labor. CVN is volunteering to do the lion's share of this work for 3 years. This would reduce the cost to the City, and once most of the existing invasives are removed, future control operations will be less labor intensive and costly to the City.

Invasive removal would be scheduled for the fall, outside nesting season and when the soil is dry. In order to prevent further overtopping of the oaks by other species of trees, native or otherwise, the grove could be cleared of these in a few days' work, regularly whenever the trees grow to a few meters. Invasive control outside the principal oak grove is beyond the scope of this project.

3) Encourage native plants within the seed bank to proliferate on this site. We may choose to actively restore or re-introduce some of the above forb and grass species as well as fruiting shrubs such as bitter cherry, Pacific crabapple and Indian plum in the sunny edges. CVNS currently has a large number of seedling Garry oaks raised from Vanier genotype acorns, which can be used to supplement the lack of oaks less than 60 years of age.

4) Maintain a certain level of disturbance over time such as the continued removal of young conifers and invasive plants that would otherwise shade or reduce Garry oak and native plant health and regeneration.

1. A Strategy for Subordinating the Overtopping Trees

Thinning is a common silviculture practice in which trees are removed to increase the growth of trees that are kept by reducing the competition for water, nutrients, or sunlight. To "release" Garry oaks to more sunlight is to favor the Garry oaks over the conifers that are shading them. The alternative is to continue to do nothing and watch the Garry oaks and their ecosystem values die. **This is a limited time opportunity**. **Given the current rate of mortality in the**

[18]Shackleford, et al., *Ten years of pulling*

grove, we strongly believe this may be the last opportunity to save the Vanier Garry oaks.

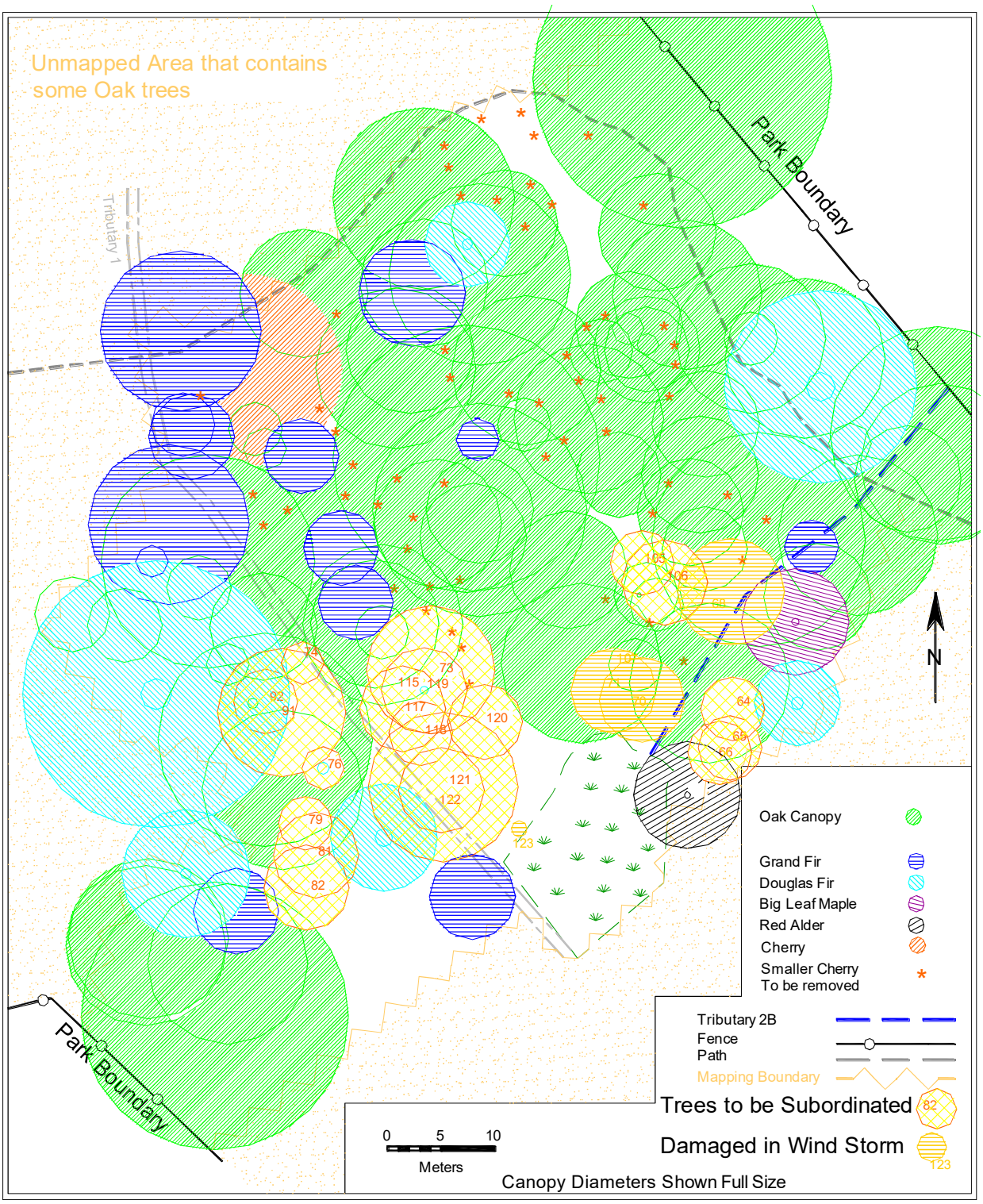


Figure 5 *- Trees in Orange Recommended for Modifying to Habitat Snags*

To thin only the tallest trees that are shading the Garry oak grove from the south and slightly southwest, we have specifically identified 3 Douglas firs and18 grand firs. Two veteran firs (#94 & #108) will not be affected.

To protect the tributaries, the soil and the existing vegetation cover as well as maintain natural infiltration of water and water flow, we suggest subordinating the conifer trees to snags or wildlife trees as opposed to outright removal. Where conifers are designated for subordination, note that there are existing Garry oaks that will continue to provide shade for the tributaries.

Two of the younger and smaller conifers in the 20 DBH range may be removed at the base with minimal impact.

Some of the sweet cherries and conifers that are close to and intertwined with the Garry oaks may be girdled.

The tree work would be phased over the 3-year pilot project. This work should be carried out in the early fall in order to be past bird breeding season, working in a dry period and reduce the risk of sunscald to the Garry oaks.

2. The Value of Snags as Wildlife Trees

It is becoming a more customary practice in the urban forest to reduce hazardous trees to wildlife snags rather than outright removal whenever possible. **Trees that are subordinated to snags continue to function ecologically even after they die**. Standing snags offer food and shelter for wildlife species. Downed deadwood also supplies food for wildlife, is critical for soil health and provides nutrients to streams. There are more than 80 species of wildlife in BC that are dependent on wildlife trees for nesting, feeding, communicating, roosting, sheltering, and overwintering. Tall, large diameter trees that are greater than 50cm DBH are particularly valuable as they last longer but all sizes of snags can be used.[19]

Forest Service Pathologist David Rusch[20] recommended the use of MCH anti-aggregate pheromone which can be stapled to the bole of the subordinated trees and will reduce the risk from Douglas-fir beetle.

[19] BC Parks – Ministry of Environment, *Wildlife/Danger Tree Assessor's Course Workbook*
[20] Rusch, David, Personal communication, 2022

3. Options for Creating Snags from Live Trees[21]

All the methods listed below would remove most of the shade potential of these trees at the outset **yet cause them to die slowly** with the decay process moving from inside the tree to the outside creating a longer lasting snag. **The length of time that snags stand depends on the diameter and species**. Douglas fir snags will last longer than grand firs and larger diameter snags will last longer than smaller diameter snags. Douglas fir snags of DBH 30-50cm size that were created in 2004-2005 in Somenos Garry Oak Protected area in Duncan are still standing and used by wildlife in 2021 (Figure 6).

a) Remove the top ~1/3 (creating a jagged top that looks most natural and helps start the decay process) **of the tree and half the remaining limbs**.

b) Leave the top and remove or shorten most of the side branches.

c) Remove most of the living tree crown but keep at least one or two large branches.

d) Leave the top but remove all the branches

The choice of method would depend on the conifer height, live crown height and the location. A diversity of snag heights and types would be ideal. No wildlife trees taller than 1 tree height of the main path around the oak grove to reduce future risk.

***Figure 6** –Snags in Somenos Garry Oak Reserve*

[21] Washington Dept of Fish and Wildlife, *Snags - the Wildlife Tree*

Girdling is done by removing a 4" belt of inner and outer bark around the trunk. It also creates wildlife snags, but the decay process moves from the outside in. By the time decay has progressed enough for cavity nesters such as woodpeckers to excavate a cavity, the trunk is vulnerable to outright breakage. Girdled trees are susceptible to breakage at the girdle point. A report from girdling done at Mt, Tzouhalem Ecological Reserve in Duncan notes that it took several years for needles to even start to fall. [22] For these reasons we suggest that this technique be used primarily on trees where it is most useful such as those that are close to and intertwined with the Garry oaks or other trees.

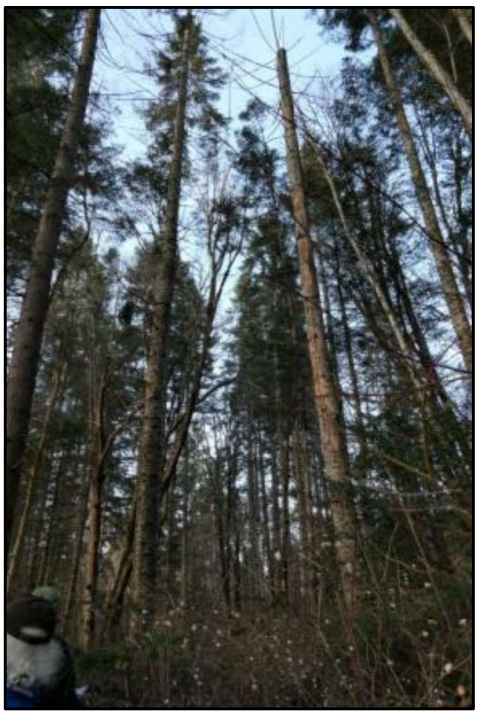


Figure 7 – Trees with Snags in Vanier Park Principal Grove

4. Chipping of Branches and Coarse Woody Debris

Most of the branches removed in the pruning of native species should be removed for chipping but the logs larger than 20 cm can be kept on the ground in the woodland. Placing the logs parallel on the slopes of the main grove will help to slow water runoff, trap sediments as well as nutrients and would create excellent nurse logs in addition to the other benefits already noted for downed wood. In the recent Helliwell Provincial Park restoration project where 81 trees were removed, logs 2 meters long were laid end to end and piled 2 high to define the

[22] Polster, D*. 2014 Mt. Tzouhalem ER Df Removal and Monitoring Report*

park boundary.[23] This strategy could perhaps be used in Vanier to delineate the main path.

It may be beneficial to leave some of the branches of the native species on the forest floor, unchipped. This would allow the plant material to slowly decompose into the soil.

All invasive plant parts would be removed from the site as detailed in the CVN Vanier Forest Garry Oaks Restoration and Stewardship Pilot Project.

G. Recommended Future Actions

a) We have shared this report with KFN, and are happy to receive input from them at any time.

b) Continue Garry oak survey to west of trench with staking and mapping **and recommendations for tree remediation**.

c) Receive permission to remove specified invasives with support of the City of Courtenay, following current best practices.

d) Assist the City of Courtenay in outreach to stakeholders

e) Work with other entities to improve water retention in the wetlands.

f) Consult with the City of Courtenay on assessing CVN reports for Vanier Garry oaks restoration priority as part of the Parks Master Plan review and parks management project scheduling.

g) Monitor the released oaks for epicormic growth, increased twig growth, acorn production and signs of improved health. A control area untouched and with the oaks un-released, could be established in the remnant grove north of the main trail. The CVRD grove behind the arenas could also be used as a reference site with the recent subordination of a grand fir which formerly was shading the grove.

[23] Godfrey, J. *Helliwell Provincial Park Habitat Restoration completed in 2020 for Taylor's Checkerspot Butterfly: Conifer Removal Summary*

h) Begin regular and systematic observations of the grove eco-system through to the fall, and to watch for expected ephemeral perennials, amphibians and invertebrates.

i) Monitor stream flow into Towhee Creek for changes or improvement. Historical data may be available from others.

Conclusion

Vanier Park has a Garry oak ecosystem that is a rare example of a wetland/deep soil ecosystem. This ecosystem is in danger of being lost as conifers, which only recently began to invade the property during the mid-20th Century, overtop the oaks. Garry oaks are shade-intolerant and cannot survive or reproduce in the shade of the taller and faster growing Douglas firs and grand firs. Likewise, stressed Garry oaks produce fewer acorns which do not generate well in shadows, or under dense underbrush.

We have a limited time opportunity to save this rare treasure.

This report offers workable recommendations, in line with accepted arboriculture and forestry practices, that can be incorporated into a three-year plan proposed in the March 2021 CVN report. The recommendations are focused on having a minimally invasive impact to the Vanier Forest.

Comox Valley Naturalists Society supports the protection and restoration of the Garry oaks trees present in the City of Courtenay's Vanier Park. These trees are the largest collection of Garry oaks on public property in the Comox Valley, and a significant remnant of First Nations' cultural practice of keeping Garry oak woodland for the cultivation of food, protection from fire and hunting areas.

In BC and across the Pacific North West community organizations, academics and land managers have cooperated to spearhead Garry oak ecosystem restoration over the last 30 years. University of Victoria Environmental Science researchers have recently created an online geospatial tool to map and collect management information and reports about 120 Canadian Garry oak restoration projects.[24] Currently, there are two projects in the Comox Valley on this map: Helliwell Provincial Park on Hornby Island and the Courtenay River Airpark. Comox Valley Nature is proud to be listed as a collaborator with the City of Courtenay on this project since 1995. Let's put another great Garry oak restoration project on this map.

[24] https://garryoakrestoration.wixsite.com/garryoakrestoration

We welcome feedback on the survey and the recommendations of this report from all interested parties.

Appendix A – Garry Oaks - City of Courtenay

The City of Courtenay has public documents which mention the Vanier Park Garry oaks, including the City's *Urban Forest Strategy*, and the *Parks and Recreation Master Plan.*

1. Urban Forest Strategy[25]

Vanier Park has been named in the Parks and Recreation Plan as a priority to receive a specific management plan. They note that without human intervention firs will eventually shade out the Garry oaks.

"Garry oak are a heritage tree that defines Courtenay's future"

Garry oak forests are part of the "Significant stands and corridors" designation.

Garry oaks with their long lives and dense wood are the best local choice for best carbon storage.

The Garry oak woodlands in the vicinity of Vanier Park are a notable example of significant and sensitive ecosystems that are not under municipal ownership or otherwise protected.

Protect Actions 11h.: Target a permanent protection solution for the Garry Oak ecosystem in the vicinity of G.P. Vanier Secondary School and Vanier Park.

2. Parks Management Plan

"Vanier Park Consider enhancement and protection of this Garry oak Forest"

3. City Bylaw 2850 Consolidated version [26]

"**Protected species**" means a **Garry oak** (Quercus garryana)

"**Protected tree**" means

a) a public tree

[25] City of Courtenay, *Parks and Recreation Master Plan (Final)*

[26] City of Courtenay, *Bylaw No. 2850*

b) a tree of any size within a: Riparian Assessment Area; or Environmentally Sensitive Area (ESA).
c) a protected species over 0.5 meters in height

4. Tsolum River Garry Oak Ecosystem [27]

The larger area of the Tsolum River Garry oak meadows was recommended by the City of Courtenay and accepted for registration with Canada's Historic Places in 2009. Of interest is the photo of the oaks known at this time. **The Vanier Park grove was owned by SD71 and has not been inventoried by the City of Courtenay yet**.

Among other comments in the Registry are the following:

a) "Mature Garry oak trees occurring either in groups or as isolated trees"

b) "Associated native vegetation including other trees and understory shrubs, ferns, wildflowers and grasses"

c) "Native animals including birds, small mammals and butterflies that use Garry oak or other components of the system"

d) "Rich soils that developed with the oaks and which were influenced by First Nations burning"

Based on this collection of city bylaws, published plans and commitments the overall ecological importance of the Garry oak grove in Vanier Park has been well proven.

Appendix B - Parameters for Data Collection

We have been using a template to collect several physical data points, as well as appraising the vigor and health of the trees of note.

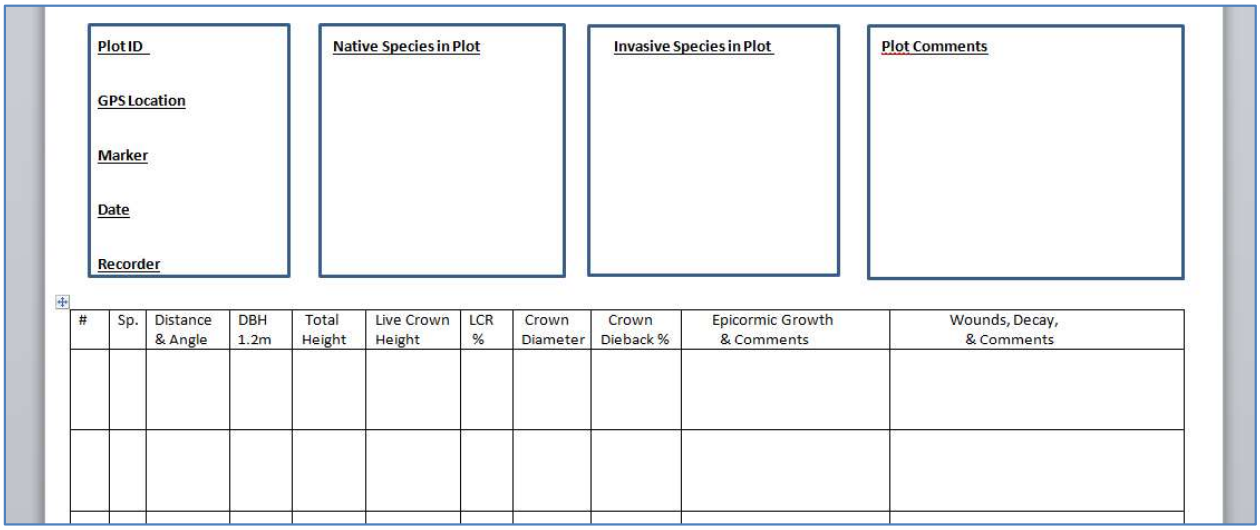
Total Tree Height and Live Crown Height in meters: estimated with a range finder. Live crown height refers to the vertical length of the live section of trunk.

Stem Diameter in centimeters (DBH): Use a DBH tape around the stem at exactly 1.2m above the ground. In later monitoring years this should be repeated at the

[27] Canada's Historic Places, Tsolum River Garry Oak Ecosystem

same time of year. This is a particularly useful measure of how the tree is responding to its growing condition and changes in tree vigor.

Crown diameter (width of crown) in meters: measured with two measurements perpendicular to each other, and averaged. This can be a sign of past crowding or shading.



Plot ID

GPS Location

Marker

Date

Recorder

Native Species in Plot

Invasive Species in Plot

Plot Comments

#	Sp.	Distance & Angle	DBH 1.2m	Total Height	Live Crown Height	LCR %	Crown Diameter	Crown Dieback %	Epicormic Growth & Comments	Wounds, Decay, & Comments

Figure 8 *- Data Collection Form*

Live Crown Ratio (LCR): a ratio of live crown height to tree height. It is calculated by dividing the vertical length of the live crown by the total tree height and multiplied by 100 to arrive at a percentage. The lower the live crown ratio is on the trunk, the larger the ratio.

Crown dieback: Express as a percent of the tree. Crowns with dieback greater than 50% are of concern since stress has clearly occurred to reduce photosynthesis. However, when lack of sun has caused the dieback, oaks can recover from dieback when they are "released" from shading.

Wounds on the stem or evidence of decay. There are of diseases that are specific to the Garry oaks and the other species of trees near or in the grove.

Presence of epicormic growth: Epicormic branches sprout from suppressed buds under the bark on the trunk and branches of Garry oaks. This growth may be triggered by injury such as crown dieback or damage by limb breakage. However, Garry oaks also sprout epicormics growth in response to a sudden increase in sunlight such as "release" from shading. Note if epicormic growth is present on the stem and first-order limbs below the live crown.

Complete data information is available upon request.

Appendix C – Estimating Tree Age[28]

An important characteristic of any tree is its age, but this cannot be accurately figured out without using an invasive measure, such as drilling incremental core bores and counting the rings or cutting cross-sections. This is because an individual's growth rate is only loosely determined by referring to the species average growth rate. Several variables determine its trunk size, including access to sunlight, availability of soil nutrients, moisture levels, root stresses and the tree's vigor and general health. In the case of a grove, the individual ages of the trees in the grove can provide a better understanding of the grove's past and its position in the succession processes, and its health and future.

The International Society of Arboriculture first proposed using DBH and an average growth factor based on the average number of annual rings/cm across the trunk radius to arrive at a rough estimate of tree age. We have been able to count annual rings in three Garry oaks in the grove that were down and cut across the trunk. Using the calculation $\#rings \div trunk\ radius(DBH \div 2)$ we found the average number of annual rings/cm. was 4.9. We used this factor rounded to 5/cm in the following calculation to estimate the age of other Garry oaks in the grove: $radius \times av.\#rings\ per\ cm\ (5) = tree\ age$

[28] Michigan Department of Natural Resources, *How Old is My Tree?*

Appendix D – Tree Location Map

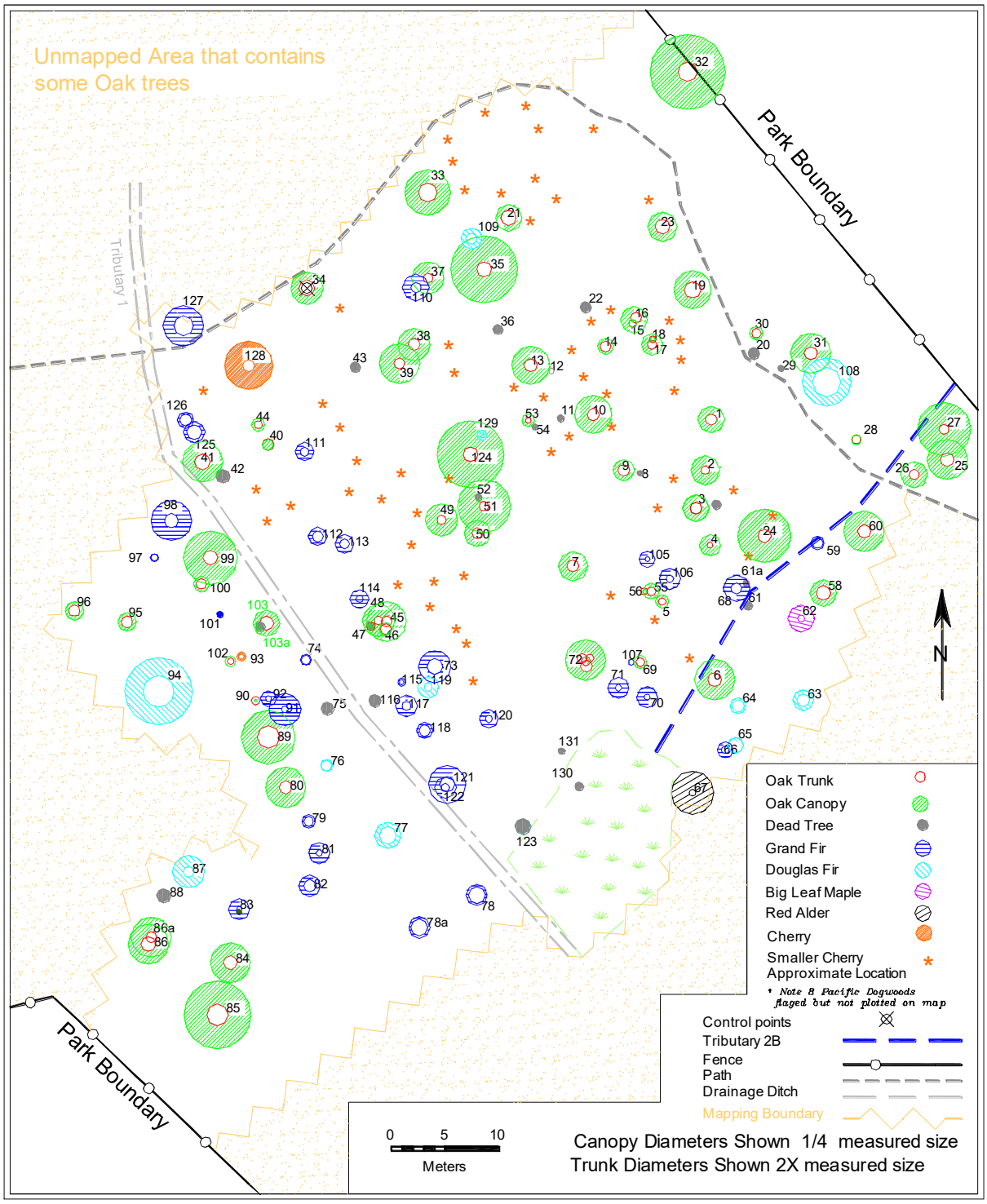


Figure 8 Tree Location Map shows all tree numbers and canopies at 25%

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